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BRYOPHYTE FLORA OF THE SOUTH KURIL ISLANDS (EAST ASIA)

ФЛОРА МОХООБРАЗНЫХ ЮЖНЫХ КУРИЛЬСКИХ ОСТРОВОВ (ВОСТОЧНАЯ АЗИЯ)

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Abstract

The annotated list of 217 hepatics and 380 mosses that were revealed in the South Kuril Islands, including Simushir, Urup, Chirpoi, Iturup, Kunashir, and Shikotan is presented. This is the local bryophyte flora with the highest number of species in Russia. Many species of mosses are reported for the first time from Russia, including *Glossadelphus ogatae, Philonotis turneriana, Leptodictyum mizushimae*, etc. Two new varieties, *Nardia geoscyphus* (De Not.) Lindb. var. *dioica* Bakalin and *Plectocolea flagellata* S. Hatt. var. *kurilensis* Bakalin are described.

Резюме

Приводится аннотированный список мохообразных Южных Курил (Симушир, Чирпой, Уруп, Итуруп, Кунашир, Шикотан) включающий 217 видов печеночников и 380 мхов. Это наиболее богатая по числу видов локальная бриофлора на территории России. Многие виды мхов приводятся впервые для России (*Glossadelphus ogatae, Philonotis turneriana, Leptodictyum mizushimae* и др.), Описаны две новые разновидности: *Nardia geoscyphus* (De Not.) Lindb. var. *dioica* Bakalin и *Plectocolea flagellata* S. Hatt. var. *kurilensis* Bakalin.

KEYWORDS: bryoflora, mosses, hepatics, Kuril Islands, East Asia, phytogeography

Introduction

The Kuril Islands are arranged in a line between the south tip of Kamchatka Peninsula and Hokkaido, extending for ca. 1250 km, in NE – SW direction, linking areas with boreal flora in the north with the temperate area in the south. Many temperate genera of vascular plants have their northern limit within this area. The most conspicuous examples include *Psilotum, Magnolia, Sasa, Toxicodendron, Skimmia, Quercus, Tilia, Phellodendron, Actinidia, Hydrangea*, etc. Naturally, there may also be found no less phytogeographically important although not so well-known examples among the other groups of plants and animals, too; the present study addresses one of these groups, bryophytes, that has maximal diversity in this area compared to the other parts of Russia.

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STUDY AREA

The present paper deals with the bryophyte flora of the South Kuril Islands that includes Shikotan Island of the Lesser Kuril Ridge and Simushir, Chirpoi, Urup, Iturup and Kunashir Islands of the Greater Kuril Ridge (Fig. 1), the total area being 6533 km^2.

The Greater Kuril Ridge started to form during the Paleogene as an underwater ridge and by the Oligocene several groups of volcanoes had emerged from the sea. At the beginning of Quaternary most of islands reached their final shorelines (Bezverkhnii et al., 2002). At the end of Pleistocene the role of explosive volcanism increased, calderas were formed and an extensive ejects of pyroclastic materials occurred. After that time, the volcanic activity declined, although it continues up to now. One of the latest eruptions happened in 1973 from Tyatya Volcano, on Kunashir, where pyroclastic field covered a half-moon area ca. 5 km in diameter around the new crater on SE-facing slope of the main volcano peak.

The Lesser Kuril Ridge belongs to an older geological formation formed much earlier than the Greater Kuril Ridge. The freshest lava and tufa deposits are dated to the middle Miocene (Shantser, 1974). Today all that remains of a once large ridge is the Shikotan Island and a series of small islands nearby. Shikotan is characterized by a denudational-tectonic relief with old and substantially destroyed ancient volcanoes, which elevations rarely exceed now 300 m.

The Kuril Islands have a moderately cold, hyperoceanic climate. February is the coldest month, with average temperatures across the entire archipelago ranging from – -6°C to – -7 °C; the warmest months having +17°C in the southern islands. Annual precipitation is 1400-1500 mm, snow cover reaches to 2.5 meters at the north end of the archipelago. Fog and low cloud cover are frequent summer events, with winter experiencing heavy snowstorms (Atlas, 1994, Barkalov & Eremenko, 2003). Addition information and number of species in the studied islands are provided in Table 1.

VEGETATION[1]

Many botanists who visited the Kuril Islands noted its interesting mosaic of boreal and temperate elements. Species which are well separated in their distribution in continental Asia occur here in close proximity to each others: *Pinus pumila* forms understory in *Quercus* forests, *Magnolia* and *Toxicodendron* are associated with *Picea* and *Abies*. Similarly, among hepatics *Anthelia juratzkana* (occurring mostly in tundra-like communities) grows in mixture with temperate *Metzgeria lindbergii,* among mosses similar examples may include *Thamnobryum* and *Anomodon* with *Hylocomiastrum pyrenaicum*, *Arctoa* with *Trematodon longicollis*, etc.

The principal zonation of vegetation includes from sea level upward the broad-leaved forests, coniferous forests, *Betula ermanii* woods, ranging from tall-tree type to elfin-woods, *Pinus pumila* thickets, and treeless tundroid vegetation and on the northern island true tundra. These types, however, are not rarely mixed up due to local conditions and easy exchange of species from different belts (Barkalov, 2002; Barkalov & Eremenko, 2003).

Broad-leaved forests occur in Kunashir and Iturup below 300 m elev., and are composed of *Quercus crispula, Acer mayrii, Kalopanax septemlobus, Phellodendron sachalinensis, Magnolia hypoleuca*. Numerous lianas occur there: *Actinidia kolomikta, Hydrangea petiolaris, Toxicodendron orientale, Schizophragma hydrandeoides, Vitis coignetiae,* etc. *Sasa* is common in these forests. Bryophytes are relatively few in broad-leaved forests due to relatively dry conditions. Trunks are inhabited by *Rauiella fujisana, Anomodon thraustus, Homalothecium laevisetum*, etc. Hepatics are very rare and only *Lophocolea heterophylla* occasionally grows at the trunk base and on decaying wood here. *Myuroclada maximowiczii* is locally common on soil.

Broad-leaved forests are not extensive in these islands, being confined to southern Kunashir and central Iturup. More commonly they are mixed with *Picea ajanensis*, *Abies sachalinensis*, and occasionally *Taxus cuspidata,* and these mixed forests are rather widespread on more wet slopes, reaching 400(-500) m elev. Depending upon the light availability, the understory is formed by *Sasa* (more open forests), a variety of herbs, not rarely tall herbs, or in a large proportion by ferns and bryophytes.

1 – for illustrations of habitat types see http://arctoa.ru/ru/Archive-ru/18/Kurily-supplement.php; vascilar plan names are according to Cherepanov (1995)

Table 1. Size and elevation of islands and number of bryophytes in their flora.

	Shikotan	Iturup	Kunashir	Urup	Chirpoi	Simushir
Length, km	32	200	123	120	17	59
Width, km	13	27	30	20	17	13
Area, km^2	225	3139	1490	1430	10	228
Highest peaks, m elev.	412	1634	1819	1426	691	1539
Highest peak name	Shikotan Mt	Stokap Vlc	Tyatya Vlc	Vysokaya Mt	Chirpoi Mt	Milna Mt
Number hepatics/mosses	137/181	148/285	151/237	22/32	9/0	47/32

Mixed forests are more humid and have plenty of rotten logs, with numerous hepatics, e.g. common *Calypogeia integristipula, Cephalozia bicuspidata, C. leucantha, C. lunulifolia, Lepidozia reptans, Lophocolea heterophylla*; and more rare species, including *Anastrophyllum michauxii, Blepharostoma minus, B. trichophyllum, Liochlaena subulata, Lophozia silvicola, L. guttulata, Macrodiplophyllum plicatum, Riccardia palmata, Scapania hirosakeinsis, Schistochilopsis cornuta.* Epixylic mosses are diverse and also include some rare species, e.g. *Brachythecium auriculatum, Plagiothecium obtusissimum, Echinophyllum sachalinense,* etc. On trunks occur *Frullania appendiculata, Metzgeria furcata, Neohattoria herzogii, Nipponolejeunea subalpina, Ptilidium pulcherrimum, Radula japonica;* among mosses are rather common *Boulaya mittenii, Anomodon longifolius, Haplohymenium triste, Herzogiella adscendens, Neckera yezoensis, Ulota crispa*, etc.

Fir and spruce forests are more dark and humid compared with mixed forests, and bryophytes are consequently more numerous and diverse there, both on trunks, rotten logs, rocks and soil. No less than half of a hundred hepatic species, most of them being obligate or facultative epixylic, grow here (e.g. *Bazzania japonica, Calypogeia neogaea, C. suecica, Crossocalyx hellerianus, Nowellia curvifolia, Trichocolea tomentella*, etc.), forming an addition to hepatics of mixed forests that mostly occur here as well. Forest floor in coniferous forests on slopes is composed often of herbs, but mossy types, dominated by *Pleurozium, Hylocomium, Pleuroziopsis, Rhytidiadelphus triquetrus, Dicranum majus, Pogonatum japonicum*, etc. occur as well.

In addition to *Abies* and *Picea ajanensis*, there are also forests of another spruce species, *Picea glehnii,* which forms boggy types of vegetation with a continuous carpet of *Sphagnum* spp., *Hylocomium, Pleurozium, Pleuroziopsis, Harpanthus flotovianus*, typical boreal shrublets of Vacciniaceae, and also *Lysichiton camtschatcense*. The epiphytic bryoflora of such *Picea glehnii* forests is rich in temperate East Asiatic species (*Frullania appendiculata, Neohattoria herzogii, Nipponolejeunea subalpina*, etc.).

Larix kurilensis forests have rather limited distribution in South Kurils, and are not rich in bryophytes due to commonly present dense *Sasa* thickets in underbrush.

Tall-tree *Betula ermanii* forests (with trunks to 70 cm in diameter) have a limited distribution in the studied area at the middle elevations, while at the upper elevations this species is represented by a divaricate shrubs 3-4 m high. The bryophyte composition in these elfin woods is mostly boreal (*Sanionia uncinata, Sciuro-hypnum reflexum*), but with some conspicuous East-Asiatic elements, namely *Rigodiadelphus robustus, Dicranum hakkodense* and *Iwatsukiella leucotricha*, growing on tree trunks.

Pinus pumila is widely distributed in the islands starting from sea level, but in Kunashir its pure communities occur mostly above 700 m elev., while in northern Iturup and Simushir they appear at the lowest elevations. Potentially *Pinus pumila* can grow throughout upper elevations, but it is restricted by windy and foggy environment of the summits, as well as by fires due to volcanic eruptions. The only island where *P. pumila* is absent is Shikotan, and this ecological niche is largely substituted by *Juniperus sargentii*. Bryophyte diversity is limited, only few species occur upon thick twigs of *Pinus pumila* where it is growing as a shrub to 2-3 m tall*;* among common species are *Lophocolea heterophylla, Ptilidium californicum* and *P. pulcherrimum*, among rare ones *Bazzania ovifolia, Cephalozia leucantha, Lophozia silvicoloides, Macrodiplophyllum plicatum, Mylia verrucosa, Orthocaulis attenuates*; moss-

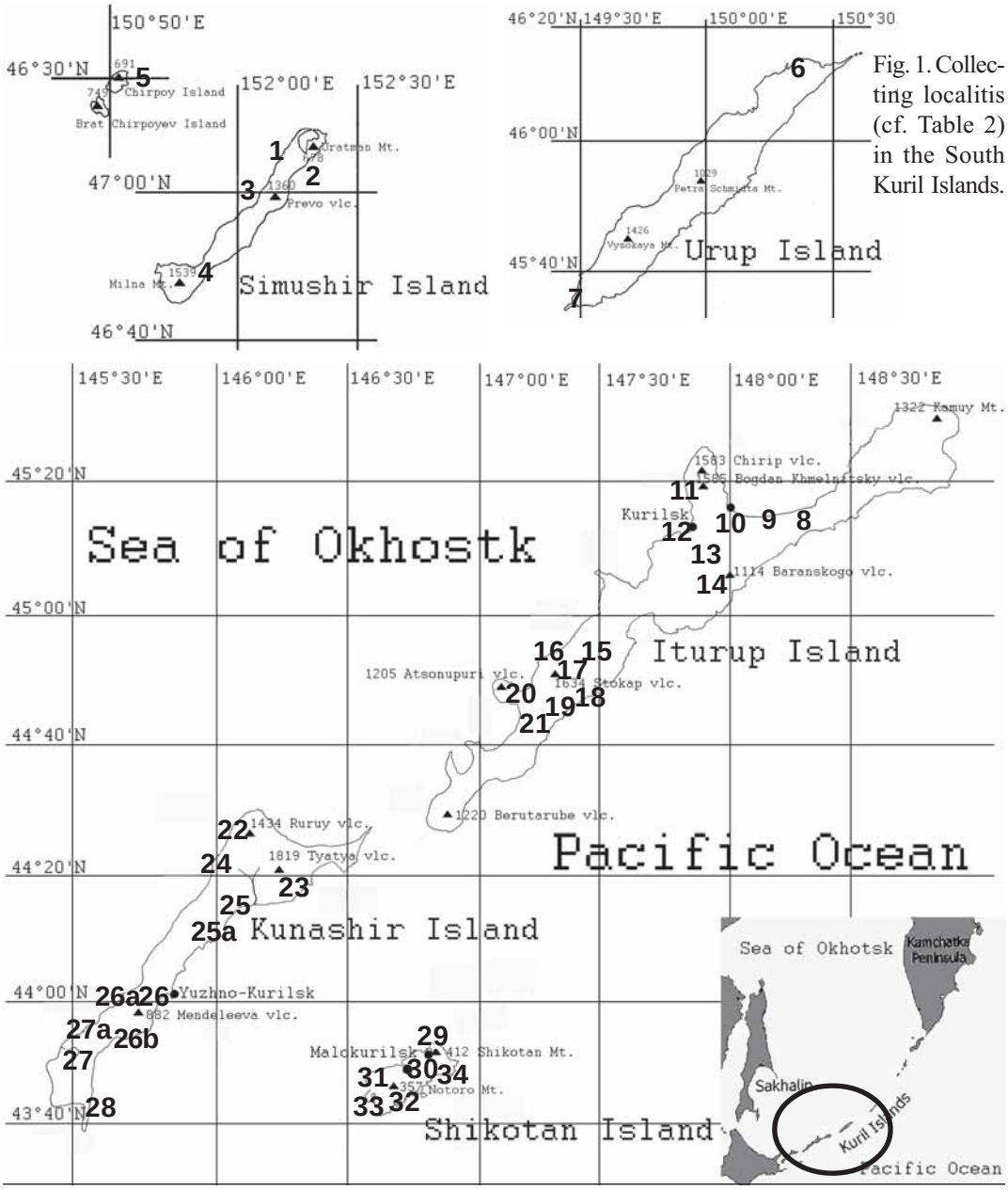

Fig. 1. Collecting localitis (cf. Table 2) in the South Kuril Islands.

es are rare, being represented by *Sanionia uncinata, Sciuro-hypnum reflexum* and a few others. At the upper limit the species does not exceed 1 m tall and almost totally lacks epiphytes other than lichens.

Juniperus sargentii forms specific dense cushions 0.5-0.7 m tall, almost free of vascular plants. The conditions inside them seem to be mild enough and many temperate species are observed only within these 'cushions': *Lejeunea japonica, L. otiana, Macrodiplophyllum plicatum, Metzgeria lindbergii, M. temperata, Radula complanata*, *Isothecium hakkodense, Stereodon plumaeformis,* etc.

Upper treeless areas are covered by so-called tundroids: typical tundra shrublets of *Phyllodoce, Cassiope, Diapensia,* and *Empetrum* are associated here with *Sasa, Eubotryoides* and other temperate elements. Among climatic conditions, tundroids are much affected by volcanic eruption,

Table 2. Collecting localities (cf. Fig. 1); ** – territory of the strict nature reserve "Kurilsky";. * – buffer zone of the strict nature reserve "Kurilsky"; *** – partly protected area of "Malye Kurily" Federal Reserved Area. Collectors number of Bakalin are given for corresponding localities after //.

Simushir Island (Sm)

1 – Malaya Bay, Okhotsk coast; 10-200 m alt.; 47°05'N, 152°08'E
2 – Dushnaya Bay, Pacific coast; 10-30 m. alt.; 47°03'N, 152°10'E
3 – Polyanskogo Cape; 5-30 m alt.; 47°01'N, 152°04'E
4 – Kostochko Isthmus; 10-60 m alt.; 46°50'N, 151°52'E

Chirpoi Island (Chp)

5 – Slopes of Chernogo and Snou Volcanoes; 330-450 m alt.; 46°30'N, 150°52'E

Urup Island (U)

6 – Novokuril'skaya Bay; 5-25 m alt.; 46°13'N, 150°19'E
7 – Van-der-Lind Cape and Kataeva Bay; 100-150 m alt.; 45°35'N, 149°25'E

Iturup Island (I)

8 – Belye Skaly Cliffs (white pumice deposits massif) and Vetrovoy Isthmus; 18-28 m alt.; 45°15'-16'N, 148°13'-18'E; // K-67...69-05
9 – Chyornye Skaly Cliffs (black pumice deposits massif); 15 m alt.; 45°15'N, 148°10'E; // K-66-05
10 – Reydovoye Lake; 20-25 m alt.; 45°14'N, 148°00'E; // K-61...65-05
11 – Western slope of Bogdan Khmelnitsky Volcano, 200-400 m alt.; 45°20'N, 147°52'E; // K-70-05, 71-05
12 – Kurilsk town area; 5-100 m. alt.; 44°55'-45°12'N, 147°35'-50'E; // K-44...47-05, K-9...10-07
13 – Gniloye Lake; 391-425 m alt.; 45°09'N, 147°57'E; // K-48...52-05
14 – Baranskogo Volcano; 193-1114 m alt.; 45°05'-06'N, 147°59'E; // K-53...60-05
15 – Eastern end of Bogatyr Range; 250-1335 m alt.; 44°53'-54'N, 147°27'-30'E; // K-11...16-07, K-35-07
15a – Burevestnik, low elevations; ~44°56'N, 147°36'E
16 – Lower course of Trostnikovaya River; 68-329 m alt.; 44°52'N, 147°20'E; // K-23...25-07
17 – Stokap Volcano; 659-1600 m alt.; 44°51'N, 147°23'E; // K-17...22-07
18 – Plavnaya River; 20 m alt.; 44°46'N 147°26'E; // K-34-07
19 – Jodnaya River; 10 m alt.; 44°44'N 147°22'E; // K-33-07
20 – Atsonupuri Isthmus; 15-39 m alt.; 44°45'-47'N 147°11'-13'E; // K-26...28-07, K-32-07
21 – Tikhoye Lake; 10 m alt., 44°45'N 147°13'E; // K-29...31-07

Kunashir Island (K)

**22 – North-west slope of Ruruj Volcano; 38-1300 m alt.; 44°27'-29'N, 146°05'-08'E; // K-36...42-06
**23 – South-east slope of Tyatya Volcano; 40-1500 m alt.; 44°17'-21'N, 146°15'-18'E; // K-56...60-06
*24 – Prasolova Cape; 20 m alt.; 44°22'N, 146°02'E; // K-43-06
**25 – Saratovskaya River; 21-27 m alt.; 44°15N146°06'E; // K-61...63-06
25a – Filatovka and Chaika; 5-50 m alt.; ~44°56'N, 147°36'E
26 – Yuzhno-Kurilsk town area (including Kislaya and Lesnaya Rivers, Otradnoye settlement, Lagunnoe and Serebryanoye Lakes); 10-100 m alt.; 44°00'-03'N, 145°46'-51'E; // K-50...55-06
*26a – Stolbchatyy Cape, north-western slope of Mendeleev Volcano and between Mendeleevo and Sernovodsk; low elevations; 44°00'N, 145°41-42'E
26b – Mendeleevo Settlement area and Vodopadnyj Cape; 43°55'N, 145°40'E
**27 – Golovnina Volcano's caldera and Ozernaya River; 30-180 m alt.; 43°51'-53'N, 145°27'-32'E; K-44...48-06
**27a – Alekhino settlement area; low elevations; 43°54'N, 145°32'E
*28 – Golovnino settlement area; 20 m alt.; 43°42'N, 145°32'N; // K-49-06

Shikotan Island (S)

29 – Malokurilsk settlement, Otradnaya Bay and Shikotan Mt. areas; 100-400 m alt.; 43°52'N, 146°51'E; // K-36...38-07, K-66-07
30 – Krabozavodsk town area, including Gorobets River and Otradnaya Mt.; 10-290 m alt.; 43°47'-50'N, 146°42'-47'E; // K-39...40-07, K-63...65-07
31 – Ploskaya Mt. area, including Uglovoy Cape; 20-340 m alt.; 43°47'-48'N, 146°35'-38'E; K-47...52-07
32 – Area of Notoro Mt., Tomari Mt., Tserkovnaya and Agatovaya Bays; 15-320 m alt.; 43°43'-47'N, 146°41'-43'E; // K-41...46-07, K-57...62-07
***33 – Ostrovnoy Cape and lower course of Ostrovnaya River; 20-25 m alt.; 43°44'-45'N, 146°39'E; // K-53...56-07
***34 – Aerodromnaya Bay; 0-40 m alt.; 43°48'N, 146°50'E.

often developing on pyroclastic fields. Bryophyte composition is mosaic, with the large proportion being arctic-alpine species (especially common is *Arctoa fulvella*), but usually rather poor due to dry windy conditions.

Late and subpermanent snow-beds occur in Iturup and Kunashir even at moderate elevations, ca. 500 m, due to abundant snow accumulation in winter. Hepatics *Anthelia juratzkana, Calycularia crispula, Cephalozia bicuspidata, Chiloscyphus polyanthos, Cryptocoleopsis imbricata, Diplophyllum albicans, Lophozia sudetica, L. wenzelii, Marsupella adusta, Metzgeria lindbergii, Nardia scalaris, N. unispiralis, Plectocolea infusca, Preissia quadrata, Radula japonica* and mosses *Kiaeria blytti, K. starkei, Andreaea rupestris* are characteristic for these habitats.

Peatlands are relatively rare in these islands, and most of them are formed by *Calamagrostis* with a low occurrence of mosses. However some treeless *Sphagnum* communities with scattered *Carex, Molinia, Rhynchospora* and Ericaceae shrublets occur in a few places in Kunashir and Iturup, being intermediate between bogs and poor fens. In wetlands *Calypogeia muelleriana, Cephalozia bicuspidata, Harpanthus flotovianus, Gymnocolea inflata, Scapania paludicola* are common; more rarely and in oligotrophic conditions only, the following species occur: *Aneura pinguis*, *Calypogeia neogaea, C. sphagnicola, Cephalozia pleniceps, Cephaloziella divaricata, Chiloscyphus polyanthos, Cladopodiella fluitans, Kurzia makinoana, Mylia anomala, Nardia assamica, Pellia endiviifolia, Riccardia aeruginosa, R. multifida, R. latifrons, Scapania irrigua, Solenostoma fusiforme*.

Soil banks along roads, especially in wet and open places, are characterized by diverse species composition: *Aneura pinguis, Blasia pusilla, Blepharostoma trichophyllum, Calypogeia integristipula, Cephalozia bicuspidata, Cephaloziella divaricata, Conocephalum japonicum, Diplophyllum taxifolium, Geocalyx lancistipulus, Fossombronia alaskana, Gymnocolea inflata, Isopaches bicrenatus, Liochlaena subulata, Nardia assamica, N. geoscyphus, N. japonica, N. scalaris, Pellia endiviifolia, Plectocolea infusca, Solenostoma koreanum, S. pseudopyriflorum*. One species, *Diplophyllum andrewsii*, has been found only in these secondary habitats and probably can be considered as a recently introduced from Japan. Species of thermal fields sometimes occur in disturbed places as well, e.g. *Plectocolea vulcanicola* and *Solenostoma fusiforme*.

Extensive areas are covered by pure *Sasa* communities, where *Sasa kurilensis* is the most common; it reaches 1-3(-4) m tall. Almost no bryophytes occur in the dark under its canopy.

The interesting habitats are the thermal fields, banks of hot and warm springs and permanently warmed rocks in the areas of active volcanoes. The most common and most tolerant is probably *Plectocolea vulcanicola,* surviving on ground ca. +50°C near fumaroles and hot sulphur springs. Other hepatics associated with this type of habitat include: *Cryptocoleopsis imbricata, Gymnocolea inflata, Gymnomitrion concinnatum, Lophozia sudetica, Marchantia latifolia, Marsupella tubulosa, Mylia verrucosa, Nardia assamica, N. compressa, N. subclavata, Pellia neesiana, Protolophozia debiliformis*. Occasionally *Calypogeia arguta* and *Marchantia paleacea* were found near thermal fields. Mosses observed in most warm places include *Funaria hygrometrica, Leucobryum juniperoideum, Philonotis turneriana, Trematodon longicollis, Bryum argenteum*.

HISTORY OF EXPLORATION

Study of liverwort flora of South Kurils was started by Horikawa (1935) who reported *Diplophyllum plicatum* Lindb. (= *Macrodiplophyllum plicatum*) for Kunashir. Subsequent publications brought rather limited additions (Horikawa, 1940a, 1940b; Korotkevich, 1952; Abramova, 1960; Ladyzhenskaya, 1964; Noguchi, 1967; Abramova & Abramov, 1975; Blagodatskikh & Duda, 1987). Altogether they include 53 species (Nyushko, Potemkin, 2005), which is hardly a comprehensive account of this area.

Our exploration of liverworts in the South Kuril Islands was started in 2005, when Bakalin has visited Iturup. Later on, he collected on Kunashir Island in 2006 and on Iturup and Shikotan Islands in 2007. Some interesting findings were reported earlier (Bakalin, 2007a, 2007b). At the same time, Nyushko studied bryoflora of the Middle and South Kuril Islands including Urup and Simushir Islands in 2006-2008. Also, in 2006, she collected bryophytes on Shikotan and in 2008 on Iturup. Some results of these studies are published (Nushko & Potemkin, 2007a,

2007b; Nushko, 2008; Nushko, 2009a, 2009b). In addition, she revised old and mostly unidentified collections of hepatics from Urup, Iturup, Kunashir and Shikotan in LE (collectors: D.P. Vorob'ev, E.Z. Koval', I.D. Kil'dyushevskij, K.B. Gorodkov, etc.) and these data are also presented in this paper. The current list is based on the identification of 2856 specimens, which reveals 217 species in the flora of these six islands. In the present paper the section on liverworts is written by Bakalin and Nyushko.

The early period of exploration of moss flora of South Kurils was overviewed by Bardunov & Cherdantseva (1984), who started their own studies when only a little more than 50 species of mosses were known from the area. Their collections were gathered in 1978 and 1980 by Bardunov in Kunashir and Iturup, and in 1978 by Cherdantseva in Kunashir and Shikotan and as a result they published an annotated list of 228 species, including some earlier published data (Bardunov & Cherdantseva, 1984). Species are characterized by habitats, frequency and list of localities is given for most of them, excepting the species dominating throughout the territory. Later on, the only one paper of Higuchi & Sato (2004) was published, who reported 17 species from Kunashir.

New moss collections were made on Iturup and Shikotan by Bakalin in 2005 (269 specimens) and 2007 (599 specimens) and several dozen specimens were added from southern islands also by Nyushko. Although this material was collected in the course of hepatic exploration, these collections were intentionally made in order to present the whole diversity of mosses, and thus nothing surprising that they include many new species for these islands, as well as for Russia in a whole. In addition, in 2006 Ignatov collected in Kunashir 1100 moss specimens. Of three other islands, Chirpoi has no data on mosses, and for Simushir and Urup a number of mosses were identified among collections of Nyushko and also in old unidentified collections kept in LE. A number of collections of Bardunov and Cherdantseva were revised, and 11 species are now excluded as incorrectly identified. However, the number of species increased considerably, up to 380 species (2487 specimens studied, not counting confirmed identifications of Bardunov's and Cherdantseva's collections in VLA and IRK). In the present paper the section on mosses is written by Ignatov, Ignatova and Cherdantseva.

Hepatics and Anthocerotae

After the species the data on the presence of reproductive organs is given, using the following abbreviations: antheridia (ant.), archegonia (arch.), gemmae (gemm.), perianths (per.), sporophytes (spor.), or juvenille sporophytes (spor. juv.). Then the elevation range is indicated and localities are enumerated following their numbering in Table 2. After that, the habitat characteristic follows and the associated species are listed. At the end of annotation one specimen from each collecting point is cited. In some cases the literature citations are given if the mentioned species is not collected in the corresponding locality. The most of specimens are kept in VLA (started with "K-" in collector number), other are in LE and SAK.

Anthocerotophyta

Phaeoceros carolinianus (Michx.) Prosk. – spor. – 20 m – **S:** 33 – One collection: track of old road in *Alnus-Salix* thickets with cover of high herbs. **S:** K-55-3-07.

Marchantiophyta

Alobiellopsis parvifolia (Steph.) R.M. Schust – 420 m – **I:** 13 **–** Fine-grained soil in hollow of *Carex-Juncus*-moss bog near lake shore. **I**: K-51-14-05.

Anastrophyllum michauxii (F. Weber) H. Buch – per., ant. – 15-300 m – **K:** 22, 26 – Decaying wood in *Picea-Betula* inundated forest and *Abies sachalinensis* forest with admixture of broad-leaved trees. Commonly with epixylous species such as *Blepharostoma trichophyllum*, *Crossocalyx hellerianus*, *Lepidozia reptans*, *Lophozia guttulata*, *Mylia verrucosa*, *Nowellia curvifolia*, *Ptilidium pulcherrimum*, *Scapania hirosakiensis*. **K:** K-37-20-06, K-50-2-06

Aneura cf. *maxima* (Schiffn.) Steph. – 10-40 m – **S:** 30, 33 – Decaying wood in *Picea-Abies* forest with admixture of *Taxus*; between patches of *Eriophorum* and *Eleocharis* in wet depression in windy community of *Sasa* and small herbs. In pure mats or with *Lepidozia reptans*, *Macrodiplophyllum plicatum*, *Scapania hirosakiensis*. **S:** K-40-15-07, K-54-11-07.

A. pinguis (L.) Dumort. – arch. – 10-500 m – **Sm:** 1, 4**; Chp:** 5; **I:** 10, 12, 13, 20, 21**; K:** 22, 23, 29b, 27, 27a; **S:** 30, 31, 32, 33, 34 – Hollows in different (mainly with sedges dominancy) boggy communities; banks of streams in forested and forestless areas; fine-grained soil in wet cliff crevices of tufa cliffs; wet

cliffs near high waterfalls; decaying wood in coniferous forests with admixture of broad-leaved trees. In pure mats or associated with *Bazzania ovifolia*, *Blepharostoma trichophyllum*, *Cephalozia leucantha*, *Conocephalum conicum*, *C. japonicum*, *Crossogyna autumnalis*, *Scapania apiculata*, *Lepidozia reptans*, *Liochlaena subulata*, *Lophocolea heterophylla*, *Lophozia guttulata* on decaying wood. In overwetting habitats with *Cephalozia bicuspidata*, *Jungermannia pumila*, *Pellia neesiana*, *Plagiochila porelloides*, *Riccardia* cf. *chamaedryfolia*. **Sm:** C-41-07, C-28.3-07, **Chp:** Chp-3-08, **U:** U-2.1-07, U-2-08, **I:** K-46-2-05, K-28-4-07, K-31-4-07, It-1-08, It-20-08, **K:** K-40-6-06, K-47-1-06, K-56-2-06, "6-7.X.1968, K.B. Gorodkov (LE)", **S:** K-39-5-07, K-48-13a-07, K-54-8-07, K-57-1-07, K-61-10-07, Sh-23.1-06, Sh-25-06.

Anthelia juratzkana (Limpr.) Trev. – per., ant. – 20-1600 m – **Sm:** 1, 2, 4; **U:** 6, 7; **I:** 14, 15, 16, 17, 20; **K:** 22, 23, 27; **S:** 29, 30, 31, 32, 34 – Crevices in cliffs near sea coast, river-sides, outliers in full sun, old clinkers, crater's cliffs, fine-grained soil along streams in upper altitude; stones in snow-bed hollows; spots of bare ground in wind-stressed meadow on slope to sea. In pure mats, but very frequently with other liverworts, usually with *Cephalozia bicuspidata*, *Cephaloziella uncinata*, *Gymnomitrion concinnatum*, *Lophozia savicziae*, *L. sudetica*, *Nardia geoscyphus*, *N. scalaris*, *N. unispiralis*. **Sm**: C-28.1-07, C-42-07, C-18-07, **U**: U-2.1-07, U-2-08, **I:** K-58-11a-05, K-66-2-05, K-15-21-07, K-16-7-07, K-23-1-07, **K:** K-37-38a-06, K-46-13a-06, K-58-2-06, **S:** K-38-8-07, K-42-16-07, K-49-10-07, K-60-7-07, K-65-19-07, Sh-015-06.

Apometzgeria pubescens (Schrank) Kuwah. – 50-110 m – **K:** 22; **S:** 31 – Decaying wood, boulders, soil along streams in coniferous and mixed forests, mainly in shady places. In pure mats or rarely with *Porella grandiloba*, *Radula japonica*. **K:** K-36-4-06, K-42-9-06, **S:** K-50-45-07.

Barbilophozia barbata (Schmid. ex Schreb.) Loeske – 1170 m – **I:** 15 – One collection: crevices between boulders in nival dwarf-shrub-grass tundra. **I:** K-16-41-07. In the sample mod. *bilobifolia* prevailed.

B. hatcheri (A. Evans) Loeske – 400 m – **I:** 13 – One collection: soil in *Betula ermanii* forest with thick underbrush of *Pinus pumila* and *Sasa* in stream source. **I:** K-48-1-05.

Bazzania bidentula (Steph.) Steph. – 410 m – **I:** 14 – One collection: vertical side of shaded boulder in *Sorbus-Betula* forest with underbrush of *Pinus pumila*, *Sasa* and *Calamagrostis*. **I:** K-56-17-05.

B. japonica (Sande Lac.) Lindb. – 10-180 m – **I:** 20; **K:** 26, 27; **S:** 30 – Decaying wood and bases of *Picea* in *Picea–Abies* forests. In pure mats or with common epixylous species such as *Blepharostoma trichophyllum*, *Calypogeia integristipula*, *Lepidozia reptans*, *Mylia verrucosa*, *Scapania hirosakiensis*. **I:** K-26-14-07, **K:** K-45-20-06, K-50-7a-06, **S:** K-40-4-07, "17.X.1949, N.F. Mikhajlova (LE)".

B. ovifolia (Steph.) S. Hatt. – 10-400 m – **I:** 10, 12, 15, 18, 20, 21; **K:** 22, 23, 25, 26, 27; **S:** 29, 30 (Korotkevitch, 1952), 31, 32, 33, 34 – Very common species in lower altitude level, growing on decaying wood, trunks of *Taxus*, bases of *Abies* and *Larix* trees, boulders in coniferous forests, sometimes with admixture of leaved trees; living branches of *Pinus pumila* in dense thickets; ground cover in forests and wind stressed tundroids; wet or dry shaded or exposed crevices in cliffs near sea coast and in outliers. In pure mats or commonly with *Calypogeia integristipula*, *Crossogyna autumnalis*, *Diplophyllum taxifolium, Frullania appendiculata,-Lepidozia reptans*, *Lophocolea heterophylla*, *Macrodiplophyllum plicatum*, *Metacalypogeia cordifolia*, *Metzgeria lindbergii*, *Mylia verrucosa*, *Neohattoria herzogii*, *Nowellia curvifolia*, *Ptilidium pulcherrimum*, *Schistochilopsis cornuta*, etc. **I:** K-45-15-05, K-65-5-05, K-27-9-07, K-31-1-07, K-34-4-07, K-35-13-07, **K:** K-36-7-06, K-47-7-06, K-50-6-06, K-53-4b-06, K-56-3-06, K-61-1-06**, S:** K-36-11-07, K-41-1-07, K-47-20-07, K-50-25-07, K-56-12-07, Sh-14-06.

B. tricrenata (Wahlenb.) Lindb. – 15-400 m – **I:** 9, 12; **K:** 27; **S:** 29 – Cliff crevices, boulders and ground cover, mainly in shady places, both in forested and forestless areas (wind stressed tundroid communities). In pure mats, more rarely with *Blepharostoma trichophyllum*, *Diplophyllum taxifolium*, *Lophocolea heterophylla*, *Pedinophyllum truncatum*, *Sphenolobus minutus*. **I:** K-45-22-05, K-66-3-05, **K:** K-46-11-06, **S:** K-66-7-07.

B. trilobata (L.) S. Gray – 20-420 m – **I:** 13, 15; **K:** 26a, 27, **S:** 32 (Duda, 1978) – Living branches of *Pinus pumila* in *Pinus-Sasa* dense thickets; *Sphagnum* mats in swampy open *Larix* forest with cover of *Sphagnum* and *Carex*; decaying wood and bases of trees in *Picea glehnii* forest. In pure mats, once with *Calypogeia integristipula*. **I:** K-50-1-05, K-35-4-07, **K:** K-45-17-06, "13.IX.1964, E.I. Kil'dyushevskiy (LE)".

Blasia pusilla L. – gemm. – 5-50, 400 m – **U:** 6; **I:** 8, 9, 11, 12; **K:** 24, 26; **S:** 32 – Wet cliffs near streams; crumble slopes near watercourses, along sea coast, in pumice and tufa deposits; clayish wet roadsides. Mainly in pure mats, rarely with *Nardia assamica*, *Plectocolea vulcanicola*. **U:** U-4-08, **I:** K-44-23-05, K-66-8-05, K-67-4-05, K-71-3b-05, **K:** K-43-1a-06, K-55-7-06, **S:** K-61-19-07, Sh-044-06.

Blepharostoma minus Horikawa – 15-300 m – **I:** 12, 20; **K:** 22, 23, 27; **S:** 30, 31, 32, 33 – Decaying wood in coniferous and mixed forests; cliff crevices near

streams in forested areas and on sea coast, in shady places. In pure mats or often with other hepatics, such as *Cephalozia lunulifolia*, *Crossocalyx hellerianus*, *Lepidozia reptans*, *Lophocolea heterophylla*, *Metzgeria lindbergii*, *Mylia verrucosa*, *Nipponolejeunea subalpina*, *Odontoschisma denudatum*, *Scapania hirosakiensis*, etc. **I:** K-10-24-07, K-26-17-07, **K:** K-36-6-06, K-46-7a-06, K-56-7b-06, **S:** K-40-33-07, K-49-6-07, K-54-31-07, K-61-2-07.

B. trichophyllum (L.) Dumort. var. *trichophyllum*[1] – per. – 10-1450 m – **Sm:** 1, 2, 3; **I:** 9, 10, 11,12, 15, 16, 17, 20; **K:** 22, 25, 26, 26b, 27, 27a; **S:** 29, 30, 31, 32, 34 – Decaying wood, boulders, ground cover on steep slopes in coniferous and mixed forests; rock outcrops, coastal cliffs, outliers, canyons in forested and tundroid areas; crevices in tufa and pumice deposits; outliers in tundroid belt; crater's cliffs. In pure mats or with many hepatics, most frequently with *Bazzania ovifolia*, *Calypogeia integristipula*, *C. muelleriana*, *Cephalozia leucantha*, *Diplophyllum taxifolium*, *Lepidozia reptans*, *Liochlaena subulata*, *Lophocolea heterophylla*, *Lophozia guttulata*, *Mylia verrucosa, Nowellia curvifolia*. **Sm:** C-50-07, C-15.1-07, C-44.2-07, **I:** K-45-21-05, K-65-12-05, K-66-14a-05, K-71-5-05, K-15-14-07, K-19-19-07, K-23-6-07, K-32-15-07, **K:** K-36-17-06, K-47-12-06, K-50-7b-06, K-61-1b-06, "18.VII.1951, Kusakin (LE), **S:** K-37-18-07, K-40-7-07, K-42-17-07, K-50-13-07, Sh-040.2-06, Sh-15.1-06.

Calycularia crispula Mitt. – ant. – 200-1200 m – **I:** 16; **K:** 22, 23; **S:** 29, 32 – wet crevices of cliffs at sea coast, river canyons, outliers in forested and forestless areas; fine-grained soil and stones covered by alluvial ground along temporary streams, snow-bed hollows, cliffs in tectonic breakage in forestless belt. In pure mats or with *Blepharostoma trichophyllum*, *Cephalozia bicuspidata*, *Diplophyllum taxifolium*, *Lophozia ventricosa* var. *ventricosa*, *Nardia scalaris*, *Scapania parvitexta*. **I:** K-24-6-07, **K:** K-37-28-06, K-58-3a-06, **S:** K-42-13-07, K-66-5-07.

Calypogeia arguta Nees & Mont. – 50-400 m – **I:** 14, 15; **K:** 22 – Wet peaty and clayish ground along thermal stream in hydrosolfatar field; fine-grained soil under *Sasa* thickets. **I:** It-28.1-08, K-12-18-07, **K:** K-41-5a-06.

C. azurea Stotler & Crotz – gemm. – 40-300, 1170 m – **I:** 14, 15, 20; **K:** 26 **(**Korotkevich, 1952), **S:** 29 (Duda, 1978), 30 (cf.) – Decaying wood in *Abies* forest with admixture of broad-leaved trees and cover of *Sasa*; crevices between boulders in nival dwarf-shrub-grass tundra; wet soil along thermal stream. In pure mats or (in tundra belt) with *Cephalozia bicuspidata*, *Nardia scalaris* ssp. *harae*. **I:** It-28.1-08, K-16-49-07, K-26-37-07, **S:** "17.X.1949, N.F. Mikhajlova (LE)".

C. integristipula Steph. – gemm. – 10-1220 m – **Sm:** 2; **I:** 10, 12, 13, 14, 16, 17, 20; **K:** 22, 25, 26, 27, 27a; **S:** 29, 30, 31, 32, 34 – One of the commonest species, growing on wet roadsides, litter, decaying wood, base of trunks, boulders and rocks in coniferous, mixed and elfin forests; wet rocks and fine-grained and peaty soil banks near streams (also sulphur ones), waterfalls, rivers in forested areas; sea coast cliffs; hummocks in boggy areas and tundroid communities. In pure mats or with *Blepharostoma trichophyllum*, *Cephalozia bicuspidata*, *C. leucantha*, *Lepidozia reptans*, *Liochlaena subulata*, *Lophocolea heterophylla*, *Scapania hirosakiensis*, *S. diplophylloides*, *Schistochilopsis cornuta*, *S. incisa*, etc. **Sm:** 15.1-07, **I:** K-45-61-05, K-48-14-05, K-55-1-05, K-61-12-05, K-69-2b-05, K-17-12-07, K-23-14-07, K-26-11-07, It-5-08, **K:** K-36-5-06, K-45-2a-06, K-50-1-06, K-61-2-06, "18.VII.1951, O.G. Kusakin (LE)", **S:** K-36-37-07, K-40-32-07, K-50-41-07, Sh-27-06.

C. muelleriana (Schiffn.) Müll. Frib. – 10-500 m – **Sm:** 1, 2; **U:** (Kojosan Mt.); **I:** 13, 14; **K:** 22, 25, 28, 26b, 27; **S:** 32 – Bases of trees, decaying wood in coniferous and mixed forests; fine-grained soil along slopes to streams; hummocks in *Carex*-dwarf shrub-moss mires and tundroid communities. In pure mats or with *Blepharostoma trichophyllum*, *Cephalozia bicuspidata*, *C. lunulifolia*, *Diplophyllum taxifolium*, *Lepidozia reptans*, etc. **Sm:** C-15.1-07, C-54.2-07, **U:** "25.VII.1946, Vorob'ev (LE), **I:** K-48-9-05, K-56-9a-05, It-20-08, **K:** K-36-5-06, K-47-4a-06, K-51-2-06, K-63-7-06, "30.VII.1965, O. Blum (LE)", **S:** K-62-16-07.

C. neesiana (C. Massal. & Carestia) Müll. Frib. – gemm. – 20-140 m – **I:** 10, 20; **K:** 22, 26, 27; **S:** 29 (Duda, 1978), 30 (Korotkevitch, 1952), 32, 34 – Decaying wood in *Abies-Picea* forest with admixture of *Acer, Quercus* and *Tilia* and in *Abies* forest; fine-grained ground in tufa cliffs crevices (also splashed by water of the lake). In pure mats, among mosses or with *Bazzania ovifolia*. **I:** K-28-3-07, It-4.2-08, **K:** K-36-7-06, K-45-23-06, "13.IX.1964, E.I. Kil'dyushevskij (LE)", **S:** Sh-043-06.

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[1] – species of *Blepharostoma* may be keyed by the following key (derived from H. Inoue, 1974):

— Segments of leaves and underleaves distinctly to moderately incurved, obtuse at apex; margins of segments more or less crenulate due to dilated transverse walls; perianth pluriplicate, hardly contracted to the mouth *B. minus*

— Segments of leaves and underleaves obliquely to rather widely patent, never incurved, attenuate to acute toward apex; margins of segments smooth or sometimes only slightly crenulate; perianth long cylindrical, contracted to the mouth *B. trichophyllum*

C. neogaea (R.M. Schust.) Bakalin – 10-500 m – **I:** 13, 14, 20; **K:** 22, 23, 25, 26, 26b; **S:** 30, 32, 33 – Decaying wood in coniferous forests; hummocks in different types of mires; fine-grained soil along streams in forested areas. In pure mats or with *Cephalozia bicuspidata*, *C. lunulifolia*, *Geocalyx* cf. *graveolens*, *Kurzia makinoana*, *Mylia anomala*, *Schistochilopsis incisa*, *Solenostoma fusiforme*. **I:** K-52-3-05, K-54-8-05, K-28-11-07, **K:** K-40-12-06, K-51-3-06, K-52-8-06, K-56-8a-06, K-63-6-06, "6.10.1968, K.B. Gorodkov (LE)", **S:** K-40-6-07, K-54-24-07, K-57-4-07, Sh-041.1-06.

C. sphagnicola (Arnell & J. Perss.) Warnst. & Loeske – 20-420 m – **I:** 10, 13, **S**: (Horikawa,1940) – Hummocks in different types of moss mires. In pure mats or with *Cladopodiella fluitans*, *Mylia anomala*. **I:** K-51-18-05, K-63-15-05.

C. suecica (Arnell & J. Perss.) Müll. Frib. – gemm. – 20-300 m – **K:** 22, 25, 26; **S:** 29, 32 – Decaying wood in coniferous and mixed forests. In pure mats or with epixylous *Blepharostoma trichophyllum*, *Calypogeia integristipula*, *Cephalozia leucantha*, *C. lunulifolia*, *Lepidozia reptans*, *Lophocolea heterophylla*, *Lophozia guttulata*, *Odontoschisma denudatum*, *Riccardia palmata*, *Scapania hirosakiensis* etc. **K:** K-37-8a-06, K-40-1-06, K-55-2-06, K-61-5-06, **S:** K-37-23-07, K-57-15-07, Sh-041.1-06.

Cephalozia bicuspidata (L.) Dumort. – per., ant., spor. – 10-1500 m – **Sm:** 1, 2, 4; **Chp:** 5; **U:** 7; **I:** 8, 11, 13, 14, 15, 17; **K:** 22, 23, 24, 25, 26, 27; **S:** 29, 30, 32, 33, 34 – Eurytopic species, occupies many periodically wetted substrates in different habitats: decaying wood in coniferous and mixed forests; fine-grained ground in disturbed areas near watercourses, roadsides; ridges and hollows in swampy *Larix* forests, mires, tundroid wind-stressed communities, mountain tundras, boggy forests and elfin forests; wet cliff crevices in different altitudinal belts including sea coast and volcanic outliers; banks or submerged in streams (including sulphur and thermal ones); snow-bed communities; old clinker in upper altitude. Sometimes in pure mats, but more frequently with greater part of hepatic species, more commonly with *Anthelia juratzkana*, *Blepharostoma trichophyllum*, *Calypogeia muelleriana*, *C. neogaea*, *Cephalozia leucantha*, *C. lunulifolia*, *Cladopodiella fluitans*, *Gymnocolea inflata*, *Mylia anomala*, *Nardia assamica*, *N. hiroshi*, *N. japonica*, *N. scalaris*, *N. subclavata*, *Pleurocladula albescens*, *Scapania paludicola*, *S. parvitexta*, *Solenostoma pseudopyriflorum*, etc. **Sm**: C-15.1-07, 28.1-07, C-54.2-07, **Chp:** Chp-1-08, **U:** U-2.3-07, **I:** K-52-3-05, K-55-6-05, K-69-2-05, K-70-2a-05, K-11-4-07, K-19-2-07, K-35-5-07, It-15-08, **K:** K-37-28-06, K-43-5a-06, K-45-8a-06, K-50-10-06, K-56-8a-06, K-63-7-06, **S:** K-38-42-07, K-40-6-07, K-42-9-07, K-48-13a-07, K-54-24-07, Sh-17-06.

C. connivens (Dicks.) Lindb. – 180 m – **S:** 32 – One collection: decaying wood in *Picea glehnii* forest. **S:** K-45-18a-06.

C. leucantha Spruce – per. – 10-500, 1200 m – **I:** 10, 12, 13, 14, 20; **K:** 22, 23, 25, 26, 26b, 27, 27a; **S:** 30 – Decaying wood and wet moss mats in floor of coniferous, mixed and *Betula* forests; lower branches of *Pinus pumila* in elfin forests; wet cliffs (where growing both on rocky material and dying moss mats), especially near waterfalls and streams (also sulphur spring) in forested belt; once collected in upper altitude (1200 m alt.) in wet cliff crevices of old volcanic cone. In pure mats or on decaying wood with *Bazzania ovifolia*, *Blepharostoma trichophyllum*, *Calypogeia integristipula*, *Calypogeia muelleriana*, *Calypogeia suecica*, *Cephalozia lunulifolia*, *Crossocalyx hellerianus*, *Lophozia guttulata*, *L. silvicola*, *L. lacerata*, *Mylia verrucosa*, *Scapania hirosakiensis*, *Schistochilopsis cornuta*, etc. **I:** K-48-10a-05, K-56-4b-05, K-65-19-05, K-27-29-07, It-14.2-08, **K:** K-37-7-06, K-45-21-06, K-50-10-06, K-56-4a-06, K-61-5-06, "30.VII.1965, O. Blum (LE)", "6-7.X.1968, K.B. Gorodkov (LE)", **S:** K-40-9-07.

C. lunulifolia (Dumort.) Dumort. – arch., ant., per. – 10-500 m – **Sm:** 1; **I:** 10, 12, 13, 14, 20; **K:** 22, 23, 25, 26, 26b, 27, 27a; **S:** 29, 30, 31, 32, 34 – Decaying wood and base of trees in coniferous, mixed and *Betula* and *Sorbus* forests; over mosses and on bare soil along slopes of streams in tundroid and forested areas; cliffs near watercourses. In pure mats or with many hepatics, mainly with *Bazzania ovifolia*, *Blepharostoma minus*, *B. trichophyllum*, *Calypogeia integristipula*, *C. neogaea*, *C. suecica*, *Lepidozia reptans*, *Liochlaena subulata*, *Lophozia guttulata*, *Mylia verrucosa*, *Odontoschisma denudatum*, *Orthocaulis attenuatus*, *Scapania hirosakiensis*. **Sm:** C-54.2-07, **I:** K-45-64-05, K-48-9-05, K-56-13a-05, K-65-8-05, K-27-14-07, K-28-11-07, It-15-08, **K:** K-36-10-06, K-45-19-06, K-53-2-06, K-56-8a-06, K-61-5-06, "6.X.1968, Gorodkov (LE)", "30.VII.1965. O. Blum (LE)", **S:** K-37-18-07, K-40-5-07, K-48-22-07, K-49-46-07, K-57-9-07, Sh-041.1-06.

C. otaruensis Steph. – per., ant., arch. – 10-400 m – **I:** 9, 13; **S:** 32 – crevices in wetted cliffs in wind-stressed tundroid communities and cliffs shaded by *Alnus* along sea coast; fine grained soil along slope to stream in full shade of *Sasa* in *Betula ermanii* forest. In pure mats or with *Diplophyllum albicans*, *D. taxifolium*, *Kurzia makinoana*, *Scapania curta*. **I:** K-48-14-05, K-66-17-05, **S:** K-42-23-07.

C. pachycaulis R.M. Schust. – ant. – 100-150, 1000-1170 m – **I:** 15, 17; **K:** 22, 26, 27 – Fine-grained soil along rivulet valley in tundroid community in upper altitude or in the same habitats in forest belt near sulphur springs; wet snow-bed communities and cliffs of tectonic breaking in forestless area. In pure mats

or with *Cephalozia bicuspidata*, *Gymnocolea inflata*, *Marsupella sphacelata*, *Pellia neesiana*, *Pleurocladula albescens*, *Scapania diplophylloides*. **I:** K-16-1-07, K-21-2-07, **K:** K-38-5a-06, K-45-9b-06, K-52-13-06. This originally described from North America and still poorly known species was recently recorded for Eurasia (Konstantinova et al., 2004). Its distribution is incompletely known and needs further study. Morphologically it is closely related to Japanese *Cephalozia hamatiloba* Steph.

C. pleniceps (Austin) Lindb. – arch., ant. (autoicous) – 10-190 m – **I:** 14; **K:** 26, 27 – Decaying wood in *Picea glehnii* forest; over moss mats hanging above hot stream steamed with H_2O and SO_2, as well as wet fine-grained soil with crystalline sulphur in the steam of hot water; hollows between *Sphagnum* in dwarf shrub-moss-sedge mire. In pure mats or with *Calypogeia integristipula*, *Kurzia makinoana*, *Mylia anomala*. **I:** K-55-3a-05, **K:** K-45-14-06, K-51-4-06, K-52-7-06.

Cephaloziella arctogena (R.M. Schust.) Konstant. – per., ant. (autoicous) – 200 m – **K:** 27 – One collection: wet clayish roadside in *Sasa* thickets with clumps of *Pinus pumila* community. **K:** K-48-3c-06.

C. divaricata (Sm.) Schiffn. – arch., per., ant., gemm. – 30-430 m – **Sm:** 1; **U:** 6, 7; **I:** 13, 14; **K:** 27; **S:** 32, 34 – Pure peat spots in *Juncus*-*Carex*-dwarf shrub-moss mire and grass meadow; fine-grained soil along roadside in community of *Pinus pumila* or *Betula ermahnii* with *Sasa* underbrush; rocky outcrops along seacoast and in coniferous forest with moss cover; fine-grained soil on costal steeps. In pure mats or with *Diplophyllum andrewsii*, *Gymnocolea inflata*, *Nardia assamica*. **Sm:** S-42-07, **U:** U-3-08, U-2.1-07, **I:** K-49-14-05, K-50-12-05, It-18-08, **K:** "1.VIII.1964, E.I. Kil'dyushevskij (LE)", **S:** Sh-015-06.

C. elachista (J.B. Jack ex Gottsche & Rabenh.) Schiffn. – per., arch., ant. – 10-20 m – **I:** 10; **K:** 26 – Over *Sphagnum* hummocks in dwarf-shrub-moss-sedge mire and *Larix* forest with *Sphagnum* cover. In pure mats. **I:** K-62-4-05, **K:** K-51-6a-06.

C. uncinata R.M. Schust. – 1170-1450 m – **I:** 15, 17 – Snow-bed community, wet crevices in cliffs at the outer side of crater. With *Anthelia juratzkana*, *Diplophyllum taxifolium*, *Scapania ligulata*. **I:** K-16-18-07, K-19-16-07.

Cheilolejeunea obtusifolia (Steph.) S. Hatt. – per., ant. – 10-300 m – **S:** 30, 31, 32, 34 – Crystalline substrate in cliffs along streams, outliers in wind-stressed tundroid habitats and forest belt; sea coast cliffs shaded by *Alnus*. In pure mats or with *Marsupella sphacelata*, *Plectocolea infusca* var. *ovalifolia*, *Preissia quadrata*. **S:** K-42-49-07, K-48-15-07, K-59-2-07, K-65-11-07, Sh-015-06.

Chiloscyphus fragilis (A. Roth) Schiffn. – ant. – 20-410 m – **Sm:** 3; **I:** 10, 11, 12, 14, 16; **K:** 22, 26 – Boulders and rocks along streams (also containing sulphur) and near the waterfalls, rivers and lakes in forest belt. In pure mats or with *Blasia pusilla, Pellia neesiana*. **Sm:** C-57.1-07, **I:** K-45-29-05, K-56-6-05, K-64-8-05, K-71-3b-05, K-12-15-07, **K:** K-42-18a-06, K-52-21-06.

C. pallescens (Ehrh. ex Hoffm.) Dumort. – **I:** 12 (Blagodatskikh & Duda, 1987 – on soil and stones along stream in mixed forest.

C. polyanthos (L.) Corda – per., ant. – 10-700 m – **Sm:** 1, 2, 3; **I:** 9, 10, 12, 21; **K:** 22, 26; **S:** 31, 32 – Boulders along stream and lake banks in forested area; wet cliffs along sea coast (in full sun or partial shade); between *Sphagnum* patches in dwarf shrub-moss-sedge mire; peaty soil between grass and dwarf-shrubs in grass-sedge bog on the bank of lake; swampy community with *Lysichiton* and high herbs; stones of snow-bed hollow. In pure mats or with *Conocephalum conicum*, *Jungermannia pumila*, *Pellia* cf. *neesiana*. **Sm:** C-52.1-07, C-56-07, C-21.1-07, **I:** K-45-49-05, K-64-9-05, K-10-19-07, K-30-13-07, It-21-08, **K:** K-37-33b-06, K-51-7a-06, **S:** K-48-5-07, K-58-2-07, "VI.1964. E.I. Kil'dyushevskij (LE)".

C. cf. *rivularis* (Schrad.) Haszl. – 20 m – **I:** 10; **K:** 26, 27a – On boulders in streams; peaty bank of lake. In pure mats or with *Conocephalum conicum*. **I:** K-64-2-05, **K**: "23.VII.1951, Kusakin, Shegolev (LE)", "13.IX.1964, Kil'dyushevskij (LE)".

Cladopodiella fluitans (Nees) H. Buch – 10-420 m – **I:** 10, 13, 14 (Blagodatskikh & Duda, 1987), 15; **K:** 26 – Between patches in moss-sedge mires and tundroid communities; banks of thermal spring; *Sphagnum* mats in swampy lighted *Larix* forest with cover of *Sphagnum* and *Carex*. In pure mats or with *Cephalozia bicuspidata*, *Kurzia makinoana*, *Riccardia* cf. *latifrons*, *Scapania paludicola*. **I:** K-51-5-05, K-63-12-05, K-35-5-07, **K:** K-51-9-06.

C. francisci (Hook.) H. Buch ex Jørg. – gemm. – 300-1300 m – **Chp:** 5; **I:** 14; **K:** 22 – Fine-grained soil filling wet cliff crevices in upper altitudes in forestless belt (also near fumaroles field), wet soil along thermal stream. In pure mats or with *Cephalozia bicuspidata*, *Lophozia sudetica*, *Marsupella sphacelata*, *Nardia scalaris*. **Chp:** Chp-2-08, **I:** K-58-16c-05, It-27-08, **K:** K-39-7-06.

Cololejeunea macounii (Spruce) A. Evans – 150 m – **K:** 27 – One collection: bark of *Abies* on the height 1-2 m from the ground in *Abies* forest with admixture broad-leaved trees, *Taxus* and *Picea*. With *Nipponolejeunea subalpina*. **K:** K-47-18a-06.

C. subkodamae Mizut. – **S:** Horikawa (1940b).

Conocephalum conicum (L.) Underw. – ant. – 10-330 m – **Sm:** 1, 2, 3, 4; **I:** 9, 10, 11, 12, 16, 18; **K:** 22, 26, 26a, 27, 27a; **S:** 29, 30, 31, 32 (Duda, 1978) – Banks (cliffs in tectonic breaking, boulders, humus, fine-

grained soil) of streams and lakes in different types of forests; hollows between *Carex* patches in springy mires; disintegrating travertine cone; once collected on overwetting decaying wood in *Abies-Picea* forest with admixture of *Kalopanax*, *Acer* and underwood of *Taxus*, *Weigela*, *Hydrangea*. In pure mats or commonly with *Aneura pinguis*, *Cephalozia bicuspidata*, *Chiloscyphus* cf. *rivularis*, *C. polyanthos*, *Harpanthus flotovianus*, *Hattorianthus erimonus*, *Pellia endiviifolia*, *Plagiochila porelloides*, *Radula japonica*, *Riccardia multifida* ssp. *decrescens*, etc. **Sm:** C-24-07, C-32-07, C-53.3-07, C-56-07, **I:** K-44-12-05, K-64-2-05, K-66-6-05, K-70-3a-05, K-23-4-07, K-34-11-07, It-21-08, **K:** K-36-3-06, K-53-11-06, "1.VIII.1964, Kil'dyushevskij (LE)", "24.VII.1951, Kusakin (LE)", **S:** K-37-5-07, K-39-11-07, K-48-2-07.

C. japonicum (Thunb.) Grolle – gemm. – 5-400 m – **Sm:** 1, 3; **U:** 6; **I:** 9, 11, 12, 14, 16, 18; **K:** 22, 23, 24, 26, 27; **S:** 30, 31, 32, 33, 34 – Fine-grained soil bank and rocks along streams (also thermal one) and waterfalls, roadsides in forests; rocky and tufa cliffs along sea coast; overgrowing wet sandy coastal dunes. In pure mats or commonly with *Aneura pinguis*, *Blasia pusilla*, *Blepharostoma trichophyllum*, *Cephalozia bicuspidata*, *Harpanthus flotovianus*, *Jungermannia pumila*, *Nardia assamica*, *N. geoscyphus*, *Pellia endiviifolia*, *Plectocolea infusca* var. *ovalifolia*, *P. rosulans*, *Porella grandiloba*, *Solenostoma fusiforme*. **Sm:** C-51-07, C-56-07, **U:** U-4-08, **I:** K-44-16-05, K-66-2a-05, K-70-7d-05, K-23-7-07, K-34-2-07, It-27-08, **K:** K-37-15a-06, K-43-4b-06, K-46-9-06, K-54-4-06, K-60-4-06, "1.VIII.1964, Kil'dyushevskij (LE)", **S:** K-36-3-07, K-40-34-07, K-49-16-07, K-54-6-07, K-58-11-07, Sh-17-06, Sh-044-06.

Crossocalyx hellerianus (Nees) Meyl. – per., gemm. – 40-300 m – **I:** 20; **K:** 22; **S:** 31 – Decaying wood in coniferous forests. Mainly with *Anastrophyllum michauxii*, *Bazzania ovifolia*, *Blepharostoma trichophyllum*, *Cephalozia leucantha*, *Lophozia guttulata*, *Nowellia curvifolia*, *Scapania hirosakiensis.* **I:** K-32-8-07, **K:** K-37-20-06, **S:** K-50-15-07.

Crossogyna autumnalis (DC) Schljakov – per. – 10-500, 1174 m – **I:** 15, 20, 21; **K:** 22, 26, 26b; **S:** 31, 32 – Base of tree trunks and decaying wood in coniferous forests, sometimes with admixture of broad-leaved trees; once at base of big boulder in nival tundra (1174 m alt.). In forest belt with *Blepharostoma minus*, *B. trichophyllum*, *Cephalozia leucantha*, *C. lunulifolia, Frullania appendiculata, Geocalyx* cf. *graveolens*, *Lepidozia reptans*, *Lophocolea heterophylla*, *Lophozia guttulata*, *Ptilidium pulcherrimum*, *Scapania apiculata*, *S. hirosakiensis*. **I:** K-16-28-07, K-26-9-07, K-31-3-07, **K:** K-40-6-06, "6.X.1968, K.B. Gorodkov (LE)", K-50-4a-06, **S:** K-47-31-07, K-57-21-07.

Cryptocoleopsis imbricata Amakawa – 200-700 m – **Chp:** 5; **I:** 16, 17; **K:** 22 – Stones in snow-bed hollow of temporary spring and near steam and gas solfatara, cliffs in edges of tectonic breaking. In pure mats or with *Cephalozia bicuspidata*. **Chp:** Chp-3-08, **I**: K-22-3-07, K-24-8-07, **K:** K-37-40-06.

Diplophyllum albicans (L.) Dumort. – gemm. – per. – 10-1600 m – **I:** 14, 15, 17; **K:** 22, 23; **S:** 29, 31, 32, 33, 34 – Cliff crevices in rocks outcrops, outliers, coastal cliffs in various vegetation belts; over moss mats in tundroid habitats; stones and fine-grained soil on slopes to watercourses (including snow-bed habitats) and other naturally or antropogenically disturbed areas; old clinkers in flat subcrator part of volcano and volcanic cones. In pure mats or commonly with *Anthelia juratzkana*, *Blepharostoma trichophyllum*, *Cephalozia bicuspidata*, *Kurzia makinoana*, *Lophozia sudetica*, *Macrodiplophyllum plicatum*, *Marsupella commutata*, *M. sphacelata*, *Nardia scalaris*, *N. subclavata*, *Radula brunnea*, *R. japonica*, *Scapania integerrima*, *S. ligulata*, *Tritomaria quinquedentata*. **I:** K-58-1-05, K-15-21-07, K-18-8-07, **K:** K-37-32-06, K-57-8a-06, **S:** K-38-5-07, K-42-16-07, K-48-18-07, K-56-2-07, K-64-15-07, Sh-15.1-06.

D. andrewsii A. Evans – per., ant. – 40-430 m- **I:** 13, 15; **K:** 26, 27; **S:** 30, 32 – Fine-grained and clayish soil on roadsides and in areas with disturbed vegetation cover along watercourses in coniferous forest, flood-land communities, *Pinus pumila* elfin forest with *Sasa* underbrush. In pure mats or with *Cephalozia bicuspidata*, *Conocephalum japonicum*, *Gymnocolea inflata*, *Nardia assamica*, *Pellia* cf. *neesiana*, *Plectocolea infusca* var. *infusca*, *Solenostoma* cf. *fusiforme*, *S.* cf. *koreanum*. **I:** K-50-8-05, K-11-4-07, **K:** K-44-1-06, K-53-6b-06, **S:** K-40-47-07, K-58-11-07, K-65-1-07. – The species is distributed mainly (or even exclusively) in antropogenically disturbed areas and does not deeply penetrates into native communities. Probably occurrence of this species is a result of Japanese expansion in Kurils.

D. taxifolium (Wahlenb.) Dumort. var. *macrosticta* H. Buch – gemm., per. – 10-1600 m – **Sm:** 1, 2, 3, 4; **U:** 6, 7; **I:** 9, 10, 11, 12, 13, 14, 15, 16, 17, 20; **S:** 29, 30, 31, 32 – A very eurytopic species growing in crevices in river canyon cliffs, outliers, lava clinkers, coastal cliffs – in places with different degrees of shading and various vegetation belts; fine-grained soil and stones on steep slopes to and along watercourses in forested and tundroid areas; volcanically disturbed areas: old clinkers, wet stream banks in scoria fields, tufa cliffs; rarely decaying wood in coniferous forests. In pure mats or with ca. 50 species of the flora, more commonly with *Anthelia juratzkana*, *Bazzania ovifolia*, *Calycularia crispula*, *Conocephalum japonicum*, *Eremono-*

tus myriocarpus, *Gymnomitrion concinnatum*, *Lophozia silvicola*, *L. sudetica*, *L. guttulata*, *Marsupella commutata*, *M. sphacelata*, *Nardia assamica*, *N. scalaris*, *Preissia quadrata*, *Sphenolobus minutus*. **Sm:** C-15.1-07, C-33-07, C-35-07, C-44.1-07, **U:** U-2.1-07, U-3-08, **I:** K-45-13-05, K-48-14-05, K-56-3-05, K-66-10c-05, K-70-5-05, K-12-16-07, K-18-7-07, K-23-7-07, K-27-33-07, It-3-08, It-20-08, It-21-08, **K:** K-37-16-06, K-46-15-06, K-57-8-06, **S:** K-37-1-07, K-43-3-07, K-49-6-07, K-65-10-07, Sh-4.1-06.

Eremonotus myriocarpus (Carring.) Lindb. & Kaal. – per., ant. – 290-1450 m – **I:** 17; **K:** 23; **S:** 30, 34 – Cliff crevices in river canyon; coastal outcrops; crater's edges, tectonic breaking and dense tufa of old volcanic cone. **I:** K-19-15-07, **K:** K-58-5c-06, **S:** K-65-9-07, Sh-015-06.

Fossombronia sp. – 100 m – **S:** 29 – Bank of stream in *Abies-Picea* forest. **S:** K-36-3-07. The specimen is sterile, so identification up to species is impossible, but with high probability it represents *F. alaskana*.

F. alaskana Steere & H. Inoue – spor. – 10-20 m – **K:** 25, 26 – Wet sand in sea-coastal dunes overgrowed by *Juncus*; peaty spots along roadside in wet grass-sedge meadow with admixture of *Sasa*. **K:** K-54-1-06, K-62-2-06.

Frullania appendiculata Steph. – per., arch. – 10-400 m – **K:** 25, 26, 27, 27a; **S:** 29, 30, 31, 32, 33 – In areas wetted by sea fogs: on bark of coniferous trees (*Abies*, *Picea*, *Taxus, Quercus*), rarely on decaying wood in coniferous and mixed forest; in cliff crevices and on rocks outcrops in forestless areas: on sea coastal cliffs, in windy *Sasa* and tundroid *Juniperus sargentii* communities. In pure mats or with *Bazzania ovifolia*; *Crossogyna autumnalis*, *Herbertus aduncus*, *Lepidozia reptans*, *Macrodiplophyllum plicatum*, *Neohattoria herzogii*, *Nipponolejeunea subalpina*, *Plagiochila ovalifolia*. **K:** K-47-16-06, K-50-10a-06, K-63-24-06, "5.VII.1946, D.P. Vorob'ev (LE)", **S:** K-38-9-07, K-41-22-07, K-48-17-07, K-56-12-07, K-57-21-07, K-64-16-07.

F. bolanderi Austin – per. – 50-100 m – **K:** 26; **S:** 29, 34 – Bark of trees in *Alnus* forests with *Betula, Salix* and *Picea*. In pure mats and among mosses. **K:** "13.IX.1964, Kil'dyushevskij", **S:** Sh-9-06, Sh-04-06, Sh-28-06.

F. davurica Hampe – ant. – 10-20 m – **S:** 32, 34 – Sea coast cliffs shaded by *Alnus*. **S:** K-59-1-07, Sh-15.2-06.

F. inflata Gottsche – per., ant. – 20-110 m – **I:** 10; **S:** 31 – Bark of *Taxus* and *Alnus* in *Picea glehnii-Abies* and wet *Alnus-Salix* forests respectively. **I:** K-61-7-05, **S:** K-50-24-07. – Collection from Iturup represents form with deciduous shoots and is similar in this respect to *F. koponenii*, but being autoicous should be probably referred to this species.

F. koponenii S. Hatt. – per., spor. – 40-150 m – **K:** 22, 26, 27; **S:** 30 – Decaying wood and bark of *Picea*, *Abies*, *Betula* in coniferous forests with small admixture of *Betula*, *Sorbus* and *Alnus*. **K:** K-36-7a-06, K-47-24-06, K-55-4-06, **S:** K-40-25-07.

F. muscicola Steph. – per., spor., ant. – 10-500 m – **I:** 10; **K:** 22, 26; **S:** 29 – Bark of *Taxus*, *Picea* and *Quercus* in coniferous forests and oak forest with *Sasa*. In pure mats or with *Metzgeria* sp., *Nipponolejeunea subalpina*, *Radula japonica*. **I:** It-8.2-08, **K:** K-40-13-06, K-55-4b-06, **S:** K-37-39-07.

Geocalyx graveolens (Schrad.) Nees[1] – 30-40 m – **I:** 20; **K:** 22; **S:** 32 – Decaying wood in forests dominated by *Abies* with admixture of *Acer* and *Tilia*. With *Calypogeia integristipula*, *C. neogaea*, *Cephalozia lunulifolia*, *Crossogyna autumnalis*, *Lepidozia reptans*, *Liochlaena subulata*, *Scapania hirosakiensis*. **I:** K-26-9-07, **K:** K-36-10-06, "7.X.1968, K.B. Gorodkov (LE)", **S:** Sh-041.1-06.

G. lancistipulus (Steph.) S. Hatt.[1] – 30-120 m – **K:** 25; **S:** 30, 31, 32 – Decaying wood, eroding roadside and wet moss mats in floor of boggy *Picea-Abies* forests. In pure mats or with *Blepharostoma trichophyllum*, *Calypogeia* cf. *muelleriana*, *C. integristipula*, *Cephalozia lunulifolia*, *Lepidozia reptans*, *Macrodiplophyllum plicatum*. **K:** K-63-4-06, **S:** K-40-35-07, K-49-35-07, K-57-9-07. – A certain identification of the species is possible for fertile or gemmiparous plants. As it was shown by Inoue (1974), characters of sterile plants such as their size and the number of free cells rows on dorsal side of stem, which sometimes have been used for separating *G. lancistipulus* and *G. graveolens,* are unreliable. So, all identifications of this species from Kurils (and Russia as a whole) are uncertain.

Gymnocolea inflata (Huds.) Dumort. – per. – 100-1300 m – **Chp:** 5; **I:** 13, 14; **K:** 22, 26, 27 – Pure peat, peaty and fine-grained soil in sedge-*Sphagnum* mires, crumble banks of lakes, sulphur springs in fumaroles fields, roadside in *Sasa-Pinus pumila* dense thickets; wetted

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[1] – The differentiation of *Geocalyx* species is as follow:

— Androecia on main shoot with strongly inflated, bilobed dorsal sac at the dorsal base of the bracts (looking like *Chiloscyphus*), or on short, ventral intercalary branches, deeply bilobed (up to 2/3 their length) with distal portion of the lobes more or less strongly incurved (especially dorsal ones); gemmae rarely present, two-celled, oblong to elliptical, pale green on the margin of scale-like, small leaves on elongate apices *G. lancistipulus*

— Androecia on ventral-intercalary, abbreviated branches with 4-8 paired bracts, ventricose and closely imbricate, never deeply bilobed; gemmae always absent *G. graveolens*

cliff crevices in river canyons. In pure mats or commonly with *Cephalozia bicuspidata*, *C. pachycaulis*, *Marsupella sphacelata*, *Plectocolea vulcanicola*, *Scapania paludicola*. **Chp:** Chp-1-08, **I:** K-49-14-05, K-58-30-05, **K:** K-38-2c-06, K-45-1-06, K-52-13-06.

G. marginata (Steph.) S. Hatt.[1] – 1110-1300 m – **I:** 14; **K:** 22 – Wet fine-grained soil in cliff crevices near volcano peaks. In pure mats or with *Marsupella sphacelata*, *Mylia taylorii*, *Nardia assamica*. **I:** K-58-28-05, **K:** K-39-11a-06. The status of the taxon is somewhat ambiguous. Kitagawa (1966) following F. Stephani and S. Hattori treats it as species separate from *G. inflata*, but Inoue (1969) synonymized it with the latter one. Indeed the appearance and ecology of this species is strictly different from *G. inflata*, but morphological difference may be environmentally inducted and this question needs further study.

Gymnomitrion apiculatum (Schiffn.) Müll. Frib. – 1450-1500 m – **I:** 17; **K:** 23 – Wet fine-grained ground in the crevices of old clincer in flat subcrator part of volcano; crevices in the cliffs near glacier in crater of dormant volcano. In pure mats or with *Anthelia juratzkana*, *Cephalozia bicuspidata*, *Diplophyllum albicans*, *Lophozia sudetica*, *Nardia unispiralis*, *Pleurocladula albescens*. **I:** K-20-4-07, **K:** K-57-4b-06.

G. concinnatum (Lightf.) Corda – 150-1600 m – **I:** 14, 15, 17; **K:** 22, 23; **S:** 29, 30, 32 – Cliff crevices in outliers, old clinkers, river canyons near volcano peaks, wind-stressed tundroid communities and fumaroles fields. In pure mats or mainly with *Anthelia juratzkana*, *Diplophyllum albicans*, *D. taxifolium*, *Lophozia sudetica, Marsupella commutata, M. sphacelata, Scapania integerrima, S. parvitexta, Tritomaria quinquedentata*. **I:** K-58-2-05, K-58-7a-05, K-59-3-05, K-15-1-07, K-18-10-07, K-19-6-07, **K:** K-38-1b-06, K-39-2a-06, K-57-3a-06, **S:** K-38-36-07, K-42-27-07, K-45-20-07, K-64-14-07, K-66-9-07. White or white-greenish plants are very common in South Kurils (in Shikotan this modification only). They are superficially similar to *G. obtusum* Lindb., which is absent in our flora.

G. corallioides Nees – 1100-1500 m – **K:** 22, 23, 27 – Fine-grained soil along small streams and filling cliff crevices and old clinkers in upper altitude; spots of bare ground on slope to sea in windy meadow in lower altitude. In pure mats or with *Anthelia juratzkana*, *Cephalozia bicuspidata*, *Diplophyllum albicans*, *Marsupella sphacelata*, *Pleurocladula albescens*. **K:** K-38-1c-06, K-46-13b-06, K-57-3b-06.

Haplomitrium hookeri (Sm.) Nees – 100 m – **I:** 13 – On spots of wet peaty soil in sedge mire. In pure mats and with *Aneura pinguis*, *Riccardia* cf. *multifida*. **I:** It-20-08.

Harpanthus flotovianus (Nees) Nees – 30-410 m – **I:** 11, 13, 14; **K:** 25, 26; **S:** 29, 31 – Over mosses along sluggishly flowing streams, wet hollows in boggy coniferous forests, wet peaty soil in sedge mire; wetted tufa and crystalline rocky cliffs in river canyon in forested area. In pure mats or more commonly with *Cephalozia bicuspidata*, *C. leucantha*, *Conocephalum conicum*, *C. japonicum*, *Nardia geoscyphus*, *Plectocolea rosulans*, *Riccardia multifida*, *Scapania curta*, *S. paludicola*, *Tritomaria quinquedentata*, etc. **I:** K-56-9a-05, K-70-7d-05, It-20-08, **K:** K-50-13-06, K-63-7-06, **S:** K-37-4-07, K-49-29-07. In studied flora mod. *integrifolia* (with not incised leaves) prevails.

Hattorianthus erimonus (Steph.) R.M. Schust. & H. Inoue – ant., arch. – 20, 290 m – **S:** 30, 33 – Very wet cliff crevices in shady place in forested area; between patches of *Eriophorum* and *Eleocharis* in wet depression in wind-stressed community of *Sasa* and small herbs. In pure mats or with *Conocephalum conicum*, *Riccardia multifida*. **S:** K-54-7-07, K-65-12-07.

Herbertus aduncus (Dicks.) Gray – 20-320 m – **S:** 31, 32, 33 – Cliff and rock crevices in forestless area. Mainly in pure mats, but sometimes also with *Diplophyllum albicans*, *Frullania appendiculata*, *Macrodiplophyllum plicatum*, *Metzgeria lindbergii*, *Porella fauriei*, *Radula brunnea*, *R. obtusiloba*. **S:** K-41-19-07, K-49-18-07, K-56-9-07. Some samples have elongated lobe tips and to some degree look like as *H. armitanus* (Steph.) H.A. Mill., which is absent in our flora.

H. buchii Juslen – 200-340 m – **S:** 31, 32 – Dry rocky and tufa cliffs in well exposed place. In pure mats or with *Radula brunnea*. **S:** K-41-32-07, K-47-18-07.

Hygrobiella laxifolia (Hook.) Spruce – per., ant. – 200-1200 m – **Sm:** 1; **I:** 11, 15, 16; **K:** 22, 23; **S:** 31 – Stones and wet cliffs along streams, wetted rocks near waterfalls in forested and forestless belts (in flat subcrator part of volcano as well). Mainly in pure mats, but sometimes with *Cephalozia bicuspidata*, *Jungermannia pumila*, *Marsupella sphacelata*, *Plectocolea infusca* var. *ovalifolia*, *P. rosulans*, *Scapania diplophylloides*, *S. integerrima*, etc. **Sm:** C-53.3-07, **I:** K-70-2a-05, K-12-6-07, K-24-1-07, **K:** K-37-11-06, K-58-3-06, **S:** K-48-13-07.

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[1] – Species of *Gymnocolea* can be differentiated by the following key:

— Plants not flaccid; leaves as wide as long to wider than long, concave to cupped and canaliculate, imbricate in upper portion of shoot, secund dorsally *G. marginata*

— Plants flaccid; leaves longer than wide, rarely as wide as long, plane to only slightly concave, distant, not secund dorsally *G. inflata*

Isopaches bicrenatus (Schmid. ex Hoffm.) H. Buch – per., ant., gemm. – 30-200 m – **U:** 7; **I:** 8, 14, **K**: 26, 27 – Overgrowing wet sandy dunes along Okhotsk Sea coast; wet clayish roadside in *Sasa* thickets with *Betula* and clumps of *Pinus pumila*; wet fine-grained soil with sulphur crystals along hot sulphur steam. In pure mats, once (in dunes) with *Marsupella sprucei*. **U:** U-2.1-07, **I:** K-68-3a-05, It-18-08, **K:** K-48-1b-06, K-52-9a-06.

Iwatsukia jishibae (Steph.) N. Kitag. – per., ant. – 100 m – **K:** 26 – One collection: on wet decaying wood in *Abies-Picea* forest along river. With *Mylia verrucosa*, *Nowellia curvifolia*, *Riccardia palmata*, *Scapania hirosakiensis*. **K:** K-52-20a-06.

Jungermannia eucordifolia Schljakov – per., ant. – 10-390 m – **Sm:** 1, 2, 3, 4; **I:** 12, 13, 14; **K:** 24, 27; **S:** 30, 31, 32 – Stones along streams (also sulphur springs) in forested and forestless area; wetted cliffs on sea coast, waterfalls and river canyons; hollows in *Carex-Juncus* eutrophic mires. In pure mats or with *Conocephalum japonicum*, *Plagiochila porelloides*. **Sm:** C-28.1-07, C-24-07, C-56-07, **I:** K-52-4-05, K-54-17-05, K-10-15-07, **K:** K-43-1b-06, K-46-19a-06, **S:** K-42-42-07, K-47-4-07, K-65-32-07.

J. exsertifolia Steph. – ant. – 150-200, 1340 m – **I:** 14, 15; **K:** 22; **S:** 25 – Moss mats hanging from big boulders and cliffs above hot stream steamed with H_2O and SO_2 (it is always humid, acidic and warm); wet cliffs near streams and waterfalls. In pure mats or with *Calypogeia integristipula*, *Cephalozia bicuspidata*, *Nardia subclavata*. **I:** K-55-6-05, K-15-28-07, **K:** K-37-17a-06, **S:** K-45-37-07.

J. polaris Lindb. – per., ant. – 10-20 m – **Sm:** 1, 2, 3, 4 – Sea coastal cliffs, along stream, on slopes of river canyon, in wet crevices in cliffs near the waterfall. In pure mats. **Sm:** C-24-07, C-28.4-07, C-43.2-07.

J. pumila With. – ant., arch., per., spor. – 10-1200 m – **I:** 11, 12; **K:** 22, 23; **S:** 30, 31, 32 – Rocks along banks of temporary and permanent streams; wetted crevices (frequently on fine-grained soil filling crevices) in rocky and tufa cliffs along streams, waterfalls, sea coast and outliers. In pure mats or commonly with *Aneura pinguis*, *Blepharostoma trichophyllum*, *Cephalozia bicuspidata*, *Hygrobiella laxifolia*, *Marsupella sphacelata*, *Pellia neesiana*, etc. **I:** K-46-2-05, K-70-2a-05, **K:** K-37-17b-06, K-58-3c-06, **S:** K-42-50-07, K-49-25-07, K-65-17-07.

Kurzia makinoana (Steph.) Grolle – per., ant. – 10-1450 m – **I:** 14, 17; **K:** 22, 23, 26, 27; **S:** 29, 30, 31, 32, 34 – Tufa cliffs along dormant volcano crater's lake, well exposed cliff crevices and fine-grained soil in forestless (mainly in areas destroyed by volcanic eruptions) area; rocks along streams (including hot sulphur ones); over *Sphagnum* dwarf shrub-moss-sedge mires; rarely wet decaying wood in *Picea–Abies* forests. In pure mats or with many hepatic taxa, more commonly with *Anthelia juratzkana*, *Bazzania ovifolia*, *Diplophyllum albicans*, *D. taxifolium*, *Mylia anomala*, *Pleurocladula albescens*, *Solenostoma sphaerocarpum*, *Sphenolobus minutus*, etc. **I:** K-55-3a-05, K-19-5-07, **K:** K-39-4b-06, K-47-13-06, K-51-2-06, K-58-4c-06, **S:** K-38-14-07, K-42-22-07, K-51-12-07, Sh-15.1-06.

Leiocolea heterocolpos (Thed. ex Hartm.) H. Buch var. *heterocolpos* – 20 m – **I:** 20 – One collection: wet lava clinker in *Picea-Abies* forest with admixture of *Kalopanax*, *Betula*, *Sorbus*. **I:** K-27-42-07.

Lejeunea cavifolia (Ehrh.) Lindb. – 30 m – **K:** 27 – One collection: crevices along sea-coast, shaded by broad-leaved trees. With *Blepharostoma minus*, *Radula japonica*. **K:** K-46-10-06.

L. japonica Mitt. – per., ant. – 120-300 m – **S:** 31, 32 – Branches of *Juniperus sargentii* in its wind-stressed dense thickets; splashed stones along streams in *Picea–Abies* forests. In pure mats or with *Conocephalum conicum*, *Metzgeria lindbergii*, *Plagiochila porelloides*, *Preissia quadrata*, *Radula complanata*. **S:** K-41-11-07, K-49-40-07.

L. otiana S. Hatt. – per., ant. – 200 m – **S:** 32 – One collection: branches of *Juniperus sargentii* in its dense thickets. With *Metzgeria temperata*, *Radula complanata*. **S:** K-41-16-07.

L. ulicina (Taylor) Gottsche et al. – ant. – 10-110 m – **K:** 26; **S:** 31 – Bark of *Abies* and leaves of mosses in *Picea–Abies* forest. With *Nipponolejeunea subalpina*, *Radula japonica*. **K:** "29.V.1964, E.I. Kil'dyushevskij (LE)", **S:** K-50-38-07.

Lepidozia reptans (L.) Dumort. – per. – 10-500 m – **I:** 10, 12, 20; **K:** 22, 25, 26, 26b, 27, 27a; **S:** 29, 30, 31, 32, 34 – Decaying wood and (rarely) horizontal parts of lower branches of trees, trunk bases in coniferous, mixed and wet broad-leaved forests; rocks along streams, outliers, old clinkers, coastal cliffs in forested belt; fine-grained soil along sulphur springs. In pure mats or with many epixylous species such as *Anastrophyllum michauxii*, *Bazzania japonica*, *B. ovifolia*, *B. trilobata*, *Blepharostoma minus*, *B. trichophyllum*, *Calypogeia integristipula*, *C. suecica*, *Cephalozia leucantha*, *Crossogyna autumnalis*, *Liochlaena subulata*, *Lophozia guttulata*, *Metacalypogeia cordifolia*, *Metzgeria lindbergii*, *Mylia verrucosa*, *Ptilidium pulcherrimum*, *Riccardia palmata*, *Scapania hirosakiensis*, *Schistochilopsis cornuta*, etc. **I:** K-65-10-05, K-9-11-07, K-26-12-07, It-4.2-08, **K:** K-36-5-06, K-45-15-06, K-50-1-06, K-61-1-06, "30.VII.1965, O. Blum (LE)", **S:** K-36-8-07, K-40-4-07, K-46-2-07, K-47-23-07, Sh-20.3-06.

Liochlaena subulata (A. Evans) Schljakov – gemm., per. – 10-170 m – **Sm:** 1; **I:** 12, 20; **K:** 22, 23, 25, 26, 27; **S:** 29, 30, 31 – Decaying wood and wet moss mats covering slopes to streams in coniferous and

mixed forests; roadside in *Sasa-Pinus pumila* thickets; boulders along streams in forested area. In pure mats or with *Aneura pinguis*, *Blepharostoma trichophyllum*, *Calypogeia integristipula*, *C. muelleriana*, *C. neogaea*, *Lepidozia reptans*, *Lophocolea heterophylla*, etc. **Sm:** C-37-07, **I:** K-27-11-07, It-21-08, **K:** K-36-10-06, K-45-4b-06, K-47-4a-06, K-56-2a-06, K-61-1a-06, «27.V.1964, E.I. Kil'dyushevskij (LE)», **S:** K-36-22-07, K-40-6-07, K-49-28-07, Sh-33-06.

Lophocolea cuspidata (Nees) Limpr. – 10-200 m – **I:** 20; **K:** 26; **S:** 31 – Crevices in tufa cliffs, wet lava clinker and wet hollows in forest floor in *Picea–Abies* forests. In pure mats or with *Plectocolea infusca* var. *ovalifolia*, *Radula obtusiloba*, *Riccardia chamaedryfolia*. **I:** K-27-43-07, **K:** K-50-16-06, **S:** K-49-8-07.

L. heterophylla (Schrad.) Dumort. – per., ant., spor. – 5-500 m – **Sm:** 1, 2; **I:** 9, 10, 12, 13, 14, 20, 21; **K:** 22, 23, 25, 26, 26b, 27; **S:** 29, 30, 31, 32, 34 – Decaying wood, bases of trees, litter, bark of *Acer mayrii* in coniferous, mixed, *Betula*, broad-leaved and elfin forests, thickets of *Pinus pumila*; decaying drift wood in grassland near sea coast; crevices in coastal cliffs; hummocks and spots of bare peat in sedge-dwarf-shrub-moss mires. In pure mats or commonly with *Aneura pinguis*, *Bazzania ovifolia*, *B. tricrenata*, *Calypogeia integristipula*, *C. suecica*, *Cephalozia leucantha*, *C. lunulifolia*, *Crossogyna autumnalis*, *Lepidozia reptans*, *Mylia verrucosa*, *Ptilidium pulcherrimum*, *Riccardia palmata*, *Scapania hirosakiensis* etc. **Sm:** C-25-07, C-48-07, **I:** K-44-22-05, K-49-13-05, K-56-23-05, K-61-12-05, K-66-3a-05, K-26-17-07, K-29-1-07, It-9-08, **K:** K-37-7a-06, K-45-15a-06, K-50-11a-06, K-56-3-06, K-61-1b-06, ą 674, "20.IX.1956, Koval' (LE), **S:** K-36-10-07, K-40-7-07, K-50-11-07, K-61-2-07, Sh-13.1-06.

L. itoana H. Inoue – arch. – 70 m – **I:** 12 – One collection: boulder covered by fine-grained soil in full shade in *Quercus-Acer* forest with admixture of *Sorbus*, *Betula ermanii*, *Salix*, *Alnus* and thick underwood of *Sasa*. **I:** K-45-16-05.

L. minor Nees – gemm. – 30-400 m – **I:** 11, 20; **K:** 27; **S:** 30, 34 – Wet stony wall of river canyon in volcanically destroyed area; decaying wood and base of *Abies* in *Abies* forest. In pure mats or with *Crossogyna autumnalis*, *Diplophyllum taxifolium*, *Lepidozia reptans*, *Scapania hirosakiensis*. **I:** K-71-2-05, K-28-7-07, **K:** K-47-8b-06, **S:** Sh-25-06.

Lophozia excisa (Dicks.) Dumort. **–** 50 m – **Sm:** 4 – Along stream in river canyon. **Sm:** C-29.1-07.

L. guttulata (Lindb. & Arnell) A. Evans – per., ant., gemm. – 10-500, 1500 m – **Sm:** 1, 2; **I:** 10, 13, 14, 20; **K:** 22, 23, 25, 26; **S:** 30 (Korotkevitch, 1952, as *L. porphyroleuca* (Nees) Schiffn.), 32, 34 – Decaying wood in coniferous and mixed forests; wetted crevices in cliffs along river canyons, outliers, old clinkers; boulders along mineral stream with high content of iron in *Sorbus-Betula* forest with underbrush by *Pinus pumila*, *Sasa* and *Calamagrostis,* on branches of *Pinus pumila* in *Pinus pumila* thickets; logs ejected from sea on beach. Rarely in pure mats, more commonly with other hepatics, such as *Anastrophyllum michauxii*, *Blepharostoma trichophyllum*, *Crossocalyx hellerianus*, *Lepidozia reptans*, *Lophozia sudetica*, *Mylia verrucosa*, *Nowellia curvifolia*, *Ptilidium pulcherrimum*, *Scapania hirosakiensis*, *Schistochilopsis cornuta*, *S. incisa*. **Sm:** C-14.1-07, C-35-07, **I:** K-56-3-05, K-65-19-05, K-27-29-07, It-20-08, **K:** K-37-18a-06, K-53-2-06, K-56-1-06, K-61-2-06, **S:** Sh-23.2-06.

L. lacerata N. Kitag. – 410, 1340 m – **I:** 14, 15 – Boulders along mineral stream with high content of iron in elfin *Sorbus-Betula* forest with underbrush by *Pinus pumila*, *Sasa* and *Calamagrostis* at lower altitude; crevices in tufa cliffs on the top of mountain at upper altitude. In pure mats (at upper altitude), or with *Calypogeia integristipula*, *Cephalozia leucantha*, *Diplophyllum taxifolium*, *Lophocolea heterophylla*. **I:** K-56-5a-05, K-15-15-07.

L. cf. *propagulifera* (Gottsche) Steph. – ant., per., spor., gemm. – **Sm:** 4 – On bare soil on slope of stream canyon. **Sm:** C- 28.1-07

L. savicziae Schljakov – gemm., per., spor. – 1110-1220 m – **I:** 14, 15, 17 – Wet crevices in vertical wall of cliff in full sun near volcano peak; snow-bed communities. With *Lophozia sudetica*, *Macrodiplophyllum plicatum*, *Marsupella sphacelata*, *Nardia hiroshi*, *N. scalaris*. **I:** K-58-22a-05, K-16-7-07, K-17-11-07.

L. silvicola H. Buch – gemm., ant., per. – 10-400 m – **I:** 10, 11, 12, 13, 20; **K:** 26; **S:** 31 – Decaying wood, over moss mats in mossy coniferous and mixed forests; fine-grained soil on slopes to streams in elfin *Betula ermanii* forest with thick underbrush of *Pinus pumila* and *Sasa*; wet fine-grained soil with sulphur content along steam of hot water in *Betula* and *Sorbus* forest. In pure mats or with *Calypogeia integristipula*, *C. muelleriana*, *Cephalozia leucantha*, *Mylia verrucosa*, *Nardia scalaris*, *Tritomaria exsecta*, etc. **I:** K-45-69-05, K-48-23-05, K-65-21-05, K-70-5-05, K-32-14-07, **K:** K-50-10-06, **S:** K-48-21-07.

L. silvicoloides N. Kitag. – gemm., ant., per. – 40-430, 1200 m – **I:** 13, 14, 15; **K:** 22, 23; **S:** 30, 31, 32 – Decaying wood and bases of trees in coniferous (including *Picea pumila* wind-stressed elfin forest); horizontal parts of *Pinus pumila* branches, wet soil near the base of cliff in communities of *Pinus pumila* with *Sasa* underbrush; wet moss mats in tundroid community with *Juniperus sargentii*, *Ledum*, *Empetrum*, *Vaccinium uliginosum* on slope to stream; over moss mats hanging from big boulders and cliffs above hot

stream steamed with H_2O and SO_2 (it is always humid, acidic and warm) in *Sasa* community; cliff crevices in old volcanic cone at upper altitude. In pure mats or with *Bazzania ovifolia*, *B. trilobata*, *Calypogeia integristipula*, *Cephalozia lunulifolia*, *Crossogyna autumnalis*, *Diplophyllum taxifolium*, *Lepidozia reptans*, *Mylia verrucosa*, *Orthocaulis attenuatus*, *Ptilidium californicum*, *P. pulcherrimum*, *Scapania hirosakiensis*, *Schistochilopsis cornuta*. **I:** K-50-3-05, K-55-2-05, K-13-16-07, **K:** K-36-16a-06, K-56-4-06, **S:** K-40-19-07, K-47-31-07, K-62-1-07.

L. sudetica (Nees ex Huebener) Grolle – gemm., per., spor. – 60, 700-1500 m – **Sm:** 4; **I:** 10, 12, 14, 15, 17; **K:** 22, 23 – Wet or dry cliff crevices in river canyons in full sun, mountain circus near fumaroles field, old clinkers and cliffs near glaciers; stones in snow-bed hollows. In pure mats or with *Anthelia juratzkana*, *Diplophyllum albicans*, *D. taxifolium*, *Gymnomitrion concinnatum*, *Lophozia guttulata*, *Marsupella commutata*, *Nardia scalaris*, *N. unispiralis*, *Pleurocladula albescens*, *Protolophozia debiliformis*, *Scapania ampliata* etc. **Sm:** C-28.4-07, **I:** K-58-13-05, K-10-22-07, K-15-6-07, K-20-2-07, It-8.2-08, **K:** K-37-33-06, K-57-1-06.

L. ventricosa (Dicks.) Dumort. var. *ventricosa* – per. – 30-150, 1100-1114 m – **I:** 14; **K:** 22, 27 – Wind-stressed meadow on slope to sea with spots of bare ground; cliff crevices in volcanic caldera's wall under strong impact of SO_2 gases; fine-grained soil along stream in area near volcano peak in upper altitude. In pure mats or with *Anthelia juratzkana*, *Calycularia crispula*, *Diplophyllum taxifolium*, *Gymnomitrion concinnatum*, *Pleurocladula albescens*. **I:** K-58-25b-05, **K:** K-37-30-06, K-45-11a-06.

L. wenzelii (Nees) Steph. – **K:** 22 – 700 – One collection: stones in snow-bed hollow of temporary spring in volcanic destroyed area. With *Diplophyllum albicans*, *D. taxifolium*. **K:** K-37-32-06.

Macrodiplophyllum plicatum (Lindb.) H. Perss. – per., gemm. – 10-1110 m – **Sm:** 1; **I:** 10, 12, 13, 14, 15, 20, 21; **K:** 22, 23, 25, 26, 26b, 27; **S:** 29, 30, 31, 32, 33, 34 – Decaying wood, bases of trees, bark *Taxus* and *Picea*, litter in coniferous, broad-leaved and mixed forests; litter, base of cliffs and branches of *Pinus pumila* in elfin forests; cover in dwarf shrub or moss tundroid communities; branches of *Juniperus sargentii* in wind-stressed shrub community; coastal cliffs and other rocks in forested and forestless area, also in volcanic destroyed areas near old crater. In pure mats or with many hepatics, mainly *Anastrophyllum michauxii*, *Bazzania ovifolia*, *Calypogeia integristipula*, *Diplophyllum albicans*, *Frullania appendiculata*, *Herbertus aduncus*, *Lepidozia reptans*, *Lophocolea heterophylla*, *Mylia verrucosa*, *Ptilidium pulcherrimum*. **Sm:** C-53.3-07, **I:** K-45-69-05, K-50-6-05, K-58-22a-05, K-65-7-05, K-13-8-07, K-27-19-07, K-31-5-07, K-35-14-07, **K:** K-37-19a-06, K-47-15-06, K-50-2a-06, K-56-3-06, K-61-3a-06, **S:** K-37-27-07, K-40-15-07, K-41-30-07, K-47-20-07, K-53-4-07, K-57-25-07, K-64-4-07.

Marchantia latifolia Gray – gemm., ant. – 20, 420 m – **Sm:** 1, 2, 3; **I:** 12 (Blagodatskikh & Duda, 1987 as *M. polymorpha*), 13, 14; **S:** 31, 34 – Fine-grained soil along stream in coastal meadow and along thermal stream; place with vegetation cover disturbed by fire; wet crevices of coastal cliffs. **Sm:** C-37-07, C-47-07, C-56-07, **I:** K-51-22-05, It -13-08, **S:** K-49-17-07, Sh-25-06.

M. polymorpha L. (sensu *M. aquatica* (Nees) Burgeff) – 150 m – **K:** 27 – One collection: wet clayish soil near thermal hot spring. **K:** K-45-6-06.

M. paleacea Bertol. – 40 m – **K:** 22 – One collection: destroying travertine cone wetted by seeping thermal water. **K:** K-36-1-06.

Marsupella adusta (Nees) Spruce – ant., spor. – 700 m – **K:** 22 – Stones in snow-bed hollow of temporary spring. **K:** K-37-39-06.

M. alata S. Hatt. – ant. – 200-400, 1170 m – **I:** 15; **S:** 27, 31, 32 – Wet crevices in outliers, cliffs along river canyons in forested and forestless areas, including nival communities. In pure mats or with *Diplophyllum albicans*, *D. taxifolium*, *Metzgeria lindbergii*, *Plectocolea biloba*. **I:** K-16-42-07, **S:** K-43-2-07, K-48-4-07, K-66-3-07. Some forms with poorly developed keel (present only in some leaves), similar (probably transitional) to *M. pseudofunckii* were found.

M. alpina (Gott. ex Limpr.) H. Bernet – spor., ant. – **I:** 15; **K:** 22, 23 – 1300-1500 – Wet fine-grained soil in cliff crevices in volcanically destroyed area; wet fine-grained ground in crevices of old clinker in flat subcrator part of volcano; wet tufa cliffs near mountain's top. In pure mats or with *Diplophyllum taxifolium*, *Marsupella sphacelata*. **I:** K-15-3-07, **K:** K-39-8-06, K-57-10-06.

M. boeckii (Aust.) Lindb. ex Kaal. – per., ant. – 20-1200 m – **Sm:** 1; **K:** 23; **S:** 34 – Wet crevices in cliffs (including of old volcanic cone). **Sm:** C-42-07, **K:** K-58-3b-06, **S:** Sh-15.1-06.

M. commutata (Limpr.) H. Bern. – per., ant. – 1100-1500 m – **I:** 14, 15; **K:** 22, 23 – Wet crevices in cliffs and clinkers in full sun in volcanically destroyed areas; wet banks of streams in snow-bed habitats; fine-grained soil along rivulet valley in elfin forests. In pure mats or with *Diplophyllum albicans*, *D. taxifolium*, *Gymnocolea inflata*, *Gymnomitrion concinnatum*, *Lophozia sudetica*. **I:** K-58-29-05, K-15-37-07, **K:** K-38-1b-06, K-57-8b-06.

M. funckii (F.Weber & D.Mohr) Dumort. – per., ant., spor. – 1100-1500 m – **K:** 22, 23 – Fine-grained ground along rivulet valleys and crevices in old clin-

ker. In pure mats or with *Nardia japonica*. **K:** K-38-1-06, K-57-16-06.

M. pseudofunckii S. Hatt. – per. – 200 m – **I:** 16 – Cliffs near stream in tectonic breaking. With *Marsupella sphacelata*. **I:** K-24-4-07.

M. sphacelata (Gieseke ex Lindenb.) Dumort. – ant., per., spor. – 30-1500 m – **I:** 11, 12, 13, 14, 15, 16, 17; **K:** 22, 23, 26, 27; **S:** 30, 31 – Boulders, tufa deposits, old clinkers and rocks, wet or more or less dry cliffs in shade or full sun, stones along streams in forested or forestless belts; fine-grained soil along slope to stream in full shade of *Sasa* in elfin *Betula* forest; over moss mats hanging from big boulders and cliffs above hot stream steamed with H_2O and SO_2 (it is always humid, acidic and warm). In pure mats or with many hepatics, mainly such as *Cephalozia bicuspidata*, *Diplophyllum taxifolium*, *Gymnocolea inflata*, *Gymnomitrion concinnatum*, *Nardia scalaris*, *Plectocolea infusca* var. *ovicalyx*, *Solenostoma pyriflorum*, *Tritomaria quinquedentata*. **I:** K-48-24-05, K-55-5a-05, K-70-2a-05, K-10-22-07, K-12-9-07, K-17-9-07, K-23-1-07, **K:** K-37-27a-06, K-45-11-06, K-53-2a-06, K-57-3-06, **S:** K-50-51-07, K-51-11-07, K-65-8-07. This species is common in South Kurils and shows extraordinary variability in this area, the pigmentation varies from dark-brown and blackish, which are characteristic of this species, to reddish and purple, which is never observed in the boreal zone, but occur in temperate Eastern Asia). The latter modifications are readily confused with *M. emarginata*, but differ in stem cross section features.

M. sprucei (Limpr.) H. Bernet – per., ant., arch. – 30, 1110-1340 m – **I:** 8, 14, 15 – Wet crevices in vertical wall of cliff (tufa cliffs as well) in full sun near volcanic peak; overgrowing sandy dunes along Okhotsk Sea coast. In pure mats or once with *Isopaches bicrenatus*. **I:** K-58-8-05, K-68-1-05, K-15-22-07.

M. tubulosa Steph. – arch., per., ant. – 30-700 m – **Sm:** 1; **Chp:** 5; **K:** 22, 26 – Slopes of stream canyon and along bank of stream; wet soil in solfataric fields. **Sm:** C-42-07, **Chp:** Chp-1-08, **K:** K-53-5-06, K-37-38a-06.

Metacalypogeia cordifolia (Steph.) H. Inoue – 30-340 m – **K:** 27; **S:** 31, 32, 34 – Base of *Larix* and *Picea* in wind-stressed elfin forest; moss cover in coniferous forest; cliffs near streams and waterfalls in *Picea–Abies* forests. In pure mats or with *Bazzania ovifolia*, *Calypogeia* cf. *muelleriana*, *C. integristipula*, *Lepidozia reptans*, *Macrodiplophyllum plicatum*, *Pedinophyllum truncatum*, *Scapania hirosakiensis*, *S. diplophylloides*, *Schistochilopsis incisa*, *Tritomaria exsecta*. **K:** K-46-20-06, **S:** K-41-5-07, K-47-21-07, K-50-39-07, K-61-18-07, Sh-s.n.-1, Sh-34.5-06, Sh-034.1-06.

Metzgeria lindbergii Schiffn. – 10-700 m – **I:** 9, 10, 12, 20; **K:** 22, 23; **S:** 29, 31, 32 – Decaying wood, cliffs (lava clinkers as well) along streams in coniferous forests and volcanically destroyed areas; branches of *Juniperus sargentii* in dense thickets of the latter; boulders along lakes in forested area; stones in snow-bed hollow of temporary spring. In pure mats or with *Bazzania ovifolia*, *Blepharostoma minus*, *B. trichophyllum*, *Lejeunea japonica*, *Lepidozia reptans*, *Marsupella alata*, *Plectocolea infusca* var. *ovalifolia*, *Porella fauriei*, *Radula complanata*, *R. constricta*, *R. japonica*, *R. obtusiloba*, etc. **I:** K-64-12a-05, K-66-16-05, K-10-23-07, K-32-1-07, **K:** K-36-6-06, K-60-1a-06, **S:** K-37-10-07, K-41-11-07, K-48-6-07, Sh-039.1-06.

M. temperata Kuwah. – gemm. – 30-200 m – **K:** 23, 25, 27; **S:** 29, 31, 32 – Bark of *Picea, Abies,* and *Sorbus commixta* in coniferous and mixed forests; branches of *Juniperus sargentii* in its dense thickets. In pure mats or with *Frullania appendiculata, Lejeunea otiana*, *Macrodiplophyllum plicatum*, *Neohattoria herzogii*, *Nipponolejeunea subalpina*, *Radula* cf. *japonica*, *R. complanata*, *R. japonica*. **K:** K-47-22-06, K-56-10-06, K-63-31-06, **S:** K-37-49-07, K-41-16-07, K-50-36-07.

Moerckia blyttii (Moerck ex Hornem.) Brockm. – per., ant. – 20 m – **S:** 33 – Only one locality: wet depression between patches of *Eriophorum* and *Eleocharis* in wind-stressed community of *Sasa* and small herbs. In pure mats or with *Conocephalum japonicum*, *Nardia assamica*, *Solenostoma fusiforme*. **S:** K-54-3-07.

Mylia anomala (Hook.) S.Gray – ant., gemm. – 5-420 m – **U:** (Abramova, 1960)**, I:** 13, 15; **K:** 26; **S:** 31, 34 – Wet moss mats on slope to stream in tundroid community with *Juniperus sargentii*, *Ledum*, *Empetrum*, *Vaccinium uliginosum*; hummocks in sedge-moss and sedge-moss-dwarf shrub mires; wet fine-grained soil with sulphur content in the steam of hot thermal water; *Sphagnum* mats in swampy lighted *Larix* forest with cover of *Sphagnum* and *Carex*. In pure mats or with *Calypogeia neogaea*, *C. sphagnicola*, *Cephalozia bicuspidata*, *C.* cf. *pleniceps*, *Kurzia makinoana*. **I:** K-51-16-05, K-35-8-07, **K:** K-51-3-06, **S:** K-51-2-07, Sh-12.2-06.

M. taylorii (Hook.) S. Gray – 300-400, 1110-1300 m – **I:** 14; **K:** 22; **S:** 29, 32 – Wet crevices in cliffs, always in forestless summit areas (which are in case of Shikotan not so high). In pure mats or with *Gymnocolea marginata*, *Gymnomitrion concinnatum*, *Lophozia sudetica*, *Macrodiplophyllum plicatum*, *Marsupella sphacelata*, *Protolophozia debiliformis*, *Scapania ampliata*, *Sphenolobus minutus*. **I:** K-58-22-05, **K:** K-39-1-06, **S:** K-42-3-07, K-66-12-07.

M. verrucosa Lindb. – per., ant., spor. – 10-500 m – **I:** 13, 14, 20; **K:** 22, 25, 26, 26b, 27, 27a; **S:** 29, 30, 31,

32, 34 – Decaying wood, bases of trees, litter on steep slopes and rocks along watercourses in coniferous forests; base of *Betula* trunk in *Betula ermanii* elfin forest; horizontal surface of *Pinus pumila* branches in *Pinus pumila* community with *Sasa* underbrush; over moss mats hanging from big boulders and cliffs above hot stream steamed with H_2O and SO_2 (it is always humid, acidic and warm) in fumaroles field; boulders and over moss mats in tundroid communities of *Juniperus sargentii*; wet fine-grained soil with sulphur content along steam of hot water in volcanic destroyed area. In pure mats or mainly with epixylous hepatics *Anastrophyllum michauxii*, *Bazzania japonica*, *B. ovifolia*, *Blepharostoma minus*, *Crossocalyx hellerianus*, *Iwatsukia jishibae*, *Lepidozia reptans*, *Lophocolea heterophylla*, *Lophozia guttulata*, *Macrodiplophyllum plicatum*, *Nowellia curvifolia*, *Scapania hirosakiensis*. **I:** K-48-9-05, K-55-11-05, K-32-7-07, **K:** K-36-17-06, K-47-2-06, K-50-7b-06, K-63-2-06, "18.VII.1951, Kusakin (LE)", "30.VII.1965, Blum (LE)", **S:** K-37-14-07, K-40-4-07, K-41-1-07, K-47-20-07, Sh-13.7-06.

Nardia assamica (Mitt.) Amakawa – ant., per. – 10-430 m – **Chp:** 5; **I:** 8, 9, 10, 11, 13, 14, 15; **K:** 22, 25, 26, 26a, 27; **S:** 29, 30, 32, 33 – Spots of bare clayish or sandy ground in places with natively or antropogenically destroyed vegetation cover (stream banks, pyroclastic deposits, crumble pumice on slopes to sea, travertine cones in hot stream areas, roadsides), rocks along cool and hot sulphur spring in forested and forestless area; cliffy wall in *Salix-Duschekia* wet community; among mosses in hummocks in sedge-moss mires; between patches of *Eriophorum* and *Eleocharis* in wet depression in wind-stressed community of *Sasa* and small herbs. In pure mats or commonly with *Blasia pusilla*, *Cephalozia bicuspidata*, *Cephaloziella divaricata*, *Conocephalum japonicum*, *Diplophyllum andrewsii*, *D. taxifolium*, *Fossombronia sp*., *Nardia scalaris*, *Plectocolea vulcanicola*, *Scapania ampliata*, *Solenostoma koreanum*, *S. rishirense*. **Chp**: Chp-3-08, **I:** K-48-13-05, K-54-11-05, K-66-20a-05, K-67-2-05, K-71-3a-05, K-14-4-07, It-3-08, **K:** K-41-2-06, K-45-1a-06, K-52-9-06, K-62-3a-06, **S:** K-36-3-07, K-40-42-07, K-43-1-07, K-54-6-07 . In addition to typical forms of this species, plants intermediate with *N. subclavata* were collected.

N. breidleri (Limpr.) Lindb. – ant., arch., spor. – 360, 1220-1450 m – **Chp:** 5; **I:** 15, 17 – Banks of small streams in snow-bed communities, wet crevices in tufa and clinker cliffs near tops of volcanoes. In pure mats. **Chp:** Chp-1-08, **I:** K-15-31-07, K-17-17-07.

N. compressa (Hook.) Gray – 50-350 m – **Chp:** 5; **It:** 14 (Blagodatskikh & Duda, 1987); **K:** 26a – Fine-grained soil along thermal streams (also in warm water) and near steam and gas solfatara. **Chp:** Chp-3-08, **K:** "9.X.2007, A.V. Petukhov (LE)".

N. geoscyphus (De Not.) Lindb. – per., ant. – 50-660 m – **Sm:** 1, 4; **U:** 7; **I:** 11, 14 (Blagodatskikh & Duda, 1987) – Thin layer of fine-grained soil covering wet tufa cliffs of river canyon; roof of big cavity in tufa cliff in middle course of tectonic breaking; in mixed forest. In pure mats or with *Cephalozia bicuspidata*, *Conocephalum japonicum*, *Harpanthus flotovianus*, *Plectocolea rosulans*. **Sm:** C-33-07, C-53.2-07, **U:** U-2.3-07, **I:** K-70-7d-05.

N. geoscyphus (De Not.) Lindb. var. *dioica* Bakalin[1] – arch. – 400 – **S**: 29 – Cliff crevices near the top of mountain. **S**: K-38-8-07

N. hiroshii Amakawa – per., ant., spor. – 60-1450 m – **I:** 12, 15, 16, 17 – Stones, crevices in tufa cliffs along streams, crater's lakes, glaciers, tectonic breaking. In pure mats or with *Anthelia juratzkana*, *Blepharostoma trichophyllum*, *Cephalozia bicuspidata*, *Conocephalum japonicum*, *Diplophyllum taxifolium*, *Lophozia savicziae*. **I:** K-10-2-07, K-16-7-07, K-19-1-07, K-23-7-07. Amakawa (1959) described *N. hiroshi* as a new species related to *N. unispiralis*, but different in size of underleaves and larger cells along leaf margin. The species was not accepted by Vana (1976), who however did not provide a discussion on its taxonomy. In South Kurils we collected some specimens with mature capsules. Elaters in the latter are uniformly bispiral, but unispiral as in *N. unispiralis,*

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[1] – *Nardia geoscyphus* (De Not.) Lindb. var. *dioica* Bakalin var. nov. – *A typo varietatis in dioeciae sexualis dispositio differt*.

Holotypus: Russia, Sakhalin Province, Shikotan Island, area of Malokurilsk Village. Shikotan Mt. (43°52'17,0"N 146°51'18,1"E), 400 m alt., cliff crevices near the top. 23.VIII. 2007 Coll. V.A. Bakalin K-38-8-07 (VLA), (locality no. 29 in present paper).

The present variety differs from var. *geoscyphus* in dioicous inflorescence.

Amakawa (1957) described *Nardia geoscyphoides* Amakawa as close to *N. geoscyphus*, but different in dioicous inflorescence. Later Vana (1976) showed that the type specimen of the former species is actually paroicous (l.c., 379: "Bei dem Studium des Originalmaterials fand der Verfasser aber in zwei subinvolukralen Blatten je zwei Antheridienstiele mit Fragmenten der Antheridiumwand und stellte damit Parozie fest") and belongs to *N. geoscyphus* in narrow sense. In our material we found only unfertilized archegonia with no traces of antheridia bodies or stalks below. We suppose this is a separate taxon of variety level within *N. geoscyphus*.

which support the acceptance of *N. hiroshi* as of an independent species. All records of *N. unispiralis* for Russia (Bakalin, 2005; present paper, etc.) are based on sterile plants and are therefore ambiguous.

N. insecta Lindb. – per., ant. – 20-50 m – **Sm:** 1, 3, 4 – Fine-grained soil on steep slopes of stream, crevices of coastal rocks and cliffs. **Sm**: C-28.4-07, C-42-07, C-44.2-07.

N. japonica Steph. – ant., per., spor. – 50-1340 m – **Sm:** 4; **Chp:** 5; **I:** 13, 15; **K:** 22, 27; **S:** 32 – Fine-grained soil along roadsides, stream banks, crevices of rocks, eroded slopes in forestless areas; wet bank of spring near glacier. In pure mats or with *Cephalozia bicuspidata*, *Diplophyllum andrewsii*, *Marsupella funckii*, *M. sphacelata*, *Nardia scalaris*, *Scapania diplophylloides*. **Sm:** C-28.2-07, **Chp:** Chp-1-08, **I:** K-50-8-05, K-15-30-07, **K:** K-38-4b-06, K-44-2-06, **S:** K-44-2-07.

N. scalaris S. Gray ssp. *scalaris* – ant., per. – 110-1300 m – **Sm:** 1, 3, 4; **U:** 7, **I:** 11, 14, 15; **K:** 22, 23; **S:** 29, 30, 31, 32, 34 – Cliff crevices (mainly on thin soil layer filling cavities) in forestless areas (wind-stressed meadows on tops of knolls, tundroid communities); rocks along river's canons, outliers, rocks outcrops, vertical walls of mountain circus around fumaroles field; stones and soil in snow-bed hollow of temporary spring; tufa rocks in volcanic destroyed areas; over wet moss mats in tundroid communities with *Juniperus sargentii*, *Ledum*, *Empetrum*, *Vaccinium uliginosum*. In pure mats or with *Calycularia crispula*, *Calypogeia integristipula*, *Diplophyllum albicans*, *D. taxifolium*, *Kurzia makinoana*, *Lophozia silvicola*, *L. sudetica*, *Nardia assamica*, *Plectocolea infusca* var. *ovalifolia*, *P. infusca* var. *ovicalyx*, *Scapania integerrima*, *S. ligulata*, *S. undulata*, etc. **Sm:** C-28.1-07, C-53.3-07, C-44.1-07, **U:** U-2.3-07, **I:** K-58-1-05, K-70-1a-05, K-16-6-07, **K:** K-37-36b-06, K-58-6c-06, **S:** K-38-5-07, K-42-13-07, K-51-3-07, K-56-5-07, K-64-11-07, Sh-015-06.

N. scalaris S.Gray ssp. *harae* (Amakawa) Amakawa – per. – 1170-1220 m – **I:** 15, 17 – Basal part and crevices in big boulders and cliffs in nival communities. In pure mats or with *Calypogeia azurea*, *Cephalozia bicuspidata*. **I:** K-16-27-07, K-17-8-07.

N. subclavata (Steph.) Amakawa – per., ant. – 20-410 m – **I:** 10, 11, 14; **K:** 26, 26a; **S:** 29, 33 – Fine-grained soil along streams and rivers (also sulphur springs and streams with high content of *Fe*) in coniferous and mixed forests, elfin *Pinus pumila* forests, *Sasa* communities; cliff crevices in river canyons; rocky walls near fumaroles field. In pure mats or with *Diplophyllum albicans*, *Marsupella sphacelata*, *Nardia unispiralis*, *Protolophozia debiliformis*, *Scapania ampliata*, *S. ligulata*, *S. rishirense*, *S. sphaerocarpum*, etc. **I:** K-54-10-05, K-65-28-05, K-70-1-05, It-22-08, **K:** K-52-4-06, **S:** K-38-42-07, K-56-2-07.

N. unispiralis Amakawa – arch., per. – 30-1500 m – **I:** 8, 14 – Boulders covered by thin layer of fine-grained soil along mineral stream with high content of *Fe* in *Betula* and *Sorbus* forest; on swamping old airdrome strip, stones in snow-bed hollow of temporary spring; fine-grained soil filling the crevices of old clinker in flat subcrator part of volcano. In pure mats or with *Anthelia juratzkana*, *Gymnomitrion apiculatum*, *Lophozia sudetica*, *Nardia subclavata*, *Plectocolea* cf. *rosulans*, *Solenostoma jenseniana*. **I:** K-56-1-05, K-68-6-05, It-14.2-08.

Neohattoria herzogii (Hatt.) Kamim. – per. – 10-300 m – **I:** 20; **K:** 23, 25, 26, 27, 27a (Ladyzhenskaya, 1963); **S:** 29, 30, 31, 32, 34 – Trunks (*Picea*, *Abies*, *Taxus*, *Acer mayri*) and decaying wood in coniferous and mixed forests. In pure mats or with *Bazzania ovifolia, Frullania appendiculata, F. inflata*, *Lepidozia reptans*, *Lophocolea heterophylla*, *Metzgeria temperata*, *Nipponolejeunea subalpina*, *Radula japonica*. **I:** K-26-43-07, **K:** K-47-20a-06, K-50-10b-06, K-56-10a-06, K-63-24-06, "29.05.1964, E.I. Kil'dyushevskij (LE)", **S:** K-37-41-07, K-40-26-07, K-48-28-07, K-57-24-07, Sh-32-06, Sh-9-06, Sh-039.

Nipponolejeunea subalpina (Horikawa) S. Hatt. – per. – 10-500 m – **U:** 6?; **I:** 10, 12, 14, 20; **K:** 22, 25, 26, 27; **S:** 29, 31, 32, 34 – Trunks (*Picea*, *Abies*, *Taxus*, *Larix, Betula*) and decaying wood in coniferous and mixed forests. In pure mats or with epiphytes and epixyles such as *Cololejeunea macounii*, *Frullania appendiculata*, *F. muscicola*, *Microlejeunea ulicina*, *Lepidozia reptans*, *Metzgeria temperata*, *Neohattoria herzogii*, *Ptilidium pulcherrimum*, *Radula japonica*, *Scapania hirosakiensis*, etc. **U:** "2.VIII.1946, Vorob'ev (LE), **I:** K-65-16-05, K-26-39-07, K-31-8-07, It-25-08, **K:** K-40-13-06, K-47-18-06, K-50-20-06, K-63-29a-06, "29.V.1964, E.I. Kil'dyushevskij (LE)", **S:** K-37-43-07, K-48-28-07, K-61-2-07, Sh-32-06, Sh-039.1-06.

Nowellia curvifolia (Dicks.) Mitt. – 60-500 m – **K:** 22, 26, 27a – Decaying wood in *Picea–Abies* forests (sometimes with admixture of *Betula* and broad-leaved trees). In pure mats or with *Anastrophyllum michauxii*, *Cephalozia leucantha*, *Crossocalyx hellerianus*, *Iwatsukia jishibae*, *Lophocolea heterophylla*, *Lophozia guttulata*, *Mylia verrucosa*, *Ptilidium pulcherrimum*, *Riccardia palmata*, *Scapania hirosakiensis, S. parvitexta*, etc. **K:** K-37-20-06, K-52-19a-06, "18.VII.1951, O.G. Kusakin (LE)".

Obtusifolium obtusum (Lindb.) S.W. Arnell – arch. – 50-100 m – **Sm:** 3; **K:** 26 – Slope of stream canyon, wet fine-grained soil with sulphur in the steam of hot water in the area of thermal springs. In pure mats or

with *Cephalozia bicuspidata*. **Sm:** C-31-07, **K:** K-52-11-06.

Odontoschisma denudatum (Mart.) Dumort. – gemm. – 10-180 m – **K:** 26, 27; **S:** 31, 32 – Decaying wood in *Picea–Abies* forests; once on wet fine-grained soil with sulphur in the steam of hot water in the area of thermal springs. In pure mats or with *Anastrophyllum michauxii*, *Blepharostoma minus*, *Calypogeia suecica*, *Cephalozia lunulifolia*, *Lepidozia reptans*, *Riccardia palmata*, *Scapania hirosakiensis*. **K:** K-45-14a-06, K-50-4-06, "13.IX.1964, E.I. Kil'dyushevskij (LE)", **S:** K-48-26-07, K-57-8-07, Sh-041.1-06.

O. macounii (Austin) Underw. – 150 m – **K:** 27 – One collection: wet cliff crevices on the shore of young volcanic caldera's lake with very strong volcanic activity. With *Calypogeia integristipula*, *Lophozia ventricosa* var. *ventricosa*. **K:** K-45-11a-06.

Orthocaulis attenuatus (Mart.) A. Evans – gemm. – 190-430 m – **I:** 13, 14 – Base of *Larix* in larch forest with *Sasa* underbrush; bark in the base of *Betula ermanii* trunk in birch elfin forest with underbrush of *Pinus pumila* and *Sasa*; hummocks in *Juncus-Carex*-dwarf shrub-moss mire; horizontal surface of *Pinus pumila* branches in community of *Pinus pumila* with *Sasa* underbrush; over moss mats hanging from big boulders and cliffs above hot stream steamed with H_2O and SO_2 (it is always humid, acidic and warm). In pure mats or with *Bazzania trilobata*, *Calypogeia integristipula*, *C. muelleriana*, *Cephalozia lunulifolia*, *Lophocolea heterophylla*, *Lophozia silvicoloides*, *Macrodiplophyllum plicatum*, *Mylia verrucosa*, *Ptilidium californicum*. **I:** K-48-7-05, K-55-11-05, It-25-08.

Pallavicinia lyellii (Hook.) Carruthers – 30 m – **K:** 25 – Only one locality: wet hollows in *Picea glehnii* with admixture of *Sorbus*, *Betula*, *Taxus cuspidata*; *Abies sachalinensis* boggy moss forest. In pure mats or with *Cephalozia bicuspidata*. **K:** K-63-8-06.

Pedinophyllum interruptum (Nees) Lindb. per – 100 m – **S:** 29 – One collection: decaying wood in *Abies-Picea* forest. **S:** K-36-19-07.

P. truncatum (Steph.) H. Inoue – per. – 30-340 m – **I:** 20; **K:** 22, 27; **S:** 31, 32 -Base of trees and soil on steep slopes, wet cliffs near streams, boulders and lava clinkers in full shade in *Picea–Abies* forests; bare ground in wind-stressed meadow on more or less steep slope to sea. In pure mats or with *Bazzania tricrenata*, *Diplophyllum taxifolium*, *Metacalypogeia cordifolia*, *Plectocolea hyalina*, *Radula* cf. *obtusiloba*, *Scapania diplophylloides*, *Sphenolobus minutus*, *Tritomaria exsecta*. **I:** K-32-6-07, **K:** K-42-11b-06, K-46-12a-06, **S:** K-47-30-07, K-61-22-07.

Pellia endiviifolia (Dicks.) Dumort. – per., ant., arch. – 10-400, 1170 m – **U:** 6; **I:** 9, 10, 12, 14, 15; **K:** 22, 26; **S:** 29, 30, 31, 32 – Wet crevices in outliers, cliffs of river canyons, wet mossy slopes and stones along streams in forested and forestless belts; cliffs shaded by *Alnus* along sea coast; wet clayish roadsides in coniferous forests; hollows between *Carex* patches in eutrophic mires; wet snow-bed communities. In pure mats or with *Blasia pusilla*, *Cephalozia bicuspidata*, *Conocephalum conicum*, *C. japonicum*, *Harpanthus flotovianus*, *Jungermannia pumila*, *Riccardia aeruginosa*, *R. multifida* ssp. *decrescens*, *Trichocolea tomentella*. **U:** U-4-08, **I:** K-47-7-05, K-66-9-05, K-16-3-07, It-1-08, **K:** K-37-13a-06, K-53-4a-06, **S:** K-38-2-07, K-39-8-07, K-49-34-07, K-62-25-07.

P. epiphylla (L.) Corda – per., ant. – 10 m – **I:** 21 – One collection: peaty soil in grass-sedge bog on the bank of lake. **I:** K-30-6-07.

P. neesiana (Gottsche) Limpr. – ant., arch., per. – 20-1200 m – **Sm:** 1, 2, 4; **U:** 7; **I:** 10, 12, 13, 14, 15, 21; **K:** 22, 23, 26, 27; **S:** 29, 30, 31, 34 – Wet humus and fine-grained soil along streams and wet depressions in coniferous, mixed, *Betula, Sorbus* and *Alnus* and broad-leaved forests, dense *Sasa* thickets, elfin *Alnus* and *Pinus pumila* communities; hollows in sedge-moss-dwarf shrub mires; wet crevices in waterfall's and coastal cliffs; boulders along lake shore; wet snow-bed communities; hot (40°C) strata of travertine in fumaroles field; once collected in upper altitude in wet tufa deposits in crevices of old volcanic cone. In pure mats or with many hepatics, more commonly with *Aneura pinguis*, *Calypogeia muelleriana*, *C. neogaea*, *Cephalozia bicuspidata*, *Chiloscyphus polyanthos*, *Conocephalum conicum*, *Jungermannia pumila*, *Lophozia sudetica*, *Marsupella sphacelata*, *Pleurocladula albescens*, *Scapania diplophylloides*, *Solenostoma fusiforme*. **Sm:** C-41-07, C-24-07, **U:** U-2.3-07, U-1-08, **I:** K-45-51-05, K-48-17-05, K-51-24-05, K-63-6-05, K-13-12-07, K-21-2-07, K-30-12-07, It-21-08, **K:** K-37-12a-06, K-48-1-06, K-51-6-06, K-58-5d-06, **S:** K-36-44-07, K-39-5-07, K-49-26-07, K-64-1-07.

Plagiochila ovalifolia Mitt. – ant., per. – 15-400, 1340 m – **I:** 15, 20; **S:** 29, 30, 31 – Cliff crevices near tops of mountains in forested and forestless areas; wet lava clinker in *Picea-Abies* forest. In pure mats or with *Blepharostoma trichophyllum*, *Diplophyllum taxifolium*, *Frullania appendiculata*, *Metzgeria lindbergii*, *Plagiochila porelloides*. **I:** K-15-17-07, K-27-34-07, **S:** K-38-49-07, K-48-17-07, K-65-10-07. The distinction between this species and *P. porelloides* is obscure. The differentiating features announced by various authors (Inoue, 1958, etc.), e.g. thickness of outer stem layer, size of leaf cell trigones, armature of perianth, etc. are unreliable and seem to be influenced by growing condition. In our opinion these taxa are most probably synonymous. However here we follows Yamada & Iwatsuki (2006).

P. porelloides (Torrey ex Nees) Lindenb. – per., ant. – 20-400, 1600 m – **Sm:** 2; **U:** 6; **I:** 10, 11, 12, 17; **K:** 23, 27a; **S:** 29, 30, 31, 32, 33, 34 – Wet and dry cliffs, mainly in partial shade on rocks outcrops, in river canyons, near waterfalls, cliffs splashed by streams in forested and forestless belts; bank of sluggishly flowing rivulet in moss-dwarf shrub community; base of *Picea* and *Abies* and soil in coniferous forests; once collected in crater's cliff of dormant volcano. In pure mats or commonly with *Bazzania ovifolia*, *Blepharostoma trichophyllum*, *Cephalozia bicuspidata*, *Conocephalum conicum*, *Diplophyllum taxifolium*, *Lejeunea japonica*. **Sm:** C-14.2-07, **U:** U-3-08, **I:** K-61-17-05, K-71-5-05, K-10-27-07, K-18-2-07, **K:** K-60-3-06, "24.VII.1951, O.G. Kusakin (LE)", **S:** K-42-6-07, K-48-13a-07, K-54-15-07, K-65-10-07, Sh-04-06.

Plectocolea biloba Amakawa (= *J. cephalozioides* Amakawa) per., ant. – 110-300 m – **S:** 31, 32 – Wet cliffs, bank of stream, boulders in steep slope in full shade in *Picea–Abies* forests. In pure mats, rarely with *Marsupella alata*. **S:** K-43-4-07, K-48-4-07, K-50-53-07.

P. flagellata S. Hatt. var. *kurilensis* Bakalin[1] – per. – 64 – **I**: 12 – Wetted stones along river in *Duschekia* flood-valley forest. – I: K-10-1-07.

P. harana Amakawa – per., ant. – 400 m – **I:** 15 – One collection: wet soil near the base of cliff in *Pinus pumila* community. **I:** K-13-13-07.

P. hattoriana Amakawa – per., ant. – 20 m – **S:** 33 – One collection: hollows between patches of *Eriophorum* and *Eleocharis* in wet depression in windy community of *Sasa* and small herbs. **S:** K-54-5-07.

P. hyalina (Lyell) Mitt. – arch., per., ant. – 10-420, 1200 m – **Sm:** 1, 3; **U:** 7; **I:** 8, 9, 10, 14; **K:** 23, 27, 27a; **S:** 29, 32, 33, 34 – Wet fine-grained soil along banks of streams (with sulphur content as well) in *Picea–Abies* forests; crevices in vertical cliffs in wind stressed communities of *Eubotrioides*, *Sasa*, *Spiraea*, *Juniperus sargentii* and small herbs; bare ground spots in wind-stressed meadow on slope to sea; sea coastal cliffs shaded by *Alnus* or in full sun; crumble slope of white pumice deposits; once collected in upper altitude in cliffs along slope of old volcanic cone. In pure mats or with *Anthelia juratzkana*, *Bazzania tricrenata*, *Conocephalum japonicum*, *Fossombronia sp.*, *Hygrobiella laxifolia*, *Nardia assamica*, *Pedinophyllum truncatum*, *Pellia neesiana*, *Preissia quadrata*, *Scapania irrigua*. **Sm:** C-28.1-07, C-37-07, **I:** K-53-1-05, K-66-7a-05, K-67-2-05, It-4.1-08, **K:** K-45-22-06, K-58-5d-06, "1.VIII.1964, E.I. Kil'dyushevskij (LE)", ą 678, **S:** K-36-3-07, K-42-26-07, K-53-8-07, Sh-4.1-06.

P. infusca Mitt. var. *infusca* – per., ant. – 40-330 m – **I:** 14 (Blagodatskikh & Duda, 1987, without indication of variety), 16; **S:** 30 – Eroding roadside in *Picea–Abies* forest; cliff splashed by water during high-flood period in lower course of tectonic breaking (forested belt). In pure mats or with *Blepharostoma trichophyllum*, *Cephalozia bicuspidata*, *Diplophyllum andrewsii*. **I:** K-23-6-07, **S:** K-40-43-07.

P. infusca Mitt. var. *ovalifolia* Amakawa – arch., per., ant. – 20-700 m – **I:** 15, 18; **K:** 22, 23, 27; **S:** 30, 31, 32, 33 – Wet crevices and fine-grained soil along steep cliffy slopes, banks of streams, waterfalls, coastal cliffs in forested and forestless belts; eroding roadsides; stones in snow-bed hollow of temporary spring; once collected on wet decaying wood in *Picea-Betula* forest. In pure mats or with many hepatics, more commonly with *Anthelia juratzkana*, *Cephalozia bicuspidata*, *Conocephalum japonicum*, *Nardia scalaris*, *Preissia quadrata*, *Scapania parvitexta*. **I:** K-12-6-07, K-34-1-07, **K:** K-37-16-06, K-46-6-06, K-62-1-06, **S:** K-41-27-07, K-48-24-07, K-53-3-07, K-64-11-07.

P. infusca Mitt. var. *ovicalyx* (Steph.) Bakalin – ant., per. – 20-500 m – **I:** 11, 16; **K:** 22, 23, 27; **S:** 30, 31, 32 – Cliff crevices along sea coast, outliers, over boulders, cliffs near stream in full shade in forested and

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[1] – *Plectocolea flagellata* S. Hatt. var. *kurilensis* Bakalin *var. nova*

A var. flagellata distinguitur in cormus foliosus 2.0 mm lato.

Holotypus: Russia, Sakhalin Province, Iturup Island, valley of Khvoynaya River near Gornyy Settl. (44°55'55,6"N 147°34'30,2"E), 64 m alt., *Duschekia* flood-valley forest with admixture of *Betula* and *Sorbus* and cover of high herbs, on stones along river, sometimes splashed by water. 7.VIII.2007 Coll. V.A. Bakalin, K-10-1-07 (VLA) (point no. 12 in the present paper)

The var. *kurilensis* differs from var. *flagellata* in small size of shoots – up to 2 mm wide, versus 3-4 mm, and numerous colorless rhizoids versus few and purple ones.

P. flagellata belongs to *Flagellata* group, the most taxonomically diverse cluster of *Plectocolea* in East Asia. The species is characterized by (Amakawa, 1960: 17) as having "rigid and erect stem, the conduplicate-concave leaves, the oil-bodies of the grape-cluster type and particularly the rigid flagella". It should be noted that under flagellae Amakawa (l.c.) means rather geotropic stolons which penetrate into substratum and are nearly leafless (only small, decolorated scale-like phyllids are present). So far it was found only in Kyushu Island in southern flank of Japan, and was known only from the type specimen. The present collection is the second one and as it is possible to suppose this species shows more wide variability than it was assumed by Amakawa (1960).

forestless areas; decaying wood, bark of *Acer* in mixed forests. In pure mats or commonly with *Calypogeia muelleriana*, *Cephalozia bicuspidata*, *Diplophyllum albicans*, *D. taxifolium, Marsupella sphacelata*, *Nardia scalaris*. **I:** K-71-7a-05, K-24-10-07, **K:** K-40-8-06, K-46-1a-06, K-60-3a-06, **S:** K-45-11-07, K-49-20-07, K-64-15-07.

P. obovata (Nees) Mitt. – per., ant. – **Sm:** 20-50 m – 1, 2, 3, 4 – Fine-grained soil in crevices of coastal cliffs and on slopes of stream. In pure mats. **Sm:** C-50-07, C-44.1-07, C-29.1-07, C-15.2-07.

P. obscura A. Evans – 30 m – **Sm:** 1 – Boulders and soil along stream. **Sm:** C-53.2-07. The difference between *P. obscura* and *P. infisca* var. *ovalifolia* remains unclear. Probably var. *ovalifolia* does not belong to *P. infusca* and the former is conspecific with *P. obscura*.

P. otiana S. Hatt. – per., ant. – 10 m – **I:** 12 – One collection: stones along river, sometimes splashed by water in *Duschekia* flood-valley forest. **I:** K-10-3-07

P. rigidula S. Hatt. – per., ant. – 20–200 m – **K:** 22, 24; **S:** 31 – Wet cliff crevices at sea coast and near waterfall in mixed forest. In pure mats or with *Hygrobiella laxifolia, Scapania integerrima*. **K:** K-37-11-06, K-43-2-06, **S:** K-49-11-07.

P. rupicola (Amakawa) Bakalin. – per., ant. – 30-410 m – **I:** 11, 14, 16; **K:** 22, 23, 28 – Boulders along mineral stream with high content of *Fe* in *Betula* and *Alnus* forest; tufa rocks in stream canyon; sea coastal cliffs crevices; wet cliffs near waterfall and streams in broad-leaved forest. In pure mats or with *Blepharostoma trichophyllum*, *Cephalozia bicuspidata*, *Harpanthus flotovianus*, *Hygrobiella laxifolia*, *Jungermannia pumila*, *Marsupella sphacelata*, *Nardia geoscyphus*, *N. subclavata*, *N. unispiralis*. **I:** K-56-1-05, K-70-2-05, K-23-5-07, **K:** K-37-31-06, K-46-5-06, K-60-5-06, "14.VII.1951, O.G. Kusakin (LE)".

P. virgata Mitt. – per. – 15 m – **I:** 8 – One collection. Crumble white pumice stone in sea coast. With *Nardia assamica*. **I:** K-66-20a-05.

P. vulcanicola Schiffn. – ant., arch., per. – 10-970 m – **I:** 8, 9, 14; **K:** 22, 24, 26, 26a, 27, 27a; **S:** 30 – Banks of sulphur springs, near fumaroles fields; over mosses hanging from big boulders and cliffs above hot stream steamed with H_2O and SO_2 (it is always humid, acidic and warm); crevices in sea coastal cliffs; waterfall rocks in forest; roadsides in *Sasa-Pinus pumila* thickets and *Picea–Abies* forest. Mostly in pure mats, very rarely with *Blasia pusilla*, *Cephalozia bicuspidata*, *Conocephalum japonicum*, *Nardia assamica* in sulphur-free habitats. **I:** K-53-4-05, K-66-14-05, K-67-7a-05, It-16-08, **K:** K-37-11b-06, K-43-4-06, K-45-2-06, K-52-2-06, "23.VII.1951, O.G. Kusakin (LE)", **S:** K-40-39-07. This species is very polymorphous in morphology, some sterile forms cannot be differentiated from *Solenostoma fusiforme*.

Pleurocladula albescens (Hook.) Grolle – 500-1500 m – **I:** 14, 15, 17; **K:** 22, 23 – Wet fine-grained soil filling cliff crevices near tops of mountains affected by volcanic eruptions (tufa cliffs, old clinkers); wet snow-bed communities; crater's outliers; cliffs near stream in tectonic breaking; once collected in lower altitude in forest belt on fine-grained bank of stream flowing from top of old volcano. In pure mats or with *Anthelia juratzkana*, *Cephalozia bicuspidata*, *C. pachycaulis*, *Diplophyllum albicans*, *D. taxifolium*, *Gymnomitrion apiculatum*, *G. concinnatum*, *Kurzia makinoana*, *Lophozia sudetica*, *Pellia neesiana*, *Scapania diplophylloides*, etc. **I:** K-58-16a-05, K-16-13-07, K-19-3-07, **K:** K-39-11-06, K-57-8a-06.

Porella fauriei (Steph.) S. Hatt. – 20-300 m – **I:** 10, 12; **K:** 22, 23, 27; **S:** 29, 32 – Base and lower part of trunks of *Acer*, *Alnus hirsuta*, *Salix, Betula*; decaying wood in *Picea–Abies* and *Betula* and *Sorbus* forests; cliffs splashed by stream water, partly shaded crevices in outliers, boulders in forest belt; crevices in coastal cliffs shaded by broad-leaved trees. In pure mats or with *Blepharostoma minus*, *Herbertus aduncus*, *Metzgeria lindbergii*, *Radula japonica*, *R. obtusiloba*. **I:** K-45-2-05, K-61-21-05, It-10-08, **K:** K-36-6-06, K-46-7-06, K-56-11-06, **S:** K-45-22-07, K-61-21-07, Sh-6-06.

P. grandiloba Lindb. – 20-50 m – **Sm:** 2; **K:** 22, 27 – Boulders in full shade in *Picea–Abies* forest and along river in tall grass communities; crevices in sea coastal cliffs shaded by broad-leaved trees. In pure mats or with *Apometzgeria pubescens*, *Plectocolea infusca* var. *ovalifolia*, *Radula japonica, Conocephalum conicum, Pellia neesiana*. **Sm:** C-19-07, **K:** K-42-9-06, K-46-9-06, "24.VII.1951, Kusakin (LE).

Preissia quadrata (Scop.) Nees – spor., ant. – 50-1450 m – **Sm:** 1, 3; **I:** 17; **K:** 22, 23; **S:** 29, 30, 31, 32 – Crevices filled by fine-grained ground in outliers, old volcanic tufa cone, rock outcrops in forestless belt; slopes of stream canyon; crevices in vertical cliffs and rocks near waterfall in *Picea–Abies* forest; stones in snow-bed hollow of temporary spring. In pure mats or with *Anthelia juratzkana*, *Bazzania ovifolia*, *Blepharostoma trichophyllum*, *Cheilolejeunea obtusifolia*, *Diplophyllum taxifolium*, *Eremonotus myriocarpus*, *Lejeunea japonica*, *Plectocolea hyalina*, *Plectocolea infusca* var. *ovalifolia*, *Scapania ligulata*, *Scapania parvitexta*. **Sm:** C-43.1-07, C-56-07, **I:** K-19-14-07, **K:** K-37-15-06, K-58-1-06, **S:** K-38-20-07, K-42-17-07, K-48-15a-07, K-65-19-07.

Protolophozia debiliformis (Schust.) Konstant. – gemm., arch. – 400-1450 m – **I:** 14, 15, 17; **S:** 29 – Crevices in outliers in forestless and elfin shrub belts; snow-bed habitats; crater's wet cliffs; vertical walls in fumaroles circus. In pure mats or with *Bazzania ovifo-*

lia, *Diplophyllum taxifolium*, *Gymnocolea inflata*, *Gymnomitrion concinnatum*, *Lophozia sudetica*, *Marsupella alata*, *M. sphacelata*, *Nardia subclavata*, *Scapania ligulata*. **I:** K-58-22-05, K-13-5-07, K-17-15-07, **S:** K-38-7-07.

Ptilidium californicum (Aust.) Pears. – per., ant. – 30-430 m – **Sm:** 1, 2; **I:** 13, 14 – Bark near base of *Betula* trunk in birch elfin forest; horizontal part of *Pinus pumila* branches in *Pinus pumila* community with *Sasa* underbrush; wet soil on slope of stream. In pure mats or with *Bazzania trilobata*, *Lophozia silvicoloides*, *Orthocaulis attenuatus*. **Sm:** C-53.1-07, C-13-07, **I:** K-48-3-05, K-50-3-05, It-19-08.

P. ciliare (L.) Hampe – 320-970 m – **I:** 14; **S:** 32 – Horizontal ledge in cliffs in wind-stressed dwarf shrub community; vertical walls in fumarole circus. **I:** K-59-2-05, **S:** K-42-11-07.

P. pulcherrimum (Weber) Vain. – per., spor. – 10-1220 m – **I:** 10, 12, 15, 17, 20; **K:** 22, 23, 27; **S:** 29, 31, 32 – Decaying wood and bases of trees in coniferous, mixed, broad-leaved and *Betula* and *Alnus* forests; bark of *Quercus* and *Acer* in dominantly *Sorbus* forest. In pure mats or with epixylous species such as *Anastrophyllum michauxii*, *Cephalozia leucantha*, *Crossocalyx hellerianus*, *Crossogyna autumnalis*, *Lepidozia reptans*, *Lophocolea heterophylla*, *L. guttulata*, *Nowellia curvifolia*, *Riccardia latifrons*, *Scapania apiculata*, *S. hirosakiensis*, etc. **I:** K-45-60-05, K-65-11-05, K-17-4-07, K-26-30-07, K-32-7-07, K-35-10-07, It-6-08, **K:** K-37-9a-06, K-45-15b-06, K-50-6-06, K-56-7a-06, **S:** K-37-21-07, K-47-23a-07, K-57-2-07, Sh-34.3-06.

Radula brunnea Steph. – 140-340 m – **S:** 31, 32 – Cliff crevices and wetted rock outcrops in belt of wind-stressed communities of different combinations of shrubs (*Eubotriodes*, *Sasa*, *Spiraea*, *Juniperus sargentii*, *Dasiphora fruticosa*). In pure mats or (more frequently) with *Diplophyllum albicans*, *Frullania appendiculata*, *Herberthus* cf. *buchii*, *H. aduncus*, *Scapania undulata*. **S:** K-42-31-07, K-47-18-07.

R. complanata (L.) Dumort. – per., ant., spor. – 20-400 m – **Sm:** 1, 2; **U:** (Abramova, 1960); **I:** 10, 14, 20; **S:** 29, 30 (Korotkevitch, 1963), 32 – Branch of *Juniperus sargentii* in its dense thickets in wind-stressed tundroid community; bark of *Alnus* at the height of 1 m in wet *Alnus-Salix* forest with small admixture *Larix*; *Abies* trunk in fir forest; fine-grained soil on steep slope along sea coast and along stream. In pure mats or with *Lejeunea japonica*, *L. otiana*, *Metzgeria lindbergii*, *M. temperata*, *Radula japonica*. **Sm:** C-15.1-07, C-37-07, **I:** K-61-19-05, K-26-44-07, It-2-08, It-17-08, **S:** K-38-51-07, K-41-12-07, Sh-25-06.

R. constricta Steph. – gemm., per., arch. (unfertilized) – 20-400 m – **I:** 10, 13; **S:** 31 – Dry sea coastal cliffs; boulders in stream bed in *Betula* elfin forest with thick underbrush of *Pinus pumila* and *Sasa*; boulders along lake bank in coniferous forest. In pure mats or with *Diplophyllum taxifolium*, *Metzgeria lindbergii*. **I:** K-48-30-05, K-64-10-05, **S:** K-49-22-07.

R. japonica Gottsche – per., ant., arch. – 10-700 m – **I:** 9, 12, 13, 20; **K:** 22, 23, 25, 26, 27, 27a; **S:** 29, 30, 31, 32, 33 – Wet and partly shaded cliff crevices near streams, waterfalls, outliers, rocks outcrops in coniferous and mixed forests; decaying wood, bark of *Abies*, *Taxus*, *Acer*, *Kalopanax*, *Toisusu urbaniana* in forested areas; fine-grained soil along slope to stream in full shade of *Sasa* in *Betula* elfin forest; stones in snow-bed hollow of temporary spring. In pure mats or with *Apometzgeria pubescens*, *Bazzania ovifolia*, *Blepharostoma minus*, *Diplophyllum taxifolium*, *Frullania muscicola*, *Plectocolea infusca* var. *ovalifolia*, *Porella fauriei*, *P. grandiloba*, *Radula complanata*, etc. **I:** K-45-13-05, K-48-17-05, K-66-9b-05, K-26-39-07, **K:** K-36-12-06, K-46-1-06, K-50-25-06, K-56-10-06, K-61-6-06, "14.IX.1956, Koval' (LE)", **S:** K-37-39-07, K-40-24-07, K-42-37-07, K-50-36-07, K-56-10-07.

R. obtusiloba Steph. – ant., per., spor. juv. – 20-1220 m – **I:** 12, 16, 17, 18, 20; **K:** 22, 23; **S:** 29, 31, 32 – Cliff crevices, boulders, rocky stream banks and waterfall walls, in *Picea–Abies* forests and wind-stressed tundroid communities; bark of *Betula* in elfin birch forest; stones and crevices between boulders in snow-bed hollows of temporary streams; wet sea coastal cliffs. In pure mats or with *Bazzania ovifolia*, *Herbertus aduncus*, *Lophocolea cuspidata*, *Metzgeria lindbergii*, *Pedinophyllum truncatum*, *Porella fauriei*, *Tritomaria* cf. *exsecta*. **I:** K-16-37-07, K-17-3-07, K-24-18-07, K-26-25-07, K-34-4-07, **K:** K-37-33a-06, K-56-9-06, **S:** K-36-31-07, K-42-56-07, K-48-8-07, K-49-8-07.

Reboulia hemisphaerica (L.) Raddi ssp. *orientalis* R. M. Schust. – ant., arch., spor. – 30-40 m – **K:** 27; **S:** 32 – Shaded cliff crevices near stream in *Picea–Abies* forest and along sea coast. In pure mats or with *Diplophyllum taxifolium*. **K:** K-46-9a-06, **S:** K-61-11-07.

Riccardia aeruginosa Furuki – arch. – 10-290 m – **K:** 25, 26; **S:** 30 – Wet hollows between moss hummocks in dwarf shrub-moss-sedge mire and *Picea glehnii* mossy boggy forest with admixture of *Sorbus*, *Betula*, *Taxus cuspidata*, *Abies sachalinensis*; wet cliff crevices in *Picea–Abies* forest. In pure mats or with *Calypogeia* cf. *neogaea*, *Cephalozia bicuspidata*, *Jungermannia pumila*, *Kurzia makinoana*, *Pellia endiviifolia*, *Schistochilopsis cornuta*. **K:** K-51-7-06, K-63-6-06, **S:** K-65-20-07.

R. chamaedryfolia (With.) Grolle – ant., arch. – 10-150 m – **U:** 7; **K:** 25, 26, 26b, 27a; **S:** 32, 34 – Wet hollows in the ground and decaying wood in *Picea–*

Abies forests. In pure mats or with *Aneura pinguis*, *Calypogeia integristipula*, *Cephalozia leucantha*, *Harpanthus flotovianus*, *Lophocolea cuspidata*. **U:** U-9.2-07, **K:** K-50-15-06, K-63-19-06, "30.VII.1965, Blum (LE)", "7.X.1968, Gorodkov (LE)", **S:** K-57-1-07, Sh-13.7-06.

R. latifrons (Lindb.) Lindb. – ant., arch. – 10-700 m – **K:** 22, 26; **S:** 32 – Decaying wood in *Picea–Abies* forest; wet hollows between *Sphagnum* hummocks in dwarf shrub-moss-sedge mire; over peaty mats of dying mosses on cliffs of river canyon; stones in snow-bed hollow of temporary spring. In pure mats or with *Blepharostoma trichophyllum*, *Cephalozia bicuspidata*, *Cladopodiella fluitans*, *Kurzia makinoana*, *Lophocolea heterophylla*, *Lophozia guttulata*, *Ptilidium pulcherrimum*, *Scapania* cf. *irrigua*. **K:** K-37-35-06, K-51-9-06, **S:** Sh-041.1-06.

R. multifida (L.) Gray – ant., spor., arch. – 10-400 m – **Sm:** 2; **I:** 10, 12, 13, 21; **K:** 26; **S:** 30, 31, 33 – Wet hollows in the ground, shaded boulders in mossy *Picea–Abies* or *Betula* elfin forests, wind-stressed *Sasa* communities; boulders along lake shore in coniferous forest; hollows in eutrophic moss bogs; fine-grained soil along acid (with high content of sulfurous acid) stream. In pure mats or with *Calypogeia* cf. *muelleriana*, *C.* cf. *neogaea*, *Cephalozia bicuspidata*, *Conocephalum conicum*, *Harpanthus flotovianus*, *Hattorianthus erimonus*, *Lophocolea heterophylla*, *Pellia endiviifolia*, *Plagiochila porelloides*, *Solenostoma fusiforme*, *Trichocolea tomentella*. **Sm:** C-21.1-07, **I:** K-45-41a-05, K-48-18-05, K-64-12-05, K-30-5-07, It-20-08, **K:** K-50-18-06, **S:** K-39-8-07, K-49-52-07, K-54-12-07.

R. palmata (Hedw.) Carruth. – ant., arch. – 10-500 m – **I:** 20, 21; **K:** 22, 23, 25, 26, 26b, 27; **S:** 29, 30, 31, 32, 34 – Decaying wood in coniferous and mixed forests; over wet moss mats in wind-stressed tundroid habitats with *Juniperus sargentii*, *Ledum*, *Empetrum*, *Vaccinium uliginosum* and mosses on slope to streams; permanently seeped horizontal ledges of rocks in forestless belt. With *Blepharostoma trichophyllum*, *Calypogeia integristipula*, *C. neogaea*, *C. suecica*, *Cephalozia leucantha*, *C. lunulifolia*, *Lepidozia reptans*, *Lophozia guttulata*, *Mylia verrucosa*, *Nowellia curvifolia*. **I:** K-26-36-07, K-31-9-07, **K:** K-36-14b-06K-47-2-06, K-50-7-06, K-56-3a-06, K-61-4-06, "6.X.1968, K.B. Gorodkov (LE)", **S:** K-36-21-07, K-40-10-07, K-42-5-07, K-49-48-07, Sh-041.1-06.

R. subalpina Furuki – arch., ant. – 40 m – **I:** 14 – One collection: decaying wood in *Alnus-Betula-Abies* forest with admixture of *Picea*, *Kalopanax*, *Taxus* with forb cover. **I:** K-56-7-05.

R. vitrea Furuki – spor. juv. – 70 m – **I:** 12 – One collection: crumble fine-grained soil along stream in partial shade in *Quercus-Acer* forest with admixture of *Sorbus*, *Betula ermanii*, *Salix*, *Alnus* and thick underbrush of *Sasa*. **I:** K-45-46-05.

Riccia fluitans Lindenb. – 20 m – **S:** 33 – One collection: track of old road in *Alnus-Salix* thickets with cover of high herbs in river's flood plain. **S:** K-55-5-07.

Scapania ampliata Steph. – gemm., per., ant. – 20-60, 1110-1300 m – **I:** 8, 14; **K:** 22, 26 – In lower altitude on crumble slope of white pumice deposits and fine-grained soil along river flowing from old volcano; in upper altitude in wet crevices in vertical walls of cliffs in full sun near volcano tops. In pure mats or with *Kurzia makinoana*, *Lophozia sudetica*, *Marsupella sphacelata*, *Mylia taylorii*, *Nardia subclavata*, *Solenostoma sphaerocarpum*. **I:** K-58-24b-05, K-67-7-05, **K:** K-39-17a-06, K-53-5-06.

S. apiculata Spruce – gemm – 10-500 m – **K:** 22, 26 – Decaying wood in coniferous and mixed forests. Mainly with many hepatic species, such as *Aneura pinguis, Crossogyna autumnalis, Blepharostoma trichophyllum, Ptilidium pulcherrimum, Lophozia guttulata, Lophocolea heterophylla*. **K**: K-40-7-06, "27.V.1964, E.I. Kil'dyushevskij (LE)".

Scapania crassiretis Bryhn – gemm. – 1110 m – **I:** 14 – Only one locality: wet crevices in vertical wall of cliff in full sun near top of active volcano. In pure mats or with *Kurzia makinoana*, *Lophozia sudetica*, *Marsupella sphacelata*, *Nardia scalaris*. **I:** K-58-13-05.

S. curta (Mart.) Dum. – per., gemm. – 10-1110 m – **U:** 6, 7; **I:** 9, 11, 14 – Wet crevices in vertical wall of cliff, in full sun near top of active volcano; crevices in cliffs shaded by *Alnus* along sea coast; wet rocky wall of river canyon; fine-grained soil along roadside. In pure mats or with *Anthelia juratzkana, Cephalozia otaruensis*, *Diplophyllum taxifolium*, *Harpanthus flotovianus*, *Lophozia sudetica*, *Tritomaria quinquedentata*. **U:** U-2.1-07, U-2-08, **I:** K-58-24-05, K-66-17-05, K-71-3-05.

S. diplophylloides Amakawa & S. Hatt. – ant., per. sol. – 100-1170 m – **I:** 11, 14, 15, 17; **K:** 22; **S:** 29, 31 – Stones and fine-grained ground along streams, river canyons and steep shaded slopes in forested belt; crevices between boulders in nival dwarf shrub-grass tundra; wet crevices in vertical wall of cliff in full sun near peak of active volcano. In pure mats or with *Blepharostoma trichophyllum*, *Calypogeia integristipula*, *Cephalozia bicuspidata*, *C. pachycaulis*, *Nardia japonica*, *N. scalaris*, *Pedinophyllum truncatum*, *Pellia neesiana*, *Pleurocladula albescens*, *Tritomaria exsecta*, etc. **I:** K-56-18-05, K-71-8-05, K-16-44-07, K-21-2-07, **K:** K-38-3b-06, **S:** K-36-2-07, K-47-30-07.

S. hirosakiensis Steph. – ant., per., gemm. – 10-500 m – **I:** 20; **K:** 22, 23, 25, 26, 26b, 27, 27a; **S:** 29, 30, 31, 32, 34 – Decaying wood in coniferous and mixed for-

ests; over peaty mats of decaying mosses in cliffs along river. In pure mats or more frequently with *Anastrophyllum michauxii*, *Bazzania ovifolia*, *Blepharostoma minus*, *B. trichophyllum*, *Crossogyna autumnalis*, *Lepidozia reptans*, *Lophozia guttulata*, *Macrodiplophyllum plicatum*, *Metacalypogeia cordifolia*, *Mylia verrucosa*, *Nowellia curvifolia*, *Schistochilopsis cornuta*, *S. incisa*, *Tritomaria exsecta*, etc. **I:** K-26-18-07, **K:** K-36-11a-06, K-47-3-06, K-50-1-06, K-56-4-06, K-61-4a-06, "6.X.1968, Gorodkov (LE)", "18.VII.1951, Kusakin, Shegolev (LE)", **S:** K-37-16-07, K-40-4-07, K-49-48- 07, K-50-12-07, K-61-2-07, Sh-13.5-07.

S. integerrima Steph. – per. – 100-1300 m – **I:** 11; **K:** 22, 23, 26; **S:** 29, 32 – Wet cliff crevices in outliers, rocks outcrops, river canyons, waterfalls, tufa volcanic cones, mainly in forestless area; fine-grained soil along streams (hot sulphur springs as well) in forest belt. In pure mats or with *Cephalozia bicuspidata*, *Diplophyllum albicans*, *D. taxifolium*, *Gymnomitrion concinnatum*, *Hygrobiella laxifolia*, *Marsupella sphacelata*, *Nardia scalaris*, *Tritomaria quinquedentata*. **I:** K-71-7-05, **K:** K-37-11-06, K-52-1-06, K-58-6b-06, **S:** K-38-34-07, K-42-9-07.

S. irrigua (Nees) Nees – gemm. – 20-1450 m – **Sm:** 1; **I:** 8, 12, 13, 15, 17; **K:** 22 – Pure peat between *Carex* patches in *Juncus-Carex*-dwarf shrub-moss oligotrophic mire; crumble slope of white pumice deposits along sea coast; soil and stones on slopes to streams; stones in snow-bed hollow of temporary spring. In pure mats or with *Calypogeia integristipula*, *Crossogyna autumnalis*, *Nardia assamica*, *Plectocolea* cf. *hyalina*, *Riccardia latifrons*. **Sm:** C-53.3-07, **I:** K-49-4-05, K-67-2-05, K-16-28-07, K-17-12-07, It-26-08, **K:** K-37-35-06.

S. ligulata Steph. – per., ant. – 140-1600 m – **I:** 15, 17; **S:** 29, 31, 32 – Wet cliff crevices in outliers, rocky outcrops, crater's cliffs and stream banks in both forested and forestless areas. In pure mats or with *Anthelia juratzkana*, *Cephaloziella uncinata*, *Diplophyllum albicans*, *D. taxifolium*, *Eremonotus myriocarpus*, *Nardia scalaris*, *N. subclavata*, *Preissia quadrata*, *Protolophozia debiliformis*, *Schistochilopsis cornuta*. **I:** K-15-12-07, K-18-11-07, **S:** K-38-5-07, K-42-52-07, K-47-3-07, Sh-040.2-06.

S. lingulata H. Buch – 30-50 m – **Sm:** 1, 3 – Coastal cliffs and slopes of stream canyon. In pure mats. **Sm:** C-28.4-07, C-42-07.

S. paludicola Loeske & Müll. Frib. – 10-420 m – **I:** 13, 15, 21; **K:** 25, 26; **S:** 33 – Hollows in different variations of *Carex*-dwarf shrub-moss mires and wet *Picea glehnii* forest. In pure mats or with *Cephalozia bicuspidata*, *Cladopodiella fluitans*, *Gymnocolea inflata*, *Harpanthus flotovianus*. **I:** K-49-6-05, K-51-1-05, K-52-28-05, K-30-10-07, K-35-1-07, **K:** K-51-1-06, K-63-10-06, **S:** K-54-21-07.

S. paludosa (Müll. Frib.) Müll. Frib. – per., ant. – 20-400, 1170 m – **Sm:** 1, 2, 3; **I:** 13, 14 (Blagodatskikh & Duda, 1987), 15; **K:** 22, 28; **S:** 31 – Cliffs and stones splashed by water near streams and waterfalls in coniferous forests; hollows in *Carex-Juncus*-moss eutrophic mires; peaty soil in grass-sedge bog on the bank of lake; slopes and banks of streams; in upper altitude in wet snow-bed community. In pure mats or with *Solenostoma fusiforme*. **Sm:** C-30-07, C-54.1-07, C-47-07, **I:** K-48-32-05, K-52-5-05, K-16-9-07, **K:** K-37-13-06, "10.VII.1951, O.G. Kusakin (LE)", **S:** K-49-43-07. In addition to typical forms some variants transitional to *S. uliginosa* occur, they are characterized by small dorsal lobes, purple vinous-violet coloration, thick leaf cell walls, bulging trigones and dentate leaf margin.

S. parvifolia Warnst. – per. – 30 m – **K:** 27 – One collection: spots of bare ground on slope to sea in wind-stressed meadow. **K:** K-46-13-06.

S. parvitexta Steph. – ant. – 50-1600 m – **I:** 11, 17; **K:** 22, 26; **S:** 29, 30 – Wet cliff crevices in outliers, rocks outcrops, crater's cliffs, stones along streams in forestless area (including snow-bed habitats); once collected on decaying wood in *Abies-Picea* forest with admixture of *Taxus cuspidata* and *Kalopanax septemlobum*. In pure mats or with *Anthelia juratzkana*, *Calycularia crispula*, *Cephalozia bicuspidata*, *Diplophyllum taxifolium*, *Gymnomitrion concinnatum*, *Marsupella sphacelata*, *Plectocolea infusca* var. *ovalifolia*, *Preissia quadrata*, etc. **I:** K-70-3b-05, K-18-15-07, **K:** K-37-27-06, K-53-10-06, **S:** K-38-20-07, K-65-19-07.

S. scandica (Arnell & H. Buch) Macvicar – ant. – 20-300 m – **Sm:** 1, 2; **U:** 6, 7; **S:** 29, 34 – Wet cliff crevices in coastal outliers and cliffs; fine-grained soil along roadside; logs ejected from sea on beach. With *Blepharostoma trichophyllum, Diplophyllum taxifolium, Scapania subalpina*, etc. **Sm:** C-50-07, C-15.1-07, **U:** U-3-08, **S:** Sh-17-06, Sh-33-06.

S. subalpina (Nees ex Lindenb.) Dumort. – gemm., ant. – 30-1300 m – **Sm:** 1, 2, 3, 4; **I:** 12, 15; **K:** 22, 23, 25 – Fine-grained soil along streams (with sulphur content as well), wet cliff crevices of river canyons, outliers in forested and forestless areas; once collected on decaying wood in mixed *Alnus-Betula-Abies* forest with admixture of *Picea*, *Kalopanax*, *Taxus*. In pure mats, once with *Plectocolea harana*. **Sm:** C-15.1-07, C-44.1-07, C-29.1-07, C-42-07, **I:** K-10-12-07, K-12-5-07, **K:** K-37-14a-06, K-56-7-06, K-63-23-06.

S. uliginosa (Lindenb.) Dumort. – per., gemm. – 10-250 m – **Sm:** 2; **S:** 32 – Wet bank of temporary stream, shaded by elfin *Alnus* in wind-stressed community of *Eubotrioides*, *Sasa*, *Spiraea* and small herbs; swampy community with *Lysichiton* and high

herbs (along stream as well). **Sm:** C-23.1-07, **S:** K-42-43-07.

S. umbrosa (Schrad.) Dumort. – gemm., ant. – 60 m – **K:** 26 – One collection: fine-grained soil on roadside in coniferous forest. With *Nardia subclavata*. **K:** K-53-16-06.

S. undulata (L.) Dumort. – per., ant. – 60-1300 m – **Sm:** 1; **I:** 10, 12, 13, 16; **K:** 22, 27; **S:** 29, 32 – Wet cliff crevices, bases of outliers, rocks splashed by water near waterfalls in forested and forestless areas, stones in wind-stressed community of *Botrioides*, *Sasa*, *Spiraea* and small herbs; crevices in vertical cliffs in snow-bed hollow of temporary spring; wet soil near thermal hot springs in modern volcanic caldera; wet soil and stones along stream (also submerged); and once collected on roots submerged in the stream in *Larix-Betula-Quercus-Sorbus* forest. Mainly in pure mats, but also with *Diplophyllum albicans*, *D. taxifolium*, *Marsupella sphacelata*, *Nardia scalaris*, *Radula brunnea*. **Sm:** C-52.1-07, **I:** K-52-21-05, K-65-27-05, K-10-32-07, K-24-3-07, It-12-08, **K:** K-37-12-06, K-45-9a-06, **S:** K-38-47-07, K-42-32-07.

Schistochilopsis cornuta (Steph.) Konstant. – gemm., per. – 40-1000 m – **I:** 17; **K:** 22, 23, 25, 26, 27a; **S:** 30, 31, 32 – Decaying wood in coniferous and (rarely) mixed forests; wet hollows in *Picea glehnii* forest; over decaying moss mats on rocks along streams in *Sasa* community; wet cliff crevices in wind-stressed community of *Eubotrioides*, *Sasa*, *Spiraea* and small herbs and in coniferous forest; steep wall of cliff in upper course of tectonic breaking. In pure mats or with *Bazzania ovifolia*, *Calypogeia integristipula*, *Cephalozia leucantha*, *Cephalozia lunulifolia*, *Diplophyllum taxifolium*, *Lepidozia reptans*, *Lophozia silvicoloides*, *L. guttulata*, *Macrodiplophyllum plicatum*, etc. **I:** K-21-5-07, **K:** K-40-4b-06, K-53-3a-06, K-56-4a-06, K-63-6-06, "7.X.1968, K.B. Gorodkov (LE)", **S:** K-40-21-07, K-42-51-07, K-43-6-07, K-48-20-07, K-50-1-07, K-62-1-07, "15.VI.1946 Vorob'ev (LE)". The transitional forms to *S. incisa* are frequently occur.

S. incisa (Schrad.) Konstant. – gemm., per. – 20-410 m – **Sm:** 1; **I:** 14; **K:** 25, 26; **S:** 30, 31, 32, 34 – Decaying wood in *Picea–Abies* and *Betula* forests; over decaying moss mats on steep slopes, wetted cliffs along streams (with high content of *Fe* as well) in forested area or in wind-stressed shrub-grass communities; fine-grained soil in crevices of coastal cliffs. In pure mats or with *Bazzania ovifolia*, *Blepharostoma trichophyllum*, *Calypogeia integristipula*, *Cephalozia leucantha*, *C. lunulifolia*, *Diplophyllum taxifolium*, *Kurzia makinoana*, *Lepidozia reptans*, *Lophozia guttulata*, *Metacalypogeia cordifolia*, *Scapania hirosakiensis*, etc. **Sm:** C-50-07, **I:** K-56-3-05, **K:** K-53-2-06, K-61-2-06, **S:** K-47-28-07, K-57-10-07, K-64-5-07, Sh-23.1-06.

S. opacifolia (Culm. ex Meyl.) Konstant. – 20-200 m – **I:** 8, 16 – Crumble slope of white pumice deposits near sea coast; cliffs in lower course of tectonic breaking. In pure mats or with *Blasia pusilla*, *Marsupella sphacelata*, *Nardia assamica*, *Nardia scalaris*, *Scapania lingulata*, *Solenostoma rishirense*. **I:** K-67-4-05, K-24-2-07.

Solenostoma caespiticium (Lindenb.) Steph. – per., gemm. – 170-420, 1020 m – **I:** 13, 15; **K:** 27 – Crumble bank (mixture of peat and sandy soil) of lake; roadside in *Sasa-Pinus pumila* and wet *Salix-Alnus* thickets. In pure mats or with *Diplophyllum andrewsii*. **I:** K-51-24a-05, K-14-2-07, **K:** K-45-3a-06.

S. fusiforme (Steph.) R.M. Schust. := ant., per. – 20-420 m – **I:** 9, 13, 14; **K:** 22, 25, 26, 27; **S:** 30, 33 – Fine grained soil along sulphur springs, hot strata of travertine near hydrosolfatars in forested belt; eroding roadsides in coniferous forests; peaty spots in wet grass-sedge meadow with admixture of *Sasa*; crevices of cliffs shaded by *Alnus* along sea coast; ridges in *Carex-Juncus*-moss eutrophic mire. In pure mats or with *Blasia pusilla*, *Calypogeia neogaea*, *Cephalozia bicuspidata*, *Conocephalum japonicum*, *Diplophyllum andrewsii*, *Moerckia blyttii*, *Nardia assamica*, *Pellia neesiana*, *Plectocolea infusca var. ovalifolia*, *Scapania paludosa*. **I:** K-52-2-05, K-53-2-05, K-66-8-05, **K:** K-37-13-06, K-45-5-06, K-52-18-06, K-62-1-06, **S:** K-54-6-07, K-65-1-07.

S. jenseniana (Grolle) Bakalin – per., ant. – **I:** 8 – 30 m – Fine-grained soil on abandoned aerodrome strip. **I:** K-68-6-05.

S. koreanum Steph. – per., ant. – 10-430 m – **I:** 13; **K:** 25, 26, 27 – Fine-grained, peaty and clayish soil in roadsides in *Pinus pumila* and *Sasa* communities; crumble bank (mixture of peat and sandy soil) of lake; wet sand in sea-coastal sandy dunes. In pure mats or with *Conocephalum japonicum*, *Diplophyllum andrewsii*, *Nardia assamica*. **I:** K-50-18-05, **K:** K-48-2-06, K-54-3-06, K-62-3-06.

S. pseudopyriflorum Bakalin & Vilnet per. – 40-395 m – **I:** 15; **S:** 29, 30 – Eroding roadside and cliff crevices in *Picea–Abies* forests; stones along stream in *Sasa* thickets. In pure mats or with *Cephalozia* cf. *bicuspidata*, *Conocephalum japonicum*, *Jungermannia pumila*. **I:** K-12-8-07; **S:** K-38-22-07, K-40-44-07.

S. rishiriense Amakawa – per., ant. – 30-1110 m – **I:** 8, 14; **K:** 27 – crumble slope of white pumice deposits along sea coast; fine-grained soil on abandoned aerodrome strip; boulders along stream in *Sorbus-Betula* forest; wet crevices in vertical wall of cliff in full sun near top of active volcano; spots of bare ground in

wind stressed meadow on slope to sea. In pure mats or with *Anthelia juratzkana*, *Calypogeia integristipula*, *Diplophyllum albicans*, *D. taxifolium*, *Lophozia guttulata*, *Nardia assamica*, *N. breidleri*, *N.* cf. *subclavata*, *Scapania ampliata*, *Schistochilopsis incisa*, *S. opacifolia*, etc. **I:** K-56-3-05, K-67-3b-05, **K:** K-46-13a-06.

S. sphaerocarpum (Hook.) Steph. – per., ant. – 60 m – **K:** 26 – One collection: fine-grained soil along river in forest belt. With *Kurzia makinoana*, *Nardia subclavata*, *Scapania ampliata*. **K:** K-53-5-06.

Sphenolobus minutus (Schreb.) Berggr. – 30, 1110 m – **I:** 14; **K:** 27 – Wet crevices in vertical wall of cliff, in full sun near top of active volcano in upper altitude; spots of bare ground in wind-stressed meadow on slope to sea. In pure mats or with *Bazzania tricrenata*, *Diplophyllum taxifolium*, *Kurzia makinoana*, *Mylia taylorii*, *Pedinophyllum truncatum*, *Protolophozia debiliformis*. **I:** K-58-6-05, **K:** K-46-15-06.

Trichocolea tomentella (Ehrh.) Dumort. – 40-150 m – **K:** 22, 27; **S:** 31, 32 – On decaying wood and over wet moss mats on slopes in *Picea–Abies* forests with *Abies* dominance. In pure mats or with *Conocephalum conicum*, *Harpanthus flotovianus*, *Pellia endiviifolia*. **K:** K-37-2-06, K-47-9-06, **S:** K-49-29-07, K-61-1-07, Sh-045-06.

Tritomaria exsecta (Schmid. ex Schrad.) Loeske – gemm. – 20-340 m – **I:** 18; **K:** 23, 24; **S:** 29, 31 – Decaying wood, bases of trees and shady cliffs in *Picea–Abies* forests; wet shaded cliff on the first coastal terrace; fine-grained soil along roadside. In pure mats or with *Bazzania ovifolia*, *Lepidozia reptans*, *Lophocolea heterophylla*, *Lophozia silvicola*, *Macrodiplophyllum plicatum*, *Metacalypogeia cordifolia*, *Scapania hirosakiensis*, *S. diplophylloides*, *Schistochilopsis cornuta*. **I:** K-34-4-07, **K:** K-56-3-06, K-61-1-06, **S:** K-47-30-07, Sh-33-06.

T. quinquedentata (Huds.) H. Buch – per. – 30-1340 m – **Sm:** 1, 3; **I:** 11, 15; **K:** 22; **S:** 29, 32 – Cliffs wetted by seeping water and tufa cliffs in forestless belts; along stream and in crevices of coastal cliffs; stones in snow-bed hollow of temporary spring. In pure mats or with *Diplophyllum albicans*, *Gymnomitrion concinnatum*, *Harpanthus flotovianus*, *Marsupella sphacelata*, *Plagiochila porelloides*, *Scapania curta*, *S. integerrima*. **Sm:** C-29.1-07, C-50-07, **I:** K-71-3-05, K-15-16-07, **K:** K-37-32a-06, **S:** K-42-6-07, K-66-4-07.

Excluded or doubtful records of hepatics:

Alobiellopsis parvifolia (Steph.) R.M. Schust. – The report of the species in Bakalin 2007a (VLA, K-45-22-06) for Kunashir Island is doubtful and the specimen probably belongs to poorly developed form of *Plectocolea hyalina*. At present there are only two records of *A. parvifolia* in Kurils and Russia as well from Iturup and Onekotan Islands (Bakalin, 2007b; Nyushko, 2009).

Blepharostoma arachnoideum Howe – This species was recorded by Korotkevith (1952) for Kunashir and Shikotan Islands. We were able to revise one of specimen studied by her from Shikotan and found it to be *B. trichophyllum* and suppose that the other specimens likely belong to this species, too.

Jungermannia cf. *borealis* Damsh. & Váňa – Iturup Island (Bakalin, 2007a). – During the preparation of present paper we did not found sample on that this record was based. Because it was recorded basing of sterile collection we rejected it from the present checklist.

Lepidozia cf. *vitrea* Steph. – The report of the species in Bakalin 2007a (VLA, K-50-2b-06) is doubtful and the specimen probably belongs to poorly developed form of *Lepidozia reptans*.

Marsupella emarginata (Ehrh.) Dumort. – The species was reported from Iturup by Blagodatskikh & Duda (1987; locality 14 in the present paper), but we suppose it more likely belong to *M. tubulosa* or *M. sphacelata* those are very polymorphous and common in this area.

Porella vernicosa Lindb. – The species was reported from Iturup (locality 12 in the resent paper) by Abramova (1960), but we suppose this record belong to *P. fauriei* that is widely distributed in this area and superficially very similar to *P. vernicosa* s. str. that was never confirmed for the Kuril Islands and Sakhalin before 1970th.

Scapania bolanderi Austin – The report of this species from Kunashir Island (Bakalin 2007a) (VLA, K-42-4a-06, K-52-20a-06, K-50-2-06) is incorrect and should be referred to *S. hirosakiensis*.

S. ciliata Sande Lac. – The species was recorded by Horikawa (1940) from Shikotan Island. In our opinion this report should be referred to *S. hirosakiensis*, species that is habitually similar with *Scapania ciliata* and is quite frequent in the South Kuril Islands including Shikotan Island. For differentiation of these species see Nyushko & Potemkin (2007).

Scapania nemorea Grolle – Record from Shikotan by Korotkevitch (1952) should be referred to *S. hirosakiensis*.

Solenostoma fauriana (Beauverd) Bakalin – The report of this species in Bakalin (2007a) (VLA, K-46-12-06) is incorrect.

S. cf. *handelii* Schiffn. – The report of the species in Bakalin (2007a) (VLA, K-44-1-06) for Kunashir Island is incorrect and the specimen probably belongs to *Plectocolea hyalina*.

Mosses

The characteristic of mosses is a little different from that of hepatics. Only sporophytes are indicated if known, at the end of annotation. After the species name are altitudinal range, localities (cf. Table 2), habitats. One voucher specimen is cited for each species (information on other specimens can be found in database http://arctoa.ru/Flora/basa.php). Among them, numbers started with K- are the collections of Bakalin (in VLA and MHA), numbers started with 06- are collections of Ignatov (in MHA), and in certain cases other collections are cited. Data from the Urup Island refer to localities which old names remain uncorrelated with present ones, but most likely are near the locality number 6, and for this locality they are cited. The probable inexactness has to be considered for this island. In Simushir, several collections are referred to the island without exact localities; they are marked by asterisk **Sm**: *.

Abietinella abietina (Hedw.) M.Fleisch. – ca. 150 m – **K:** 27a, **S:** 32. On stems of *Juniperus* and rotten wood. 31.VIII.1978, coll. Cherdantseva (VLA).

Amblystegium serpens (Hedw.) Bruch et al. – 5-340 m – **Sm**: *; **I:** 10, 12, 15a; **K:** 23, 26, 26b; **S:** 29, 30, 31, 32, 33. Tree bases, decaying wood, rocks, tufa, concrete, wet soil, stream banks. Common. Bardunov & Cherdantseva (1984) reported also *A. juratzkanum* Schimp., which we consider now not distinct from *A. serpens*. K-53-1-07.

Amphidium lapponicum (Hedw.) Schimp. – 15-1450 m – **I:** 9, 15a; **K:** 22, 23. Cliffs and rock outcrops, including recent lava outcrops. Sporadic. 06-1749. S+.

A. mougeotii (Bruch et al.) Schimp. – 40-340 m – **K:** 22; **S:** 31, 32. Cliffs near waterfalls, cliff crevices and similar rather wet habitats. Rare. K-61-13-07.

Anacamptodon kamchaticus Czernyadjeva –150 m – **K:** 20. One collection in Golovnin Volcano area, near Goryachee Lake, on *Betula* trunk in open deciduous forest. 06-5999. S+.

A. latidens (Besch.) Broth. – [<100 m] – **I:** 12; **K:** 26b. On decorticated faces of trunks of *Populus* and *Ulmus*. 15.VIII.1978, coll. Cherdantseva, VLA. S+.

Andreaea blyttii Bruch et al. – 1174 m – **I:** 15. One collection in wet late snow-bed community on NW-facing slope near top of Bogatyr Ridge. K-16-11-07.

A. obovata Thed. – 100 m – **S:** 32. One collection from cliff crevice. K-45-8-07.

A. rupestris Hedw. s.l. (incl. *A. alpestris, A. papillosa, A. fauriei*) – 200-1600 m – **I:** 14, 15, 16, 17; **K:** 22, 23, 26; **S:** 32 (Horikawa 1940). On rocks, including tufa and pyroclastic deposits, rather common above 1000 m in Iturup and Kunashir, occasionally below; K-58-31-05. In Shikotan reported from Notoro Volcano (Bardunov & Cherdantseva, 1984). S+.

Anoectangium stracheyanum Mitt. – 100-250 m – **S:** 32. Cliff crevices in two localities on Shikotan. K-45-13-07.

Anomobryum concinnatum (Spruce) Lindb. – <100 m – **Sm**: *; **K:** 23, 26. Two findings: on big rocks on rather open slope to Rubezhny stream (06-1787) and on cliff at sea shore near Sernovodsk (Bardunov & Cherdantseva, 1984).

Anomodon giraldii Müll. Hal. – 50-350 m – **I:** 12, 20; **K:** 22; **S:** 30. Trunks and rotten logs in mixed forests and shaded rocks, K-26-48-07. Bardunov & Cherdantseva (1984) reported it as a common species in Kunashir, but it is probably only locally common there. Reported from Shikotan by Bardunov & Cherdantseva (1984), but no recent collections were made.

A. longifolius (Brid.) Hartm. – 50-75 m – **I:** 12, 20; **K:** 22; **S:** 30. On trunks of *Acer, Ulmus, Populus* in forest, especially in flood-plains. Recently collected only twice, while Bardunov & Cherdantseva (1984) reported it to be common in Iturup and Kunashir, but found in Shikotan in one place only. K-45-8-05.

A. minor (Hedw.) Fürnr. – 100-200 m – **I:** 12; **S:** 29, 32. Rather rare on trunks of *Quercus* in oak forest, on tree bases, branches of *Juniperus sargentii*. K-41-10-07.

A. rugelii (Müll. Hal.) Keissl. – 25-450 m – **I:** 10, 12; **K:** 22, 23; **S:** Bardunov & Cherdantseva (1984); the latter authors reported this species to be a common one in three islands in mixed and broad-leaved forests on tree trunks (especially at base), on shrubs of *Hydrangea*, and on rocks. Our study confirms it as a common but in a certain limited areas, especially in the western coasts of the islands. K-44-5-05.

A. thraustus Müll. Hal. – 10-110 m – **K:** 26, 26b, 27a; **S:** 29, 30, 31. On tree trunks, fallen *Abies*; rather rare in broad-leaved forests; in Kunashir mainly on the western coast. 06-3123.

Arctoa fulvella (Dicks.) Bruch et al. – 800-1800 m – **I:** 14, 15, 17; **K:** 22, 23. On boulders and cliffs faces, as well as in rock crevices and on lithosoil in high mountains, common above 1100 m on volcanic rocks, including warmed rocks around crater of Tyatya Volcano; occasionally on wet soil near late snow-beds. K-16-39-07. S+.

Atrichum flavisetum Mitt. (*A. haussknechtii* Jur. & Milde) – 10-300 m – **I:** 12; **K:** 22, 23, 26, 26b, 28; **S:** 29, 33. On soil in forest, especially along trails, landslides, at rock outcrops, etc., occasionally on soil in grasslands; 06-1054. S+.

A. undulatum (Hedw.) P.Beauv. – 100-200 m – **K:** 23, 20. In forest on slope of ravine and near rock outcrop, only in two localities; 06-1493. S+.

Aulacomnium heterostichum (Hedw.) Bruch et al. – 39-200 m – **I:** 20, 22; **K:** 27a. On wet lava cliff and on boulders in *Abies* forest. K-32-3-07.

A. palustre (Hedw.) Schwägr. – 10-422 m – **U**: Brotherus, 1899; **I:** 13, 18; **K:** 25, 26, 26b, 27; **S:** 33. In *Sphagnum* and *Carex* treeless bogs, at springs near Kipyashchee warm-water lake, in *Phragmites* mires, among *Sphagnum* in mossy *Abies* forest, sporadic. K-51-2-05.

Babula indica (Hook.) Spreng. ex Steud. var. *kurilensis* Ignatova & Ignatov – 20 m – **K**: 22. On boulder in mixed forest (with *Abies*) near sea coast. 06-1884.

B. unguiculata Hedw. – 20-100 m – K: 25a; S: 29. On concrete blocks around open thermal bath and on soil bank along a stream in forest. 06-1527.

Bartramia pomiformis Hedw. – 15-300 m – **I:** 10, 12, 16, 20; **K:** 22, 23, 26b, 27, 27a; **S:** 30, 31, 32. On rocks (including lava) and soil near rock outcrops in forests, rocky slopes, near waterfalls, occasionally on *Betula* trunks. K-45-28-05. S+.

Bartramiopsis lescurii (James) Kindb. – 20-1390 m – **I:** 14, 15; **K:** 22, 25, 26, 27; **S:** 30, 32. Among rocks and on soil banks, on open slopes and in moderately dense forests, on soil banks along roads in forests and across *Sasa* communities; abundant in many places in Kunashir. K-54-3-05. S+.

Blindia acuta (Hedw.) Bruch et al. – 1250 m – **K:** 23. Cliffs in elfin forest. 06-1835.

Boulaya mittenii (Broth.) Cardot – 10-400 m – **I:** 12, 20; **K:** 22, 23, 25, 26, 27; **S:** 30, 32. In forests on tree trunks: most commonly on *Betula*, and also on *Abies, Alnus, Acer*; rather common in all three islands. K-28-12-07.

Brachytheciastrum velutinum (Hedw.) Ignatov & Huttunen – 10 m – **I:** 10 m. One collection on wet cliff near waterfall at sea coast. K-47-7-05.

Brachythecium auriculatum A.Jaeger – 10-370 m – **I:** 10, 12, 20; **K:** 22, 23, 25, 27, 27a; **S:** 29, 31. In forests and tall-herb communities, on bases of *Acer* and *Betula* trunks, on humus, boulders covered by fine-grained soil, rocks, rotten wood. Common, especially in Kunashir and Shikotan. K-45-12-05.

B. buchananii (Hook.) A.Jaeger – 10-450 m – **I:** 20, 21; **K:** 22, 23, 27; **S:** 31. On rocks, trunks and rotten wood in mixed forests, especially those with *Abies*, sporadic. K-26-13-07.

B. campestre (Müll. Hal.) Bruch et al. – 20 m – **K:** 23. On soil at sea coast, in grassland with scattered young *Abies* trees. 06-1500.

B. extremiorientale Ignatov – 10-150 m – **K:** 23, 27. On *Hyrdangea* and on tree trunks in open forests and within *Sasa* communities, rare. 06-1793. S+.

B. frigidum (Müll. Hal.) Besch. – 340 m – **S:** 31. One collection on seepaeg on rock face of 45°. K-47-9-07a.

B. kuroishicum Besch. – 40 m – **K:** 23, 27a. In tall-herb and *Sasa* communities, on rocks and *Hydrangea* stem, rare. 06-1851.

B. mildeanum (Schimp.) Schimp. – 30 m – **K:** 26, 28. On soil in disturbed place in a yard and in park area of a village. 06-3136.

B. rivulare Bruch et al. –10-450 m – **I:** 10, 12, 18; **K:** 22, 23, 26, 27; **S:** 32. Rather common species in three islands in wet places near streams on soil or rocks, also on cliffs, trunk bases and fallen logs in wet forests, as well as in open places, including disturbed ones. K-44-3-05. S+.

B. rotaeanum De Not. – 20-100 m – **I:** 10, 12; **K:** 18a. On tree trunks and recently fallen logs, especially in the valleys where they are covered by muddy alluvium, also on boulders in mixed forests. K-44-6-05. S+.

B. rutabulum (Hedw.) Bruch et al. – 200 m – **I:** Brotherus, 1899; **K:** 22. The only collection was made on rocks on slope to waterfall. 06-1228.

B. udum I. Hagen – 10 m – **K:** 26. Depressions among dunes at sea coast, rare. 06-3205.

Brotherella henonii (Duby) M.Fleisch. – [ca. 100-200 m] – **K:** 26. Bank of Kisly Creek in *Picea+Abies* forest, at the border of developed litter and eroded slope. 22.VIII.1978, coll. Cherdantseva & Lesik (VLA, MHA).

Bryhnia hultenii E.B.Bartram *(B. novae-angliae* auct. Fl. As.) – 5-918 m – **I:** 12, 8a, 20; **K:** 22, 23, 24, 25, 18a, 26, 27; **S:** 29. On wet soil in forests, near streams, swampy places; also common on rotten wood in wet places, especially in valleys, as well as on rocks with fine soil; occasionally at trunk bases. Very common in Kunashir especially at low elevations below 500 m. K-44-15-05.

B. noesica Besch. – 30 m – **I:** 12; **K:** 22. Two collections: in alder swamp with *Lysichiton*, and on slope to stream in *Abies* forest. 06-1948.

Bryochenaea vestitissima (Besch.) Touw – 500 m – **K:** 22. One collection on bare soil at base of slope to Rubezhny Stream valley. 06-1131.

Bryoerythrophyllum alpigenum (Venturi) P.C.Chen – 20 m – **I:** 18. Wet cliff on the first coastal terrace ca. 50 m from sea coast, in shade of tall herbs. K-34-9-07.

B. brachystegium (Besch.) K.Saito – 10-64 m – **I:** 12, 18; **K:** 22. Wet cliffs and stream sides close to water. 06-1918.

B. recurvirostrum (Hedw.) P.C.Chen – sea level – 50 m – **I:** 12, 18; **K:** 26; **S:** Brotherus, 1899. On wet cliffs at sea coast, in a shade of tall herbs and in crevices. K-34-3-07. S+.

Bryoxiphium norvegicum (Brid.) Mitt. var. *japonicum* (Berggr.) A.Löve & D.Löve (*B. savatieri* (Husn.) Mitt.) – 15-1335 m – **I:** 9, 11, 12, 15, 17, 20; **K:** 22,

23, 26, 26b, 27; **S:** 30, 33. On wet shaded rocks, especially along stream, but also on big boulders in forests, cliff near waterfalls, in caves, etc.; on various rocks, but mainly on volcanic ones. K-66-16-05. S+.

Bryum amblyodon Müll.Hal. (*B. inclinatum* (Sw. ex Brid.) Blandow) – 5-10 m – **Sm:** 1; **I:** 12, 15a, 19; **S:** 29, 33, (Brotherus, 1899). On seepage on wet tufa at sea shore, coastal cliffs and flat ground habitats affected by salty water in storms, with *Tortella fragilis* (K-44-17-05, K-33-3-07). Reported in similar habitats by Bardunov & Cherdantseva (1984). S+. Brotherus (1899) described from the Shikotan *B. mayrii* Broth., that was subsequently included in this species as a variety, *Bryum inclinatum* var. *mayrii* (Broth.) Podp.

B. archangelicum Bruch et al. – 1600 m – **I**: 17. Base of cliff in *Pinus pumila* community. K-18-21-07. S+.

B. argenteum Hedw. – 20-1800 m – **I:** 12; **K:** 23; **S:** 31. On roadsides and dry rocks, rather rare; also quite abundant on warm (+20-30°C) rocks of the mouth of crater of active Tyatya Volcano (1800 m elev.). K-46-8-05.

B. bimum (Schreb.) Turner – 15-340 m – **I:** 9, 15a; **S:** 30. on sandy soil along a stream, on wet rocks, in crevices of coastal cliffs in shade of *Alnus*, on cliffs along river. K-66-11-05. S+.

B. capillare Hedw.– 20-400 m – **Sm:** 1; **I:** 10, 11, 15a. On soil on steep slope, on wet cliff in canyon, near thermal springs. K-65-1-05.

B. creberrimum Tayl.– 20-400 m – **I:** 10, 11, 19. On soil on steep slope, on wet cliff in canyon, on roadside. K-65-1-05; det. Zolotov. S+.

B. intermedium (Brid.) Bland. – 5 m – **I:** 12. Wet cliffs near sea coast. K-47-24-05, det. Zolotov. S+.

B. moravicum Podp. (*B. capillare* var. *flaccidum* (Brid.) Bruch et al.) – 5 m – **S:** 30a. coastal cliffs. 1.IX.1978, coll. Cherdantseva (VLA).

B. pseudotriquetrum (Hedw.) P.Gaertn., B.Mey. & Scherb. – 10-20 m – **Sm**: 3; **I:** 11 (var. *duvallioides* Itzigs.); **K:** 26, 28. slope to stream in forest, wet cliff, swampy river bank, etc. 06-3132.

B. radiculosum Brid. – 402 m – **I:** 13. In mire, in hollows (between *Carex*) and on bare peat. K-49-11-05. (Zovotov, 2006).

B. salinum I. Hagen ex Limpr. – ca. 10 m – **K:** 26. Wet cliffs at sea coast 2 km SE of Yuzhno-Kurilsk, 15.VII.1990 Nedoluzhko (MHA). S+.

B. schleicheri Schwägr. – 391 m – **I:** 13. On ridges and hollows in *Carex-Juncus*-moss eutrophic bog, with *Warnstorfia exannulata.* K-52-29-05.

Bryum weigelii Spreng. – **Sm**: *.

Bucklandiella laeta (Besch. & Cardot) Bednarek-Ochyra & Ochyra (*Racomitrium laetum* Besch. & Cardot) – 150-1315 m– **I:** 14; **K:** 22, 26b; **S:** 29, 30, 32, 33. In crevices and faces of cliffs; usually near tops, either of high mountains or hills. K-58-10-05.

B. microcarpa (Hedw.) Bednarek-Ochyra & Ochyra – 395-1600 m – **I:** 15, 17; **K:** 22, 23. On rocks near streams, in elfin woods, in treeless higher elevations; occasionally on soil in late snow-beds; sporadic. K-15-5-07.

B. nitidula (Cardot) Bednarek-Ochyra & Ochyra – 1250 m – **K:** 23. One collection on rocks in elfin wood at timber limit on slore to Tyatya Volcano. 06-1745.

B. sudetica (Funck) Bednarek-Ochyra & Ochyra (*Racomitrium sudeticum* (Funck) Bruch et al.) – 256-1800 m – **I:** 11, 14, 15, 17; **K:** 22, 23. Mostly above tree-line, or if below, then near late snow-beds, and only rarely on cliffs within forest belt. One collection on rocks faced to crater of Tyatya Volcano. K-58-17-05.

Callicladium haldanianum (Grev.) H.A.Crum – 10-409 m – **I:** 12, 14, 20; **K:** 22, 23, 25, 26, 26b, 27, 27a; **S:** 29, 30. Most commonly on rotten logs, but occasionally occurs on boulders and clayish soil on rather wet landslides in forests; common on Kunashir below 150 m elev. K-56-10-05. S+.

Calliergon cordifolium (Hedw.) Kindb. – 391 m – **U:** 6; **I:** 12, 13; **K:** 26, 26b, 20. On ridges and in hollows in *Carex-Juncus*-moss eutrophic bog (K-52-14-05), and also reported by Bardunov & Cherdantseva (1984) in swampy meadows, wet lake shores and creek banks.

Calliergonella cuspidata (Hedw.) Loeske – 17-25 m – **I:** 12; **K:** 26, 27; **S: 30,** 31, 32. In fens, and wet places on slopes, lake shores and creek banks. Recent collections include only two specimens from Shikotan (e.g. K-52-1-07), other information is according to Abramova (1960) and Bardunov & Cherdantseva (1984).

C. lindbergii (Mitt.) Hedenäs – 10-1250 m – **Sm**: 3; **I:** 10, 12, 13, 14, 15, 16; **K:** 22, 14, 23, 26, 26b; **S:** 30, 32. Most commonly on wet soil and rocks along streams and creeks, occasionally at the edges of *Sphagnum* bogs, disturbed areas in settlements, wet cliffs, etc. Rather common. K-52-1-05.

Campyliadelphus chrysophyllus (Brid.) R.S.Chopra – 200-750 m – **K:** 22; **S**: 30, 30a. Few collections in a variety of habitats: cliffs near waterfall, rocks in late snow-bed, on inclined *Betula* trunk, on grassy cliff ledges, rather rare. 06-1120.

C. helodes (Lindb.) Kanda – 25 m – **S:** 33. One record: low bank of lake, on very wet soil among *Phragmites*, with *Leptodictyum mizushimae*. K-54-28-07. Rare species in Russia, this specimen contains fairly robust plants.

Campylidium sommerfeltii Myrin – 50 m – **K:** 26b; **S**: 32. One collection in Shikotan on stream bank in *Picea-Abies* forest. K-46-5-07. It is likely that *C. hispidulum* (Brid.) Ochyra reported by Bardunov & Cherdantseva (1984) from *Ulmus* tree bases also belong to this species.

Campylium protensum (Brid.) Kindb. – 20-391 m – **I:** 13; **K:** 25; **S:** 32, 33. On ridges and in hollows *in Carex-Juncus*-moss eutrophic bog, in wet depressions in *Sasa* communities and along roads, rare. K-52-18-05.

C. squarrosulum (Besch. & Cardot) Kanda – 150 m – **K:** 20. On *Alnus* in forest. 06-1087.

Ceratodon purpureus (Hedw.) Brid. – 10-1221 m – **Sm**: *; **I:** 12, 13, 17, 20; **K:** 23, 26, 27, 27a, 28; **S:** 29, 33. On soil on open slopes, including ones faced to permanent strong winds, on rocks and occasionally tree bases; also in disturbed places like roadsides, abandoned lands, brick and concrete faces, etc. K-46-1-05. S+

Cirriphyllum piliferum (Hedw.) Grout – 40 m – **I:** 15a; **K:** 23, 26; **S:** 30. Recently collected only once, on litter in *Abies* forest (06-1846), while Bardunov & Cherdantseva (1984) reported few more places, on rocks, rotten logs and on soil within tall-herb vegetation.

Claopodium pellucinerve (Mitt.) Besch. – 5-150 m – **I:** 12, 20; **K:** 22, 26, 26b, 27a; **S:** 30. On wet rocks in both shady and open places, occasionally on *Hydrangea* stems and *Ulmus* trunks. K-44-21-05.

Climacium dendroides (Hedw.) F. Weber & D. Mohr – 20-300 m – **I:** 10, 12; **K:** 22, 25, 26, 26b, 27; **S:** 29, 31. On peaty banks of lake, wet soil along roads, rotten logs and among other mosses on litter in coniferous forests, wet meadows, wet rock outcrops; sporadic. K-64-1-05.

C. japonicum Lindb. – 10-25 m – **I:** 12; **K:** 26, 27, 28; **S:** 30, 30a, 33. In meadows and among dunes near sea coast and in mossy coniferous forests. 06-3069.

Codriophorus acicularis (Hedw.) P.Beauv. – [low elevation] – **I**: 12. On rocks in flooded part of stream valley. 10.IX.1980, coll. Pressman & Bardunov (IRK).

C. brevisetus (Lindb.) Bednarek-Ochyra & Ochyra – 150-1360 m – **U:** 6; **I:** 11, 14, 15, 16; **K:** 22, 23, 26; **S:** 29, 33. On wet rocks, often in creek and stream valleys, but sometimes also in quite dry places on ridge tops and exposed cliffs; rather common. K-58-18-05. S+.

C. carinatus (Cardot) Bednarek-Ochyra & Ochyra – 200-1315 m – **K:** 22. Cliffs near waterfall, rocks beside creek, rocks on ridge top; in only one valley but locally abundant in wide range of elevation. 06-1568.

C. corrugatus Bednarek-Ochyra & Ochyra – 100-1800 m – **I:** 11, 14; **K:** 22, 23, 26. On wet rocks and occasionally on soil in stream valleys, on permanently wet rocks in proximity to hot springs with SO_2 emanation; also at high elevations of Tyatya Volcano on old and recent piroclastic deposits, and on cliffs at mouth of the volcano crater. K-55-2-05.

C. fascicularis (Hedw.) Bednarek-Ochyra & Ochyra – [ca. 100]-1114 m – **U:** 6; **I:** 14; **K:** [19]; **S:** [25]. Tundroid community on pyroclastic deposits in area near the volcano´s peak. K-58-33-05. Bardunov & Cherdantseva (1984) reported this species in several other places at lower elevation; they are in square brackets.

C. mollis (Cardot) Bednarek-Ochyra & Ochyra – 475 m – **K:** 22. Rocks in narrow creek valley. 06-1202.

Conardia compacta (Drumm. ex Müll.Hal.) H.Rob. – ca. 5 m – **S:** 30. On soil in cliff crevices at sea coast. 30.VIII.1978, coll. Cherdantseva (VLA).

Coscinodon yukonensis Hastings – 200-1315 m – **K:** 22; **S:** 32. On rather dry cliffs on Mountains of Notoro and Ruruy. K-43-8-07. S+.

Cratoneuron filicinum (Hedw.) Spruce – 5-300 m – **Sm**: *; **U:** 6; **I:** 12, 15a, 18; **K:** 22, 25, 26, 26b, 27, 27a; **S:** 30a, 31, 32. On rocks and soil among rocks at stream banks, including springs with warm water; also on wet cliffs and wet sides of field roads; rather common. K-45-31-05.

Dichelyma japonicum Cardot – 20 m – **I:** 10. The bank of the western part of Reydovoye Lake, on *Salix* trunk submerged in water of lake. K-64-5-05. S+

Dichodontium palustris (Dicks.) M.Stech (*Anisothecium palustre* (Dicks.) I. Hagen) – 15-391 m – **Sm**: *; **I:** 9, 10, 12, 13, 15, 15a; **K:** 22, 26, 27; **S:** 30, 31, 32, 33. Usually on rocks and soil along stream banks, in open places and in partial shade; often near springs; occasionally in wet places along roads (in *Sasa* communities) and in cliff crevices. K-45-53-05.

D. pellucidum (Hedw.) Schimp. – 250 m – **Sm**: 3; **I:** 15; **S:** 30, 32. On rocks along stream in forests. K-11-3-07.

Dicranella cerviculata (Hedw.) Schimp. – 10 m – **I:** 14; **K:** 26, 20. On bare soil at slope to stream and on gravelly stream bar in forest (the stream has thermal springs in upper course), and at the edge of thermal field (with vapour and SO_2 emission); rare. 06-1683. S+.

D. curvipes (Lindb.) Ignatov (*D. heteromalla* var. *curvipes* auct.) – 20-1350 m – **I:** 14, 15a, 20; **K:** 22, 25, 26, 27; **S:** 30, 31, 32. Soil banks in forest, especially coniferous ones: on steep slopes, along roads, under upturned roots of fallen trees; common on Kunashir, somewhat rarer in other islands; occasionally in cliff crevices and on rock-field above tree-line. K-54-15-05. The specimens reported as *Atractylocarpus alpinus* (Milde) Lindb. (Bardunov & Cherdantseva, 1984) belong in this species. S+.

D. schreberiana (Hedw.) Hilf. ex H.A.Crum & L.E.Anderson – 100-110 m – **S:** 29, 31. On soil along roads in coniferous forests. K-36-40-07.

D. subulata (Hedw.) Schimp.– 18-1350 m – **I:** 8, 12, 17; **K:** 22, 26; **S:** 30. On clayish banks to stream, in wet crevices of tufa cliffs on the top of small knoll; rare. K-67-1-05. S+.

Dicranodontium denudatum (Brid.) E.Britton – 70-160 m – **K:** 26b, 27; **S:** 33. Rare in quite a different habitats: in cliff crevices, on soil near waterfall (in shaded canyon), and in forking stem of *Sasa* in dense *Sasa* community. 06-1450.

Dicranum bonjeanii De Not. – 25 m – **Sm**: *; **S:** 33. Rare, in *Ledum-Dasiphora-Phragmites* mire. K-54-26-07. S-.

D. flagellare Hedw. – 15-110 m – **I:** 20; **K:** 23, 26, 27, 27a; **S:** 29, 31. On rotten wood and occasionally on trunk bases in forests, especially coniferous ones. 06-1849.

D. fuscescens Turner – 20-409 m – **U:** 6; **I:** 10, 12, 13, 14, 15a; **K:** 25, 26, 27, 27a; **S:** 31, 32. Rather common in coniferous forests on trees, rotten logs, rocks and soil near trunk bases or within moss carpet; in *Sasa* communities occurs on bases of *Hydrangea* stems; occasionally on cliffs and lake shores among other mosses and in other habitats. K-48-5-05.

D. groenlandicum Brid. – 402 m – **I:** 13. The single finding in hollows (between *Carex*) on pure peat. K-49-9-05.

D. hakkodense Cardot – 200-1335 m – **U:** 6; **I:** 15; **K:** 22; **S:** 31. On rocks and trunks of *Abies, Picea yezoensis,* and *Juniperus sargentii.* K-41-18-07. This species is published by Bardunov & Cherdantseva (1984) as *D. viride.*

D. hamulosum Mitt. – 1400 m – **K:** 23. In *Pinus pumlla* scrubs. Sato 4721 (TNS), cited by Higuchi & Sato (2004).

D. japonicum Mitt. – 10-1415 m – **K:** 26. Among other mosses in mossy *Abies+Picea* forest at low elevation and at high elevation of Tyatya Volcano, in *Loiseleuria* community and in *Alnus* thicket. 06-3129.

D. majus Turner – 10-1350 m – **U:** 6; **I:** 13, 14, 15; **K:** 22, 25, 26, 27; **S:** 30, 31, Brotherus, 1899. Relatively common in three southernislands on litter, rotten logs and rocks in mixed, coniferous and elfin birch and alder forests; occasionally in other habitats like cliffs, stream sides, hummocks in bogs, etc. K-48-18-05. S+.

D. mayrii Broth. – 75 m – **I:** 12. In only one locality on *Acer, Betula* trunks and also on humus in *Quercus-Acer* forest with admixture of *Sorbus, Betula ermanii, Salix, Alnus* and thick underwood of *Sasa kurilensis*, K-45-58-05. In pure mats or with *Polytrichastrum pallidisetum.*

D. nipponense Besch. – 20-1600 m – **I:** 12, 14, 17; **K:** 22, 23, 20. On bases of *Acer* and *Betula* trunks and also on humus in *Quercus-Acer* forests and mixed forests with *Abies*, on slopes of ravines in forest, on soil in *Sorbus-Betula* forest with underwood by *Pinus pumila,* on base of cliff in shade of *Pinus pumila*, etc.; sporadic. K-45-4-05.

D. pacificum Ignatova & Fedosov – ca. 20-1200 m – **I:** 12, 15; **K:** 22, 23. On rocks and bases of tunks of *Betula, Alnus, Sorbus*; also on decaying wood. 06-1599.

D. scoparium Hedw. – 10-100 m – **U:** 6; **I:** 12, 14, 20, 21; **K:** 22, 26, 27a, 20. On decaying wood in coniferous forests, sometimes on trunk bases of *Ulmus*; rather rare. K-26-33-07. S+.

D. setifolium Cardot – 250 m – **S:** 32. One collection on wet cliff, on ledge. K-42-12-07. The species was never reported from Russia.

D. spadiceum J.E.Zetterst. – 1350 m – **K:** 22. On ridge top, on soil under *Pinus pumila*. 06-1553.

D. undulatum Schrad. ex Brid. – 340-422 m – **U:** 6; **I:** 13; **S:** 31. On ridges and in hollows in *Carex-Juncus*-moss bog near lake shore and on soil and base of trees in mossy *Picea* stand on slope. K-51-13-05.

Didymodon rigidulus Hedw. – ca. 10 m – **Sm:** 1. Coastal cliffs. 28.VII.2007, coll. Nyushko #51 (MHA).

D. tophaceus (Brid.) Lisa – 10 m – **K:** 22. Near hot spring on soil and on permanently seeped landslide at sea coast. 06-1626.

Diphyscium foliosum (Hedw.) D.Mohr – 700-1350 m – **K:** 22, 23. Two collections on soil: in *Alnus* thicket on slope to small stream (700 m, S+) and on ridge top, in niche of volcanic rocks (1350 m, S–). 06-1769. S+.

Distichium capillaceum (Hedw.) Bruch et al. – ca. 20-340 m – **I:** 15a; **S:** 31. Very rare, on shaded rocks. K-47-13-07. S+.

Ditrichum cylindricum (Hedw.) Grout – [low elevation] – **K:** 26. În gravelly S-facing slope at sea coast. 24.IX.1978, coll. Bardunov (IRK).

D. heteromallum (Hedw.) E.Britton – 10-1100 m – **I:** 13; **K:** 26, 27. On soil along roadsides and forest trails, on slope to stream and stream bars in forest and on wet places near hot springs with sulfur gas emanation. K-50-20-05. S+.

D. lineare (Sw.) Lindb. – 150 m – **I:** 12; **K:** 27. Soil bank along trail across *Sasa* field and burned place among *Sasa* community, and also in rocky bank of creek. 06-3021. S+.

D. macrorhynchum Broth. – 10 m – **K:** 26. Road cuvette and wet depression in between dunes at sea coast (both places nearby). 06-3105. S+.

D. rhynchostegium Kindb. – 100 m – **K:** 26. Soil banks along ground road across forest along electricity line. 06-1641. S+.

D. pusillum (Hedw.) Hampe – [low elevation] – **K:** 26. Reported by Bardunov & Cherdantseva (1984) on bare soil along road. 24.IX.1978, coll. Bardunov (IRK).

Dolichomitriopsis diversiforme (Mitt.) Nog. – 40-450 m – **K:** 22, 23, 27a; **S:** 29, 34. On trunk bases and soil in forests, especially on slopes, rare. 06-1847.

Dozya japonica Sande Lac. – ca. sea level-300 m – **S:** 30, 31, 32. On tree trunks and dry cliffs, mainly on

basalt rocks; sporadic in Shikotan, but not found in other islands K-48-27-07.

Drepanocladus aduncus (Hedw.) Warnst. – [low elevation] – **I:** 12. in a swampy meadow near hot spring (pure mat of several tens of square meter). 24.IX.1978, coll. Bardunov (IRK).

D. polygamus (Bruch et al.) Hedenäs – 10-25 m – **I:** 21; **S:** 32. Two collections: on wet cliffs at sea coast and in a fen. K-30-16-07a.

Echinophyllum sachalinense (Lindb.) O'Brian – 15-250 m – **I:** 12, 20; **K:** 22, 26, 26b, 27, 27a; **S:** 30. At bases of trunks of *Quercus, Acer, Alnus, Ulmus, Pic*ea, on rotten logs, rocks in forests, litter. Sporadic. K-45-19-05.

Encalypta ciliata Hedw. – ca. 10 m – **S:** 23 and also reported by Horikawa (1940). On faces and in crevices of cliffs. 30.VIII.1978, coll. Cherdantseva (VLA). S+.

Entodon scabridens Lindb. – 20 m – **K:** 18a. Flood valley, on *Populus* trunk. 06-1526.

Eurhynchiastrum pulchellum (Hedw.) Ignatov & Huttunen – 5 m – **K:** 24. Cliffs at sea coast. 06-3093.

Eurhynchiadelphus eustegius (Besch.) Ignatov & Huttunen – 50-100 m – **I:** 12; **K:** 22, 24, 27a; **S:** 30. On rocks and soil in coniferous and broad-leaved forests, and under tall-herb canopy. K-45-21-05.

Fauriella tenuis (Mitt.) Cardot – 50-120 m – **S:** 30, 31, 32. In coniferous forests on tree trunks and on slopes. K-57-26-07.

Fissidens curvatus Hornsch. – 50 m – **K:** 22. One collection on rocks on steep slope to stream. 06-1916. Det. T. Suzuki.

F. dubius P.Beauv. – 20-300 m – **I:** 12, 16; **K:** 22, 26, 27, 27a; **S:** Horikawa (1940). In forests, *Sasa* thickets and herb communities, on soil, rocks, tree and shrub bases, rather common. K-44-2-05.

F. gymnogynus Besch. – 25-50 m – **K:** 22; **S:** 33. Two collections: on soil on slope in *Abies* forest and on soil bank near road. 06-1927.

F. nobilis Griff. (*F. japonicus* Dozy & Molk.) – [low elevation] to 402 m – **I:** 12, 13, 14. On alluvial silts and clay along streams, usually in deep shade. K-48-16-05.

F. osmundioides Hedw. – 20 m – **K:** 22, 26; S: 33. Under herbs on rocky soil, on rock outcrop on steep slopes to sea, on soil bank along road; rather rare. 06-1411.

F. taxifolius Hedw. – 30-50 m – **K:** 22. On soil on steep slopes in *Abies* forest and in *Filipendula kamtschatica* community. 06-1926.

F. teysmannianus Dozy & Molk. (*F. adelphinus* Besch.) – [low elevation] – **I:** 12; **K:** 26; **S:** 25a. On bare soil and rocks. 19.IX.1980, coll. Presman (IRK, MHA); K-56-4-07.

Fontinalis antipyretica Hedw. – 20 m – **K:** 25. In a small stream at the edge of spruce forest, found just once, although in abundance. 06-1396.

F. hypnoides Hartm. – 40 m – S: 32. One finding in rocky stream bed. K-61-25-07.

Forsstroemia japonica (Besch.) Paris – 50-300 m – **I:** 12; **K:** 22, 26b, 27, 27a. On *Acer* in fir forest, and also on rotten log. 06-1156. Bardunov & Cherdantseva (1984) reported it also on trunks of *Padus, Hydrangea, Fraxinus, Ulmus,* and *Quercus*.

Funaria hygrometrica Hedw. – 3-100 m – **I:** 12, 14; **K:** 22, 23, 26, 26b; **S:** 31. Most collections are from wet cliffs near sea coast; also the species can survive on rocky substrates near thermal springs of ca. 25-30°C. K-47-20-05. S+. Surprisingly this species was never recorded in disturbed places. S+.

Glossadelphus ogatae Broth. & Yasuda – 10 m – **K:** 22. On rocks at stream bank, close to sea shore. The first record of the genus in Russia; the species known from Japan, China and Korea. 06-1105.

Glyphomitrium humillimum (Mitt.) Cardot – 10-140 m – **K:** 25, 26, 26b, 27, 27a; **S:** 32. On trunks and twigs of *Abies, Sorbus, Betula* in coniferous forests and open stands. 06-1001. Interestingly, the northern limit of this species seems to be in the middle part of Kunashir – this species is absent in the northern part of the island, as well as in Iturup. S+.

Grimmia atrata Miel. ex Hornsch. – 1300-1360 m – **K:** 22. Two collections ca. 100 m from each other in cave and on cliffs near the ridge top of the ancient Ruruy Volcano. 06-1585.

G. elongata Kaulf. – 1380 m – **K:** 23. In *Phyllodoce aleutica* community. Sato 4718 (TNS). Cited by Higuchi & Sato (2004).

G. hartmanii Schimp. – 20-1250 m **– I:** 12, 16; **K:** 22, 23, 25. On rocks in forest and in open places; sporadic, but often grows in abundance. 06-1764.

G. longirostris Hook. – 1600 m – **I:** 17. One collection in cliff crevice. K-18-6-07.

Gymnostomum aeruginosum Sm. – 100-290 m – **S:** 30, 30a, 32. In crevices and caves of cliffs, on vertical and overhanging surfaces. K-65-29-07.

Haplocladium microphyllum (Hedw.) Broth. **–** 20-100 m – **I:** 12; **K:** 22, 18a, 26, 26b, 27a; **S:** 30. On trunks, fresh logs, as well as strongly rotten logs; sporadic. K-44-10-05. S+.

Haplohymenium triste (Ces.) Kindb. – 200-250 m – **S:** 32. On exposed surfaces and in crevices of dry cliffs, only in one locality. K-42-18-07.

Hedwigia ciliata (Hedw.) P.Beauv. – 144-400 m – **K:** 22; **S:** 32. Rare on rocks in two places: in *Juniperus sargentii* and *Dasiphora fruticosa* shrubs, and in wet forest on boulder at the edge of swampy part of stream valley. 06-1119. S+.

Helodium paludosum (Austin) Broth. – [ca. 150 m] – **K:** 20. Wet places along a stream. 24.VIII.1978, coll. Cherdantseva (VLA).

Herzogiella adscendens (Lindb.) Z. Iwats. & W.B. Schofield – 15-150 m – **Sm**: 1; **I:** 9, 12, 15a, 20; **K:** 22, 23, 24, 25, 26, 27, 27a; **S:** 29, 31, 32. One of the most widespread species in Kunashir and Shikotan, somewhat rarer in Iturup; occurs on trunks of many trees and shrubs, rocks, soil near rock outcrops, decaying wood; in open places as well as in forests, both deciduous and coniferous. K-44-9-05. S+.

H. turfacea (Lindb.) Z. Iwats. – 10-200 m – **I:** 15a; **K:** 22, 26, 20. On rotten wood, at base of *Picea* and *Magnolia*, under upturned roots of fallen trunks; rather rare. 06-1290. S+.

Homalia trichomanoides (Hedw.) Bruch et al. – 20-1600 m – **I:** 12, 17, 20; **K:** 22, 26, 26b, 27, 27a; **S:** 30. On bases of trunks of *Acer, Quercus, Abies* in forests, not rare; in Shikotan occasionally on *Juniperus*; also not rare on rocks in forests. K-44-4-05.

Homalothecium laevisetum Sande Lac. – 20-110 m – **I:** 10; **K:** 22, 23, 18a; **S:** 31. Bardunov & Cherdantseva (1984) reported this species as a common one, especially on *Populus* and *Ulmus* trunks, and also on *Quercus, Acer, Kalopanax, Actinidia, Hydrangea,* etc. Recent studies revealed it on *Populus* and *Fraxinus,* and also on rocks in a rather limited number of localities. 06-1788. The different evaluation can probably be explained by the somewhat different localities studied: Bardunov & Cherdantseva explored more the western coast of Kunashir, which was not in the main focus of the recent studies.

Hygroamblystegium tenax (Hedw.) Jenn. – [low elevation] – **K**: 26. On rocks along Kisly Creek. 22.VIII.1978, coll. Cherdantseva (VLA).

H. humile (P. Beauv.) Vanderp., Goffinet & Hedenäs – [sea level] – **K**: 26. Wet cliffs at sea coast in broad-leaved forest. 7.VIII.1978, Cherdantseva (VLA, MHA).

Hygrohypnella bestii (Renauld & Bryhn) Ignatov & Ignatova – **Sm:** *.

H. ochracea (Turner ex Wilson) Ignatov & Ignatova – 25-800 m – **I:** 10, 12, 14, 15, 15a; **K:** 22, 23, 26. In streams in running water, or occasionally in dry beds and on cliffs; sporadic. K-10-25-07.

Hylocomiastrum pyrenaicum (Spruce) M.Fleisch. – 100-1350 m – **U:** 6; **I:** 15, 16; **K:** 22, 23; **S:** 30. On rocks and on litter in forest, including elfin forests and *Pinus pumila* thickets at higher elevations; occasionally on trunk bases; a relatively common species. K-15-27-07.

H. umbratum (Hedw.) M.Fleisch. – 450 m – K: 22. The single collection at the edge of swamp and forest in the valley of small stream with water rich in sulphur. 06-1176.

Hylocomiopsis ovicarpa (Besch.) Cardot – 329-400 m – **I:** 16; **K:** 22. On base of *Quercus crispula* in *Sasa* thicket and on rock in forest in narrow valley; rare and only at middle elevations. K-23-20-07.

Hylocomium splendens (Hedw.) Bruch et al. – 10-1350 m – **U:** 6; **I:** 17; **K:** 22, 25, 26, 27, 27a; **S:** 30, 31. Moderately common on soil and rocks in mixed and coniferous forests and elfin woods of *Pinus pumila* and *Alnus (Duscheckia) fruticosa*, and on open cliffs in misty summits. K-17-1-07.

Hymenoloma crispulum (Hedw.) Ochyra – 1350 m – **K:** 22. On cliffs at ridge top in summit area of old Ruruj Volcano. 06-1529. S+.

Hymenostylium recurvirostrum (Hedw.) Dixon – [low elevation] – **I:** 15a. On wet cliffs. 3.IX.1980, Pressman & Bardunov (IRK).

Hypnum cupressiforme Hedw. – 10-450 m – **I:** 20; **K:** 22, 23, 18a, 26b, 27a; **S:** 30, 32, 33. Rather sporadic in southern islands, while it Iturup it was found only once, occurring mostly on rocks and occasionally on trunks (mostly bases) of *Abies, Betula, Picea, Populus, Salix, Taxus*) and also on rotten logs. 06-1516.

H. fujiyamae (Broth.) Paris – 400 m – **S:** 29. Two collections on the top of Shikotan Mt., in cliff crevices. K-38-29-07, K-66-6-07. This species is new for Russia, and in more detail will be discussed and illustrated by Afonina & Ignatova (in press).

Hypopterygium flavolimbatum Müll. Hal. – ca. 150-200 m – **K:** 27a. One collection on soil in mixed forest, 8.VIII. 1978, coll. Cherdantseva (VLA).

Isopterygiopsis alpicola (Lindb. & Arnell) Hedenäs – 50-100 m – **K:** 23; **S:** 32. Two collections: on rocks in shady mixed forest and in coniferous forest on base of *Picea* trunk. 06-1830.

I. muelleriana (Schimp.) Z.Iwats. – 40-1350 m – **I:** 15; **K:** 22, 23, 26, 26b, 27; **S:** 32. On faces, in crevices and in caves of rocks and cliffs; few collection were done from soil banks of old road across broad-leaves forest with *Magnolia* and on landslide to stream. K-16-38-07.

I. pulchella (Hedw.) Z.Iwats. – 100 m – **K:** 22. One collection on soil at cliff base. 06-1049.

Isothecium hakkodense Besch. – 50-1250 m +1174 m – **I:** 12, 14, 15; **K:** 22; **S:** 32. On rocks in forest and along streams (in forests), at bases of trunks of *Ilex sugerokii* and *Taxus cuspidata*, mostly at lower elevations and one collection from treeless mountains in Iturup, among rocks in nival dwarf-shrub-grass tundra; also on branches of *Juniperus sargentii* in Shikotan. K-16-45-07.

Iwatsukiella leucotricha (Mitt.) R.W.Buck & H.A.Crum – 10-200 m – **I:** 20; **K:** 22, 26, 27; **S:** 29. Sporadic in coniferous forests, on trunks and occasionally on twigs of *Abies, Picea, Taxus*, and one collection from *Actinidia* stem. K-26-50-07. S+.

Kiaeria blytti (Bruch et al.) Broth. – 650-1450 m – **I:** 15. **K:** 22. Wet bank of nival spring near glacier in summit area in Iturup and in Kunashir along Dalny

Creek, at lower elevation in proximity to late snow-beds. 06-1314. S+.

K.starkei (F.Weber & D.Mohr) I.Hagen – 750-1174 m – **I:** 15; **K:** 22. Base of big rock on slope and on soil and rocks near late snow-bed at base of waterfall cliff in narrow valley. K-16-32-07. S+.

Leptobryum pyriforme (Hedw.) Wilson – [ca 5-20 m] – **U:** 6; **I:** 15a; **S:** 30a. On bare soil along streams. 1.VIII.1978, coll. Cherdantseva (VLA). S+.

Leptodictyum mizushimae (Sakurai) Kanda – 25 m – **S:** 33. Low bank of lake, on very wet soil among *Phragmites*. K-54-29-07. Very rare species, previously known only from few localities in Japan.

Lescuraea saxicola (Bruch et al.) Molendo – 64-1221 m – **I:** 12, 17; **K:** 22, 23; **S:** 29. Rock outcrops from mountain tundra and elfin forests to foothills, also on separate boulders in tall-herb meadow in flood-plain. K-10-31-07.

Leskea polycarpa Hedw. – 10 m – **I:** 12; **S:** 30. On bark of *Salix* in *Salix* stands in flood-plain and at lake shore. K-63-4-07. S+.

Leucobryum juniperoideum (Brid.) Müll.Hal. – 41-250 m – **I:** 14; **K:** 26; **S:** 30, 32. Rare species. In Kunashir and Iturup found as extensive mats hanging from big boulders and cliffs above hot and warm streams (in Kunashir some tufts had temperature above +30°C, while air temperature was about +20°C; in Iturup collected from rocks seeping from waterfall, with water temperature +40°C). Collections from Shikotan are from *Picea+Abies(+Taxus)* forests and on soil banks along forest road. K-55-3-05. This species was reported by Bardunov & Cherdantseva (1984) as *L. glaucum*.

Leucodon sciuroides (Hedw.) Schwägr. – [low elevation] – **I:** 12; **K:** 26, 26b, 27a; **S:** 30. Record from Shikotan belongs to Abramova (1960) and from Iturup and Kunashir to Bardunov & Cherdantseva (1984). The species was collected in broad-leaved and poplar forest in flood valley, on trunks of *Acer mayrii* and *Alnus hirsuta*, 8.IX.1980, Bardunov & Pressman (IRK).

Macromitrium japonicum Dozy & Molk. – 20 m – **K:** 26b. In mixed forest on *Ulmus* trunk. 30.IX.1978, coll. Bardunov (VLA).

Mielichhoferia japonica Besch. (*M. mielichhoferiana* var. *japonica* (Besch.) Wijk & Margad.) – sea level to 1300 m – **I:** 15a; **K:** 22. Cliff crevices and caves at sea coast, as well as in summit area of Ruruj Volcano. 06-1551. S+.

Meesia uliginosa Hedw. – 10 m – **K:** 22. On soil near thermal springs at sea coast. 06-1104.

Mnium heterophyllum (Hook.) Schwägr. – 50-500 m – **I:** 12, 18; **K:** 22, 26. On wet cliff on the first coastal terrace, shaded by tall herbs; at base of *Betula* in open forest on slope; on soil in *Abies* and *Salix* forests; rare. K-34-6-07.

M. lycopodioides Schwägr. – 25-1350 m – **Sm:** 3; **I:** 16; **K:** 22, 26, 27; **S:** 30, 31, 32, 33. On rocks and cliffs, at their bases and in crevices and caves; also on soil near rock outcrops; occasionally on trunk bases and soil on flat places. 06-1137. We follow here the broad circumscription of this species, suggested by Koponen (1994) which includes *M. ambiguum* and *M. laevinerve* that were reported by Bardunov & Cherdantseva (1984).

M. orientale R.E. Wyatt, Odrzykoski & T.J. Kop. – 20-200 m – **U:** 6; **I:** 14; **K:** 25, 26, 27, 27a. On soil in wet forests, including *Sphagnum*-types, on bank of stream splashed by water, on upturned roots of fallen trunks, rotten wood, etc.; sporadic. K-61-15-05. The specimens assigned to *Mnium hornum* (Bardunov & Cherdantseva, 1984) belong in this species, as true *M. hornum* was excluded from East Asia as a result of study of Wyatt et al. (1997).

M. stellare Hedw. – 10 m – **I:** 12. On rocky slope and cliffs faced to the sea. 6.IX.1980, coll. Bardunov (VLA).

M. thomsonii Schimp. (*M. orthorrhynchium* auct.) – 15-1350 m – **I:** 9, 11, 12, 14; **K:** 22, 23, 26. On shaded rocks and cliffs, and occasionally on rotten logs, trunk bases, soil banks to stream, etc.; rather rare. K-66-13-05.

Myurella sibirica (Müll.Hal.) Reimers – 200 m – **S:** 31. One collection in crevice of tufa cliff in *Picea-Abies* forest. K-49-4-07.

Myuroclada maximowiczii (G.G.Borshch.) Steere & W.B.Schofield – 20-110 m – **I:** 10, 12; **K:** 22, 18a, 27; **S:** 31. On soil, rocks and at bases of trunks of *Acer, Populus, Salix,* and *Ulmus;* in forests, open stands, and under canopy of tall herbs in meadow. Common in Kunashir, somewhat more rare in other islands, but never collected above 110 m. K- 45-1-05.

Neckera borealis Nog. – low elevation to 500 m – **K:** 22, 26b, 27a. On trunks, especially on inclined and dead ones of *Betula, Kalopanax, Ulmus, Abies* in mixed and coniferous forest. 06-1122.

N. pennata Hedw. – 10-450 m – **K:** 22, 26. On *Picea yezoensis* and *Abies* trunks in wet coniferous forests, and at base of *Magnolia* trunk in deciduous forest; rare. 06-1114.

N. yezoana Besch. – 20-200 m – **K:** 22, 23, 25; **S:** 29, 31, 30, 32, 33. Very common in Kunashir, and its total absence in Iturup looks very strange. It grows in different types of forests on trunks of *Alnus, Taxus, Ulmus, Kalopanax, Acer, Abies, Picea, Tilia, Hydrangea, Juniperus sargentii*, more rarely on rocks. 06-1265. S+.

Niphotrichum canescens (Hedw.) Bednarek-Ochyra & Ochyra – 100 m – **Sm:** *; **I:** 12. On fine-grained soil on the roadside, with *Bryum argenteum.* K-46-8-05.

Bardunov & Cherdantseva (1984) accepted this species in more broad sence, so some of their records, especially those from Kunashir may belong to the next species.

N. ericoides (Brid.) Bednarek-Ochyra & Ochyra – 10-1600 m – **I:** 17; **K:** 23, 26. On cliffs bases above tree line, on pyroclastic fields from recent eruptions, among sandy dunes at sea coast; rare, but locally abundant. K-18-22-07.

N. muticum (Kindb.) Bednarek-Ochyra & Ochyra – 400 m – **I:** 11. On wet cliffs of river canyon. K-71-9-05.

Ochyraea duriuscula (De Not.) Ignatov & Ignatova – 64-400 m – **Sm:** 3; **I:** 12, 15, 16; **K:** 22. Rocks in and along stream that are often flooded or sprayed, and on wet cliffs; only in Iturup and northern part of Kunashir. K-10-4-07.

Okamuraea brachydictyon (Cardot) Nog. – low elevations, 39 m – **I:** 20; **K:** 26, 26b; **S:** 30. On trunks of *Abies, Hydrangea* and *Salix* in mixed forests and willow stands; rare. K-26-46-07.

O. hakoniensis (Mitt.) Broth. – 20 m – **K:** 18a. One collection on *Populus* trunk in open stand at river bank. 06-1523.

Oligotrichum aligerum Mitt. – 20-1174 m – **I:** 12, 14, 15, 15a; **K:** 25, 26b, 27; **S:** 30. Among boulders in mountain tundra; in wet cliff crevices from sea level to high mountains; and at low elevations very common locally on soil banks along forest ground roads (where it dominates at places in central Kunashir for many kilometer) and along trails across *Sasa* communities. K-58-3-05.

O. hercynicum (Hedw.) Lam. & DC. – [low elevation] to 1221 m – **Sm:** *; **I:** 12, 17; **K:** 22, 26. At high elevations on cliffs and volcanic rock outcrops in summit areas, rare. K-17-16-07. At low elevations on alluvial deposits of rivers (voucher: 31.VII.1978, coll. Zakharova, VLA).

O. parallelum (Mitt.) Kindb.– 25-1453 m – **I:** 12, 14, 17; **K:** 22, 18a; **S:** 33. Wet cliff crevices at high elevation and especially characteristic of dry beds of streams in their middle and upper course, rare in lower course; locally not very rare, but known from limited number of localities; occasionally on cliffs near sea and under upturned roots of fallen trunk in *Picea yezoensis* forest. K-58-10-05.

Oncophorus wahlenbergii Brid. – 10-400 m – **K:** 22, 26, 26b, 27; **S:** 30, 32. Most common on rotten logs in wet coniferous, mostly *Abies* forests, and occasionally occurs on rocks outcrops, on slopes to stream beds, cliff bases, etc. 06-1681. S+.

Orthotrichum obtusifolium Brid. – [low elevation] – **S:** 30. On cliffs [likely near sea coast]. 21.III.1955, coll. O. Kusakin, det. A.L.Abramova (LE).

O. sordidum Sull. & Lesq. – 10-39 m – **I:** 19, 20; **K:** 26b, 27a; **S:** 30. On trunks of *Abies, Acer, Salix* in broad-leaved and coniferous forests and willow stands, occasionally on rocks. K-26-44-07. S+.

Oxystegus tenuirostris (Hook. & Taylor) A.J.E.Sm. – 100-150 m (+1174 m) – **I:** 15; **K:** 23, 26, 27; **S:** 30, 31, 33. On rocks, trunk bases and occasionally recently fallen trunks, sporadic, one record above tree-line, within cushion of *Bucklandiella microcarpa*. 06-1790.

Paraleucobryum longifolium (Hedw.) Loeske – 400-1250 m – **K:** 22; **S:** without exact locality (Abramova, 1960). On big boulders in mixed forest, elfin woods, etc. 06-1157.

Pelekium pygmaeum (Bruch et al.) Touw (*Thuidium pygmaeum* Bruch et al.) – [low elevation] – I 12. On boulder in broad-leaved forest near stream. 10.IX.1980, coll. Bardunov (VLA).

Philonotis americana Dism. – 150 m – **K:** 26b, 20. Cliff crevices near stream (running from volcano) and at cold springs on low bank of Kipyashchee Lake, located in depression with many fumaroles, thus frequently with high concentration of sulphur dioxide in the air. 06-1043. American species, reported here for Russia for the first time.

P. caespitosa Jur. – 5-1250 m – **K:** 23, 24, 28; **S:** 32. Wet rocks and cliffs, wet roadsides, stream banks at lower elevation; on cliffs near tree-line. 06-3096.

P. fontana (Hedw.) Brid. – 10-1335 m – **Sm:** *; **U:** 6; **I:** 12, 13, 15, 15a, 17; **K:** 22, 23, 26, 27; **S:** 30, 31. Various wet places: cliffs, rocks, stream banks, wet places in meadows and among dunes, roadsides, eutrophic mires. Rather common. K-15-29-07.

P. turneriana (Schwägr.) Mitt. – [low elevation] – **I:** 14. On wet cliffs near hot waterfall (water temperature +40°C). It-28.2-08b. Tropical and temperate species of East Asia and Oceania, reported here for Russia for the first time.

P. yezoana Besch. & Cardot – 15-30 m – **I:** 9; **K:** 22. Two findings: in crevices of cliffs shaded by *Alnus* along sea coast and on slope to stream in *Abies* forest. K-66-11-05.

Plagiobryum hultenii (Ochi & Perss.) Hedd. – [low elevation] – **S:** 30a. On humus in crevices of cliff near the coast. 1.IX.1978, Cherdantseva & Lesik (VLA, MHA).

P. cf. *zieri* (Hedw.) Lindb. – 250-1315 m – **K:** 22; **S:** 31, 32. Wet rocks and crevices of cliffs. 06-1593. All specimens are sterile, which does not allow separate this species from the closely related rare species *P. japonicum.*

Plagiomnium acutum (Lindb.) T.J.Kop. – 50-64 m – **I:** 12; **K:** 22, 26b, 27a. On trunk bases of *Acer, Quercus* and *Ulmus*; wet rocks in *Abies* forest and at stream bank; rather rare. K-10-34-07.

P. cuspidatum (Hedw.) T.J.Kop. – 20-150 m – **I:** 10, 12, 20; **K:** 22, 18a, 20. On base of *Quercus, Populus,*

Abies, Taxus, Ulmus, Sambucus in different types of forest, but more commonly in *Abies* forests; also on banks to streams, rocks in forest, rotten logs. Common in Kunashir, sporadic in Iturup. K-44-3a-05. S+.

P. ellipticum (Brid.) T.J.Kop. (*Mnium rugicum* auct.) – 300 m – **U:** 6; **I:** 12; **K:** 22, 26; **S:** 30. Wet rocks and rocky soil. 06-1186.

P. maximowiczii (Lindb.) T.J.Kop. – 290 m – **S:** 30. Crevices of N-facing cliff. K-65-14-07.

P. medium (Bruch et al.) T.J.Kop. – 20-450 m – **I:** 12, 15a; **K:** 22, 25, 26. In rather different habitats: alluvial deposits of river, in swamp in stream valley, banks to streams in forest, on rock outcrops. 06-1375.

P. vesicatum (Besch.) T.J.Kop. – 50-395 m – **Sm:** 3; **I:** 12, 15, 15a, 18; **S:** 29, 31. Mostly on wet rocks, and also on banks to stream and lake in forest, often within *Alnus (Duscheckia)* thickets. K-47-10-07.

Plagiopus oederianus (Sw.) H.A.Crum & L.E.Anderson – [low elevation] – **I:** 12. On humus ledges of N-facing cliff, the only finding, 6.IX.1980, Bardunov (IRK).

Plagiothecium cavifolium (Brid.) Z. Iwats. – 10-1350 m – **I:** 9, 12, 16; **K:** 22, 23, 26, 26b, 27; **S:** 29, 30, 31, 32. Very common in mesic and wet forest types on soil, trunk bases, rotten logs, rocks, banks to streams and other kinds of vertical soil faces (landslides, under upturned roots, etc,). K-49-32-07. S+.

P. denticulatum (Hedw.) Bruch et al. – 500-1453 m – **I:** 17; **K:** 22, 23. Three collections, all made from wet and more or less shaded cliffs, and also reported by (Higuchi & Sato, 2004) K-19-18-07.

P. euryphyllum (Cardot & Thér.) Z.Iwats. – 25-450 m – **I:** 10; **K:** 22, 20. Three collections from rather different habitats: soil bank to stream, among mosses in swamp, and base of *Quercus* trunk in *Sasa* community. 06-1080.

P. laetum Bruch at al. – 100-422 m – **I:** 13; **K:** 20. On *Sorbus* trunk and on soil along road in forest. K-51-2-05.

P. latebricola Bruch at al. – 15-110 m – **I:** 9, 12; **K:** 26; **S:** 31. On rotten logs, bases of *Betula* and *Alnus*, and in cliff crevices. K-66-1-05.

P. nemorale (Mitt.) A.Jaeger – 20-550 m – **I:** 10, 12, 20; **K:** 22, 25, 27, 27a. On soil banks and rocks in a broad range of habitats in forest (on soil, tree bases, rotten logs and stumps, boulders, cliffs, etc.); rather common in all three islands. K-45-62-05.

P. obtusissimum Broth. – 10-300 m – **K:** 22, 25, 26, 27; **S:** 32, 34. Rather common, especially on strongly rotten wood in wet and shady coniferous forest; also on boulders, steep slope slides, tree bases (especially *Picea* and *Abies)*, in cliff crevices. K-27-16-07.

Platydictya jungermannioides (Brid.) H.A.Crum – [ca 5-10 m low elevation] – **I:** 12. Among rocks in rock field, the only finding, 14.IX.1980, Bardunov (IRK).

Platygyrium repens (Brid.) Bruch et al. – 25-150 m – **I:** 10; **K:** 20. On bark of *Alnus, Betula, Quercus, Phellodendron, Sorbus*; in few places, but locally rather common. K-61-20-05.

Pleurozia purpurea (Lyell ex Hook.) Lindb. – 10-450 m – **U:** 6, Brotherus, 1899; **I:** 16, 20; **K:** 22, 23, 25, 26, 20. In wet *Picea-Abies* forests with developed moss carpet, among *Pleurozium, Hylocomium, Sphagnum,* etc.; also on strongly rotten wood, occasionally on ravine slopes, and slopes to streams. K-23-12-07.

Pleurozium schreberi (Brid.) Mitt. – 10-1221 m – **U:** 6; **I:** 15, 17, 20; **K:** 22, 23, 25, 26, 27; **S:** 31. Common moss forming carpet in coniferous forests, including *Pinus pumila* communities; sometimes in mixed forests and in *Sasa* communities. grows on soil, rotten logs, tree bases, rocks. 06-1845.

Podperaea krylovii (Podp.) Z.Iwats. & Glime – 50-200 m – **K:** 22. On steep slope to stream, on rocks and on soil nearby. 06-1901.

Pogonatum contortum (Brid.) Lesq. –10-1350 m – **I:** 15; **K:** 22, 25, 26, 27, 27a; **S:** 29, 30, 31, 32. On soil, especially on bare places along roads, landslides, stream banks, under upturned roots of fallen trees, etc., occasionally among dense moss cover, on tree bases and on rocks, especially in crevices. Common on three southern islands. K-13-3-07. S+.

P. dentatum (Brid.) Brid. – sea level-1300 m – **I:** 15a, 17; **K:** 22, 20, 28. Rocks and soil near cliffs and other outcrops, along stream beds, mostly at higher elevations, above 900 m; occasionally at lower elevations on cliffs near sea coast, meadow with scattered low *Sasa*, fire places. K-17-29-07. S+.

P. inflexum (Lindb.) Sande Lac. – 20-425 m – **I:** 13, 15a; **K:** 22, 25, 26, 26b, 27, 28; **S:** 29, 30, 32, 33. On soil, especially along roadsides in meadows and *Sasa* communities, occasionally in burned places, rocks, stream banks. K-50-9-05. S+.

P. japonicum Sull. & Lesq. –15-1000 m – **Sm:** *; **U:** 6; **I:** 12, 14, 15a; **K:** 22, 26. On soil in forests, among moss cover as well as on rather open places on slopes to streams, under upturned roots of fallen trees and on rocks along streams; sporadic. K-56-24-05. S+.

P. spinulosum Mitt. – ca. 20 m – **K:** 27a. On soil along trail and on rotten log in mixed forest. 2.VIII.1978, coll. Cherdantseva (VLA). S+.

P. urnigerum (Hedw.) P.Beauv. – 10-400 m – **I:** 11, 12, 15a; **K:** 26, 27, 27a; **S:** 30. On wet rocks and rocky soil banks along streams, occasionally on roadsides, on wet sands among dunes at sea coast, treeless slopes permanently exposed to strong winds, etc. K-71-9-05. S+.

Pohlia andrewsii A.J.Shaw – ca 800 m – **I:** Bogdan Khmel'nitsky Volcano, on soil under *Alnus* thicket, 5.VIII.1982. coll. Barkalov (VLA, MHA).

P. annotina (Hedw.) Lindb. – 10-150 m – **K:** 22, 23, 25, 20. On bare soil on slopes to stream and along ground roads in forests and *Sasa* communities. 06-1920.

P. cruda (Hedw.) Lindb. – 550-1453 m – **I:** 12, 17; **K:** 22; **S:** 30. On soil in cliff crevices and niches and soil banks on slopes. K-22-4-07. S+.

P. crudoides (Sull. & Lesq.) Broth. – 20 m + 1221-1450 m – **I:** 17; **K:** 22, 23. At high elevations, on rocks, and one collection at sea coast, along a road in *Sasa* vegetation. 06-1738. S+.

P. drummondii (Müll. Hal.) A.L.Andrews – 10-1174 m – **I:** 15; **K:** 26. In snow-bed community at ridge top and in road cuvette at sea level. 06-3108.

P. elongata Hedw. – 100 m – **I:** 15a; **K:** 26. Soil bank at little used forest road along a cut for electric-line. 06-1680. Collection from Iturup is likely from a higher elevation («mountain bog»). S+.

P. filum (Schimp.) Mårtensson – 5-1450 m – **Sm:** *; **K:** 23, 26. In wet depressions among dunes and on wall of bear's den at high elevation. 06-1735.

P. melanodon (Brid.) A.J.Shaw – [low elevation] – **I:** 12, 15; **K:** 26, 26b. On soil bank near thermal springs, under tall-herb canopy in meadows, near rock outcrops, sporadic. 14.IX.1980, Bardunov (IRK).

P. nutans (Hedw.) Lindb. – 10-193 m – **I:** 14; **K:** 26, 20. Rather rare, and only once collected on rotten stump, the typical habitat of the species; other collections were gathered from soil bank along road, pebbly river bar, big boulder steamed by thermal spring, *Calamagrostis* swamp. 06-1674. S+.

P. proligera (Kindb.) Lindb. ex Broth. – 20 m – **S:** 32. Rock outcrops near stream bank. K-58-10-07.

P. tundrae A.J.Shaw – 10-150 m – **K:** 26, 20. In abundance along roads in forest and across *Sasa* communities; also on fallen log in coniferous forest and under upturned roots of fallen trunks. 06-1639.

P. wahlenbergii (F.Weber & D.Mohr) A.L.Andrews – 5-1221 m – **U:** 6; **I:** 17; **K:** 22. Near thermal field at sea coast and on ridge above tree line; only two localities. 06-1156.

Polytrichastrum alpinum (Hedw.) G.L.Sm. – 20-1450 m – **Sm:** *; **U:** 6; **I:** 10, 11, 12, 15a, 16, 17; **K:** 22, 23, 27; **S:** 30. Usually on rock outcrops, in shady or almost open places, in forest belt and above tree-line; occasionally at trunk bases and on soil banks to stream beds. Sporadic. K-10-11-07.

P. formosum (Hedw.) G.L.Sm. – 10-20 m – **K:** 25, 26. In wet forest of *Picea glehnii*, among mosses in well-developed moss carpet and at trunk bases. 06-3047. Bardunov & Cherdantseva (1984) reported it from bare soil in *Sasa* community.

P. longisetum (Sw. ex Brid.) G.L.Sm. – [low elevation] – **I:** 12. In wet meadow. 31.VIII.1980, Bardunov & Pressman (IRK).

P. pallidisetum (Funck) G.L.Sm. – 20-250 m – **I:** 12, 15a; **K:** 22, 25, 26, 27, 28. On various soil banks in forest, mostly on slopes, and also along trails in forest and across *Sasa* communities; occasionally on base of *Betula* trunk; in low and wet grassland of Veslo Peninsula sporadic along ground roads. 06-1408. S+.

P. sexangulare (Flörke ex Brid.) G.L.Sm. – 918-1600 m – **I:** 15, 17. In crevices of rocks on slope of Stokap Mt.. K-18-14-07. S+.

P. sphaerothecium (Besch.) J.-P.Frahm – 5-1800 m – **I:** 12, 15a; **K:** 22, 23. On volcanic rocks in several places; in abundance only on big lava blocks forming a belt across almost lifeless pyroclastic field in summit area of Tyatya Volcano; among more frequent species occurring on this lava are *Arctoa fulvella, Rhacomitrium lanuginosum*, and on overhanging surfaces *Tetrodonium repandum*. 06-1720. S+.

Polytrichum commune Hedw. – 10-150 m – **I:** 12, 17; **K:** 26, 26b, 27, 28. In *Sphagnum* bog, bogging meadows and on creek banks, on sandy dunes near sea coast, very rare on rotten logs in forest. 06-3029.

P. jensenii I.Hagen – ca. sea level – 150 m – **I:** 14; **K:** 26, 26b, 27, 28. Various wet places including springs, low lake shores, wet roads, etc., sporadic. 06-1041.

P. juniperinum Hedw. – 20-600 m – **Sm:** *; **U:** Brotherus, 1899; **I:** 14, 15a; **K:** 23, 26, 26b, 27, 28. On bare soil in forest, banks along roads, near rock outcrops, denudated river banks; rather rare. K-55-10-05.

P. piliferum Hedw. – 200-1510 m – **I:** 14; **K:** 23; **S:** 32. Rare and in quite different habitats: cliff crevices, landslides, in tundroid community and on recent pyroclastic deposits in summit area of active Tyatya Volcano, with *Racomitrium lanuginosum.* 06-1727.

P. strictum Brid. – [low elevation] – **U:** 6; **I:** 12, 14. On eroded slope and near thermal fields, at the edge of *Pinus pumila* community.10.IX.1980, Bardunov & Pressman (IRK).

Pseudobryum cinclidioides (Huebener) T.J.Kop. – [low elevation] – **U:** 6; **I:** 14. Alluvial deposits along stream bank, rare. 16.IX.1980, Bardunov & Pressman (IRK).

Pseudohygrohypnum subeugyrium (Renauld & Cardot) Ignatov & Ignatova – 250 m – **U:** 6; **S:** 32. Wet banks of temporary stream on slope with community of *Botrioides, Sasa, Spiraea, Juniperus sargentii* and numerous rock outcrops. K-42-44-07.

Pseudoleskeella nervosa (Brid.) Nyh. – 20-200 m – **I:** 10, 12; **K:** 22. On *Salix, Alnus, Acer* trunks and on cliffs near waterfall. 06-1297.

Pseudotaxiphyllum pohliaecarpum (Sull. & Lesq.) Z. Iwats. – 10 m – **K:** 26. In coniferous forest in big hole formed due to erosion of nearby creek, on ledges of subverical walls of this hole. 06-1697. The first record in Russia. Species common on eroded soil in Japan, China and SE Asia.

Pterigynandrum filiforme Hedw. – [low elevation] to 500 m – **I:** 12; **K:** 22. One collection in floodplain forest on *Alnus*, and two in the valley of Dalny Creek at middle elevftion, on *Abies* and *Betula*. 06-1145.

Ptilium crista-castrensis (Hedw.) De Not. – 10-422 m – **I:** 13, 15a; **K:** 20, 25, 26b, 27a; **S:** 30, 31, 32. Sporadic in moss carpet of coniferous forests, also on rotten logs, boulders covered by mosses, tree bases, occasionally in open bogs. K-51-3-05.

Pylaisia brotheri Besch. – [low elevation] – **K:** 26b, 27a. On trunks of *Populus* and *Actinidia* in mixed and coniferous forests, occasionally on fresh logs. 1.10.1978, Bardunov (IRK). Bardunov & Cherdantseva (1984) reported it also from Iturup, but later the specimen was reidentified as *P. subcircinata*. S+.

P. falcata Bruch et al. – 20 m – **K:** 25a. On *Populus* in *Populus* stand along river bank. 06-1524. S+.

P. obtusa Lindb. – 40 m – **K:** 23. On *Hydrangea* and *Sambucus* in mixed forest alternating with openings with dense *Sasa.* 06-1822. S+.

P. polyantha (Hedw.) Bruch et al. – 10-150 m – **K:** 26, 27; **S:** 30. Rare: in *Quercus* (open place among *Sasa* vegetation) and on *Picea glehnii* twigs. 06-1067. S+.

P. subcircinata Cardot – 100 m – **K:** 26b, 28; **S:** 29, 30. Several collections from trunks of *Acer* and *Ulmus*. K-37-48-07. S+.

Pylaisiadelpha tenuirostris (Bruch & Schimp. ex Sull.) W.R.Buck – 20-150 m – **K:** 25, 26, 27, 27a. In *Abies* forest on thin twigs of *Abies*, on *Quercus* trees in *Sasa* communities, in broad-leaved forest on *Phellodendron*. 06-1384. Bardunov & Cherdantseva (1984) record of *Clastobryella kusatsuensis* also belongs to this species. S+.

Racomitrium lanuginosum (Hedw.) Brid.– 100-1800 m – **Sm:** *; **I:** 14, 17; **K:** 22, 23, 26; **S:** 32, 33. Common on recent volcanic deposits at high elevation, above 1000 m, and occasionally occurs on rocks and cliffs below. K-58-33-05.

Rauiella fujisana (Paris) Reimers – 10-600 m – **I:** 10, 12; **K:** 22, 23, 25, 18a; **S:** 29. Common in Kunashir and Shikotan, somewhat more rare in Iturup. It grows on trunks of *Abies, Acer, Quercus, Sorbus, Alnus, Kalopanax, Populus, Betula, Ulmus,* in forest and in more or less open places; also on fallen logs and on rocks. K-44-8-05. S+.

Rhabdoweisia crispata (Dicks. ex With.) Lindb. (*R. kusenevae* Broth.) – 15-1390 m – **I:** 9, 12, 20; **K:** 22, 23, 26, 27; **S:** 30, 32. On rock outcrops, especially in crevices and under overhanging rocks, and also on vertical banks in shady places in forests (slides to stream and similar habitats), also on soil in open place in tundra-like community on slope at sea coast, exposed to strong, permanent winds; rather common. K-66-1-05. S+.

Rhizomnium magnifolium (Horik.) T.J.Kop. – 10-1453 m. – **Sm:** *; **U:** 6; **I:** 12, 15a, 17; **K:** 22, 26, 26b; **S:** 30, 32. In forests (mostly coniferous) on rocks and not rarely on litter, also along stream banks and in cliff crevices. 06-1134.

R. nudum (E.Britton & R.S.Williams) T.J.Kop. – 329-1174 m – **I:** 15, 16; **K:** 22. On fine-grained soil on slope to stream, in shade of *Sasa*; on base of big boulder in nival tundra; on rocks near stream. Three collections. K-16-31-07.

R. pseudopunctatum (Bruch & Schimp.) T.J.Kop. (*Mnium subglobosum* Bruch et al.) – 20 m – **K:** 25; **S:** Horikawa (1940). We collected the species only once, in boggy forest of *Picea glehnii*. 06-1399.

R. striatulum (Mitt.) T.J.Kop. – 20-500 m – **Sm:** 3; **I:** 11, 14, 16; **K:** 22, 25, 26, 27; **S:** 29, 31. Very common and in a wide range of habitats: on decaying wood, separate boulders covered by at least thin soil layer; more or less stable soil banks to streams, trunk bases; also collected above rocks in streams, including those with water rich in sulphur. 06-1332. S+.

R. tuomikoskii T.J.Kop. – 20 m – **K:** 25. Low bank of Saratovka Creek, only one locality. 06-1376.

Rhodobryum ontariense (Kindb.) Kindb. – 100 m – **K:** 23. On big boulders with soil layer in forest, only one locality. 06-1801. Horikawa (1940) reported from Shikotan also *R. roseum* (Hedw.) Limpr., a species that was understood that time in a broader sense, and included also *R. ontariense*.

Rhynchostegium aquaticum A. Jaeger – 20-200 m – **I:** 12; **K:** 25, 26, 26b, 27, 27a; **S:** 30, 31, 32. On rocks in streams, in running water and temporarily flooding banks; sporadic. K-45-55-05. This species was previously reported from Asiatic Russia as *R. riparioides* or *Platyhypnidium riparioides*. S+.

R. pallidifolium (Mitt.) A. Jaeger – [low elevation] – **K:** 27a. On soil in secondary broad-leaved forest. 5.VIII.1978, Cherdantseva (VLA, MHA).

Rhytidiadelphus japonicus Reimers – 5-402 m – **U:** 6; **I:** 10, 11, 12, 13; **K:** 22, 23, 24, 25, 26b, 27; **S:** 29, 30. In forests, mostly coniferous, at bases of trunks (*Abies, Alnus, Salix,* etc.), also on rocks, soil near rock outcrops, on soil within tall-herb communities. K-45-12-05.

R. squarrosus (Hedw.) Warnst. – 20-350 m – **K:** 22, 25. Sandy dunes at sea coast. K-71-2-05.

R. subpinnatus (Lindb.) T.J.Kop. – 20-350 m – **K:** 22, 23, 25. Rare, in wet *Abies* and *Picea* forest and on swampy stream bank. K-71-2-05.

R. triquetrus (Hedw.) Warnst. – 10-1390 m – **U:** 6; **I:** 11, 16, 17, 20; **K:** 22, 25, 26, 26b, 27a; **S:** 29, 31. Common throughout the territory on litter in forests, on rotten logs, boulders and occasionally trunk bases; sometimes in meadows and other types of vegetation. K-71-2-05.

Rhytidium rugosum (Hedw.) Kindb. – 110 m – **S:** 30, 30a, 31. On dry cliffs and rock outcrops, only in Shikotan. K-51-17-07.

Rigodiadelphus robustus (Lindb.) Nog. – 25-1453 m – **I:** 10, 12, 14; **K:** 22, 27, 27a; **S:** 31. On rocks and trunks, sporadic, but rather common in elfin *Betula* forest at high elevation, where it is characteristic on bases of *Betula ermanii* trunks. K-56-8-05.

Saelania glaucescens (Hedw.) Broth. – 15-200 m – **I:** 12, 16, 20; **K:** 26; **S:** 30, 31, 33. In cliff niches, among rocks on slopes, on soil banks near roads. K- 24-1-07. S+.

Sanionia uncinata (Hedw.) Loeske – 10-1350 m – **Sm:** 1; **U:** 6; **I:** 10, 12, 13, 14, 17, 20; **K:** 22, 23, 26, 26b, 27a; **S:** 29, 30, 30a. On trunks, especially at bases and on inclined portions, of *Quercus*, *Salix*, *Larix, Betula, Alnus, Taxus, Pinus pumila, Euonymus;* also on rotten logs, on litter in elfin forests, on rocks; common. K-44-3-05. S+.

Schistidium lancifolium (Kindb.) H.H.Blom – 10-1350 m – **K:** 22, 23, 27; **S:** 29, 30, 32. On rocks in different environments; the most common species of the genus, but in general rather sporadic. 06-1197. S+.

S. liliputanum (Müll. Hal.) Deguchi – 25 m – **S:** 33. The only finding in cliff crevices in tundroid windy community. K-54-39-07. S+.

S. *maritimum* (Sm. ex R.Scott) Bruch et al. – 5-20 m – **Sm:** *; **U:** 6; **K:** 18a, 26; **S:** *. Cliifs near ocean coast. 06-1513.

S. papillosum Culm. – 10-1350 m – **K:** 22, 20. Rocks in forest, open places, tall-herb meadows. Rare. 06-1421. S+.

S. pulchrum H.H.Blom – 30 m – **K:** 26. On big boulders in open place in town. 06-3137. S+.

S. rivulare (Brid.) Podp. – [low elevation] and 64 m – **I:** 12. On rocks at river bank, close to water. K-10-6-07. S+.

Schistostega pennata (Hedw.) F.Weber & D.Mohr – 10-150 m – **I:** 15a; **K:** 25, 26, 26b, 27; **S:** 32. Under upturned roots of fallen trunks, usually in rather dark and wet coniferous forest; once in big cave in tufa cliff, also in *Picea-Abies* forest. K-27-48-07. S+.

Sciuro-hypnum brotheri (Paris) Ignatov & Huttunen – 25-409 m – **I:** 10, 14; **K:** 23, 20. Usually on soil in more or less open places (banks to roads and trails in forests and *Sasa* communities, ravine slopes, banks to streams in forest), occasionally on rocks, trunk bases in forest, rotten logs. K-56-8-05. S+.

S. curtum (Lindb.) Ignatov & Huttunen – 50-75 m – **I:** 12. Rare, in deciduous forest with *Sasa kurilensis*, on base of *Sorbus* trunk and on fine-grained soil along stream, in partial shade. K-45-48-05.

S. plumosum (Hedw.) Ignatov & Huttunen – 10-1450 m – **I:** 11, 13, 16; **K:** 22, 23, 26, 27; **S:** 30a, 32. Rather frequent although inabundant. Usually grows on rocks along streams, but some collections are from trunks of *Betula* and *Hydrangea* and rotten logs. K-24-15-07. S+.

S. populeum (Hedw.) Ignatov & Huttunen – 20-150 m – **I:** ; **K:** 23, 27, 27a; **S:** 30. Relatively rare, on trunks (*Acer, Hydrangea*), rotten logs, and rocks in moderately shaded places. 06-3190.

S. reflexum (Starke) Ignatov & Huttunen – 10-1350 m – **I:** 12, 20; **K:** 22, 23, 18a, 27, 27a; **S:** 30, 30a. On trunks (usually near base) of *Salix, Alnus, Phellodendron, Betula, Pinus pumila*, and also on rocks, soil (including places near late snow-beds), and litter in elfin *Betula* forest (on layer of slowly decomposing *Betula ermanii* leaves fallen in the previous fall). 06-1617. The plants are extremely variable in their morphology. S+.

S. starkei (Brid) Ignatov & Huttunen – 10-409 m – **Sm:** 2; **I:** 12, 14, 20; **K:** 22, 23, 25, 26, 26b, 27; **S:** 30. Sporadic to locally common, but never abundant. Grows mostly in mesic to wet *Abies* forest and under tall-herb vegetation, occasionally in other types of forests; often among moss carpet on litter and rotten logs, stumps and wood, occasionally at trunk bases. K-56-24-05.

S. uncinifolium (Broth. & Paris) Ochyra & Zarnowiec – 20-1250 m – **I:** 15; **K:** 22, 23. Most collections are from rocks (separate boulders in forest and among tall-herb vegetation, cliff bases in forest, etc.), and occasionally on trunks of *Betula*; locally common, but known in few areas. K-16-35-07. S+.

Scorpidium scorpioides (Hedw.) Limpr. – 391 m – **I:** 13. The only finding in hollows of *Carex-Juncus*-moss eutrophic bog. K-52-25-05.

Sphagnum alaskense R.E. Andrus & Janssens – 50-150 m – **I:** 18; **K:** 25a; **S:** 29. Three collections: in swampy open *Larix* forest, *Sphagnum+Carex* type, in *Picea glehnii* mossy forest, and in moss mats on N-facing cliffs in summit area of a hill. K-64-3-07.

S. angustifolium (C.E.O.Jensen ex Russow) C.E.O.Jensen – [elevation unknown] – **I:** without exact locality (Vasiljeva, 1960).

S. aongstroemii Hartm. – 340 m – **S:** 31, 34. Two collections on soil and base of trees in massif of short-trunked *Picea yezoensis* forest with moss carpet on slope and on partly overgrown rock-field. K-47-26-07.

S. capillifolium (Ehrh.) Hedw. – 10-422 m – **I:** 13; **K:** 25, 26; **S:** 30, 31, 32. In various habitats: in large open *Sphagnum* bogs, *Picea glehnii* forests with *Sphagnum* carpet, swampy coniferous forests with *Lysichiton*, mire at lake shore, wet cliffs, etc. K-51-17-05.

S. compactum Lam. & DC. – [elevation unknown] – **I:** without exact locality (Vasiljeva, 1960).

S. contortum Schultz – 10 m – **I:** 21. One finding on

peaty soil in grass-sedge-dwarf shrub bog at lake shore. K-30-2-07.

S. fallax (H. Klinggr.) H. Klinggr. – 10-200 m – **I:** 10, 14; **K:** 25, 26. On hummock in moss-sedge bog and in *Picea glehnii* forest with *Sphagnum* carpet, swampy place in *Abies* forest on slope, in open extensive bog near sea coast. K-63-7-05.

S. fimbriatum Wilson – 70-450 m – **I:** 12, 14; **K:** 22, 26; **S:** 20. Wet coniferous forests and boggy stream valleys, mires around lakes, and occasionally wet rock outcrops and steep slopes in forest and among *Sasa* communities. Locally common, although number of known localities is limited. One collection on wet cliffs close to hot waterfall and one on rather warm rocks along creek (with *Leucobryum juniperoideum*). 06-1237.

S. cf. *flexuosum* Dozy & Molk. – ca. 50 m – **K:** 27, 28. Bogging meadow near Golovnino and in wet place within *Sasa* thicket. 16.VIII.1990, coll. Dvorakovskaya & Konovalova (MHA). Further study of specimens is required as they have large stem leaves without fibrils, but stem hyalodermis is strongly differentiated, i.e. which does not fit well any species known in the area.

S. fuscum (Schimp.) H.Klinggr. – 10-1350 m – **K:** 22, 26; **S:** 30. Rare, in extensive open *Sphagnum* bogs, and in *Pinus pumila* communities is summit area. 06-3223.

S. girgensohnii Russow – 10-400 m – **I:** 10, 13, 14; **K:** 22, 18a, 26, 27; **S:** 29, 30, 31, 32. Common in *Abies* and *Picea glehnii* forest, and also occurs in swampy areas in deciduous forests, and different wet places, including steep slopes and cliffs. K-62-2-05.

S. imbricatum Hornsch. ex Russow s. str. – 10-250 m – **K:** 22, 25, 26; **S:** 32. Moderately common at edges of big open *Sphagnum* bogs, *Picea glehnii* forests with *Sphagnum* carpet, and in small quantity in various places: small swampy areas in mixed forests, wet cliffs and wet banks to streams, also in forests. 06-1098.

S. inundatum Russow – 25 m – **S:** 33. Two collections: from mire dominated by mosses, dwarf-shrubs (*Dasiphora, Ledum*), with admixture of *Phragmites*, in flood plain of small river and in wet depression in *Sasa*-herbs community near sea coast. K-54-14-07.

S. magellanicum Brid. – 10-20 m – **I:** 10, 12; **K:** 26. On large flat *Sphagnum* and sedge-*Sphagnum* bogs, open or with scattered *Larix* trees. K-62-1-05.

S. obtusum Warnst. – 150 m – **K:** 20. – In springy mire along low shore of Kipyashchee Lake, with *Philonotis fontana, Dichodontium paluistre, Warnstorfia fluitans*. 06-1040.

S. palustre L. – 20-50 m – **I:** 10, 18; **K:** 26, 28; **S:** 30. In Iturup in open *Larix* forest of *Sphagnum–Carex* type, and in sedge mire. K-63- 4-05. Records from Kunashir and Shikotan are based on data of Bardunov & Cherdantseva (1984).

S. papillosum Lindb. – 10-422 m – **I:** 10, 13, 18; **K:** 26. Edges of large *Sphagnum* bog, swampy places in *Picea glehnii* forest; open *Larix* forest of *Sphagnum–Carex* type, sedge mires; sporadic. K-49-9-05.

S. perfoliatum L.I.Savicz – 250 m – **S:** 32. Summit area of Notoro Mt., wet cliff, on horizontal part of cliff. K-42-8-07.

S. pulchrum (Lindb. ex Braithw.) Warnst. – 10-100 m – **I:** 10, 18; **K:** 26. On hummock in moss-sedge bog; flat *Sphagnum* bog with *Calamagrostis*; hanging springy bog on steep slope to stream. K-63-11-05.

S. riparium Aongstr. 20 m – **I:** 12. On soil in wet mixed forest, 30.VII.1997, coll. V.V.Bogatov (MHA).

S. rubellum Wilson – 17-422 m – **I:** 10, 13; **S:** 30, 31. In mossy *Picea* forest and in three bogs, mostly of *Carex*-moss and *Carex-Juncus*-moss types. K-51-8-05.

S. russowii Warnst. – 50-400 m – **I:** 11 and also [Vasiljeva, 1960]; **K:** 26; **S:** 29, 31. Moss mats hanging from big boulders and cliffs above hot stream steamed with H_2O and SO_2 (it is always humid, acidic and warm); open *Larix* forest of *Sphagnum–Carex* type; among moss carpet in tundroid community with *Juniperus sargentii, Ledum, Empetrum, Vaccinium uliginosum* on slope to stream; in cliff crevices. K-35-2-07.

S. squarrosum Crome – 10-450 m – **I:** 10, 12, 14, 15, 21; **K:** 22, 25, 26, 27, 27a; **S:** 30, 31, (Horikawa 1940). Eutrophic boggy places in forests, swampy sides of streams, lake shores, springy mires, occasionally among mesotrophic bogs in more wet places, on wet slopes, wet cliffs, permanently wet places along forest roads; rather common in a wide variety of habitats, both open and within forests. K-11-1-07.

S. subfulvum Sjörs –25 m – **S:** 33. Two collections from mire dominated by mosses, dwarf-shrubs (*Dasiphora, Ledum*), with admixture of *Phragmites*, in flood plain of small river. K-54-23-07.

S. subsecundum Nees – 20-391 m – **I:** 13; **K:** 23. In *Carex-Juncus*-moss eutrophic bog and along a wet road across *Sasa* thicket near sea shore. K-52-9-05.

S. subtile (Russow) Warnst. – 422 m – **I:** 13. In *Carex-Juncus*-moss bog, in one place. K-51-17-05a.

S. teres (Schimp.) Aongstr. – 20-391 m – **I:** 10, 12, 13. In *Carex-Sphagnum* and *Carex-Juncus*-moss bogs, rare. K-52-13-05. S+.

S. warnstorfii Russow – 20-422 m – **I:** 10, 13. In *Carex-Sphagnum* and *Carex-Juncus*-moss bogs, rare. K-51-10-05.

Stereodon densirameus (Ando) Afonina & Ignatova – 50-200 m – **K:** 22; **S:** 30, 32. On rotten logs in *Abies* and *Picea* forests, rare, but locally, e.g. in Ruruj foothills, rather abundant. 06-1056.

S. dieckii (Renauld & Cardot) Broth. – 20-500 m – **I:** 16; **K:** 22; **S:** 29, 31. Rocks and cliffs along stream, mostly in forest, but once also on costal meadow. 06-1252.

S. *holmenii* (Ando) Ignatov & Ignatova – 100 m – **K:** 26, 20. On rocks under *Hydrangea* at stream bank and on rotten log at stream bank. 06-1650.

S. pallescens (Hedw.) Mitt. (*Hypnum pallescens* (Hedw.) P.Beauv., *H. reptile* Michx.) – 10-1250 m – **Sm:** 2; **I:** 12, 20; **K:** 22, 25, 26, 27; **S:** 29, 31, 32. Rather common on tree trunks and sometimes on twigs (*Betula, Abies, Taxus, Acer, Sorbus*), and also on rotten logs in different types of forests, from shady and wet *Abies* to rather dry *Quercus* and *Betula* types. K-45-34-05. S+.

S. plicatulus Lindb. (*Hypnum plicatulum* (Lindb.) A.Jaeger) – 10-1415 m – **U:** 6; **I:** 10, 11, 12, 13, 14, 15, 15a, 18, 20; **K:** 22, 23, 25, 26, 26b, 27, 27a; **S:** 29, 30, 32. Widespread species in forests on trunks of *Betula, Larix, Abies, Picea, Acer, Sorbus*, sometimes at tree bases and on litter nearby; also on rotten logs. K-48-5-05. S+.

S. plumaeformis (Wilson) Mitt. (*Hypnum plumaeforme* Wilson) – ca. sea level to 110 m – **I:** 5 (Bardunov & Cherdantseva, 1984); **S:** 30, 31. On soil near cliff base and among other mosses in tundroid community with *Juniperus sargentii, Ledum, Empetrum, Vaccinium uliginosum* and mosses on slope to stream, rare. K-51-8-07.

S. subimponens (Lesq.) Broth. – 1350 m – **K:** 26. One finding on cliff base on top of ridge, near the summit of old volcano of Ruruy. 06-1592.

Straminergon stramineum (Dicks. ex Brid.) Hedenäs (*Calliergon stramineum* (Brid.) Kindb.) – ca. 10-150 m – **I:** 12; **K:** 26, 20. Few localities in rather extensive boggy areas, including spring mire on the shore of Kipyashchee Lake, as well as oligitrophic *Sphagnum* bog. 06-1073.

Taxiphyllum aomoriense (Besch.) Z. Iwats. – 40-200 m – **I:** 12; **K:** 22, 27, 27a; **S:** 29, 32. Sporadic, but locally common; most collections are from *Abies* forests, where the species occurs on tree bases, rocks and soil banks; occasionally also on cliffs and soil banks in broad-leaved forests, soil banks on slopes in forests, etc. 06-1227.

Tetraphis geniculata Girg. ex Milde – 20-150 m – **I:** 10; **K:** 22, 23, 26, 27; **S:** 29, 32. In mixed and coniferous forests on decaying wood, common in three southern islands at low elevations. K-65-18-05. S+.

T. pellucida Hedw. – 41 m – **S:** 30. One collection on decaying wood in *Picea-Abies* forest with admixture of *Taxus* and cover of mosses and herbs. K-40-18-07. S+.

Tetraplodon angustatus (Hedw.) Bruch et al. – 1221-1450 m – **I:** 17; **K:** 23. On lava outcrops in alpine belt, probably on strongly decayed dung, but at time of collection those are indiscernible. 06-1743. S+.

T. mnioides (Hedw.) Bruch et al. – 918-1450 m – **I:** 15, 17; **K:** 23. On rocks at high elevations and on old overgrowing road and roadsides in *Pinus pumila* thicket; the organic substrate which initiate the growth of species is usually unseen. K-13-7-07. S+.

Tetrodontium repandum (Funck) Schwägr. – 100-1450 m – **K:** 23, 20. Found in two localities in rather different environment: on wet rocks near waterfall in deep valley, and on lava field (several hundred years old) in alpine belt of active volcano of Tyatya, mostly on overhanging surfaces; in the latter place in a sufficient quantity throughout an extensive field, although not abundant. 06-1731. S+.

Thamnobryum neckeroides (Hook.) E.Lawton – 20-400 m – **I:** 12, 14, 15a; **K:** 22. **S:** 32. On rocks and cliffs in wet shady forests (more commonly of *Abies*), rare, but locally abundant. This species was reported by Bardunov & Cherdantseva (1984) as *T. sandei*). K-43-11-07.

T. subserratum (Hook. ex Harv.) Nog. & Z. Iwats. – 20 m – **K:** 22. On rocks among tall-herb vegetation near hot springs, rare. 06-1906.

Thuidium assimile (Mitt.) A.Jaeger (*T. philibertii* Limpr.) – [low elevation] – **S:** 30. On grassy slope and cliff ledges. 30.VIII.1978, coll. Cherdantseva (VLA).

T. delicatulum (Hedw.) Bruch et al. – 20-450 m – **I:** 13; **K:** 22; **S:** 31, 32. Rather common in wet, mostly coniferous forests, on soil, rotten wood, trunk bases and boulders, and occasionally along streams, slopes to the sea, in various meadows and in swampy community with *Lysichiton* and high herbs. 06-1128.

T. glaucinoides Broth. – 100-340 m – **S:** 30, 31, 32. On wet cliffs and banks of stream, in both cases in shaded places in forest. K-36-6-07.

T. kanedae Sak. **–** [low elevation] – **I:** 12. On boulders in broad-leaved-poplar forest in flood-valley. 8.IX.1980, coll. Bardunov (VLA).

T. pristocalyx (Müll.Hal.) A.Jaeger – 20 m – **K:** 22. Found only once in wet meadow near hot springs. 06-1903.

T. submicropteris Cardot – 64-329 m – **I:** 12, 16. Two collections: on rocks in *Duschekia* flood-valley forest and on trunk base of *Quercus* in *Sasa* thicket. K-10-36-07.

T. tamariscinum (Hedw.) Bruch et al. – 10-370 m – **I:** 14, 20; **K:** 22, 25, 26, 26b, 27, 27a; **S:** without exact locality (Bardunov & Cherdantseva, 1984). Moderately common in coniferous, both *Abies* and *Picea* type, usually wet forests, among other mosses (including *Sphagnum*), on rocks, trunk bases, rotten logs; also on rocks near streams. 06-1205. S+.

Timmia norvegica J.E. Zettrst. – [low elevation] **I:** 12. On wet N-facing cliffs, only one locality, 6.IX.1980, Bardunov (IRK).

Tortella fragilis (Hook. & Wilson) Limpr. – 5-250 m – **I:** 12, 19; **S:** 30, 31, 32. In crevices and on faces of dry cliffs near sea coast, including those sprayed by

salty water of storms; two collections on cliffs distant from the coast. K-33-3-07.

T. tortuosa (Hedw.) Limpr. – 250 m – **S:** 32. Found only once in crevice of vertical cliff. K-42-38-07.

Tortula cernua (Huebener) Lindb. (= *Desmatodon cernuus* (Huebener) Bruch et al.) – [low elevation] – **I:** 12, 15a. On soil in cliff niche and in open place near hot springs. 4.IX.1980, coll. Bardunov (VLA, MHA). S+.

T. edentula Ignatova & Ignatov – 5 m – S: 31. Cliffs at sea coast. K-49-2-07.

Trachycystis flagellaris (Sull. & Lesq.) Lindb. –15-329 m – **I:** 10, 12, 16, 20; **K:** 22, 23, 26, 27; **S:** 29, 30, 31, 32. Very common on all islands on rotten logs, trunk bases (*Acer, Picea, Betula, Alnus, Salix, Quercus*), rocks in forests, and occasionally on soil in forests, *Sasa* thicket and tall-herb meadows; on inclined trunks high up above ground; on *Hydrangea* bases in *Sasa* communities; on rocky soil in tundra-like community on steep slope exposed to permanent strong winds (at sea level), etc. K-45-5-05.

T. ussuriensis (Maack & Regel) T.J.Kop. – 10-402 m – **I:** 10, 13. On boulders in stream bed and on wet soil in microdepression, in forest; only two collections. K-48-31-05, K-61-29-05.

Trematodon ambiguus (Hedw.) Hornsch. – 10-100 m – **K:** 25, 26. Locally abundant on wet open soil among dunes near sea shore and in disturbed places along forest roads, trails across swamps, etc. 06-1397. S+.

T. longicollis Michx. – 1800 m – **K:** 23. The only collection at the border of crater of Tyatya Volcano, on reddish soil that has temperature above +20°C when the air temperature was ca. +10°C. 06-1812. S+.

Trichstomum crispulum Bruch – 5 m – **I:** 12. On seepage on tufa cliff near sea coast. K-44-17-05. S+.

Ulota crispa (Hedw.) Brid. – 10-1250 m – **I:** 10, 12; **K:** 22, 25, 26, 27; **S:** 29, 30, 31, 32, 34. Common in Iturup and Kunashir, somewhat more rare in Shikotan. Most common in *Abies* and *Picea* forests and in coniferous-deciduous mixed forests, but occasionally occurs in other types as well; collections were made from trunks and twigs of *Abies, Picea, Betula, Phellodendron,* and *Salix*. many times plants were found on bark of recently fallen trunks of *Picea* and *Abies*, including crown part of trunk. K-61-34-05. S+.

U. drummondii (Hook. & Grev.) Brid. – ca. 10-200 m – **I:** 12; **K:** 23, 18a, 26. On bark of *Alnus (Duschekia) fruticosa* and *Salix spp.* in alder-willow stands, usually in open places in flood valleys and at edges of pyroclastic fields, rare. K-10-39-07. S+.

U. japonica (Sull. & Lesq.) Mitt. – 39-150 m – **I:** 12, 20; **K:** 22, 20. On trunks of *Abies, Acer, Alnus,* and *Sorbus* in forests and open stands, rather rare. K-26-44-07. S+.

U. reptans Mitt. – 20-300 m – **I:** 10, 12; **K:** 22, 23. On trunks of *Alnus, Betula, Quercus* and *Abies* in forests of different types, of *Quercus-Acer, Alnus-Salix* and *Abies*, rather rare. K-44-10-05, K-61-6-05. S+.

Warnstorfia exannulata (Bruch et al.) Loeske – 150-391 m – **I:** 13, 14; **K:** 22, 26, 26b, 20. *Carex-Juncus*-moss eutrophic bog, spring mires, near streams; sporadic. K-52-10-05, K-52-29-05.

W. fluitans (Hedw.) Loeske (*W. kurilensis* (Smirnova) Schljakov)– 100-409 m – **U:** 6; **I:** 14; **K:** 26, 27; **S:** without exact locality (Bardunov & Cherdantseva, 1984). Along stream and brooks near thermal spring, at shore of Kipyashee Lake (meaning "Boiled Lake") in abundance; occasionally in other wet mineral-rich habitats, sometimes with traces of sulfur, although not always. K-54-8-05, K-56-15-05. S+.

W. pseudostraminea (Cardot & Thér.) Tuom. & T.J. Kop. – 5-450 m – **K:** 22, 20. Three collections in wet places among *Sasa* and grass communities and near thermal springs. 06-1170.

Weissia controversa Hedw. – 5-200 m – **K:** 22, 24, 26, 26b, 27a; **S:** 32, 34. Sporadic, on soil in cliff crevices, under grass and herb canopy on steep slopes (especially near sea coast), on banks along roads in forest, etc. 06-3086. Sterile specimen (**K:** 27, 06-1413) likely belongs to this species. S+.

Unconfirmed and erroneous moss records

The following records of Bardunov & Cherdantseva (1984) are reidentified or based on material which do not allow certain identification:

Atractylocarpus alpinus (Milde) Lindb. Studied specimens belong to *Dicranella curvipes*.

Atrichum tenellum (Röhl.) Bruch et al. Sterile specimen, not allowing identification.

Brachythecium salebrosum (F.Weber & D.Mohr) Bruch et al. Other *Brachythecium* species (mostly *B. rotaeanum*).

Kindbergia (Stokesiella) praelonga (Hedw.) Ochyra. Specimens reidentified as *Sciuro-hypnum starkei* and *Bryhnia hultenii*.

Oxyrrhynchium (Eurhycnhium) hians (Hedw.) Loeske. Specimens reidentified as *Bryhnia hultenii*.

Plagiothecium curvifolium Limpr. Specimen reidentified as *P. laetum*.

Dicranella crispa (Hedw.) Schimp. Specimen reidentified as *D. subulata.*

D. heteromalla (Hedw.) Schimp. We accept *D. curvipes* as a separate species and refer all the collections of *D. heteromalla* from Kuril Islands to this taxon.

D. rufescens (Dicks.) Schimp. Collection is scanty and has too young capsules for certain identification, likely it belong to *D. curvipes*.

Pylaisia selwynii Kindb. Specimen reidentified as *P. subcircinata.*

Schistidium apocarpum Hedw., *S. strictum* (Turn.) Mårtensson and *S. alpicola* (Hedw.) Limpr. Taxonomy of the genus strongly changed in recent decades. Restudied specimens belong to *S. lancifolium, S. liliputanum, S. pulchrum, S. papilosum, S. rivulare.*

Doubtful record:

Bucklandiella (Racomitrium) heterosticha (Hedw.) Bednarek-Ochyra & Ochyra. Higuchi & Sato (2004) accepted this species in a broad sense. However we use narrow species concept for this genus, which imply that *B. heterosticha* does not occur in Asia; thus this reference probably belongs to one of four species accepted here.

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