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Title	Comments on the Geography of Liverworts in the Kuril Islands with a List of Additions to the Liverwort Flora of Kunashir and Iturup of the Southern Kurils
Author(s)	Bakalin, Vadim
Description	Biodiversity and Biogeography of the Kuril Islands and Sakhalin vol.3
Citation	北海道大学総合博物館研究報告, 5, 49-61
Issue Date	2009-03
Doc URL	https://hdl.handle.net/2115/47862
Type	departmental bulletin paper
File Information	v. 3-3.pdf

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Biodiversity and Biogeography of the Kuril Islands and Sakhalin (2009) 3, 49–61.

Comments on the Geography of Liverworts in the Kuril Islands with a List of Additions to the Liverwort Flora of Kunashir and Iturup of the Southern Kurils

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Abstract A gradual shift in liverwort flora from Subarctic to South Temperate elements occurrs across the entire reach of the Kuril Island Chain. The study of different groups of organisms, including liverworts, reveals this pattern. Thirty-two hepatic species found on the Kuril Islands show the southern limit of their distribution; most of these species belong to arctic, arctic-boreal and, less often, boreal floristic elements. The Kuril Islands represent a northern distribution boundary for 50 taxa that belong to southern temperate or even subtropic floristic elements. Liverwort flora at the northern and southern extremes of the Kuril Island Chain are qualitatively different as demonstrated by their affiliation with different floristic provinces.

Key words: liverworts, geography of bryophytes, Kuril Islands

Introduction

The Kuril Island Chain is the only island chain on the earth that crosses a regional floristic border: East Asian and Circumboreal (Takhtajan 1986). Biogeography of the Kuril Island has been repeatedly analyzed and described based on the study of vascular plants. As early as the late 19th century and continuing into the mid 20th century, primarily Japanese researchers identified and illustrated descriptively the basic patterns that are characteristic of the change in the flora of these islands, and a change occurs along a latitudinal gradient.

Earlier studies (Miyabe 1890; Tatewaki 1933; etc.) noted differences in vegetation cover and floristic composition on the Kuril Islands. Kudo (1922, citation from Barkalov 2002), based on the heterogeneity of the vegetation cover of the Kuril Islands, divided the islands into two areas, at the Friz Strait between Urup and Iturup Islands. The northern half of the Kurils belongs to the Subarctic Region, and the southern to the Temperate East Asian Region. Tatewaki (1933) named this border the Miyabe-line. Tatewaki (1957) later divided the Kurils flora into three and not two districts: northern, central and southern. Hultén (1933) set the border between the Kamchatka and Japanese floristic provinces in the region of Ketoi and Ushishir Islands. Even so, he pointed out a gradual shift between two distinctly different floras in the central part of the Kurils.

Takhtajan (1986), in his well-known *Floristic Regions of the World*, drew the boundary for the East Asian and Circumboreal Regions along the central Kurils. In his system, the Northern Kurils belong to the Okhotsk-Kamchatka Province and the southern (the largest islands Urup, Iturup, Kunashir and Shikotan) are combined into the Sakhalin-Hokkaido Province that encompass, aside from these islands, the southern portion of Sakhalin Island and Hokkaido Island. Qian *et al.* (2003), in examining the phytogeography of northeast Asia (farther north than 38° north latitude) combines the Northern Kurils, the southern part of the Kamchatka Peninsula and the Commander Islands into a single region. The authors considered the southern Kurils as a part of the single region that is combined with the southern part of Sakhalin Island. Barkalov (2002), based on an analysis of the latest data on the distribution of vascular plant species, set the border between East Asian and Circumboreal floristic regions between Urup and Simushir Islands, identifying five floristic districts in the Kuril Islands. Krestov (2006) divides the East Asian and Circumboreal floristic regions along central Sakhalin and Ekaterina Strait, the latter located between Iturup and Kunashir islands.

Although all the aforementioned systems claim to be general phytogeographic systems, in fact they are based on an analysis of the vascular plant distribution only, and this when the number of vascular plant species on Kamchatka is 1.5 times higher than that of bryophytic species and the number of lichens exceeds the taxonomic diversity of the vascular plans by at least 2.5 times. The only known map of the Kuril Islands that is based on a distribution of bryophytes is a modification of the world system of floristic

kingdoms and regions that was proposed by Takhtajan (1986) and that was published by Schofield (1992). He combined, without any further detail, all the islands of the Japanese archipelago, southern Sakhalin, northeast China and the Kuril Islands into a single Southeast Asian Region.

The History of Liverwort Research on the Kuril Islands

The Japanese bryologist Horikawa played a leading role in the study of liverworts in the Kurils. He wrote two specialized works, one of which is dedicated to the bryophytes of the northern Kurils (Horikawa 1934), the other describing the mosses and liverworts of Shikotan, an island at the southern end of the Kurils (Horikawa 1940). Russian botanists published a series of notes in the second half of the 20th century that contain new information on liverworts (Abramova 1960; Korotkevich 1963; Ladyzhenskaya 1964, ect). Nyushko and Potemkin (2005) summarized the information as about 40 liverwort species found on the Kurils. As one might expect, the results obtained over the course of a century poorly reflect current liverwort flora. The flaw in the research is that the collections available for analysis were gathered, in the best instances, by botanists whose interest was in vascular plants alone or, as has often been the case, these collections are the product of non-professional botanists.

I began my exploring study of liverwort flora on the Kuril Islands, in 2004, Paramushir and Shumshu that are located at the northern extreme of the chain. In 2005 I studied Iturup and in 2006 – Kunashir. Following an identification of the specimens contained in available collections, the number of liverwort species on the islands increased by 4.5 times and today 204 liverwort species are known to exist on the Kurils. An adequately detailed description of liverwort flora is available for the northern islands only (Bakalin and Cherdantseva 2006). A description of liverwort flora for the southern Kurils has not been published yet. These facts set the stage for a discussion of the Kuril Island phytogeography, based on existing liverwort flora data. The aim of this paper is to describe the floristic composition of liverworts across the full extent of the Kuril Islands along a latitudinal gradient.

Results and Discussion

The Kuril archipelago stretches from the shores of Hokkaido to the Kamchatka Peninsula. In a phytogeographic sense, it is better to view Kamchatka as an island system separate from the Asian continent. The flora of Kamchatka, which is united to the northeastern extreme of Asia by a narrow and gentle isthmus, has island characteristics. Komarov (1940) demonstrated this point in his study of vascular plants. It has also been noted that inland locations on both Kamchatka and Hokkaido feature a subcontinental climate, with cold winters and warm, rather dry summers that are markedly different from the oceanic climate found on the coast. These local climatic deviations are impossible on the small islands that make up the Kuril Island Chain.

I compiled a floristic data set for the Kuril Islands (Nyushko and Potemkin 2005; Bakalin and Cherdantseva 2006, and my unpublished data), for Kamchatka (Bakalin 2003, 2005 , and unpublished data) and for Hokkaido (Yamada and Iwatsuki 2006) to identify and study patterns. The geographic range for this data set consists of three areas of the Kuril Islands that have been reasonably well studied: northern Kurils (Paramushir and Shumshu), Iturup and Kunashir. The flora of these islands was then subjected to comparative analysis. Analysis was restricted to primarily the liverwort flora of the northern Kurils, Iturup and Kunashir since the majority of the islands in the central part of the Kuril Island Chain have indication for only single species.

Three hundred and forty-one liverwort species are identified for a vast region stretching 40° to 60° north latitude: 218 are encountered on the Kamchatka Peninsula, 97 - in the northern Kurils, 105 - on Iturup, 149 - on Kunashir, with 182 species are found on Hokkaido.

Sixty-two species and 4 varieties found on Kamchatka demonstrate no southward shift. Most of these species have arctic and arctic-montane distribution. Examples include *Anastrophyllum sphenoloboides* R.M. Schust., *Asterella saccata* (Wahlenb.) A. Evans, *Barbilophozia rubescens* (Schust. & Damsh.) Karttunen & Soederstroem, *Cryptocolea imbricata* R.M. Schust., *etc.* A small number of recently described species, whose distribution is also likely in Japan (*Lophozia lantratoviae* Bakalin), as well as species encountered on other islands of the Japanese Archipelago (*Sphenolobus saxicola* (Schrad.) Steph., *Targionia hypophylla* L.), are likely to be discovered on Hokkaido given a through search of that island. At least a third of these species are likely to be discovered on islands in the northern portion of the Kuril Island Chain.

Sixty species found on Hokkaido are not found further north. Most of these have a South Temperate or even a predominately subtropical range (*Bazzania yoshinagana* (Steph.) Steph. in S. Hatt., *Calypogeia tosana* (Steph.) Steph., *Cavicularia densa* Steph., *Cheilolejeunea khasiana* (Mitt.) N. Kitag., *Cylindrocolea recurvifolia* (Steph.) H. Inoue). There is also a small group of species with montane distribution that might possibly be found on Kamchatka (*Anastrophyllum assimile* (Mitt.) Steph., *Mannia triandra* (Scop.) Grolle, etc.). At least half of these species are likely to found in the southern Kurils.

Given the specificity of the areas at the northern and southern extremes of the Kuril Islands, the number of common species joining all the territories studied for this paper (Kamchatka Peninsula, northern Kuril Islands, Irurup, Kunashir and Hokkaido) is extremely

few. The number of species totals 28 and all of these species are either boreal (*Cephalozia leucantha* Spruce, *Conocephalum conicum* (L.) Und., *Lophocolea heterophylla* (Schrad.) Dumort., *etc.*), or they are arctic species that are broadly distributed in corresponding mountain belts (*Anthelia juratzkana* (Limpr.) Trev., *Diplophyllum albicans* (L.) Dumort., *Nardia scalaris* S.Gray, *etc.*).

Thirteen species are found only on Kamchatka and Hokkaido and these species are not encountered on the Kuril Islands. Most have boreal and, less often, arctic, montane distribution. The absence of these species on the Kuril Islands is to be expected since volcanic activity on the islands is a determining factor in floristic formation. Such species as *Barbilophozia barbata* (Schmid. ex Schreb.) Loeske, *Calypogeia azurea* Stotler et Crotz, *Chiloscyphus pallescens* (Ehrh. ex Hoffm.) Dumort., *Herbertus aduncus* (Dicks.) Gray, *Macrodiplophyllum microdontum* (Mitt.) H.Perss., *Ricciocarpos natans* (L.) Corda are incapable of active generative reproduction and are not found in regions with volcanic activity. I will note, though, that some of these species might very well be discovered on Shikotan Island where the last identified volcanic activity is dated to the start of the Miocene (Luchinsky 1974).

The specificities of the Kuril Islands relative to adjacent territories: the Kamchatka Peninsula and Hokkaido are as follows. Sixteen species are found on a single island only, on either Kunashir or Iturup, and these species are not encountered on either Kamchatka or Hokkaido. Nearly all have a South Temperate or even a predominately subtropical distribution and all are known to exist on Honshu Island. The majority of the species, examples such as *Alobiellopsis parvifolia* (Steph.) R.M. Schust., *Bazzania japonica* (Sande Lac.) Lindb., *Iwatsukia jishibae* (Steph.) N. Kitag., *Metzgeria fruticulosa* (Dicks.) A.W. Evans, *Pallavicinia lyelli* (Hook.) Carruth., *Plectocolea rigidula* S. Hatt. are likely to be discovered on Hokkaido given an opportunity to carry out additional research on that island. The specificity of the northern Kurils in this field is not represented; there are no Kuril liverwort species found on these islands that are not represented on Kamchatka and Hokkaido.

Eight species are documented on two or more islands of the Kurils. These species, however, are not encountered on Kamchatka or Hokkaido. Six of these species are limited to the southern extreme of the archipelago. Only three of them (*Metzgeria conjugata* Lindb., *Plectocolea rosulans* (Steph.) S. Hatt. и *Solenostoma pyriflorum* Steph. var. *minutissima* (Amakawa) Bakalin) are characteristic of more southerly, South Temperate distribution and all three are found further south on Honshu Island. The status of one taxon (*Gymnocolea marginata* (Steph.) S. Hatt.) remains unclear. Two other species (*Cephaloziella elachista* (Jack ex Gottsche et Rabenh.) Schiffn., *Mylia taylorii* (Hook.) S. Gray) are limited in distribution to boreal or even arctic mountain belts (or corresponding zones in the north). Both are documented on Honshu Island and so there is a basis to suggest that with additional research they will be discovered both on Kamchatka and on Hokkaido. Two species (*Riccardia aeruginosa* Furuki and *Scapania diplophylloides* Amakawa et S. Hatt) extend across the entire Kurils, from the north to the south, but they are not encountered in adjacent regions. Both are documented on Honshu Island and might possibly be discovered in areas adjacent to the Kurils.

The eastern Asian flora of Hokkaido obviously differs in principle from the circumboreal flora of the Kamchatka Peninsula. And it is expected that their ranges should come to end as they stretch across the Kurils. Fifty-four species distributed on Kamchatka are encountered on the Kurils; these species, however, are not known to Hokkaido. Most of these species are restricted in their distribution to the northern part of the archipelago. Many species, however, extend as far south as Kunashir: *Calycularia laxa* Lindb. et Arnell, *Geocalyx graveolens* (Schrad.) Nees, *Marsupella adusta* (Nees) Spruce, *Marsupella funckii* (F.Web. et Mohr) Dumort. Among the taxa distributed on Kamchatka and the Kurils, taxa that have yet to be discovered on Hokkaido, approximately half are known to Honshu Island and their discovery on Hokkaido is more than likely. The distribution of those species for which the Kurils represent the southern extreme of their range in eastern Asia is of special interest.

Thirty-four species and one variety belong to this group. Two of the 34 species are cited in error. The reference in the literature *Blepharostoma arachnoideum* M.A. Howe (Korotkevich 1952) on Kunashir and Shikotan is most likely an inaccurate identification of *Blepharostoma trichophyllum* (L.) Dumort. The locations given in the Kurils are the only reference for this species in Asia and we have not found the species on either of the islands. Another species (*Frullania tamarisci* (L.) Dumort.) Y. Horikawa (1940) listed for Shikotan is probably based on material for *F. tamarisci* ssp. *obscura* (Verd.) S. Hatt., which in the contemporary literature is most often viewed as an independent species - *Frullania appendiculata* Steph., a species that is characteristic of primarily subtropic eastern Asian distribution at the same time that *F. tamarisci*, in the narrow sense, has a montane boreal-South Temperate circumpolar range.

The remaining 32 species and single variety belong to Arctic, Arcticboreal or, less often, Boreal floristic elements. Typical examples are *Athalamia hyalina* (Sommerf.) S. Hatt., *Calycularia laxa* Lindb. et Arnell, *Cephalozia pachycaulis* R.M. Schust., *Jungermannia polaris* Lindb., *Orthocaulis binsteadii* (Kaal.) H. Buch, *Orthocaulis quadrilobus* (Lindb.) Buch, *Tetralophozia setiformis* (Ehrh.) Schljakov. Worthy of mention is that the range of not only species but also of two genus, *Saccobasis* and *Prasanthus*, ends abruptly on the Kuril Islands as they shift south. The range of the majority of the 32 species abruptly ends on the northern Kurils and only individual taxa penetrate

further south, among which are *Cephalozia pachycaulis* R.M. Schust., a recently described species with a yet unclear distribution, *Cephaloziella arctogena* (R.M. Schust.) Konstant., whose species status is not always recognized, and *Geocalyx graveolens* (Schrad.) Nees, which in Japan is replaced by *G. lancistipulus* (Steph.) S. Hatt. To sum up, in this case the northern Kurils and not the southern extreme of the archipelago represent the primary range restricting boundary.

A gradual decline of northern species is not an evident feature of floristic composition from north to south along the Kurils Islands. A steady decline in the number of southern species found in floristic complexes as latitude increases, however, is clearly in evidence. Thirty-five species are encountered on Hokkaido and on a portion of the Kuril Islands that do not reach Kamchatka and that are entirely absent in northeastern Asia. Fifteen species that are encountered on Honshu Island and in the southern portion of the Kuril archipelago are yet to be documented on Hokkaido. Almost all of these species belong to South Temperate or Subtropical floristic elements and their range in the insular western Pacific breaks off abruptly on Kunashir or Iturup and none of the species reach the northern Kurils. Examples are *Bazzania japonica* (Sande Lac.) Lindb., *Diplophyllum andrewsii* A.W. Evans, *Frullania muscicola* Steph., *Lejeunea japonica* Mitt., *Plectocolea rigidula* S. Hatt., *Porella fauriei* (Steph.) S. Hatt., *Radula japonica* Gottsche in Steph. At the genus level, the Kuril archipelago is a natural distribution barrier for such genera as *Alobiellopsis*, *Cololejeunea*, *Iwatsukia*, *Neohattoria*, *Nipponolejeunea*, *Nowellia*, *Pallavicinia*, *Trichocolea* that are moving north into eastern Asia.

What follows from this discussion is that from north to south liverwort flora for the Kuril Islands changes significantly across the expanse of the archipelago. The range of 84 species and one variety end on insular western Pacific. 34 species are found here at the southern extreme of their distribution, and 50 - at their northern. Liverwort flora at the northern and southern extremes of the Kuril Island Chain is qualitatively different and the flora in those regions undoubtedly belong to different floristic provinces.
The appendix contains a list of the liverwort species that have been recently found in the southern Kurils for the first time.

Acknowledgements

This manuscript was translated into English by Misha Jones and to whom I am sincerely grateful. I am also grateful to Dr. Valentina Ya. Cherdantseva for a thorough reading of the manuscript and for her comments. This research was partially supported by the Russian Foundation for Basic Research (n.-06-05-64137), FEB RAS (n.-06-III-A-06-153, n.-06-III-B-06-190) and the Russian Science Support Foundation.

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Appendix

List of liverworts identified for the first time in the southern Kurils. The list is based on materials examined from collections for Iturup and Kunashir. Species are provided in alphabetic order. Taxa identified on the Kuril Islands for the first time are marked with an asterisk (*). The understanding of species and the treatment of genus correspond to the Checklist of the Hepaticae and Anthocerotae of the Former USSR (Konstantinova et al. 1992). Bakalin collected all samples and these samples are housed in the herbarium of the Institute of Biology and Soil Sciences in Vladivostok (VLA).

***Alobiellopsis parvifolia** (Steph.) R.M. Schust. – Kunashir Island, southern part, Goryachyee Lake area. (43°51'52"N – 145°30'10"E), 140 m alt., fine-grained ground in the crevices of tufa cliff sprayed by lake water, with *Cephalozia bicuspidata*, *Plectocolea hyalina*, #K-45-22-06.

***Anastrophyllum michauxii** (F. Web.) H. Buch – Kunashir Island, southern part, Serebryanoye Lake area (43°03'19"N – 145°50'18"E), 15 m alt., *Picea glehnii – Abies sachalinensis* forest with admixture of broad-leaved trees with green moss cover, on decaying wood, with *Lepidozia reptans*, *Scapania bolanderi*, #K-50-2-06.

Aneura pinguis (L.) Dumort. – Iturup Island, Pisimoy Cape area (45°12'28"N – 147°50'18"E), 100 m alt., tufa cliffs near road (abt. 1,5 km to the village of Burevestnik from the bridge across the Rybatskaya River), in wet cliff crevices, on fine-grained soil, with *Jungermannia pumila*, #K-46-3-05. – Kunashir Island, southern part, 3 km to the east from caldera's Golovnin volcano (43°50'13"N – 145°32'43"E), 150 m alt., *Abies* with admixture broad-leaved trees, *Taxus* and *Picea* forest with moss cover, on decaying wood, with *Lophocolea heterophylla*, #K-47-1-06.

Anthelia juratzkana (Limpr.) Trev. – Iturup Island, Baranskogo volcano, area near the peak (45°06'09"N – 148°01'09"E), 1114 m alt., wet crevices in vertical wall of cliff, in full sun, # K-58-11a-05 – Kunashir Island, northern part, atrium of Tyatya volcano (44°20'50"N – 146°15'06"E), 1500 m alt., old clinker, wet fine-grained ground in the crevices, with *Diplophyllum albicans, D. taxifolium* #K-57-9-06.

***Apometzgeria pubescens** (Schrank) Kuwah. – Kunashir Island, northern part, mouth of Dal'nij Creek (Ruruj Mt.) (44°28'59"N – 146°05'38"E), 50 m alt., *Abies–Picea* forest with admixture of *Kalopanax, Acer* and understory of *Taxus, Weigela, Hydrangea, etc.*, boulder in full shade, #K-42-9-06.

Barbilophozia hatcheri (Evans) Loeske – Iturup Island, headwaters of the Kuril'skaya River (Gniloye Lake area) (45°09'00"N – 147°57'50"E), 402 m alt., *Betula ermanii* forest with thick underbrush of *Pinus pumila* and *Sasa*, on soil, #K-48-1-05.

***Bazzania bidentula** (Steph.) Steph. – Iturup Island, Baranskogo volcanic area, the first Hot Springs (45°05'26"N –147°59'32"E), 409 m alt., *Sorbus–Betula* forest with understoryof *Pinus pumila, Sasa* and *Calamagrostis*, on vertical side of boulder shaded by *Sorbus*, #K-56-17-05.

***Bazzania japonica** (Sande Lac.) Lindb. – Kunashir Island, southern part, Goryachyee Lake area, (43°51'52"N – 145°30'10"E), 180 m alt., decaying wood in *Picea glehnii* forest, with *Cephalozia connivens* (Dicks.) Lindb, #K-45-20-06.

***Bazzania tricrenata** (Wahlenb.) Lindb. – Kunashir Island, southern part, Ozernaya River mouth area, (43°53'04"N – 145°27'43"E), 30 m alt., windy meadow with spots of bare ground, on slope to sea, #K-46-11-06. – Iturup Island. Chyornyye Skaly cliffs (about 8 km to the north of the village of Reydovo along Okhotsk Sea Coast) (45°15'32"N – 148°10'23"E), 15 m alt., in crevices of sheer cliffs shaded by *Alnus* along sea coast, #K-66-3-05.

Blasia pusilla L. – Iturup Island, western macroslope of Bogdan Khmel'nitski volcano, valley of Yuzhnyy Chirip sulphur river, about 1,5 km from the mouth. (45°20'48"N – 147°52'20"E), 256 m alt., on wet tufa cliffs of river's canyon, on thin layer of fine-grained soil, #K-70-7c-05 – Kunashir Island, southern Part, village of Otradnoye (44°03'24"N – 145°51'44"E), 50 m alt., *Abies* with admixture of *Betula ermanii, Kalopanax, Picea* and cover of ferns forest, on the road-side in forest, with *Nardia assamica, Plectocolea vulcanicola*, #K-55-7-06.

Blepharostoma minus Horikawa – Kunashir Island, northern part, east slope of Tyatya volcano (44°17'20"N – 146°18'00"E), 40 m alt., mixed *Alnus–Betula–Abies* forest with admixture *Picea, Kalopanax, Taxus* with forbs, on decaying wood, #K-56-7b-06.

Blepharostoma trichophyllum (L.) Dumort. – Iturup Island, western macroslope of Bogdan Khmel' nitski volcano, valley of Yuzhnyy Chirip sulphur river, about 2 km from the mouth (45°20'50,8" 147°52' 46,0"E), 400 m alt., on wet stones of walls of river's canyon, abt. 50 m from the river bed, with *Plagiochila porelloides*, #K-71-5-05 – Kunashir Island, northern Part, Dal'nij Creek (44°27'41"N – 146°06'49"E), 700 m alt., on stones in snow-bed hollow of temporary spring, with *Calycularia crispula*, #K-37-38-06.

****Calycularia crispula*** Mitt. – Kunashir Island, northern part, Atrium of Tyatya volcano, old volcanic cone in the headwaters of Krutoj Creek (44°21'38"N – 146°16'17"E), 1200 m alt., cliffs along slope, in wet crevices of cliffs, #K-58-3a-06.

Calycularia laxa Lindb. & Arnell – Kunashir Island, northern part, Dal'nij Creek (44°27'41"N – 146°06'49"E) 900m alt., on stones along small stream, with *Diplophyllum taxifolium*, *Cephalozia bicuspidata*, *Scapania parvitexta*, #K-37-28-06.

****Calypogeia arguta*** Nees et Mont. – Kunashir Island, northern part, Ruruj Hot Springs area (44°29' 20"N – 146°06'16"E), 50 m alt., near hydrosolphatars, on wet peaty ground along thermal stream, #K-41-6-06.

****Calypogeia suecica*** (Arnell et J. Perss.) Mull. Frib. – Kunashir Island, northern part, Dal'nij Creek (Ruruj Mt.), middle part (44°27'40"N – 146°06'49"E), 500 m alt., decaying wood in *Abies–Picea* with admixture of *Acer* forest, with *Cephalozia leucantha*, *Blepharostoma trichophyllum*, *Lophozia ventricosa* (Dicks.) Dumort. var. *guttulata* (Lindb. et Arnell) Bakalin, #K-40-1-06.

Cephalozia bicuspidata (L.) Dumort. – Kunashir Island, northern part, dry stream-bed in the headwaters of Dal'nij Creek (Ruruj Mt.) (44°27'22"N – 146° 07'19"E), 1100 m alt., fine-grained soil along rivulet valley, with *Nardia japonica*, #K-38-4b-06 – Iturup Island, Gniloye Lake area, headwaters of a tributary of Gniloy Creek (45°08'07"N – 147°57'45"E), 391 m alt., *Carex-Juncus*-moss eutrophic bog, on ridges and hollows, with *Nardia assamica*, #K-52-11b-05.

****Cephalozia connivens*** (Dicks.) Lindb. – Kunashir Island, southern part, Goryachyee Lake area. (43°51' 52"N – 145°30'10"E), 180 m alt., decaying wood in *Picea glehnii* forest. #K-45-18a-06.

Cephalozia leucantha Spruce – Iturup Island, Baranskogo volcano (45°05'25,8"N – 147°59'32,3"E), 409 m alt., the first hot spring, *Sorbus* forest with cover of *Pinus pumila*, *Sasa* and *Calamagrostis*, on boulders along stream (mineral with high content of Fe, but without sulphur), with *Lophozia ventricosa* var. *guttulata*, #K-56-4b-05 – Kunashir Island, northern part, Dal'nij Creek, middle part (Ruruj Mt.) (44°27'40"N – 146°06'49"E), 500 m alt., decaying wood in *Abies-Picea* with admixture of *Acer* forest, with *Scapania bolanderi*, #K-40-1b-06.

****Cephalozia otaruensis*** Steph. – Iturup Island, Chyornyye Skaly cliffs (about 8 km to the north from the village of Reydovo along Okhotsk Sea Coast) (45°15'32"N 148°10'23"E), 15 m alt., in crevices of sheer cliffs shaded by *Alnus* along sea coast, with *Diplophyllum taxifolium*, #K-66-17-05.

Cephalozia pachycaulis R.M. Schust. – Kunashir Island, southern part, Goryachyee Lake area (43°51' 52"N – 145°30'10"E), 150 m alt., wet soil near thermal hot springs on the coast of Kipyashchyee Lake, #K-45-9b-06.

Cephalozia pleniceps (Aust.) Lindb. – Kunashir Island, southern part, Goryachyee Lake area (43°51' 52"N – 145°30'10"E), 180 m alt., decaying wood in *Picea glehnii* forest, #K-45-14b-06.

Cephaloziella arctogena (R.M. Schust.) Konstant. – Kunashir Island, southern part, 3 km to the east from caldera's Golovnin volcano (43°50'13"N – 145°32' 43"E), 200 m alt., road in *Sasa* with clumps of *Pinus pumila* thickets, on wet clayish road-side, #K-48-3c-06.

Cephaloziella divaricata (Sm.) Schiffn. – Iturup Island, headwaters of the Kuril'skaya River (Gniloye Lake area) (45°09'00"N – 147°57'50"E), 402 m alt., *Juncus-Carex*-dwarf-shrub-moss bog, in hollows (between *Carex*) and on pure peat, with *Gymnocolea inflata*, #K-49-14-05.

****Cephaloziella elachista*** (J.B. Jack ex Gottsche et Rabenh.) Schiffn. – Kunashir Island, southern part, Serebryanoye Lake area (43°03'19"N – 145°50'18"E), 15 m alt., dwarf-shrub-moss-sedge bogs, wet hollows between *Sphagnum* hummocks, #K-51-6a-06. – Iturup Island, *Larix* forest with *Sphagnum* cover near the northwest shore of Reydovoye Lake (45°15'28"N – 148°01'41"E), 20 m alt., on *Sphagnum* ridges. 30.VIII.2006 K-62-4-05.

Chiloscyphus* cf. *rivularis (Schrad.) Haszl. – Iturup Island, the shore of the western part of Reydovoye Lake (45°15'28"N – 148°01'41"E), 20 m alt., on peaty bank, with *Conocephalum conicum* (L.) Und., #K-64-2-05.

Chiloscyphus fragilis (A. Roth) Schiffn. – Iturup Island, Pisimoy Cape area (45°12'33"N – 147°50' 05"E), 75 m alt., *Quercus-Acer* forest with admixture of *Sorbus, Betula ermanii, Salix, Alnus* and thick understory of *Sasa*, on boulders along stream-bed (at times sprayed by water), #K-45-29-05 – Kunashir Island, southern part, Kislaya River, the area of thermal springs (44°00'20"N – 145°46'23"E), 100 m alt., along small stream with pure water, #K-52-21-06.

Cladopodiella fluitans (Nees) H. Buch – Iturup Island, Gniloye Lake area (45°08'32,8"N – 147°57' 25,7"E), 422 m alt., *Carex-Juncus*-moss bog near lake-shore in eastern surrounding of lake, on ridges and hollows, with *Scapania paludicola* Loeske & K.Muell., #K-51-5-05 – Kunashir Island, southern part, Serebryanoye Lake area (43°03'19"N – 145°50'18"E), 15 m alt., dwarf-shrub-moss-sedge bog, wet hollows between *Sphagnum* hummocks, with *Riccardia* cf. *latifrons*, *Kurzia makinoana* (Steph.) Grolle, #K-51-9-06.

Cladopodiella francisci (Hook.) H. Buch ex Joerg. – Iturup Island, Baranskogo volcano, area near the peak (45°05'55"N – 148°00'38"E), 965 m alt., fumaroles field in mountain circus on South slope of volcano,

vertical cliff's walls of circus, with *Nardia scalaris*, *Lophozia sudetica*, #K-59-3-05 – Kunashir Island, northern part, area near the top of Ruruj Mt. (44°27'32"N – 146°08'12"E), 1300 m alt., on wet fine-grained soil in cliff crevices, with *Cephalozia bicuspidata*, *Marsupella sphacelata*, #K-39-7-06.

Cololejeunea macounii (Spruce in Underw.) A. Evans – Kunashir Island, southern part, 3 km to the east from caldera Golovnin volcano's, (43°50'13"N – 145°32'43"E), 150 m alt., *Abies* forest with admixture broad-leaved trees, *Taxus* and *Picea* with moss cover, on the bark of *Abies* at the height 1-2 m from the ground, with *Nipponolejeunea subalpina* (Horik.) S. Hatt., #K-47-18a-06.

Crossocalyx hellerianus (Nees in Lindenb.) Meyl. – Kunashir Island, northern part, Dal'nij Creek (44°27'41"N – 146°06'49"E), 300 m alt., *Picea–Betula* flood plain forest, on decaying wood, with *Lophocolea heterophylla*, *Nowellia curvifolia*, *Lophozia ventricosa* var. *guttulata*, #K-37-22a-06.

Crossogyna autumnalis (DC.) Schljakov – Kunashir Island, northern part, Dal'nij Creek, middle part (Ruruj Mt.) (44°27'40"N – 146°06'49"E), 500 m alt., decaying wood in *Abies–Picea* with admixture of *Acer* forest, with *Aneura pinguis*, *Blepharostoma trichophyllum*, *Lophozia ventricosa* var. *guttulata*, *Cephalozia leucantha*, *Lophocolea heterophylla*, #K-40-6-06.

Cryptocoleopsis imbricata Amakawa – Kunashir Island, northern part, Dal'nij Creek (44°27'41"N – 146°06'49"E), 700 m alt., on stones in temporary spring, with *Cephalozia bicuspidata*, #K-37-40-06

Diplophyllum andrewsii Evans – Kunashir Island, southern part, beginning of road to Goryachyee Lake (43°51'52"N 145°30'10"E), 80 m alt., fine-grained soil along road-side, with *Solenostoma handelii*, #K-44-1-06. – Iturup Island, southern macroslope of Volchyok knoll (Gniloye Lake area). Community of *Pinus pumila* with *Sasa* underbrush (45°09'23"N – 147°57'58"E), 425 m alt., on fine-grained soil along road-side With *Nardia japonica*, #K-50-8a-05.

Eremonotus myriocarpus (Carr.) Lindb. & Kaal. – Kunashir Island, northern part, atrium of Tyatya volcano (44°21'38"N – 146°16'17"E), 1200 m alt., old volcanic cone in the headwaters of Krutoj Creek, cliffs along slope, in wet crevices of cliffs, #K-58-5c-06

Fossombronia alaskana Steere et Inoue – Kunashir Island, southern part, village of Otradnoye (44°03'24"N – 145°51'44"E), 10 m alt., sea coastal sandy dunes, wet place overgrowth by *Juncus*, on wet sand, #K-54-1-06.

Frullania inflata Gottsche – Iturup Island, 1 km to the southwest of Reydovoye Lake. Right tributary of Mineral'nyy Creek (45°14'48"N – 148°00'51"E), 25 m alt., flood-plain, wet *Alnus-Salix* with solitary *Larix* trees forest with tall grasses, on bark of *Alnus* at the height of 1,5 m, #K-61-7-05.

Frullania koponenii S. Hatt. – Kunashir Island, southern part, village of Otradnoye (44°03'24"N – 145°51'44"E), 50 m alt., *Abies* forest with admixture of *Betula ermanii, Kalopanax, Picea* and cover of ferns, on the bark of *Picea, #K*-55-4-06.

Frullania muscicola Steph. – Kunashir Island, southern part, village of Otradnoye (44°03'24"N – 145 °51'44"E), 50 m alt., *Abies* forest with admixture of *Betula ermanii, Kalopanax, Picea* and cover of ferns, on the bark of *Picea*, #K-55-4b-06.

Geocalyx graveolens (Schrad.) Nees – Kunashir Island, Ruruj Hot Springs area (44°29'07"N – 146°05' 57"E), 38 m alt., *Abies–Picea* forest with admixture of *Acer* and *Tilia*, on decaying wood and boulders in shade, with *Cephalozia lunulifolia*, *Calypogeia integristipula*, *Liochlaena subulata*, *Lepidozia reptans*, #K-36-10-06.

Geocalyx lancistipulus (Steph.) S. Hatt. – Kunashir Island, northern part, Saratovka River mouth area (44°15'21"N – 146°05'57"E), 27 m alt., *Picea glehniii* boggy forest with admixture of *Sorbus, Betula, Taxus cuspidata, Abies sachalinensis* and moss cover, in wet hollows, #K-63-14-06.

Gymnocolea inflata (Huds.) Dumort. – Iturup Island, headwaters of the Kuril'skaya River (Gniloye Lake area) (45°09'00"N – 147°57'50"), 402 m alt., *Juncus-Carex*-dwarf-shrub-moss bog, in hollows (between Carex) and on pure peat, with *Cephaloziella divaricata*, #K-49-14-05 – Kunashir Island, northern part, headwaters of Dal'nij Creek (Ruruj Mt.) (44°27'22"N – 146°07'19"E), 1100 m alt., dry stream-bed, fine-grained soil along rivulet valley, #K-38-2c-06.

Gymnocolea marginata (Steph.) S. Hatt. – Kunashir Island, northern part, area near the top of Ruruj Mt. (44°27'32"N – 146°08'12"E), 1300 m alt., on wet fine-grained soil in cliff crevices, #K-39-11a-06. – Iturup Island, Baranskogo volcano , area near the peak (45°06'09"N – 148°01'09"E), 1114 m alt., wet crevices in vertical wall of cliff, in full sun, #K-58-28-05.

Gymnomitrion apiculatum (Schiffn.) Mull. Frib. – Kunashir Island, northern part, atrium of Tyatya volcano (44°20'50"N – 146°15'06"E), 1500 m alt., old clinker, on wet fine-grained ground in the crevices, #K-57-12a-06.

Gymnomitrion concinnatum (Lightf.) Corda – Iturup Island, Baranskogo volcano, area near the peak, (45°06'09"N – 148°01'09"), 1114 m alt., wet crevices in vertical wall of cliff, in full sun, with *Kurzia makinoana*, #K-58-2-05 – Kunashir Island, northern part, atrium of Tyatya volcano (44°20'50"N – 146°15'06"E), 1500 m alt., old clinker, on wet fine-grained ground in the crevices, #K-57-16c-06.

Gymnomitrion corallioides Nees – Kunashir Island, northern part, headwaters of the Dal'nij Creek (Ruruj Mt.) (44°27'22"N – 146°07'19"E), 1100 m alt., dry stream-bed, fine-grained soil along rivulet valley, with *Anthelia juratzkana* (Limpr.) Trev., #K-38-3a-06.

Harpanthus flotovianus (Nees) Nees – Iturup Island, western macroslope of Bogdan Khmel'nitski volcano, valley of Yuzhnyy Chirip sulphur river, about 2 km from the mouth (45°20'51"N – 147°52'46"E),

400 m alt., on wet stones of walls of river's canyon, abt. 50 m from the river bed, with *Scapania curta, Tritomaria quinquedentata*, #K-71-3-05 – Kunashir Island, southern part, Serebryanoye Lake area (43°03'19"N – 145°50'18"E), 15 m alt., *Picea glehnii – Abies sachalinensis* with admixture of broad-leaved trees forest with green moss cover, wet hollows, #K-50-13-06.

Hygrobiella laxifolia (Hook.) Spruce – Iturup Island, western macroslope of Bogdan Khmel'nitski volcano, valley of Yuzhnyy Chirip sulphur river, about 2 km from the mouth (45°20'51"N – 147°52'46"E), 400 m alt., on wet stones of walls of river's canyon, abt. 50 m from the river bed, with *Diplophyllum taxifolium, Cephalozia bicuspidata, Jungermannia pumila, Blepharostoma trichophyllum, Scapania diplophylloides*, #K-71-8-05 – Kunashir Island, northern part, atrium of Tyatya volcano (44°21'38"N – 146°16'17"E), 1200 m alt., old volcanic cone in the headwaters of Krutoj Creek, cliffs along slope, in wet crevices of cliffs, #K-58-3-06.

Isopaches bicrenatus (Schmid. ex Hoffm.) H. Buch – Iturup Island, Vetrovoy Peresheek neck (45°16'14.8"N – 148°18'17.3"E), 28 m alt., on overgrowing sandy dunes along Okhotsk Sea coast, with *Marsupella sprucei*, #K-68-3a-05 – Kunashir Island, southern part, 3 km to the east from caldera's Golovnin volcano (43°50'13"N – 145°32'43"E), 200 m alt., road in *Sasa* with clumps of *Pinus pumila* thickets, on wet clayish road-side, #K-48-1b-06.

****Iwatsukia jishibae*** (Steph.) N. Kitag. – Kunashir Island, southern part, Kislaya River, the area of thermal springs (44°00'20"N – 145°46'23"E), 100 m alt., on wet decaying wood in *Abies–Picea* forest along river, with *Riccardia palmata, Mylia verrucosa, Nowellia curvifolia, Scapania bolanderi*, #K-52-20a-06.

****Jungermannia*** cf. ***borealis*** Damsh. et Vana – Iturup Island, *Betula ermanii* forest with thick underbrush of *Pinus pumila* and *Sasa* in headwaters of the Kuril'skaya River (Gniloye Lake area) (45°09'00"N – 147°57'50"E), 402 m alt., on boulders in the stream-bed, #K-48-32-05.

Jungermannia eucordifolia Schljakov – Iturup Island, area near the stream near entrance to the village of Rybaki from Kurilsk town side (45°12'38"N – 147°51'12"E), 10 m alt., on wet cliffs near waterfall of sea-coast cliffs, #K-47-11-05 – Kunashir Island, northern part, Prosolov Cape, 20 m alt., in wet crevices of coastal cliffs, #K-43-1b-06.

Jungermannia exsertifolia Steph. – Kunashir Island, northern part, Dal'nij Creek (44°27'41"N – 146°06'49"E) 200 m alt., wet cliffs near high waterfall (abt. 50 m of height), #K-37-17a-06.

Jungermannia pumila With. – Iturup Island, area near the stream at the entrance to the village of Rybaki near the city of Kurilsk (45°12'38"N – 147°51'12"E), 10 m alt., on wet cliffs near waterfall of sea-coast cliffs, #K-47-17-05 – Kunashir Island, northern part, atrium of Tyatya volcano (44°21'38"N – 146°16'17"E), 1200 m alt., old volcanic cone in the headwaters of the Krutoj Creek, cliffs along slope, in wet crevices of cliffs, #K-58-3c-06.

****Lejeunea cavifolia*** (Ehrh.) Lindb. – Kunashir Island, southern part, Ozernaya River mouth area (43°53'04"N – 145°27'43"E), 30 m alt., in the crevices along sea-coast, shaded by broad-leaved trees, #K-46-10-06.

****Lepidozia*** cf. ***vitrea*** Steph. – Kunashir Island, southern part, Serebryanoye Lake area (43°03'19"N – 145°50'18"E), 15 m alt., *Picea glehnii – Abies sachalinensis* with admixture of broad-leaved trees forest with green moss cover, on decaying wood, #K-50-2b-06.

****Liochlaena subulata*** (Evans) Schljak. – Kunashir Island, northern part, east slope of Tyatya volcano (44°17'20"N – 146°18'00"E), 40 m alt., mixed *Alnus–Betula–Abies* with admixture *Picea, Kalopanax, Taxus* forest with forbs, on decaying wood, #K-56-2a-06.

****Lophocolea cuspidata*** (Nees) Limpr. – Kunashir Island, southern part, Serebryanoye Lake area (43°03'19"N – 145°50'18"E), 15 m alt., *Picea glehnii – Abies sachalinensis* with admixture of broad-leaved trees forest with green moss cover, wet hollows, with *Riccardia chamaedryfolia*, #K-50-16-06.

Lophocolea heterophylla (Schrad.) Dumort. – Iturup Island, the forest massif along stream flowing to Reydovoye Lake abt. 2 km to the southwest of the village of Reydovo (45°15'28"N – 148°01'41"E), 20 m alt., *Larix-Betula-Quercus-Sorbus* forest with cover of *Ilex rugosa, Taxus, Skimia* and *Calamogrostis*, on decaying wood, with *Plagiochila porelloides*, #K-65-15-05 – Kunashir Island, northern part, 1 km to the northwest from Saratovka River mouth (44°15'58"N – 146°06'23"E), 21 m alt., *Abies* with admixture *Betula* and *Picea glehnii* forest, on decaying wood, with *Blepharostoma trichophyllum*, #K-61-1b-06.

****Lophocolea itoiana*** H. Inoue – Iturup Island, Pisimoy Cape area (45°12'33"N – 147°50'05"E), 75 m alt., *Acer–Quercus* forest with admixture of *Sorbus, Betula ermanii, Salix, Alnus* and thick understory of *Sasa*, in full shade, on boulder covered by fine-grained soil, K-45-16-05.

Lophocolea minor Nees – Iturup Island, western macroslope of Bogdan Khmel'nitski volcano, valley of Yuzhnyy Chirip sulphur river, about 2 km from the mouth (45°20'51"N – 147°52'46"E), 400 m alt., on wet stones of walls of river's canyon, abt. 50 m from the river bed, with *Diplophyllum taxifolium*, #K-71-2-05 – Kunashir Island, southern part, 3 km to the east from caldera's Golovnin volcano (43°50'13"N – 145°32'43"E), 150 m alt., *Abies* with admixture broad-leaved trees, *Taxus* and *Picea* forest with moss cover, on decaying wood, #K-47-8b-06.

Lophozia lacerata N. Kitag. – Iturup Island, Baranskogo volcano , the first Hot Springs (45°05'26"N – 147°59'32"E), 409 m alt., *Sorbus-Betula* forest with understory of *Pinus pumila, Sasa* and *Calamagrostis*, on decaying wood of *Pinus pumila*, with *Cephalozia leucantha, Lophocolea heterophylla*, #K-56-23-05.

Lophozia savicziae Schljakov – Iturup Island, Baranskogo volcano , area near the peak (45°06'08,8"N – 148°01'09,2"E), 1114 m alt., wet crevices in vertical wall of cliff, in full sun, with *Lophozia sudetica* var. *anomala* (Schljakov) Schljakov, *Macrodiplophyllum plicatum*, #K-58-22a-05.

Lophozia silvicola H. Buch – Iturup Island, the forest massif along stream flowing to Reydovoye Lake abt. 2 km to the southwest of the village of Reydovo (45°15'28"N – 148°01'41"E), 20 m alt., *Larix-Betula-Quercus-Sorbus* forest with cover of *Ilex rugosa, Taxus, Skimmia* and *Calamogrostis*, on decaying wood, with *Macrodiplophyllum plicatum*, #K-65-21-05 – Kunashir Island, southern part, Kislaya River, the area of thermal springs (44°00'20"N – 145°46'23"E), 100 m alt., on wet fine-grained soil with sulphur in the steam of hot water, with *Lepidozia reptans*, *Mylia verrucosa*, #K-52-3-06.

Lophozia silvicoloides N. Kitag. – Iturup Island, southern macroslope of Volchyok Knoll (Gniloye Lake area) (45°09'23.1"N – 147°57'58.0"E), 425 m alt., community of *Pinus pumila* with *Sasa* underbrush, on horizontal part of *Pinus pumila* branches, with *Orthocaulis attenuatus*, *Bazzania trilobata*, *Ptilidium californicum*, #K-50-3-05 – Kunashir Island, northern part, east slope of Tyatya volcano (44°17'20"N – 146°18'00"E), 40 m alt., mixed *Alnus-Betula-Abies* with admixture *Picea, Kalopanax, Taxus* forest with forbs, on decaying wood, with *Riccardia* sp., *Scapania bolanderi*, #K-56-4-06.

Lophozia sudetica (Nees ex Huebener) Grolle – Iturup Island, Baranskogo volcano, area near the peak (45°06'09"N – 148°01'09"E), 1114 m alt., wet crevices in vertical wall of cliff, in full sun, with *Gymnomitrion concinnatum*, #K-58-15-05 – Kunashir Island., northern part, atrium of Tyatya volcano (44°20'50"N – 146°15'06"E), 1500 m alt., old clinker, on wet fine-grained ground in the crevices, #K-57-1-06.

Lophozia wenzelii (Nees) Steph. – Kunashir Island, northern part, Dal'nij Creek (44°27'41"N – 146°06'49"E), 700 m alt., on stones in snow-bed hollow of temporary spring, with *Diplophyllum albicans, D. taxifolium*, #K-37-32-06.

Marchantia aquatica (Nees) Burgeff – Kunashir Island, southern part, Goryachyee Lake area (43°51'52"N – 145°30'10"E), 150 m alt., wet soil near thermal hot springs on the coast of Kipyashchyee Lake, #K-45-6-06.

****Marchantia paleacea*** Bertol. – Kunashir Island, Ruruj Hot Springs area (44°29'07"N – 146°05'57"E), 38 m alt., destroying travertine cone, in percolated thermal water, #K-36-1-06.

****Marsupella adusta*** (Nees) Spruce – Kunashir Island, northern part, Dal'nij Creek, (44°27'41"N – 146°06'49"E), 700 m alt., on stones in snow-bed hollow of impermanent spring #K-37-39-06.

Marsupella alpina (Gottsche ex Limpr.) H. Bernet – Kunashir Island, northern part, atrium of Tyatya volcano (44°20'50"N – 146°15'06"E), 1500 m alt., old clinker, on wet fine-grained ground in the crevices, with *Diplophyllum taxifolium*, #K-57-10-06.

Marsupella boeckii (Aust.) Lindb. ex Kaal. – Kunashir Island, northern part, atrium of Tyatya volcano (44°21'38"N – 146°16'17"E), 1200 m alt., old volcanic cone in the headwaters of the Krutoj Creek, cliffs along slope, in wet crevices of cliffs, #K-58-3b-06.

****Marsupella commutata*** (Limpr.) H. Bernet – Iturup Island, Baranskogo volcano, area near the peak (45°06'09"N – 148°01'09"E), 1114 m alt., wet crevices in vertical wall of cliff, in full sun, with *Gymnomitrion concinnatum*, #K-58-29-05. – Kunashir Island, northern part, area near the top of Ruruj Mt. (44°27'32"N – 146°08'12"E), 1300 m alt., on wet fine-grained soil in cliff crevices, with *Gymnomitrion concinnatum*, *Diplophyllum albicans*, *D. taxifolium*, *Lophozia sudetica*, #K-39-2a-06.

Marsupella emarginata (Ehrh.) Dumort. – Kunashir Island, southern part, the area of confluence of Kislaya and Lesnaya Rivers (44°00'20"N – 145° 46'23"E), 60 m alt., on fine-grained soil along river, with *Scapania ampliata*, *Kurzia makinoana*, *Nardia subclavata*, *Solenostoma sphaerocarpum*, #K-53-5-06.

****Marsupella funckii*** (F. Web. & D. Mohr) Dumort. – Kunashir Island, northern part, area near the top of Ruruj Mt. (44°27'32"N – 146°08'12"E), 1300 m alt., on wet fine-grained slip soil, with *Nardia japonica*, #K-39-20-06.

Marsupella sphacelata (Gieseke ex Lindenb.) Dumort. – Iturup Island, Baranskogo volcano, area near the peak (45°06'09"N – 148°01'09"E), 1114 m alt., wet crevices in vertical wall of cliff, in full sun, #K-58-16-05 – Kunashir Island, southern part, the area of confluence of Kislaya and Lesnaya Rivers (44°00'20"N – 145°46'23"E), 60 m alt., on fine-grained soil along river, #K-53-6-06.

Marsupella sprucei (Limpr.) H. Bernet – Iturup Island, Vetrovoy Peresheek neck (45°16'15"N – 148°18'17"E), 28 m alt., on overgrowing sandy dunes along Okhotsk Sea coast., #K-68-1-05.

****Marsupella tubulosa*** Steph. – Kunashir Island, northern part, Dal'nij Creek. (44°27'41"N – 146°06'49"E), 700 m alt., on stones in snow-bed hollow of temporary spring, with *Anthelia juratzkana*, #K-37-38a-06.

****Metzgeria conjugata*** Lindb. – Kunashir Island, northern part, Dal'nij Creek. (44°27'41"N – 146°06' 49"E), 700 m alt., on stones in snow-bed hollow of temporary spring, with *Blepharostoma trichophyllum*, #K-37-40c-06. – Iturup Island. The shore of the western part of Reydovoye Lake (45°15'28"N – 148°01'41"E), 20 m alt., on boulders, #K-64-12a-05.

****Metzgeria fruticulosa*** (Dicks.) A. Evans – Kunashir Island, southern part, 3 km to the east from caldera's Golovnin volcano (43°50'13"N – 145°32'43"E), 150 m alt., *Abies* with admixture broad-leaved trees, *Taxus* and *Picea* forest with moss cover, on the bark of *Abies* on the height 1-2 m from the ground, #K-47-22-06.

Mylia anomala (Hook.) S.Gray – Iturup Island, Gniloye Lake area (45°08'32,8"N – 147°57'25,7"E), 422 m alt., *Carex-Juncus*-moss bog near lake-shore in east surrounding of lake, on ridges, #K-51-16-05 – Kunashir Island, southern part, Serebryanoye Lake area (43°03'19"N – 145°50'18"E), 15 m alt., dwarf-shrub-moss-sedge bog, wet hollows between *Sphagnum* hummocks, with *Kurzia makinoana*, *Calypogeia neogaea*, #K-51-3-06.

****Mylia taylorii*** (Hook.) S. Gray – Kunashir Island, northern part, area near the top of Ruruj Mt. (44°27'32"N – 146°08'12"E), 1300 m alt., on wet fine-grained soil in cliff crevices, #K-39-1-06. – Iturup Island, Baranskogo volcano, area near the peak (45°06'09"N – 148°01'09"E), 1114 m alt., wet crevices in vertical wall of cliff, in full sun, with *Lophozia sudetica*, *Macrodiplophyllum plicatum*, #K-58-23a-05.

****Nardia assamica*** (Mitt.) Amakawa – Kunashir Island, northern part, Ruruj Hot Springs area, near hydrosolphatars. (44°29'20"N – 146°06'16"E), 50 m alt., on hot (30-40°C) strata of travertine, #K-41-2-06. – Iturup Island, Baranskogo volcano, the Second (Big) Hot Springs (45°04'40"N – 147°59'13"E), 193 m alt., moss mats hanging from big boulders and cliffs above hot stream steaming with H_2O and SO_2 (it is always humid, acidic and warm), #K-60-7b-05.

Nardia breidleri (Limpr.) Lindb. – Iturup Island, Vetrovoy Peresheek neck (45°16'15"N – 148°18'17"E), 28 m alt., on fine-grained soil of swampy, former Japanese airfield, with *Solenostoma pyriflorum* var. *minutissima*, #K-68-8-05.

Nardia geoscyphus (De Not.) Lindb. – Iturup Island, western macroslope of Bogdan Khmel'nitski volcano, valley of Yuzhnyy Chirip sulphur river, about 1,5 km from the mouth (45°20'48"N – 147°52'20"E), 256 m alt., on wet tufa cliffs of river's canyon, on thin layer of fine-grained soil, with *Conocephalum japonicum*, *Harpanthus flotovianus*, *Plectocolea rosulans*, *Cephalozia bicuspidata*, #K-70-7d-05.

Nardia japonica Steph. – Iturup Island, southern macroslope of Volchyok knoll (Gniloye Lake area) (45°09'23"N – 147°57'58"E), 425 m alt., community of *Pinus pumila* with *Sasa* underbrush, on fine-grained soil along road-side, with *Diplophyllum andrewsii*, #K-50-8-05 – Kunashir Island, northern part, dry stream-bed at the headwaters of the Dal'nij Creek (Ruruj Mt.) (44°27'22"N – 146°07'19"E), 1100 m alt., fine-grained soil along rivulet valley, with *Cephalozia bicuspidata*, #K-38-4b-06.

Nardia scalaris S. Gray – Iturup Island, Baranskogo volcano, area near the peak (45°06'09"N – 148°01'09"E), 1114 m alt., wet crevices in vertical wall of cliff, in full sun, with *Cephalozia bicuspidata*, *Diplophyllum taxifolium*, #K-58-5-05 – Kunashir Island, northern part, dry stream-bed at the headwaters of Dal'nij Creek (Ruruj Mt.) (44°27'22"N – 146°07'19"E), 1100 m alt., fine-grained soil along rivulet valley, #K-38-5b-06.

****Nardia subclavata*** (Steph.) Amakawa – Kunashir Island, southern part, Kislaya River, the area of thermal springs (44°00'20"N – 145°46'23"E), 100 m alt., on wet fine-grained soil with sulphur in the stream of hot water, #K-52-4-06. – Iturup Island, western macroslope of Bogdan Khmel'nitski volcano, valley of Yuzhnyy Chirip sulphur river, about 1,5 km from the mouth (45°20'48"N – 147°52'20"E), 256 m alt., on wet tufa cliffs of river's canyon, on thin layer of fine-grained soil, with *Cephalozia bicuspidata*, #K-70-1-05.

Nardia unispiralis Amakawa – Iturup Island, Vetrovoy Peresheek neck (45°16'15"N 148°18'17"E), 28 m alt., on fine-grained soil of swampy, former Japanese airfield, with *Solenostoma jenseniana* (Grolle) Bakalin, #K-68-6-05 – Kunashir Island, northern part, atrium of Tyatya volcano (44°20'50"N – 146°15'06"E), 1500 m alt., old clinker, on wet fine-grained ground in the crevices, #K-57-2-06.

****Nowellia curvifolia*** (Dicks.) Mitt. – Kunashir Island, southern part, Kislaya River, the area of thermal springs (44°00'20"N – 145°46'23"E), 100 m alt., on wet decaying wood in *Abies–Picea* forest along river, with *Scapania bolanderi*, #K-52-19a-06.

****Obtusifolium obtusum*** (Lindb.) S.W. Arnell – Kunashir Island, southern part, Kislaya River, the area of thermal springs (44°00'20"N – 145°46'23"E), 100 m alt., on wet fine-grained soil with sulphur in the steam of hot water, with *Cephalozia bicuspidata*, #K-52-11-06.

****Odontoschisma denudatum*** (Mart.) Dumort. – Kunashir Island, southern part, Goryachyee Lake area (43°51'52"N – 145°30'10"E), 180 m alt., decaying wood in *Picea glehnii* forest, #K-45-14a-06.

****Orthocaulis attenuatus*** (Mart.) Evans – Iturup Island, *Betula ermanii* forest with thick underbrush of *Pinus pumila* and *Sasa* at the headwaters of the Kuril'skaya River (Gniloye Lake area) (45°09'00"N – 147°57'50"E), 402 m alt. on bark of *Betula* near trunk base, with *Ptilidium californicum*, #K-48-7-05.

****Pallavicinia lyellii*** (Hook.) Carruthers – Kunashir Island, northern part, Saratovka River mouth area (44°15'21"N – 146°05'57"E), 27 m alt., *Picea glehnii* with admixture of *Sorbus, Betula, Taxus cuspidata, Abies sachalinensis* boggy with moss cover forest, in wet hollows, #K-63-8-06.

****Pedinophyllum truncatum*** (Steph.) H. Inoue – Kunashir Island, northern part, mouth of Dal'nij Creek (Ruruj Mt.). (44°28'59"N – 146°05'38"E), 50 m alt., *Abies–Picea* forest with admixture of *Kalopanax, Acer* and understory of *Taxus, Weigela, Hydrangea, etc.*, boulder in full shade, #K-42-11b-06.

Pellia endiviifolia (Dicks.) Dumort. – Iturup Island, Chyornyye Skaly cliffs (about 8 km to the north of the village of Reydovo along Okhotsk Sea Coast) (45°15'32"N – 148°10'23"E), 15 m alt., on wet sandy slumping slope of a maritime dune, with *Conocephalum japonicum*, *Blasia pusilla*, #K-66-19-05 – Kunashir Island, northern part, Dal'nij Creek (44°27'41"N – 146°06'49"E), 200 m alt., wet cliffs near high waterfall (abt. 50 m of height), #K-37-13a-06.

Plectocolea hyalina (Lyell) Mitt. – Iturup Island, Belyye Skaly cliffs (about 12 km to the north of the

village of Reydovo along Okhotsk Sea Coast) (45°15' 48"N – 148°13'03"E), 18 m alt., on slumping slope of white pumice deposits, #K-67-3a-05. – Kunashir Island, southern part, Goryachyee Lake area (43°51'52"N – 145°30'10"E), 140 m alt., fine-grained ground in the crevices of tufa cliffs sprayed by lake water by water of the lake, #K-45-24a-06.

***Plectocolea infusca** Mitt. var. **ovalifolia** Amakawa – Kunashir Island, northern part, mouth of Dal'nij Creek (Ruruj Mt.). (44°28'59"N – 146°05'38" E), 50 m alt., *Abies–Picea* forest with admixture of *Kalopanax, Acer* and understory of *Taxus, Weigela, Hydrangea, etc.*, boulder in full shade, #K-42-15-06.]

***Plectocolea infusca** Mitt. var. **ovicalyx** (Steph.) Bakalin – Iturup Island, western macroslope of Bogdan Khmel'nitski volcano, valley of Yuzhnyy Chirip sulphur river, about 2 km from the mouth (45°20'51"N – 147°52'46"E), 400 m alt., on wet stones of walls of river's canyon, abt. 50 m from the river bed, with *Marsupella sphacelata*, #K-71-7a-05. – Kunashir Island, southern part, Ozernaya River mouth area (43°53'04"N – 145°27'43"E), 100 m alt., *Abies-Picea*-broad-leaved forest on slope to river, on the bark of *Acer*, #K-46-1a-06.

***Plectocolea rigidula** S. Hatt. – Kunashir Island, northern part, Dal'nij Creek (44°27'41"N – 146°06'49"E), 200 m alt., wet cliffs near high waterfall (abt. 50 m high), with *Hygrobiella laxifolia, Scapania integerrima*, #K-37-11-06.

***Plectocolea rosulans** (Steph.) S. Hatt. – Kunashir Island, northern part, Dal'nij Creek (44°27'41"N – 146°06'49"E), 100 m alt., on stones along small stream, #K-37-31-06. – Iturup Island, western macroslope of Bogdan Khmel'nitski volcano, valley of Yuzhnyy Chirip sulphur River, about 1,5 km from the mouth (45°20'48"N – 147°52'20"E), 256 m alt., on wet tufa cliffs of river's canyon, on thin layer of fine-grained soil, #K-70-2-05.

***Plectocolea virgata** Mitt. – Iturup Island, Chyornyye Skaly cliffs (about 8 km north of the village of Reydovo along Okhotsk Sea Coast) (45°15'32"N – 148°10'23"E), 15 m alt., on pumice stone, with *Nardia assamica*, #K-66-20a-05.

***Pleurocladula albescens** (Hook.) Grolle – Iturup Island, Baranskogo volcano , area near the peak (45°06'09"N – 148°01'09"E), 1114 m alt., wet crevices in vertical wall of cliff, in full sun, with *Kurzia makinoana, Diplophyllum taxifolium* var. *macrosticta* H. Buch, #K-58-18-05 – Kunashir Island, northern part, atrium of Tyatya volcano (44°20'50"N – 146°15'06"E), 1500 m alt., old clinker, on wet fine-grained ground in the crevices, with *Lophozia sudetica, Diplophyllum albicans*, #K-57-8a-06.

***Porella fauriei** (Steph.) S. Hatt. – Kunashir Island, northern part, mouth of Dal'nij Creek (Ruruj Mt.) (44°28'59"N – 146°05'38"E), 50 m alt., *Abies–Picea* forest with admixture of *Kalopanax, Acer* and understory of *Taxus, Weigela, Hydrangea, etc.*, boulder in full shade, #K-42-8-06. – Iturup Island, Pisimoy Cape area (45°12'33"N – 147°50'05"E), 75 m alt., *Quercus–Acer* forest with admixture of *Sorbus, Betula ermanii, Salix, Alnus* and thick understory of *Sasa*. On the base of *Acer* tree, #K-45-2-05.

***Porella grandiloba** Lindb. – Kunashir Island, northern part, mouth of Dal'nij Creek (Ruruj Mt.) (44°28'59"N – 146°05'38"E), 50 m alt., *Abies–Picea* forest with admixture of *Kalopanax, Acer* and understory of *Taxus, Weigela, Hygrangia, etc.*, boulder in full shade, #K-42-13-06.

***Preissia quadrata** (Scop.) Nees – Kunashir Island, northern part, atrium of Tyatya volcano (44°21'38"N – 146°16'17"E), 1200 m alt., old volcanic cone in the headwaters of the Krutoj Creek, cliffs along slope, in wet crevices of cliffs, #K-58-1-06.

***Protolophozia debiliformis** (Schust.) Konstant. – Iturup Island, Baranskogo volcano , area near the peak (45°06'09"N – 148°01'09"E), 1114 m alt., wet crevices in vertical wall of cliff, in full sun, with *Sphenolobus minutus, Mylia taylorii*, #K-58-22-05.

***Ptilidium californicum** (Aust.) Pears. – Iturup Island, headwaters of the Kuril'skaya River (Gniloye Lake area) (45°09'00"N – 147°57'50"E), 402 m alt., *Betula ermanii* forest with thick underbrush of *Pinus pumila* and *Sasa*, on bark of *Betula* near its base, #K-48-3-05.

***Ptilidium ciliare** (L.) Hampe – Iturup Island, Baranskogo volcano, area near the peak (45°05'55"N – 148°00'38"E), 965 m alt., fumaroles field in mountain cirque on South slope of volcano, vertical cliff's walls of cirque , #K-59-2-05.

***Radula complanata** (L.) Dumort. – Iturup Island, 1 km to the southwest of Reydovoye Lake, the right tributary of Mineral'nyy Creek (45°14'48"N – 148°00'51"E), 25 m alt., flood-plain, wet *Alnus-Salix* with solitaries *Larix* trees forest with tall grasses, on bark of *Alnus* at the height of 1 m, #K-61-19-05.

***Radula constricta** Steph. – Iturup Island, the shore of the western part of Reydovoye Lake (45°15'28"N –148°01'41"E), 20 m alt., on boulders, #K-64-10-05.

***Radula japonica** Gottsche in Steph. – Iturup Island, Pisimoy Cape area (45°12'32,9"N – 147°50'04,5"E), 75 m alt., *Quercus–Acer* forest with admixture of *Sorbus, Betula ermanii, Salix, Alnus* and thick understory of *Sasa*, on big boulder in full shade in the headwaters, with *Conocephalum conicum*, #K-45-37-05. – Kunashir Island, southern part, Ozernaya River mouth area (43°53'04"N – 145°27'43"E), 100 m alt., *Abies–Picea*–broad-leaved forest on slope to river, on the bark of *Acer*., #K-46-1-06.

***Riccardia aeruginosa** Furuki – Kunashir Island, northern part, Saratovka River mouth area (44°15'21"N – 146°05'57"E), 27 m alt., *Picea glehnii* with admixture of *Sorbus, Betula, Taxus cuspidata, Abies sachalinensis* boggy moss forest, in wet hollows, with *Schistochilopsis cornuta, Calypogeia* cf. *neogaea*, #K-63-6-06.

***Riccardia chamaedryfolia** (With.) Grolle – Kunashir Island, southern part, Serebryanoye Lake area. (43°03'19"N – 145°50'18"E), 15 m alt., *Picea*

glehnii – *Abies sachalinensis* forest with admixture of broad-leaved trees with green moss cover, wet hollows, with *Calypogeia integristipula* Steph., *Cephalozia leucantha*, *Harpanthus flotovianus*, #K-50-15-06.

Riccardia latifrons (Lindb.) Lindb. – Kunashir Island, southern part, the area of confluence of Kislaya and Lesnaya Rivers (44°00'20"N – 145°46'23"E), 60 m alt., cliffs along rivers, on peaty mats of dieing mosses, with *Kurzia makinoana*, *Cephalozia bicuspidata*, #K-53-4-06.

Riccardia multifida (L.) Gray ssp. ***decrescens*** (Steph.) Furuki – Iturup Island, Pisimoy Cape area (45°12'33"N – 147°50'05"), 75 m alt., *Quercus–Acer* forest with admixture of *Sorbus, Betula ermanii, Salix, Alnus* and thick understory of *Sasa*, on big boulder in full shade in the headwaters of stream, #K-45-41a-05.

Riccardia subalpina Furuki – Kunashir Island, northern part, east slope of Tyatya volcano (44°17'20"N – 146°18'00"E), 40 m alt., Mixed *Alnus–Betula–Abies* with admixture *Picea, Kalopanax, Taxus* forest with forbs cover, on decaying wood, #K-56-7-06.

Riccardia vitrea Furuki – Iturup Island, Pisimoy Cape area (45°12'33"N – 147°50'05"E), 75 m alt., *Quercus–Acer* forest with admixture of *Sorbus, Betula ermanii, Salix, Alnus* and thick understory of *Sasa*, on crumble fine-grained soil along stream, in part shade, #K-45-46-05.

Scapania ampliata Steph. – Kunashir Island, northern part, area near the top of Ruruj Mt. (44°27' 32"N – 146°08'12"E), 1300 m alt., on wet fine-grained soil in cliff crevices, with *Mylia taylorii*, *Marsupella sphacelata*, #K-39-17a-06. – Iturup Island, Baranskogo volcano, area near the peak (45°06'09"N – 148°01'09" E), 1114 m alt., wet crevices in vertical wall of cliff, in full sun. With *Lophozia sudetica*, #K-58-24b-05.

Scapania bolanderi Austin – Kunashir Island, northern part, mouth of Dal'nij Creek (Ruruj Mt.) (44°28'59"N – 146°05'38"E), 50 m alt., *Abies–Picea* forest with admixture of *Kalopanax, Acer* and understory of *Taxus, Weigela, Hygrangia, etc.*, on decaying wood, #K-42-4a-06.

Scapania crassiretis Bryhn – Iturup Island, Baranskogo volcano, area near the peak (45°06'09"N – 148°01'09"E), 1114 m alt., wet crevices in vertical wall of cliff, in full sun, with *Marsupella sphacelata*, *Lophozia sudetica*, #K-58-13-05.

Scapania curta (Mart.) Dumort. – Iturup Island, Baranskogo volcano, area near the peak (45°06'08,8"N – 148°01'09,2"E), 1114 m alt., wet crevices in vertical wall of cliff, in full sun, with *Lophozia sudetica*, *Diplophyllum taxifolium*, #K-58-24-05.

Scapania diplophylloides Amakawa et S. Hatt. – Iturup Island, Baranskogo volcano area, the first Hot Spring (45°05'26"N – 147°59'32"E), 409 m alt., *Sorbus-Betula* forest with understory of *Pinus pumila*, *Sasa* and *Calamagrostis*, on vertical side of boulder shaded by *Sorbus*, with *Lophozia ventricosa* var. *guttulata*, *Diplophyllum taxifolium*, #K-56-18-05 – Kunashir Island, northern part, dry stream-bed in the headwaters of Dal'nij Creek (Ruruj Mt.) (44°27'22"N – 146°07'19"E), 1100 m alt., fine-grained soil along rivulet valley, with *Diplophyllum taxifolium*, #K-38-3b-06.

Scapania integerrima Steph. – Iturup Island, western macroslope of Bogdan Khmel'nitski volcano, valley of Yuzhnyy Chirip sulphur river, about 2 km from the mouth (45°20'51"N – 147°52'46"E), 400 m alt., on wet stones of walls of river's canyon, abt. 50 m from the river bed, with *Diplophyllum taxifolium*, #K-71-7-05. – Kunashir Island, southern part, Kislaya River, in the area of thermal springs (44°00'20"N – 145°46'23"E), 100 m alt., on wet fine-grained soil with sulphur in the stream of hot water, #K-52-1-06.

Scapania irrigua (Nees) Nees – Iturup Island, headwaters of the Kuril'skaya River (Gniloye Lake area) (45°09'00"N – 147°57'50"E), 402 m alt., *Juncus-Carex*-dwarf-shrub-moss bog, in hollows (between *Carex*) and on pure peat, #K-49-4-05.

Scapania lingulata H. Buch – Iturup Island, Belyye Skaly cliffs (about 12 km to the north of the village of Reydovo along Okhotsk Sea Coast) (45°15'48"N – 148°13'03"E), 18 m alt., on crumble slope of white pumice deposits, with *Nardia assamica*, #K-67-8a-05 – Kunashir Island, northern part, dry stream-bed in the headwaters of Dal'nij Creek (Ruruj Mt.) (44°27'22"N – 146°07'19"E), 1100 m alt., fine-grained soil along rivulet valley, with *Marsupella sphacelata*, #K-38-5-06.

Scapania paludicola Loeske & Mull.Frib. – Iturup Island, Gniloye Lake area (45°08'33"N – 147°57'26"E), 422 m alt., *Carex-Juncus*-moss bog near lake-shore in east surrounding of lake, in ridges and hollows, #K-51-1-05 – Kunashir Island, southern part, Serebryanoye Lake area (43°03'19"N – 145°50'18"E), 15 m alt., dwarf-shrub-moss-sedge bog, wet hollows between *Sphagnum* hummocks, with *Cephalozia bicuspidata*, #K-51-1-06.

Scapania paludosa (Mull.Frib.) Mull.Frib. – Iturup Island, headwaters of the Kuril'skaya River (Gniloye Lake area) (45°09'00"N – 147°57'50"E), 402 m alt., *Betula ermanii* forest with thick underbrush of *Pinus pumila* and *Sasa*, on boulders in the stream-bed, with *Jungermannia* cf. *borealis*, #K-48-32-05 – Kunashir Island, northern part, Dal'nij Creek (44°27'41"N – 146°06'49"E), 200 m alt., wet cliffs near high waterfall (abt. 50 m of height), with *Solenostoma fusiforme*, #K-37-13-06.

Scapania parvifolia Warnst. – Kunashir Island, southern part, Ozernaya River mouth area (43°53'04"N – 145°27'43"E), 30 m alt., windy meadow with spots of bare ground, on slope to sea, #K-46-13-06.

Scapania parvitexta Steph. – Kunashir Island, northern part, Dal'nij Creek (44°27'41"N – 146°06'49"E), 300 m alt., on stones along small stream, #K-37-27-06.

Scapania subalpina (Nees ex Lindenb.) Dumort. – Kunashir Island, northern part, Dal'nij Creek (44°27'41"N – 146°06'49"E), 200 m alt., wet cliffs near high waterfall (abt. 50 m of height), #K-37-14a-06.

Scapania umbrosa (Schrad.) Dumort. – Kunashir

Island, southern part, the area of confluence of Kislaya and Lesnaya Rivers (44°00'20"N – 145°46'23"E), 60 m alt., on fine-grained soil of road-side in forest, with *Nardia subclavata*, #K-53-16-06.

Scapania undulata (L.) Dumort. – Iturup Island, Gniloye Lake area, headwatersof a tributary of Gniloy Creek (45°08'07"N – 147°57'45"E), 391 m alt., *Carex-Juncus*-moss eutrophic bog, on ridges and hollows, #K-52-21-05 – Kunashir Island, northern part, Dal'nij Creek (44°27'41"N – 146°06'49"E), 700 m alt., on stones in snow-bed hollow of temporary spring, #K-37-35b-06.

Schistochilopsis opacifolia (Culm. ex Meyl.) Konstant. – Iturup Island, Belyye Skaly cliffs (about 12 km to the north of the village of Reydovo along Okhotsk Sea Coast) (45°15'48"N – 148°13'03"E), 18 m alt., on slumping slope of white pumice deposits, with *Nardia assamica*, *Solenostoma pyriflorum* var. *minutissima*, *Scapania* sp., *Blasia pusilla*, #K-67-4-05.

****Solenostoma caespiticium*** (Lindenb.) Steph. – Kunashir Island, southern part, Goryachyee Lake area (43°51'52"N – 145°30'10"E), 170 m alt., road-side in *Sasa–Pinus pumila* thickets, #K-45-4a-06 – Iturup Island, Gniloye Lake area, (45°08'33"N – 147°57'26"E), 422 m alt. Coll. 14.IX.2005 On slumping slope along Gniloye Lake (mixture of peat and sandy soil) K-51-24a-05.

****Solenostoma*** cf. ***handelii*** Schiffn. – Kunashir Island, southern part, beginning of road to Goryachyee Lake (43°51'N – 145°30'E), 80 m alt., fine-grained soil along road-side, with *Diplophyllum andrewsii*, #K-44-1-06.

****Solenostoma fauriana*** (Beauverd in Steph.) Bakalin comb. nov. – *Jungermannia fauriana* Beauverd in Steph. Spec. Hepat. 6: 571. 1924. – Kunashir Island, southern part, Ozernaya River mouth area (43°53'04"N – 145°27'43"E), 30 m alt., windy meadow with spots of bare ground, on slope to sea, with *Nardia assamica*, #K-46-12-06.

****Solenostoma fusiforme*** (Steph.) Amakawa – Iturup Island, Gniloye Lake area, headwaters of a tributary of Gniloy Creek (45°08'07"N – 147°57'45"E), 391 m alt., *Carex–Juncus–moss* eutrophic bog, on ridges and hollows, #K-52-2-05. – Kunashir Island, southern part, Kislaya River, in the area of thermal springs (44°00'20"N – 145°46'23"E), 100 m alt., thermal spring mire along river, in hollows, #K-52-18-06.

****Solenostoma jenseniana*** (Grolle) Bakalin. – Iturup Island, Vetrovoy Peresheek neck (45°16'15"N – 148°18'17"E), 28 m alt., on fine-grained soil of swampy, former Japanese airfield], with *Nardia unispiralis*, #K-68-6-05.

Solenostoma koreanum **Steph.** – Iturup Island, Gniloye Lake area (45°08'33"N – 147°57'26"E), 422 m alt., on slumping slope along Gniloye Lake (mixture of peat and sandy soil), #K-51-24b-05 – Kunashir Island, southern part, 3 km to the east from caldera's Golovnin volcano (43°50'13"N – 145°32'43"E), 200 m alt., road in *Sasa* with clumps of *Pinus pumila* thickets, on wet clayish road-side, #K-48-3a-06.

****Solenostoma pyriflorum*** Steph. var. ***minutissima*** (Amakawa) Bakalin – Iturup Island, Baranskogo volcano area, the first Hot Spring(45°05'26"N – 147°59'32"E), 409 m alt., *Sorbus–Betula* forest with understory of *Pinus pumila, Sasa* and *Calamagrostis*, on boulders along stream (water with high content of *Fe*), with *Nardia* cf. *subclavata*, #K-56-4-05. – Kunashir Island, southern part, Ozernaya River mouth area (43°53'04"N – 145°27'43"E), 30 m alt., windy meadow with spots of bare ground, on slope to sea, with *Anthelia juratzkana*, #K-46-13a-06.

****Solenostoma sphaerocarpum*** (Hook.) Steph. – Kunashir Island, southern part, the area of confluence of the Kislaya and Lesnaya Rivers (44°00'20"N – 145°46'23"E), 60 m alt., on fine-grained soil along river, with *Marsupella emarginata*, *Scapania ampliata*, *Kurzia makinoana*, *Nardia subclavata*, #K-53-5-06.

Sphenolobus minutus (Schreb.) Berggr. – Iturup Island, Baranskogo volcano, area near the peak (45°06'09"N – 148°01'09"E), 1114 m alt., wet crevices in vertical wall of cliff, in full sun, #K-58-6-05.

****Tritomaria exsecta*** (Schmid. ex Schrad.) Loeske – Kunashir Island, northern part, east slope of Tyatya volcano (44°17'20"N – 146°18'00"E), 40 m alt., mixed *Alnus–Betula–Abies* forest with admixture *Picea, Kalopanax, Taxus* with forbs cover, on decaying wood, with *Lophocolea heterophylla*, *Macrodiplophyllum plicatum*, *Bazzania ovifolia*, #K-56-3-06.

Tritomaria quinquedentata (Huds.) H. Buch – Iturup Island, western macroslope of Bogdan Khmel'nitski volcano, valley of Yuzhnyy Chirip sulphur river, about 2 km from the mouth (45°20'51"N – 147°52'46"E), 400 m alt., on wet stones of walls of river's canyon, abt. 50 m from the river bed, with *Marsupella sphacelata*, #K-71-8a-05 – Kunashir Island, northern part, Dal'nij Creek (44°27'41"N – 146°06'49"E), 700 m alt., on stones in snow-bed hollow of temporary spring, #K-37-32a-06.