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MOSSES AND LIVERWORTS OF THE MAIN TREE SPECIES OF RIPARIAN FORESTS IN THE MIDDLE PART OF SAKHALIN ISLAND (RUSSIAN FAR EAST)

МХИ И ПЕЧЕНОЧНИКИ ОСНОВНЫХ ДРЕВЕСНЫХ ПОРОД ПОЙМЕННЫХ ЛЕСОВ СРЕДНЕЙ ЧАСТИ ОСТРОВА САХАЛИН (ДАЛЬНИЙ ВОСТОК РОССИИ)

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Abstract

Mosses and liverworts of the most widespread deciduous trees of the riparian forests in the middle part of Sakhalin, Russian Far East are presented. The study includes Tym' and Poronai rivers basins where the 15 localities were studied. Ten species of liverworts and 62 species of mosses were recorded on tree trunks and their bases. Most frequent epiphytes in this area are *Anomodon thraustus, Anomodontella longifolia, Homalia trichomanoides, Neckera pennata, Plagiomnium acutum, Pylaisia polyantha*, and *P. condensata*. All hepatics were found only in few localities, and on few trunks. The maximal number of bryospecies has been recorded on *Populus maximowiczii*, 58*, Salix udensis*, 25, *Alnus hirsuta* and *Ulmus* spp., 23 species. Six and nine species have been identified for *Fraxinus mandshurica* and *Chosenia arbutifolia*, respectively. The epiphytic bryoflora of the study area has less than half of species in common with the epiphytic bryofloras of Kamchatka, 28 species (45%) and southern Primorsky Territory, 26 species (41%). A number of epiphytic moss species were found in middle part of Sakhalin for the first time: *Anomodon thraustus, Fissidens* cf. *bryoides, Rauiella fujisana*.

Резюме

Выявлены мхи и печеночники основных древесных пород пойменных листопадных лесов средней части о. Сахалина, Дальнего Востока России. Обследованы бассейны самых крупных рек Сахалина – Тыми и Пороная – всего 15 точек. Выявлено 10 видов печеночников (Marchantiophyta) и 62 видов мхов (Bryophyta). Массовыми видами в исследуемых сообществах являются *Anomodon thraustus*, *Anomodontella longifolia*, *Homalia trichomanoides*, *Neckera pennata*, *Plagiomnium acutum*, *Pylaisia polyantha* и *P. condensata*. Печеночники встречены единично. Максимальное количество бриофитов зарегистрировано на тополе Максимовича 58 видов. На иве удской отмечено 25 видов. Для ясеня маньчжурского и чозении толокнянколистной было зарегистрировано 6 и 9 видов, соответственно. Эпифитная бриофлора исследуемого района имеет менее половины общих видов с эпифитной бриофлорой Камчатки, 28 видов (45%) и юга Приморья, 26 видов (41%). Впервые для средней части Сахалина приведены следующие виды: *Anomodon thraustus*, *Fissidens* cf. *bryoides*, *Rauiella fujisana*.

KEYWORDS: liverworts, mosses, bryoflora, riparian forests, Poronai River, Tym' River, middle part of Sakhalin Island, Kamchatka, southern part of Primorye

INTRODUCTION

Riparian deciduous forests are azonal vegetation and have important ecosystem significance, providing water protection, water regulation and optimal habitat conditions for hydrobionts (Korznikov, 2017). Riparian forests on Sakhalin occupy the territory that is slightly more than 1% of the entire forested area (Smirnov & Dobrynin, 2014). To date, most of these forests in the middle part of Sakhalin have been greatly transformed by economic activity (use of land for arable land, grazing, sand and gravel extraction) and replaced by secondary low-productivity small-leaved forests (Smirnov & Dobrynin, 2014). Small areas of natural riparian vegetation have been preserved only in hard-to-reach places. The study of such communities is of great scientific and practical importance, as it makes possible to identify the natural flora of all components (including bryophytes) inherent in the indigenous communities of Sakhalin. Besides, it allows discovering marker species indicating intact forest communities that are particularly valuable. At the same time, epiphytic lichens and bryophytes are of special interest, being the most vulnerable vegetation component, sensitive to habitat destruction (Kaganov & Ezhkin, 2019; Kaganov *et al*., 2021).

The diversity of mosses of riparian forests of Sakhalin is studied quite incompletely. There are rather few

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species on soil, where only 1–6 species form a projective cover of less than 1%, while epiphytic bryophytes, on the contrary, are much better developed well-developed (Korznikov & Popova, 2018).

"Bryophytes of Sakhalin" (Bakalin *et al.*, 2012) includes 438 moss and 198 liverwort species, however, details of their distribution and the ecological and coenotic confinement, were only briefly addressed in this publication. Only 6 species of liverworts and 46 species of mosses were specifically reported as growing on tree trunks in riparian forests of the middle Sakhalin (Bakalin *et al.*, 2012). For a number of species recorded on tree trunks in this publication, the forest types are not mentioned: *Bazzania trilobata, Amblystegium serpens*, *Haplocladium microphyllum*, *Herzogiella turfacea*, *Plagiothecium cavifolium*, *Rhizomnium magnifolium*, *Sciuro-hypnum populeum*, etc.

The aim of this work was to reveal the bryophyte species composition on the main tree species of riparian deciduous forests in the middle part of Sakhalin, and compare with bryophytes of trees of riparian forests in other regions of the Russian Far East – Kamchatka and southern Primorsky Territory.

STUDY AREA

The middle part of Sakhalin belong the East Sakhalin region as defined in the floristic regionalization of Sakhalin and Moneron by Krestov *et al.* (2004). It includes the East Sakhalin Mountains, the Tym'-Poronay lowland and the Terpeniya Peninsula. In the north, this area borders the North Sakhalin Lowland, in the west – the West Sakhalin Mountains, and in the east and the south it is bounded by the coasts of the Sea of Okhotsk and the Gulf of Terpeniya. The relief in most of the region is mountainous, with individual peaks reaching 1300 m and the highest elevation of 1609 m (Lopatina Mt.), the Tym'-Poronay lowland is characterized by a flat relief. Poronai River is the largest in the Sakhalin Region, which has a channel length of 350 km, a basin area of 7990 km^2. The length of Tym' River is 330 km (the second longest), the basin area is 7850 km^2 .

Picea ajanensis (Lindl. et Gord.) Fisch. ex Carr. and *Abies sachalinensis* Fr. Schmidt, are the dominant tree in the mountainous forest. *Larix cajanderi* Mayr forms forest at lower elevation, in lowlands and foothills, dominating at places in an expanded areas. It also forms mixed stands with *Abies* and *Picea* in the northern part of the area. Secondary forest formations of *Populus tremula* L. and *Betula platyphylla* Sukaczev are also widespread. *Betula ermanii* Cham. forests are common in the middle mountain zone, above the zone dominated by *Abies* and *Picea*. The highest elevations are covered by *Pinus pumila* (Pall.) Regel thickets (Krestov *et al.*, 2004).

Riparian forests are dominated by *Salix* spp., *Populus maximowiczii* A. Henry, *Chosenia arbutifolia* (Pall.) A. Skvors. As a rule, tall forbs are a characteristic element of such forests. Broad-leaved riparian forests with *Fraxinus mandshurica* Rupr., *Ulmus davidiana* var. *japonica* (Rehder) Sarg. and *U. laciniata* (Trautv.) Mayr are much less common and located on high alluvial terraces, on the periphery of high floodplain parts (Korznikov & Popova, 2018; Korznikov & Ezhkin, 2019).

MATERIALS AND METHODS

Field studies were conducted by the route method in riparian deciduous forests of the large rivers Tym' and Poronai and their tributaries in the middle part of Sakhalin in 2017–2019 (Fig. 1). Bryophytes were collected from the main tree species of these forests, including *Populus maximowiczii*, *Fraxinus mandshurica*, *Salix udensis* Trautv. et C.A. Mey., *Chosenia arbutifolia*, *Ulmus davidiana* var. *japonica*, *Ulmus laciniata* and *Alnus hirsuta* (Spach) Fisch. ex Rupr. Trees in the sites were selected to be of the same diameter, approximately the same age, with at least 10 trees in the site, without inclination and/or with inclination not exceeding 10° relative to the ground. Bryophytes were collected from tree trunks and tree bases. Coordinates of collecting sited were determined by Garmin eTrex 30 GPS navigator (Kaganov *et al.*, 2019). Samples were gathered in paper envelopes from wrapping paper. In total, 15 locations were examined. We take into account areas in the immediate vicinity of the riverbed. Total 360 samples were collected and identified. Mosses and liverworts were examined in the Laboratory of Plant Ecology and Geoecology of the Institute of Marine Geology and Geophysics Far Eastern Branch of the Russian Academy of Sciences (IMGG FEB RAS), using conventional methods of comparative morphology and anatomy. The names of mosses are given according to "Mosses of the southern Russian Far East, an annotated check-list" (Cherdantseva *et al.*, 2018). The names of liverworts are given according to "World checklist of hornworts and liverworts" (Söderström *et al.*, 2016). The samples are stored in the herbarium of nonvascular plants of IMGG FEB RAS (SAK).

RESULTS

In total, 72 species of bryophytes, including 62 mosses and 10 liverworts, were found on tree trunks in riparian forests of the middle part of Sakhalin, which is about 16% and 5%, respectively, of the total number of species known on Sakhalin.

The list of mosses and their phorophytic distribution patterns are given in Table 1. The table also includes species reported by Bakalin *et al.* (2012) for similar habitats in the middle part of Sakhalin. For the first time in riparian forests of the middle Sakhalin, we have identified 12 species of mosses. Previously, these species were recorded on stones and gravel substrates outside riparian forests (*Bartramia pomiformis*, *Bryum capillare*, *Fissidens bryoides*, *Oncophorus virens*, *Pseudoleskeella rupestris*) or in dark coniferous, stone birch, dwarf pine and other communities (*Hypnum cupressiforme*, *Pleurozium schreberi*, *Rhytidiadelphus triquetrus*, *Sciurohypnum starkei*). *Brachythecium mildeanum* was previ-

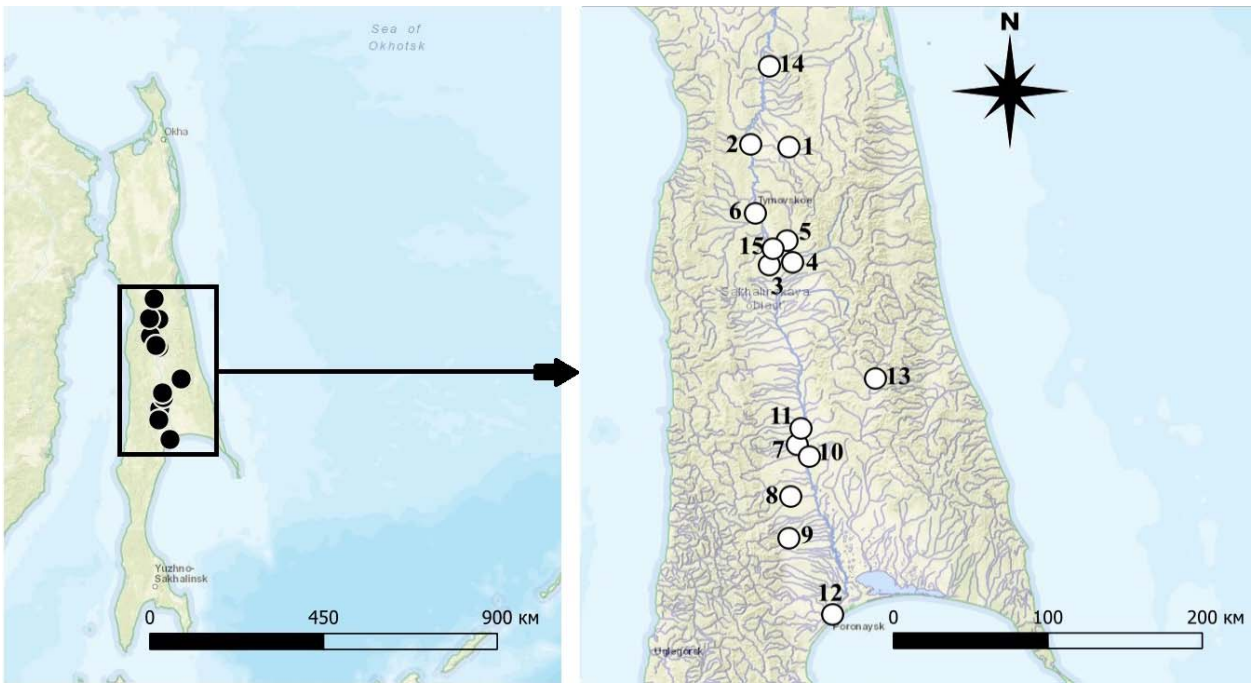

Fig. 1. Study area and site with epiphyte exploration.
1 – Pilenga River, community dominated by *Ulmus* spp. and *Populus maximowiczii,* 51°01'45"N – 142°50'33"E, 51°02'09"N – 142°49'41"E, 51°02'07"N – 142°49'26"E;
2 – Tym' River, near Krasnaya Tym', forest of *Fraxinus mandshurica* with significant participation of *Ulmus* spp., 50°46'48"N – 142°38'58"E;
3 – Tym' River, *Ulmus* spp. forest, 50°38'37"N – 142°45'59"E;
4 – Tym' River, high-stemmed forest of *Populus maximowiczii* with *Chosenia arbutifolia* and an admixture of *Alnus hirsuta* and *Salix udensis,* 50°38'47"N – 142°45'55"E, 50°38'51"N – 142°45'48", 50°38'48"N – 142°45'52"E;
5 – middle course of the river, near Slava village, mixed broad-leaved forest of *Fraxinus mandshurica* and *Ulmus* spp., an admixture of *Alnus hirsuta* and *Salix udensis,* 50°02'17"N – 142°37'16"E; 51°02'35"N – 142°36'40"E; 51°02'09"N – 142°37'15"E;
6 – Tym' River, forest of *Populus maximowiczii* with *Chosenia arbutifolia* and mixed *Ulmus* spp., 50°36'52"N – 142°50'41"E; 50°37'09"N – 142°49'53"E;
7 – Poronai River, middle course of the river, forest of *Populus maximowiczii* with *Salix udensis,* 49°54'15"N – 142°56'53"E, 49°54'24"N – 142°56'46"E;
8 – El'naya River, forest of *Populus maximowiczii* mixed with *Chosenia arbutifolia*, *Alnus hirsuta* and *Salix udensis,* 49°41'53"N – 142°51'06"E;
9 – Buyuklinka River, forest of *Ulmus* spp. with *Populus maximowiczii,* 49°32'13"N – 142°50'45"E, 49°31'13"N – 142°48'56"E;
10 – Poronai River, middle course of the river, forest of *Populus maximowiczii,* 49°51'59"N – 142°57'20"E; 49°50'52"N – 142°56'40"E;
11 – Poronai River, forest of *Populus maximowiczii* with *Salix udensis,* 49°56'12"N – 142°55'15"E, 49°55'35"N – 142°55'58"E;
12 – Leonidovka River, lower course of the river, near Poronaisk, forest of *Populus maximowiczii,* 49°13'58"N – 143°05'42"E;
13 – Beluga River, forest of *Populus maximowiczii,* 50°09'07"N – 143°20'58"E;
14 – Tym' River, forest of *Populus maximowiczii* with *Alnus hirsuta* and *Salix udensis,* near of Argi-Pagi village, 51°19'53"N – 142°43'47"E, 51°21'09"N – 142°41'50"E;
15 – Tym' River, near of Zonal'noe village, forest of *Ulmus* spp., 50°38'48"N – 142°45'53"E.

ously recorded only in swamps and damp grass meadows (Bakalin *et al.*, 2012). For a number of common species was not emphasized on tree trunks. This applies primarily to such common ground and epixylic species as *Brachythecium campestre*, *Climacium dendroides*, *Rhizomnium magnifolium* and *Tetraphis geniculata*.

Liverworts in riparian forest communities of the middle part of Sakhalin are much rarer, their findings in our samples are rare. All cited species are common on Sakhalin.

Discussion

A common species in riparian forests of the middle part of Sakhalin are *Anomodon thraustus*, *Anomodontella longifolia*, *Homalia trichomanoides*, *Neckera pennata* s.l., *Plagiomnium acutum* and *Pylaisia condensata*. With rare exceptions, they were found on all studied phorophytes. It should be noted that *Anomodon thraustus*, being a fairly common species in the southwest of Sakhalin, has not previously been recorded for its middle part. *Brachythecium* spp., *Lewinskya sordida*, *Plagio-*

Table 1. List of mosses and liverworts on tree species in the study area. The numbers indicate the collecting localities shown in Fig. 1.

Tree	*Populus maxim.*	Salix u.	Choseni	Alnus h	Frax. m.	Ulmus	Bakalin *et al.*, 2012
Species				Marchantiophyta			
Cephaloziella sp.	12	–	–	–	–	–	–
Frullania bolanderi	14	–	–	+	–	–	rw, st
Lophocolea heterophylla	12	–	–	14	–	–	tb, rw
L. minor	–	+	–	+	–	–	t, rw
Macrodiplophyllum plicatum	–	–	–	–	–	–	tb, rw, s
Plagiochila porelloides	7, 13	–	–	–	–	–	st
Porella fauriei	–	–	–	+	–	–	tb
P. grandiloba	1	–	–	–	–	1	tb
Ptilidium pulcherrimum	12	–	–	14	–	–	tb, rw
Radula complanata	6	–	–	–	–	6	t, st
				Bryophyta			
**Anacamptodon kamchaticus*	+	–	–	–	–	–	tb, w
A. latidens	+	–	–	+	–	–	t
Anomodon thraustus	6, 7, 8, 9	4, 7, 8	6	8, 9, +	2	1, 3, 5, 9, 15	t, w
Anomodontella longifolia	1, 5, 6, 7, 13, +	7, +	4	–	2, 5	1, 3, 5, 9, +	t, st
Anomodontopsis rugelii	1	–	–	–	–	1	t, st
**Aulacomnium heterostichum*	–	–	–	–	–	–	tb, s, st
**Bartramia pomiformis*	14	–	–	–	–	–	s, st, w
**Brachythecium buchananii*	–	–	–	–	–	15	t, st, w
**B. campestre*	7, 8	7, 8	4	–	–	5	s, w
**B. mildeanum*	7, 13	7	–	–	2	2	s
B. rotaeanum	6, 8, 14	8, 14	4	8	–	6	t, w
B. hultenii	–	–	–	–	–	–	tb, st, w
Bryoerythrophyllum recurvirostrum	–	–	–	–	–	–	tb, st, w
**B. rubrum*	+	–	–	–	–	–	tb
**Bryum capillare*	12	–	–	–	–	–	s, st
Callicladium haldanianum	12, +	–	–	+	–	+	tb, w
Campylidium sommerfeltii	–	–	–	–	–	–	tb, st
Climacium dendroides	4	–	–	–	–	–	s, st, w
**Cratoneuron filicinum*	+	–	–	–	–	–	t, s, st, w
**Dicranum* cf. *bonjeanii*	12	–	–	–	–	–	–
D. fuscescens	12	–	–	14	–	–	tb, w
D. majus	12	–	–	–	–	–	s, w
Fissidens cf. bryoides	7	–	–	–	–	–	s, st
Homalia trichomanoides	1, 6, 11, 14	14	–	–	2	1, 9	tb, st, w
**Hypnum cupressiforme*	–	14	–	–	–	–	t, s, st, w
Leskea polycarpa	–	–	–	14	–	–	t, tb, w
Leucodon sciuroides	1, 9, +	8	–	–	–	1, 9, 15	t
Lewinskya sordida	7, 14	7, 14	–	9	–	15	t
Mnium stellare	+	14	–	–	–	–	tb, s, w
Myuroclada longiramea	7, 8	7, 8	–	8	–	–	s, st
M. maximowiczii	7, 9	7	4	–	–	–	tb, st, w
Neckera pennata s.l.	1, 4, 6, 8, 9, 14	8	4	8	2	1, 3, 9, 15	t
Nyholmiella furcata	+	–	–	–	–	–	t
N. obtusifolia	+	+	–	–	–	–	t
**Oncophorus virens*	7, 10, 12	–	–	–	–	–	st
Plagiomnium acutum	4, 6, 8, 11, 14	8, 14	6	8	4	1, 3	tb, st, w
P. cuspidatum	7, 8	7, 8	–	8	–	5	tb, w
**P. drummondii*	+	–	–	–	–	–	tb, w
**P. rostratum*	–	–	–	–	–	–	tb, s, w
Plagiothecium cavifolium	12	–	–	–	–	5	tb, s
Platygyrium repens	+	–	–	–	–	–	t
**Pleurozium schreberi*	12	–	6	–	–	–	s, st, w
Pseudoleskeella nervosa	+	–	–	+	–	+	t, st
**P. rupestris*	7	–	–	–	–	–	st, w
Pylaisia condensata	1, 4, 6, 7, 8, 10, 14	14	5	–	2	1, 6	t
**P. falcata*	–	–	–	+	–	–	t
**P. obtusa*	1, 8	8	–	8	–	1, 5	t, SS
P. polyantha	6, 7, 14, +	7, 14	–	14	–	5, 6	t
P. subcircinata	–	–	–	–	–	–	t
Rauiella fujisana	8	8	–	–	–	–	tb, SS
**Rhizomnium magnifolium*	6	–	–	–	–	6	s, st, w
**Rhytidiadelphus triquetrus*	12	–	–	–	–	–	s, st, w
Sanionia uncinata	12	14	–	14	–	–	tb, s, st, w
**Sciuro-hypnum populeum*	7	7	–	–	–	–	tb, s, st, w
S. reflexum	6, 14, +	14	–	14	–	6	tb, s, st, w
S. starkei	7, 14	7	–	14	–	–	s, w
**Tetraphis geniculata*	12	–	–	–	–	–	rw, w
**Timmia bavarica*	4, +	–	–	–	–	–	tb, s, st
T. megapolitana	+	–	–	–	–	–	tb
**Ulota drummondii*	–	+	–	–	–	–	t
**U. intermedia*	7, +	+	–	–	–	–	t
Zygodon sibiricus	+	+	–	–	–	–	t
Total number of species	58	25	9	23	6	23	72

Note. "+" – recorded by Bakalin *et al.* (2012); *"SS"* – species recorded in the southern part of Sakhalin Island; *"rw"* – rotting wood; *"w"* – windfall, *"s"* – soil, *"tb"* – tree bases, *"t"* – tree trunks, *"st"* – stone. Asterisk (*) indicates species that were not found in riparian forests on tree trunks in the southern part of Primorsky Territory and Kamchatka

mnium cuspidatum, *Pylaisia polyantha, Sciuro-hypnum reflexum,* and *Leucodon sciuroides* are found slightly less frequently (recorded on more than half of phorophytes). The latter species is known only in the middle part of Sakhalin, where it is confined to riparian forests of *Populus maximowiczii*. Previously, it was indicated only for *Populus maximowiczii*, we also found it on *Salix udensis* and *Ulmus* spp. According to Bakalin *et al.* (2012), *Anacamptodon kamchaticus*, *A. latidens*, *Brachythecium hultenii*, *Campylidium sommerfeltii*, *Nyholmiella obtusifolia*, *Platygyrium repens*, *Pseudoleskeella nervosa*, *Pylaisia subcircinata*, *Ulota drummondii* and *Zygodon sibiricus* are also common species on tree trunks in riparian forests. But these species were not found in our collections. Findings of 20 moss species in riparian forests of the middle part of Sakhalin are rare (*Anomodontopsis rugelii*, *Brachythecium buchananii*, *Dicranum* spp., *Hypnum cupressiforme*, *Mnium stellare*, *Rauiella fujisana*, *Sciuro-hypnum populeum*, *Tetraphis geniculata*, *Timmia bavarica*, etc.). Some of them are rare species on the island. For example, *Fissidens* cf. *bryoides* – in our material, the species is recorded for the first time in the study area. *Mnium stellare*, *Pseudoleskeella rupestris* and *Timmia bavarica* were reported from only two or three points in the area. Some species rare in riparian forests are more common in other communities and ecotopes on Sakhalin (*Bartramia pomiformis*, *Bryum capillare*, *Climacium dendroides*, *Hypnum cupressiforme*, *Pleurozium schreberi*, *Pseudoleskeella rupestris*, *Rhizomnium magnifolium*, *Rhytidiadelphus triquetrus*, *Tetraphis geniculata*).

On trunks of *Populus maximowiczii*, 58 species were recorded – 80.5% of the total number of recorded species. Exclusively on *Populus* trunks, 2 liverworts and 18 moss species were collected. On *Salix udensis*, 25 species were collected, among them two specific (*Hypnum cupressiforme, Ulota drummondii*). *Alnus hirsuta* and *Ulmus* spp., have 23 species, with 2 specific species (*Porella fauriei, Leskea polycarpa* and *Brachythecium buchananii*). For *Chosenia arbutifolia* and *Fraxinus mandshurica*, 9 and 6 species were noted. For comparison, in the southern Primorsky Territory, *Ulmus* spp. turned out to have the highest number of epiphytes, 37 moss species (Bardunov & Cherdantseva, 1982).

The abundance of particular species of poplar seems is not explained by some exceptional properties of its bark. According to results of Bardunov & Cherdantseva (1982) and Chernyadieva (2012), the development of epiphytic moss-lichen cover on deciduous trees does not depend much on the tree species, but rather on the age of the tree and its inclination angle. The older is the tree, the greater its circumference, the greater the surface area of the substrate, the more the bark of the tree becomes cracked and filled with fine soil. This creates a variety of substrates for colonization by other organisms, including bryophytes. *Populus maximowiczii* is a widespread species in riparian forests of the middle part of Sakhalin, often forms monodominant communities, or participates as an admixture in many types of riparian forests. This is the most common species in the sample points studied by us. *Ulmus* spp., *Alnus hirsuta*, *Salix udensis* and even more so *Chosenia arbutifolia* and *Fraxinus mandshurica* are noted in much smaller numbers.

The forest of *Populus maximowiczii* with *Alnus hirsuta* and *Salix udensis* in riparian of the Tym' River (near Argi-Pagi settlement) turned out to be the richest point in terms of the number of species (point 14 in Fig. 1). We have noted 18 species of bryophytes here. Points 7 and 12 are also rich (17 and 14 species, respectively). Fewer species (7–12) were found at points 1, 5, 6, 8 and 9. Except for points 1, 6 and 9, all these collection points are forests of *Populus maximowiczii*, as a rule, with insignificant participation of other species. Riparian forests with a significant participation or predominance of broad-leaved species (*Ulmus* spp., *Fraxinus mandshurica*) (collection points 1, 2, 5, 6, 9, 15) turned out to be quite poor, 4–10 species were recorded in them. Based on our material, it is not possible to trace the relationship between the species composition of the forest stand and the number of bryophytes in the sample plot. This issue requires further study.

In comparison with the similar riparian bryoflora of Kamchatka (74 moss species on trunks and trunk bases – Chernyadjeva, 2012) and the epiphytic bryoflora of riparian forests in the southern part of Primorye (64 species of mosses, only on those species that were studied on middle Sakhalin – Bardunov & Cherdantseva, 1982) moss flora of riparian forests of the middle part of Sakhalin looks poorer. However, it should be taken into account that we are talking about territories that are not comparable in area, where the middle part of Sakhalin is the smallest territory. But the presence of 25 species of mosses, which have not yet been identified in similar plant communities on tree trunks either in Kamchatka or in the southern part of Primorye, indicate the specificity of the flora of riparian forests of the middle part of Sakhalin (marked with an asterisk in Table 1).

In the adjacent territories of the Russian Far East – Kamchatka and the southern part of Primorye in deciduous riparian forests on tree trunks 74 and 64 species are known, respectively. The species in common between Kamchatka and the middle part of Sakhalin are 28 (45%) and between southern Primorsky Territory 26 (41%). Such a percentage indicates a low degree of similarity of the studied moss flora of the middle part of Sakhalin with similar bryofloras of Kamchatka and the southern part of Primorye.

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