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BRYOPHYTES OF EASTERN PART OF CRILLION PENINSULA, SAKHALIN

МОХООБРАЗНЫЕ ВОСТОКА МЫСА КРИЛЬОН, САХАЛИН

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Abstract

Floristic investigations on the Aniva coast of Crillion Peninsula (south-west of Sakhalin) revealed a comparatively rich bryophyte flora. 26 species of liverworts and 115 species of mosses were collected. Six species of liverworts were newly discovered in the island: *Bazzania denudata, Cryptolophocolea compacta, Porella vernicosa, Scapania mucronata, S. pilifera,* and *Wiesnerella denudata*. Among them, *Cryptolophocolea compacta* represents a genus and species new to Russia, and *Scapania pilifera* is a species new to Russia. Among mosses, three species new to Sakhalin have been collected: *Brachytheciastrum trachypodium*, *Schistidium konoi* and *Schistidium pruinosum*. Annotated list of bryophyte species is provided.

Резюме

Флористические исследования на Анивском побережье мыса Крильон (юго-запад о. Сахалин) выявили сравнительно богатую флору мхов и печеночников. Были собраны 26 видов печеночников и 115 видов мхов. 6 видов печеночников являются новыми для Сахалина: *Bazzania denudata, Cryptolophocolea compacta, Porella vernicosa, Scapania mucronata, S. pilifera* и *Wiesnerella denudata*. *Cryptolophocolea compacta* представляет собой новые для России род и вид, а *Scapania pilifera* – новый вид для России. Также были собраны 3 новых для Сахалина вида мхов: *Brachytheciastrum trachypodium*, *Schistidium konoi* и *Schistidium pruinosum*. Приводится аннотированный список видов.

KEYWORDS: liverworts, mosses, Sakhalin, new records, East Asia

INTRODUCTION

Sakhalin is located in the north-western Pacific, between the Sea of Okhotsk and the Sea of Japan (Fig. 1). It has a significant north-south extension and several different climatic zones, each with its own representatives of flora. Sakhalin is situated on the border of the Circumboreal and Eastern Asian floristic regions (Eremin, 2019). The Crillon Peninsula is the southernmost tip of the island, closest to the islands of the Japanese archipelago, where the influence of East Asian flora is greatest. The research area is situated on the Aniva coast of the Crillon Peninsula, which is difficult to access and therefore it is less studied (Fig. 1). This study was carried out in August 2023 together with other specialists in biological fields during the expedition "Crillion 2023" sponsored by non-governmental charitable foundation "Support of Biological Research" in order to explore the biodiversity of the area, its scientific and biological potential. Previous floristic surveys avoided this area due to its inaccessibility, so this study can supplement the available data on the flora of bryophytes (Bakalin *et al.*, 2012).

Plant communities of the Crillon Peninsula include species that are not typical for the central and northern parts of Sakhalin, and some of them are not found anywhere else on the island, e.g., *Actinidia arguta* (Siebold et Zucc.) Planch. ex Miq., *Ampelopsis heterophylla* (Thunb.) Siebold & Zucc. *Kalopanax septemlobus* (Thunb.) Koidz, *Osmunda japonica* Thunb., *Phacellanthus tubiflorus* Siebold & Zucc., *Phyllitis japonica* Kom., *Toxicodendron orientale* Greene (Tolmachev, 1955, Popov, 1969, Sabirov, 2018, Eremin & Taran, 2019), as well as bryophytes *Forsstroemia japonica* (Besch.) Par. and *Hypopterygium flavolimbatum* Müll. Hal. (Bakalin *et al.*, 2012). The eastern half of the Crillon Peninsula is of a particular interest in terms of biodiversity conservation, as it was designated as a nature conservation area in 1972-2002 (Makeev, 2010).

STUDY AREA

The territory of the Crillon Peninsula lies in the subzone of dark coniferous forests with an addition of decidu1ous species and a predominance of *Abies sachalinensis* Fr. Schmidt (Barkalov & Taran, 2004). The main

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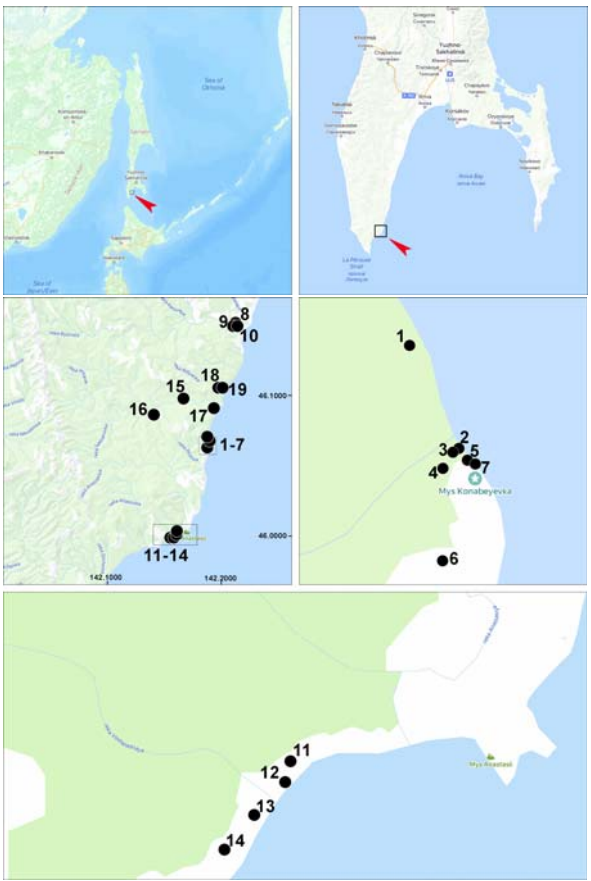

Fig. 1. Map of collecting sites in the eastern part of Crillon Peninsula. See also Table 1.

Table 1. Bryophyte collection sites in the plots where vegetation studies were carried out. See also Fig. 1.

№	Coordinates, , °N, °E	Plant communities
1	46.07339, 142.19017	Tidal marshes
2	46.07030, 142.19220	Sea side cliffs
3	46.07021, 142.19180	Hillside decidious forest
4	46.06976, 142.19168	Hillside decidious forest with groups of young coniferous trees
5	46.06993, 142.19266	Sea side cliffs
6	46.06702, 142.19164	Wet sea side cliffs
7	46.06982, 142.19286	Sea side cliffs
8	46.14212, 142.21701	Willow and alder forests
9	46.14235, 142.21361	Coniferous forest
10	46.14099, 142.21371	Coniferous forest
11	46.01526, 142.16115	Wet cliffs
12	46.01464, 142.16098	Wet cliffs near the waterfall
13	46.01264, 142.15841	Coniferous forest
14	46.01317, 142.15830	Coniferous forest and the basalt scree
15	46.09700, 142.16990	Willow and alder forests
16	46.08626, 142.14235	Coniferous forest with *Sasa* sp.
17	46.09150, 142.19460	Valley coniferous forest
18	46.10359, 142.19940	Coniferous forest on the slopes near the river
19	46.10307, 142.20042	Coniferous forest

characteristic of these forests is the presence of plant species with Eastern Asiatic suboceanic distribution: *Sasa* spp., *Skimmia repens* Nakai, *Ilex crenata* Thunb., etc. Since a significant part of the forests in the described area is secondary due to the active economic use in the past (Sabirov, 2018), young deciduous forests of *Betula ermanii* Cham. grow instead of the old-growth vegetation.

In general terms, the vegetation in the study area can be divided into the following groups: hillside forests, valley forests and meadows, tidal marshes and coastal cliffs. Coniferous forests or their derivatives grow in the highlands. In the formation of hillside forests *Abies sachalinensis*, *Picea jezoensis* Carr., *Betula ermanii*, *Sorbus commixta* Hedl. and some other species take part . Undergrowth in the fir forests consists mainly of *Sasa* sp. [16], *Leptorumohra amurensis* (Christ) Tzvel., *Lunathyrium* sp., *Osmundastrum asiaticum* (Fern.) Tagawa, *etc.* [collecting sites 9, 10, 13, 14, 18, 19] (Fig. 2B, 2E). Another type of hillside forest consists of broadleaved *Kalopanax septemlobus, Phellodendron sachalinense* and *Padus ssiori.* mixed with *Betula ermani* and *Sorbus commixta*, and sometimes young conifers [3, 4] (Fig 2A). The shrub layer in the hillside forests is formed by *Euonymus macroptera* Rupr., *Sambucus racemosa* L., *Ilex rugosa* Fr. Schmidt, *Skimmia repens* Nakai, *Lonicera glehnii* Fr. Schmidt, *Taxus cuspidata* Siebold & Zucc. ex Endl., *Hydrangea paniculata* Siebold, *H. petiolaris* Siebold & Zucc. and some other species. Secondary vegetation consists of *Betula ermanii* forests with massive *Sasa* undergrowth or pure *Sasa* fields.

The river valleys are dominated by tall-herb communities with *Angelica ursina* (Rupr.) Maxim., *Aralia cordata* Thunb., *Cacalia robusta* Tolm., *Cardiocrinum cordatum* (Thunb.) Makino, *Cirsium kamtschaticum* Ledeb. ex DC., *Filipendula camtschatica* (Pall.) Maxim., *Heracleum maximum* W. Bartram, *Petasites amplus* Kitam., *Reynoutria sachalinensis* (Fr. Schmidt) Nakai, *Senecio cannabifolius* Less., and others. In wetter places near rivers there are willow forests (*Salix schwerinii* E. Wolf subsp. *yezoensis* (C.K. Schned.) Worosch, *Salix udensis* Trautv. & Mey, etc.) and alder forests (*Alnus hirsuta* (Spach) Fisch. ex Rupr.) [8, 15]. In some places, undergrowth consists of massive *Equisetum hyemale* L., in others many of the Sakhalin tall-herb species can be found under forest canopy. *Sambucus racemosa* is the most common shrub species of valley forests. The abundance of shrubs in these communities is generally low, which is associated with a well-developed herbaceous understorey. Evergreen valley forests mainly consist of fir, they are heavily waterlogged; there is an admixture of rarer species: *Hosta rectifolia* Nakai, *Ilex crenata*, *Lysichiton camtschatcense* (L.) Schott, *Scirpus orientalis* Ohwi, *Typha latifolia* L., *etc.* [17].

The following plants are typical for marshes near the coast [1]: (Fig. 2C) *Adenophora triphylla* (Thunb.) A.

Fig. 2. A: Hillside decidious forest with groups of young coniferous trees [collecting site 4] B: Coniferous forest [10]. C: Slope at the sea coast and tidal marshes (forward) [1]. D: Wet cliffs near the waterfall on Vodopadnaya riv. [12]. E: Riverside slopes and coniferous forest on Riflyanka riv. [18].

DC., *Angelica ursina*, *Calamagrostis langsdorffii* (Link) Trin., *Leymus mollis* (Trin.) Hara, *Lysichiton camtschatcense*, *Petasites amplus, Plantago major* L. sl., Whitebush, *Reynoutria sachalinensis*, *Iris setosa* Pall. ex Link and others.

The sea cliffs [2, 5, 6, 7] are characterized by a small number of species of woody vegetation: *Alnus maximowiczii* and *Rosa rugosa* Thunb. are found on the less inclined parts of slopes. Herbaceous plants include *Aruncus dioicus* (Walt.) Fern., *Dianthus superbus* L., *Plantago camtschatica* Link, *Solidago dahurica* Kitag., Holly, *Sedum aizoon* L., *Sedum kamtschaticum* Fisch., and *Thermopsis lupinoides* (L.) Link. There are steep, wet cliffs [11, 12] with *Cystopteris fragilis* (L.) Bernh., *Dryopteris fragrans* (L.) Schott, *Saxifraga sachalinensis* Fr. Schmidt, and *Woodsia polystichoides* D. Eat. near the Vodopadnaya River (Fig. 2D).

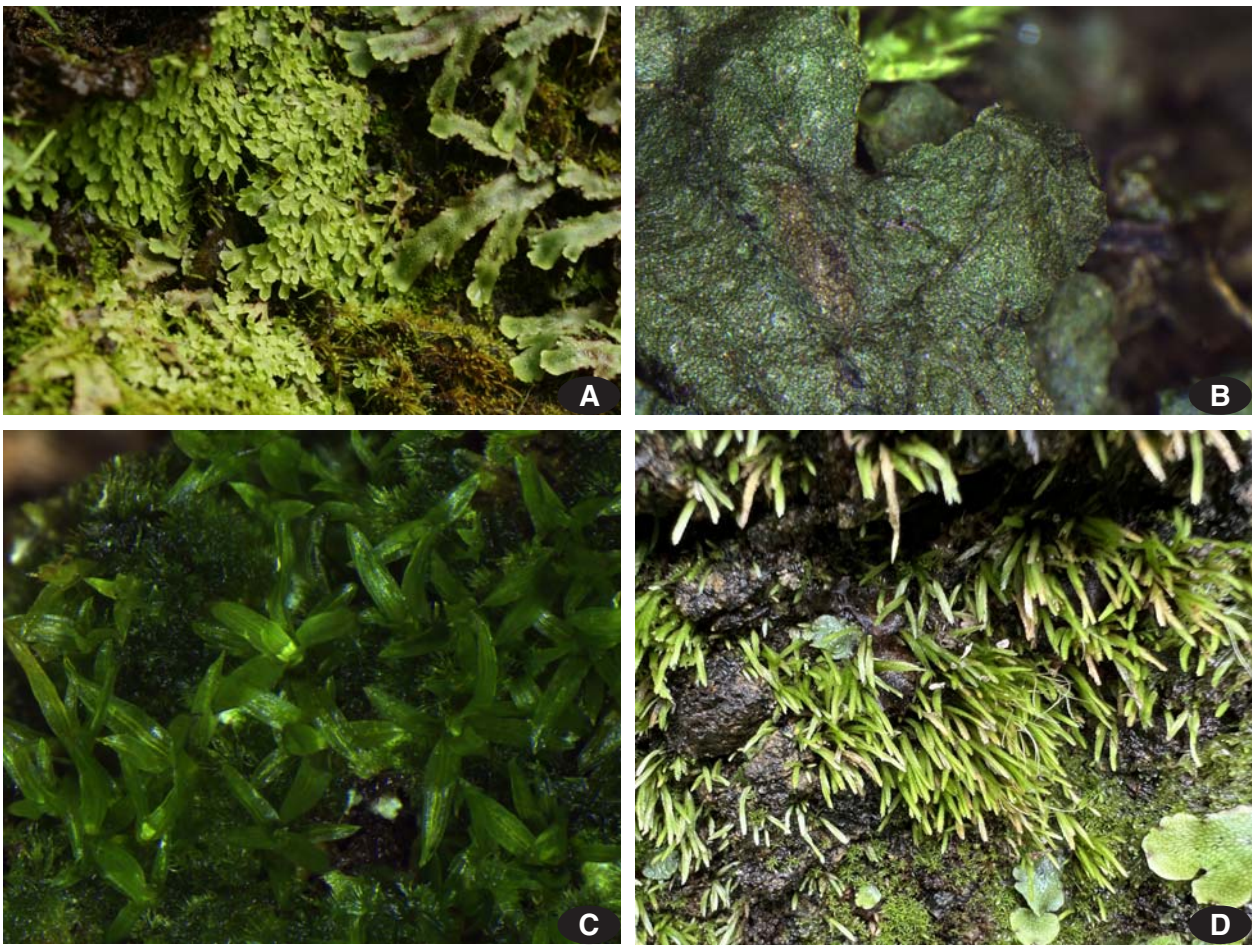

Fig. 3. A: *Conocephalum japonicum* (left) and *C. salebrosum* (right); B: *Wiesnerella denudata*; C: *Bryoerythrophyllum brachystegium*; D: *Bryoxiphium japonicum.*

SPECIES LIST

We collected bryophytes in the eastern part of the Crillon Peninsula near the rivers Moguchi, Naicha, Riflianka and Anastasia in different types of plant communities (Table 1), on 21–26 August 2023. A total of 320 specimens were collected and identified. The specimens are deposited in MHA.

Nomenclature of liverworts follows World checklist of hornworts and liverworts (Söderström *et al.*, 2016). Nomenclature of mosses is given in accordance with treatments in the Moss flora of Russia (http://arctoa.ru/Flora/taxonomy-ru/taxonomy-ru.php). Nomenclature of vascular plants is provided according to Barkalov & Taran (2004).

MARCHANTIOPHYTA

Apometzgeria pubescens – UN. 2. On a cliff by sea side.

Bazzania denudata – R. 9, 10. Epiphytic on *Picea jezoensis* and on rotten wood of fallen trunks and twigs in a coniferous valley forest.

Blasia pusilla – UN. 16. On soil under a canopy of *Sasa* in a coniferous valley forest.

Blepharostoma trichophyllum – SP. 10, 16, 18. On rotten wood of fallen trunks and twigs near a creek in a coniferous valley forest; on a riverside slope.

Calypogeia pseudointegristipula – SP. 10, 16, 18. On tree roots in a coniferous valley forest; on a riverside slope; on rotten wood of fallen trunks and twigs in a coniferous forest.

Cephalozia bicuspidata – UN. 17. In a swamp in a river valley in a tall-herb community and in a swamp in a coniferous valley forest.

Chiloscyphus polyanthos – UN. 18. On a riverside slope.

Conocephalum japonicum – SP. 3, 6, 11, 18. On rotten wood of fallen trunks and twigs in a hillside forest; on wet cliffs on a sea side; on a riverside slope.

C. salebrosum – R. 11, 12. On wet cliffs and under a waterfall on sea side with almost no vegetation, rarely with ferns and rockweed.

Cryptolophocolea compacta – UN. 17. In a swamp in a river valley in a tall-herb community.

Douinia plicata – UN. 10. On rotten wood of fallen trunks and twigs in a coniferous valley forest.

Frullania austinii – UN. 8. Epiphytic on *Alnus hirsuta* in a riverside willow forest.

F. takayuensis – UN. 10. Epiphytic on *Abies sachalinensis* in a coniferous valley forest.

Fuscocephaloziopsis lunulifolia – R. 10, 16. On roots of wooden plants and on rotten wood of fallen trunks and twigs in a coniferous valley forest; on soil under a canopy of *Sasa*.

Lepidozia reptans – UN. 9. Epiphytic on *Picea jezoensis* in a coniferous valley forest.

Lophocolea heterophylla – SP. 5, 10, 14. Epiphytic on *Abies sachalinensis*, on rotten wood of fallen trunks and twigs in a coniferous valley forest; on boulders on a sea side.

Metzgeria furcata – UN. 4. Epiphytic on *Phellodendron sachalinense* in a hillside forest.

Pellia neesiana – R. 18, 19. On a riverside slope and near a footpath in a hillside forest.

Plagiochila ovalifolia – UN. 4. Under boulders by sea side.

Porella grandiloba – UN. 4. Epiphytic on *Hydrangea paniculata* in a hillside forest.

P. vernicosa – UN. 4. Epiphytic on *Hydrangea paniculata* in a hillside forest.

Ptilidium pulcherrimum – UN. 14. On basalt scree in a hillside coniferous forest.

Radula complanata – R. 4, 8. Epiphytic on *Abies sachalinensis* in a hillside forest; on *Alnus hirsuta* near a river in a willow forest.

Scapania mucronata – UN. 7. On wet cliffs on a seaside with almost no vegetation.

S. pilifera – UN. 2. On a cliff by a sea side.

Wiesnerella denudata – UN. 4. On rocks under a canopy of *Sasa* in a hillside forest.

BRYOPHYTA

Amblystegium serpens – SP. 2, 3, 8. On wet cliffs by a sea side; epiphytic on *Hydrangea paniculata* in a hillside forest; on *Salix schwerinii* subsp. *yezoensis* in a riverside willow forest.

Anomobryum concinnatum – R. 7, 11. On wet cliffs on a sea side.

Anomodon thraustus – UN. 4. Epiphytic on of *Acer mayrii* in a hillside forest.

Anomodontella longifolia – R. 4, 15. Epiphytic on *Acer mayrii* in a hillside forest; on *Salix* sp. in a valley willow forest.

Anomodontopsis rugelii – UN. 15. Epiphytic on *Salix* sp. in a valley willow forest.

Aquilonium adscendens – FR. 2, 3, 4, 5, 9, 10. On scree by the sea side; epiphytic on *Abies sachalinensis*, *Acer mayrii*, *Alnus maximowiczii*, *Betula ermanii, Phellodendron sachalinense*, and on rotten wood in a hillside coniferous forest.

A. plicatulum – SP. 9, 10, 16, 17. Epiphytic on *Abies sachalinensis* and *Picea jezoensis*, on coniferous litter and on rotten wood in a coniferous valley forest; in a swamp in a valley coniferous forest.

Atrichum undulatum – UN. 17. In a swamp in a valley fir forest.

Bartramia pomiformis – R. 2, 18. On rocks on scree by a sea side; on a slope near a river.

Brachytheciastrum trachypodium – UN. 2. On scree by a sea side.

Brachythecium auriculatum – SP. 2, 4, 10, 16. On cliffs and boulders by a sea side; on soil under a canopy of *Sasa* in a hillside coniferous forest; on plant litter in a forest of *Betula ermanii*; on a slopes of a small damp ravines.

B. buchananii – R. 2, 11. On wetcliffs on a sea side with almost no vegetation.

B. extremiorientale – SP. 7, 8, 10. Epiphytic on *Salix schwerinii* subsp. *yezoensis* near a river in a willow forest; on wet cliffs at the seaside; on a slope of a small damp ravine.

B. hultenii – SP. 3, 9, 14, 19. Epiphytic on *Hydrangea paniculata* and on rotten wood in a hillside coniferous forest; on basalt scree and near a footpath in a hillside forest.

B. kuroishicum – UN. 11. On wet cliffs on a seaside with almost no vegetation.

B. salebrosum – UN. 13. On an old Japanese road in a coniferous hillside forest with seedlings of spruce (*Picea jezoensis*) and *Vaccinium praestans*.

B. rivulare – R. 1, 12. In a creek flowing from a marshland; under a waterfall on a cliff at a sea side.

Bryoerythrophyllum brachystegium – UN. 11. On wet cliffs on a seaside with almost no vegetation.

B. ferruginascens – SP. 2, 7, 11. On scree by a sea side.

B. recurvirostrum – R. 2, 12. On scree by a sea side.

Bryoxiphium japonicum – R. 11, 12. On ozing cliffs on a seaside with almost no vegetation, rarely with ferns and rockweed.

Bryum algovicum – UN. 7. On wet cliffs on a sea side.

B. amblyodon – UN. 11. On wet cliffs on a sea side with almost no vegetation.

B. caespiticium – UN. 2. On a large on a sea side

B. capillare – SP. 2, 4, 5, 6, 14. On a large scree, on wet cliffs and in cave on a sea side; on a basalt scree in a hillside coniferous forest.

B. creberrimum – R. 1, 5. In hollows between large boulders by a sea side; in a creek flowing from a marshland.

B. moravicum – R. 11, 12. On wet cliffs on a sea side with almost no vegetation.

B. pseudotriquetrus – UN. 1. On rocks in a creek flowing from a marshland.

Callicladium haldanianum – SP. 3, 4, 5, 8, 9. On rotten wood of fallen trunks and twigs and spruce litter in a coniferous hillside forest; epiphytic on *Alnus hirsuta* and *Betula ermanii* in a willow forest near a river.

Calliergonella cuspidate – UN. 1. In a creek flowing from a marshland at a sea side meadows.

C. lindbergii – UN. 1. In a creek flowing from a marshland at a sea side meadows.

Campylophyllopsis sommerfeltii – UN. 8. On rotten wood of fallen trunks and twigs in a riverside willow forest.

Ceratodon purpureus – SP. 2, 5, 14. On scree by a sea side; under a boulders and on basalt scree in a hillside forest.

Chionoloma tenuirostre – R. 2, 12. On scree by a sea side; on cliffs under a waterfall.

Claopodium pellucinerve – R. 2, 10. On a slope of a small damp ravine in a coniferous valley forest; on scree and in wet hollows at a sea side.

Cratoneuron filicinum – SP. 1, 6, 11, 12. In a creek flowing from a marshland at a sea side meadows; on wet cliffs at a seaside.

Dichodontium pellucidum – UN. 2, 11. On scree and wet cliffs by a sea side.

Dicranella heteromalla – SP. 10, 14, 17. On soil in a coniferous valley forest; in a swamp; on a slope of a small damp ravine; on basalt scree in a coniferous hillside forest.

Dicranum fuscescens – UN. 10. Epiphytic on *Abies sachalinensis* in a coniferous valley forest.

D. hakkodense – UN. 4. Epiphytic on of *Alnus maximowiczii* on an edge of a cliff in a hillside forest.

D. majus – SP. 5, 10, 16. On soil under a canopy of *Sasa* in a fir valley forest; on a slope of a small damp ravine.

D. mayrii – R. 3, 4. Epiphytic on *Alnus maximowiczii* and on rotten wood in a hillside forest.

D. pacificum – UN. 4. On a rotten wood in a coniferous hillside forest.

Dilutineuron brevisetum – R. 2, 5. On cliff by a sea side with sparse vegetation, or on huge boulders and stones.

Distichium capillaceum – R. 1, 10. In creek and hollows at a sea side meadows and in coniferous forests, along a banks or on stones.

Echinophyllum sachalinense – UN. 9. On a rotten wood near small river in a valley coniferous forest.

Fissidens adianthoides – UN. 2. On scree by a sea side.

F. dubius – SP. 2, 4, 5. On rotten wood and stones in a coniferous hillside forest; on scree by a sea side.

Forsstroemia japonica – UN. 4. Epiphytic on of *Acer mayrii* in a hillside forest.

F. yezoana – UN. 10. On a slope of a small damp ravine in a coniferous valley forest.

Haplocladium capillatum – R. 3, 19. Near a footpath in a hillside coniferous valley forest.

Homalia trichomanoides – SP. 2, 4, 15. On scree by a sea side; on stones in a hillside coniferous forest with *Sasa sp.* undergrowth; epiphytic on *Salix sp.* in a valley willow forest; on roots in a coniferous valley forest.

Hypnum cupressiforme– SP. 2, 4, 5, 9, 10. On scree by a sea side; epiphytic on *Alnus maximowiczii*, *Betula ermanii* and *Phellodendron sachalinense,* on a rotten wood and coniferous litter in a hillside forest.

Isopterygiella pulchella – UN. 2. On scree by a sea side.

Jochenia pallescens – SP. 4, 5, 8. Epiphytic on *Alnus maximowiczii* and on *Abies sachalinensis* on an edge of a cliff in a hillside forest; on *Betula ermanii*, *Viburnum furcatum* and *Alnus hirsuta* near a river in a willow forest; on boulders at a sea side.

Lewinskya sordida – SP. 3, 4, 8. Epiphytic on *Acer mayrii* and *Hydrangea paniculata* in a hillside forest; on stones under *Sasa sp.* canopy; on rotten wood of *Alnus hirsuta* near a river in a willow forest.

Mnium lycopodioides – UN. 11. On wet cliffs on a sea side with almost no vegetation.

M. orientale – UN. 16. On soil in hillside coniferous forest with *Sasa sp*. undergrowth.

M. thomsonii – SP. 2, 4, 7, 18. On wet cliffs on a sea side and on a riverside slope.

Myuroclada longiramea – FR. 2, 3, 4, 5, 9, 12, 18. On cliffs by a sea side; on soil and stones under a canopy of *Sasa* in a hillside and valley coniferous forests; epiphytic on *Hydrangea paniculata* and *Viburnum furcatum*, on rotten wood in a forest; on a riverside slope.

M. maximowiczii – R. 12, 15. On a cliff by a sea side in a shade, with almost no other vegetation; epiphytic on *Salix sp.* in a valley willow forest.

Niphotrichum japonicum – SP. 12, 13, 14. On an old Japanese road in a coniferous hillside forest with seedlings of spruce (*Picea jezoensis*)*; on* basalt scree in a hillside forest.

Oticodium laevisetum – UN. 12. On a cliff by a sea side, in shade, with almost no other vegetation.

Philonotis yezoana – SP. 1, 6, 7. On rocks in a creek flowing from a marshland; on wet cliffs at a seaside.

Plagiomnium vesicatum – UN. 18. On a riverside slope.

Plagiothecium cavifolium – UN. 2. On scree by a sea side.

P. denticulatum – UN. 4. On rotten wood in a coniferous hillside forest.

P. latebricola – UN. 10. On a slope of a small damp ravine in a coniferous valley forests.

P. nemorale – R. 16, 17. In a swamp and near a creek in a coniferous hillside and valley forests.

P. obtusissimum – SP. 4, 9, 10, 18. Epiphytic on *Alnus maximowiczii* and on a rotten wood in a hillside forest; on slopes near creeks and rivers.

P. rossicum – SP. 4, 9, 10, 14, 16. Epiphytic on *Alnus maximowiczii* and on a coniferous litter in a hillside forest; on a slope of a small damp ravine; on basalt scree.

P. svalbardense – UN. 18. On a riverside slope.

Platygyrium repens – UN. 9. On rotten wood in a valley coniferous forest.

Pleurozioopsis ruthenica – R. 16, 18. On soil under a canopy of *Sasa*; on a riverside slope in a fir valley forest.

Pleurozium schreberi – SP. 5, 16, 17. On soil under a canopy of *Sasa* in a hillside and valley coniferous forests; in a swamp in the valley coniferous forest.

Pogonatum contortum – UN. 15. Epiphytic on *Salix sp.* in a river valley forest.

Pohlia cruda – SP. 2, 11, 16. On wet cliffs on a sea side; on a slope of a small damp ravine in a valley coniferous forest.

P. nutans – UN. 17. In a swamp in a valley fir forest.

Polytrichastrum alpinum – SP. 2, 14, 18. On rock outcrops on steep E-facing slope by a sea; in hollows between large boulders by a sea.

Polytrichum pallidisetum – UN. 17. In a swamp in a valley fir forest.

P. piliferum – UN. 13. On an old Japanese road in a coniferous hillside forest with seedlings of spruce (*Picea jezoensis*) and *Vaccinium praestans*.

Pseudoleskeella nervosa – UN. 4. Epiphytic on of *Acer mayrii* in a hillside forest.

Pylaisia obtusa – R. 4, 15. Epiphytic on *Kalopanax septemlobus* and *Phellodendron sachalinense* in a hillside forest; on *Salix* sp. in a valley willow forest.

P. subcircinata – UN. 8. Epiphytic on *Salix schwerinii* subsp. *yezoensis* near a river in a willow forest.

Rauiella fujisana – SP. 3, 4, 15, 15. Epiphytic on *Hydrangea paniculata*, *Phellodendron sachalinense* and *Viburnum furcatum* in a hillside forest; on *Salix* sp. in a valley willow forest.

Rhizomnium magnifolium – UN. 16. Om soil in a hillside coniferous forest with *Sasa sp.* undergrowth.

R. striatulum – UN. 14. On basalt scree in a hillside coniferous forest.

Rhynchostegium aquaticum – UN. 12. Under a waterfall on a cliff at a sea side.

R. rotundifolium – UN. 4. On rotten wood in a hillside coniferous forest.

Rhytidiadelphus japonicus – SP. 2, 4, 5, 17, 18. In a creek flowing from a marshland; on soil under a canopy of *Sasa* in a hillside coniferous forest; on boulders at a sea side; on a riverside slope; in a swamp in a coniferous valley forest.

R. subpinnatus – UN. 17. In a swamp in a valley fir forest.

Saelania glaucescens – UN. 2. On cliff by a sea side with sparse vegetation, on soil and on stones.

Sanionia uncinata – SP. 5, 9, 14. On boulders and cliffs at a sea side; on rotten wood and basalt scree in a coniferous valley forest.

Schistidium konoi – UN. 1. In a creek flowing from a marshland.

S. lancifolium – SP. 2, 4, 5, 7, 14. On rocks on scree at a sea side; on rocks in a hillside forest and under a canopy of *Sasa*; on a basalt scree in a forest.

S. pruinosum – UN. 14. On basalt scree in a hillside forest.

Sciuro-hypnum brotheri – SP. 9, 10, 16. On spruce litter, rotten

wood and epiphytic on *Picea jezoensis* in a coniferous hillside forest; under a waterfall at a seaside; on a slope of a small damp ravine in the coniferous forest.

S. plumosum – SP. 2, 5, 14, 15. On scree and boulders on cliffs at a sea side; on rocks in a hillside coniferous forest; epiphytic on *Salix sp.* in a valley willow forest.

S. populeum – R. 1, 14. In a creek flowing from a marshland; on a basalt scree and other stones in a hillside forest.

S. reflexum – FR. 3, 4, 5, 8, 10, 12, 14. On rotten wood of fallen trunks and twigs and a basalt scree in a coniferous hillside forest; epiphytic on *Hydrangea paniculate* and *Viburnum furcatum*, on a rotten wood in a valley willow forest; on cliffs at a sea side.

S. starkei – R. 9, 16. On spruce litter, rotten wood and epiphytic on *Picea jezoensis* in a coniferous hillside forest; near a creek in a coniferous hillside forest; in a swamp in the valley forest.

S. uncinifolium – R. 2, 5. On scree, boulders and on cliffs at a sea side and in wet hollows in a sea side meadows.

Sphagnum girgensohnii – UN. 17. In a swamp in a valley fir forest.

S. riparium – UN. 17. In a swamp in a valley fir forest.

S. squarrosum – UN. 17. In a swamp in a river valley.

Taxiphyllum aomoriense – R. 2, 4. On scree by a sea side; epiphytic on *Acer mayrii* and *Hydrangea paniculata*, on rotten wood in hillside forest.

Tetraphis cf. *geniculata* – UN. 9. On rotten wood near small river in valley coniferous forest.

Thamnobryum neckeroides – SP. 2, 3, 4, 15, 19. On scree by a sea side; on rotten wood in a coniferous hillside forest; epiphytic on *Salix sp.* in a valley willow forest; on roots in a coniferous valley forest.

Thuidium tamariscinum – R. 16, 17. Near a creek in a coniferous hillside forest; in a swamp in the river valley.

Trachycystis flagellaris – FR. 2, 3, 4, 5, 9, 10, 16. On boulders by a seaside; epiphytic on *Abies sachalinensis*, *Alnus maximowiczii*, *Betula ermanii*, *Picea jezoensis*, *Viburnum furcatum*, on a rotten wood and coniferous litter in a hillside forest; on a riverside slope.

Ulota crispa – UN. 8. On fallen *Alnus hirsuta* near a river in a willow forest.

U. crispula – R. 3, 4. In hillside forest epiphytic on *Alnus maximowiczii, Hydrangea paniculata* and *Phellodendron sachalinense*.

U. intermedia – UN. 4. Epiphytic on *Kalopanax septemlobus* in a hillside forest.

U. japonica – UN. 8. Epiphytic on *Alnus hirsuta* near a river in a willow forest.

Warnstorfia fluitans – UN. 17. In a swamp in a valley fir forest.

Discussion

In total, 26 species of liverworts and 115 species of mosses were collected in a study area. It is a comparatively rich local flora, comprising species from various habitats in different types of vegetation.

Among liverworts, there are six species newly discovered in Sakhalin: *Bazzania denudata, Cryptolophocolea compacta, Porella vernicosa, Scapania mucronata, S. pilifera,* and *Wiesnerella denudata*. Of them, *Cryptolophocolea compacta* represents a genus and species new to Russia, and *Scapania pilifera* is a species new to Russia. The former species (as *Lophocolea compacta*) is known in China (Piippo, 1990), the Korean Peninsula (Hong, 1997), and Japan (Hokkaido, Honshu, Shikoku and Kyushu) (Yamada & Iwatzuki, 2006), while the latter was treated as endemic of Japan and was known only from Honshu (Amakawa & Hattori, 1953). The descriptions and photographs of both species based upon the studied specimens are expected in a separate special paper (in progress). Other four species are known in Primorsky Territory, so their discovery in Sakhalin was expected. Three species newly reported here for Sakhalin were already recorded for the island by Bakalin *et al.* (2012), although under other names: *Frullania austinii* was provided under *F. bolanderi*, *F. takayuensis* under *F. oakesiana*, *Calypogeia pseudointegristipula* under *C. integristipula*.

Three species of mosses new to Sakhalin were collected: *Brachytheciastrum trachypodium*, *Schistidium konoi* and *S. pruinosum*. All three species could be expected for Sakhalin, since they were previously known in nearby regions of the south of the Far East of Russia: *Brachytheciastrum trachypodium* on the Kuril Islands and in Khabarovsk Territory (Ignatov, 2020), *Schistidium konoi* on the Kuril Islands and in Primorsky Territory, *S. pruinosum* in Khabarovsk Territory (Ignatova & Blom, 2017). A second locality of *Bryoerythrophyllum brachystegium* has been discovered on Sakhalin Island. This species is rare in Russia: it was first recorded in the country from Kunashir and Iturup Islands (South Kuril Islands) by Fedosov & Ignatova (2008). It is also known from Japan (Honshu and Hokkaido) (Noguchi, 1988) and from many localities in China (Li X.-j. *et al*., 2001).

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