

## LIVERWORTS OF THE ILYCH RIVER VALLEY (KOMI REPUBLIC)

### ПЕЧЕНОЧНИКИ РЕКИ ИЛЫЧ (РЕСПУБЛИКА КОМИ)

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Abstract

An annotated list of liverworts of the Ilych River is provided. It includes 83 species and two varieties of one subspecies, of which 24 species and one variety are new to the study area. *Cephaloziella elegans* and *Cephaloziella arctogena* are first cited for the flora of the Republic of Komi. Five new sites are identified for species included in the Red Book of the Komi Republic: *Arnellia fennica*, *Cephalozia macounii*, *Heterogemma laxa*, *Lophozia ascendens*, *Oleolophozia perssonii*. The distribution range and ecology of rare taxa, formerly known for the republic at individual points are extended.

Резюме

Приводится аннотированный список печеночников долины р.Илыч, включающий 83 вида, 2 разновидности и 1 подвид, из них 24 вида и 1 разновидность являются новыми для территории исследования. *Cephaloziella elegans* и *Cephaloziella arctogena* впервые указываются для флоры Республики Коми. Выявлены новые местонахождения пяти видов, включенных в Красную книгу Республики Коми: *Arnellia fennica*, *Cephalozia macounii*, *Heterogemma laxa*, *Lophozia ascendens*, *Oleolophozia perssonii*. Расширено представление о распространении и экологии редких таксонов, приводившихся ранее для территории Республики Коми из единичных точек.

KEYWORDS: flora, liverworts, rare species, Ilych River, Komi Republic.

#### INTRODUCTION

The Ilych is a river in the Republic of Komi (Troitsko-Pechersky region), a tributary of the Pechora River. It originates in the western spur of the Northern Urals from a mire at the foot of the ridge Timaiz. The basin is almost entirely situated on the slopes of the Urals, so the river has a variable mountain-type regime and relatively high water content. The river is 411 km long and its basin area is 16 000 km<sup>2</sup>. In the upper reaches, it flows south, then it turns west. The bank in its upper reaches is low, and the stream is extremely tortuous. In its middle reaches the Ilych has a deep valley with steep, rocky cliffs. There are different types of exposed Paleozoic rocks represented by black carbonaceous limestone and dolomite, as well as calcareous and carbonaceous calcareous shales. In the lower reaches the river enters the Pechora lowland, where the valley widens to 4-5 km. Along the left bank of the river, the Pechora-Ilych State Biosphere Reserve is situated (Lavrenko *et al.*, 1995; Stolpovskii, 1999).

#### RESEARCH HISTORY OF THE ILYCH VALLEY LIVERWORTS

First data on liverworts of the Ilych River appeared in the geobotanic publication of Korchagin (1940), who listed five widespread species: *Barbilophozia lycopodioides*, *Gymnocolea inflata*, *Mylia anomala*, *Plagiochila porelloides*, *Ptilidium ciliare*. Vorobjev (1983) added one more species, *Ptilidium pulcherrimum*.

Special briofloristic studies in the Ilych area started in 1989, headed by G.V. Zheleznova. Basing on this exploration, Zheleznova & Shubina (1997, 1998) published their results, which were supplemented by collections of geobotanists from V.L. Komarov's Botanical Institute (gathered in 1973 at the Upper Ilych River, environs of Kychil-Iz, the Yaranpasael River, by M.S. Boch, V.I. Vasilevich, and T.V. Bibikova). The latter collections were transferred to the herbarium SYKO, where they are presently kept. These publications include 27 liverworts species, met in the Ilych River basin: *Barbilophozia barbata*, *B. hatcheri*, *Blasia pusilla*, *Blepharostoma trichophyllum*, *Calypogeia muelleriana*, *C. sphagnicola*, *Cephalozia lunulifolia*, *C. pleniceps*, *Conocephalum conicum*, *Diplophyllum taxifolium*, *Gymnocolea inflata*, *Leiocolea collaris*, *L. rutheana*, *Lepidozia reptans*, *Lophocolea minor*, *Lophozia longidens*, *Lophozia ventricosa* var. *longiflora*, *Mylia anomala*, *Orthocaulis attenuatus*, *O. binsteadii*, *O. floerkei*, *Pellia neesiana*, *Plagiochila porelloides*, *Scapania curta*, *S. irrigua*, *S. paludicola*, *Tetralophozia setiformis*. Six species from this list have only generalized specimen label data, and it is not clear whether they occur in the study area or somewhat outside it. However, the following specimens presented in the SYKO were further included into the list: *Barbilophozia lycopodioides*, *Lophozia silvicola*, *Ptilidium ciliare*, *Marchantia polymorpha* subsp. *ruderalis*,

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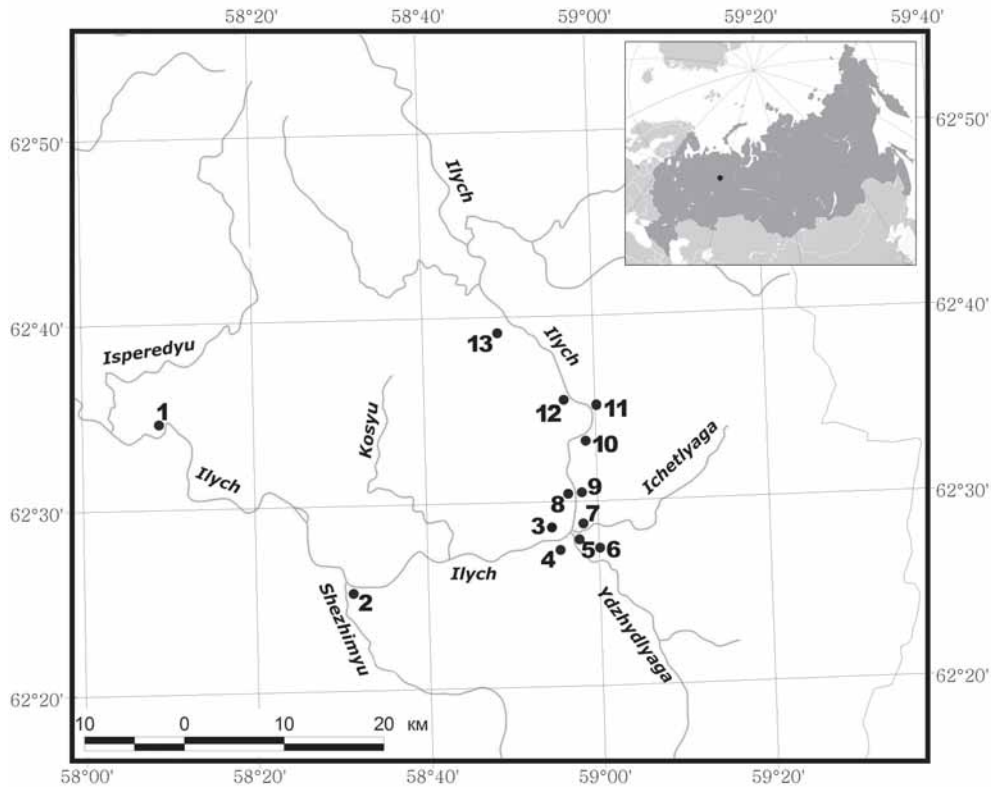


Fig. 1. Main collection sites in the Ilych River basin.

*Schljakovia kunzeana*, *Ptilidium pulcherrimum*. Alternatively, *Calypogeia trichomanis* and *Sphenobolus cavifolius* were excluded, as they were re-determined by R.N. Shljakov and V.A. Bakalin correspondingly.

Later, Bakalin *et al.* (2001) reidentified and published an additional list of 31 species and 1 variety from the same collection: *Anastrophyllum michauxii*, *Athalamia hyalina*, *Blasia pusilla*, *Blepharostoma trichophyllum*, *Calypogeia muelleriana*, *Cephalozia bicuspidata*, *Cephalozia rubella*, *Chiloscyphus pallescens*, *Jungermannia eucordifolia*, *Leiocolea badensis*, *L. bantriensis*, *L. heterocolpos*, *Lophocolea heterophylla*, *Lophozia silvicola*, *L. ventricosa*, *L. ventricosa* var. *longiflora*, *Marchantia polymorpha* subsp. *montivagans*, *Nardia geoscyphus*, *Pellia endiviifolia*, *P. neesiana*, *Plectocolea hyalina*, *Preiszia quadrata*, *Ptilidium ciliare*, *P. pulcherrimum*, *Reboulia hemisphaerica*, *Scapania praetervisa*, *S. scandica*, *Schistochilopsis incisa*, *Solenostoma confertissimum*, *S. sphaerocarpum*, *Tritomaria exsectiformis*, *T. scitula*. His list includes several more species with generalized label data only, they were also confirmed by specimens from the SYKO: *Harpanthus flotovianus*, *Lophozia guttulata*, *L. wenzelii*, *Radula complanata*, *Scapania subalpina*, *S. undulata*, *Sphenobolus minutus*, *S. saxicola*, *Tritomaria quinqueidentata*. Our recent study of herbarium collections has revealed also *Calypogeia integristipula*, *Lophozia excisa*, *Lophozia wenzelii* var. *groenlandica*, and *Obtusifolium obtusum*. Their label data are cited in the list below. Summing up the previous literature and herbarium data, 68 species and one subspecies of liverworts had been known in the study area before our research.

#### MATERIAL AND METHODS

Our field work in the Ilych River area was conducted in 2003. Twenty four localities were thoroughly studied for the liverwort flora, and 359 samples of liverworts were collected. In addition to our own specimens, we determined 56 liverwort samples collected by A.A. Kustysheva (Institute of Biology, Komi Scientific Center) in 2004 around the cordon Shezhimdikost (loc. 2 in Fig. 1). All collections are deposited in SYKO.

Species in the list below are annotated by the presence of structures associated with reproduction (gem. – gemmae; per. – perianthia or pseudoperianthia; andr. – androecia; gyn. – gynoecia; spor. – sporophytes; fem. re. – female receptacle; m. re. – male receptacle), collection point (numbers follow Fig. 1), habitat and substrate. Taxa new to the area are marked with \*, new to the Komi Republic – \*\*, included in the Red Data Book of the Republic of Komi (2009) – <sup>R</sup>. The nomenclature of liverworts follows Konstantinova, Bakalin *et al.* (2009).

Collection sites: **1** – 5.5 km east of the mouth Ispereydu River, right bank of the Ilych River, rock Lek-Iz (62°34'N – 58°09'E) (here and below we provide numbers of the field bryoflora description – 322mvd); **2** – collections of A.A. Kustysheva (2004), mouth of the Shezhimyu River, near Shezhimdikost cordon (62°25'N – 58°30'E); **3** – right bank of the Ilych River (62°29'N – 58°53'E); **3A** – 2 km west from the Ichetlyaga River mouth, lower slopes of the Valgan-Chugra elevation (335mvd), **3B** – 5 km to the northwest from the Ichetlyaga mouth, peak of Valgan-Chugra elevation, southeastern slope (336mvd); **4** – left bank of the Ilych River, 3.5 km to the southwest from the

Ichetylyaga mouth, Ljaga-Chugra elevation (62°27'N – 58°54'E) (344mvd and 345mvd); **5** – left bank of the Ilych River, right bank of the Ydzhydlyaga river, 1.5 km to the south-southeast from the Ichetylyaga mouth (62°27'N – 58°58'E) (342mvd and 343mvd); **6** – left bank of the Ilych River, Sibirjakovsky Road (62°28'N – 58°58'E): **6A** – 1.5 km southeast from the Ichetylyaga mouth (339mvd), **6B** – 2 km southeast from the Ichetylyaga mouth (340mvd), **6C** – 3 km to the southeast from the Ichetylyaga mouth (341mvd); **7** – left bank of the Ilych River, right bank of the Ichetylyaga river (62°28'N – 58°58'E): **7A** – 500 m upstream from the mouth (332mvd), **7B** – 500 m north-east from the Ichetylyaga mouth (334mvd), **7C** – 1.5 km to the north-east-east from the Ichetylyaga mouth (333mvd); **8** – 4 km to the north from the Ichetylyaga mouth, right bank of the Ilych River (62°31'N – 58°57'E) (325mvd); **9** – 4-5 km to the north from the Ichetylyaga mouth, left bank of the Ilych River (62°31'N – 58°57'E) (323mvd, 324mvd, 326mvd); **10** – 9 km to the north from the Ichetylyaga mouth, left bank of the Ilych River (62°33'N – 58°59'E) (327mvd); **11** – 12 km to the north from the Ichetylyaga mouth, left bank of the Ilych River (62°35'N – 58°60'E) (328mvd); **12** – 12.5-13.5 km to the north from the Ichetylyaga mouth, right bank of the Ilych River (62°35'N – 58°57'E) (329mvd, 330mvd, 331mvd); **13** – right bank of the Ilych River, 20-21 km to the north-northwest from the Ichetylyaga mouth (62°38'N – 58°45'E): **13A** – at the foot of Ebelyiz Mountain (337mvd), **13B** – tops and northeastern slopes of Ebelyiz Mountain (338mvd).

## ANNOTATED LIST OF SPECIES

- Anastrophyllum michauxii* (F.Weber) H.Buch (andr., per.) – 6B: on large logs in a hollow in spruce-birch greenmoss forest.
- \* *Aneura pinguis* (L.) Dumort. – 9: stream valley, on wet fine earth under a hanging rock on its northern side.
- \*<sup>R</sup> *Arnellia fennica* (Gottsche) Lindb. (andr., gyn.) – 1: on lateral surfaces of wet boulders.
- Athalamia hyalina* (Sommerf.) S.Hatt. (andr., gyn.) – 1, 9: at fine earth in the grotto, on rock ledges and steep west side of rocks.
- Barbilophozia barbata* (Schmidel ex Schreb.) Loeske – 1, 2, 4, 7C, 9, 12: on soil and tree butts in spruce, fir-spruce and mixed forests; on ledges of rocks and stones on screes facing north, northwest, south-east; on rocks on the stream bank in a rocky gorge; on ground on the trail edge in a birch greenmoss forest.
- B. hatcheri* (A.Evans) Loeske (gem.) – 3B, 4, 12, 13B: on decaying wood of spruce-fir and birch-spruce forests; in the shade between stones in the shrub-lichen tundra and rocky glade in birch-spruce grassy-greenmoss forest.
- B. lycopodioides* (Wallr.) Loeske – 2, 3A, 3B, 9, 12: on ground, sometimes on stones and rotten wood in spruce and spruce-fir forests; on wet surfaces of ledges of north-faced rocks in the stream valley; on soil and rocks along the bank of forest stream; on rocky soil of scree slope in mixed grassy-greenmoss forest.
- Blasia pusilla* L. (gem.) – 2, 8: on floodplain grassy-graminaceous and mixed-horsetail meadows; on moist soil along the bank of the river and rocky soil of scree slope in mixed grassy-greenmoss forest.
- Blepharostoma trichophyllum* (L.) Dumort. (andr., per., spor.) – 2, 4, 3B, 6A, 7A, 9, 12, 13A: on rotting wood and stones in spruce-fir, birch-spruce, pine and mixed forests; on wet ledges and vertical surfaces of rocks facing north or north-west; on soil, stones and rotten wood along forest streams; on rocks on scree eastern slope and on grass-horsetail-moss riverside.
- \* *B. trichophyllum* var. *brevirete* Bryhn & Kaal. – 12: on ledges of cliffs facing northwest in the valley of rapid stream.
- Calypogeia integristipula* Steph. (gem.) – 7: 0.5 km north-east-east from the mouth of the Ydzhydlyaga River, left bank of Ichetylyaga River on soil at the bottom of overgrowing coastal slope, together with *Cephalozia bicuspidata*, 20.VI.1989 Zheleznova # 33766 [Zheleznova] {SYKO}; on rocks in a sparse spruce-fir forest with *Pinus sibirica* on south-eastern slope of hill; on rotting wood and pine tree butts in *Eriophorum-Sphagnum* pine forest; on rotting wood in birch-spruce grassy-greenmoss forest.
- C. muelleriana* (Schiffn.) Müll. Frib. – 3B, 6A, 6C, 13A: on rocks in a sparse spruce-fir forest with *Pinus sibirica*; on rotting wood in the spruce-fir fern forest; on pine butts and rotten wood in *Eriophorum-Sphagnum* pine forest; on soil among mosses and on rotting wood on transitional *Carex-Sphagnum* bog afforested by sparse pine and birch.
- C. sphagnicola* (Arnell & J.Perss.) Warnst. & Loeske – 6C: on soil among moss on transitional *Carex-Sphagnum* bog afforested by rare pine and birch.
- \* *C. suecica* (Arnell & J.Perss.) Müll. Frib. – 6C: on rotting wood on transitional *Carex-Sphagnum* bog afforested by rare pine and birch.
- Cephalozia bicuspidata* (L.) Dumort. (andr., per., spor.) – 6A, 6B, 7B: on soil on the trail edge in the birch greenmoss forest; on rotting wood and pine rotten wood in *Eriophorum-Sphagnum* forest; on big logs in a hollow in spruce-birch greenmoss forest.
- C. lunulifolia* (Dumort.) Dumort. (andr., per., spor.) – 1, 2, 3A, 3B, 4, 6A, 6C, 7A, 9, 13A: on decaying wood and tree butts in spruce, spruce-fir, birch-spruce, pine and leaved mixed forests; on rocks in a sparse spruce-fir forest with *Pinus sibirica*, on rotting wood on transitional *Carex-Sphagnum* bog afforested by rare pine and birch and on scree in river valley.
- \*<sup>R</sup> *C. macounii* (Austin) Austin (per.) – 6C: on rotting wood on transitional *Carex-Sphagnum* bog afforested by rare pine and birch.
- C. pleniceps* (Austin) Lindb. (andr., per., spor.) – 10, 12: on soil between stones on bank of the river; on rocks on talus slope facing east in the valley of a rapid stream.
- \*\* *Cephalozia arctogena* (R.M.Schust.) Konstant. (andr.) – 3B: on rocks in a sparse spruce-fir forest with *Pinus sibirica* on south-eastern hill slope.
- \*\* *C. elegans* (Heeg) Schiffn. (andr., per.) – 6C, 7A, 12: on decaying wood in the coastal fir-spruce grassy-blueberry and birch-spruce greenmoss forests; on rotting wood on transitional *Carex-Sphagnum* bog afforested by rare pine and birch.
- C. rubella* (Nees) Warnst. (per., spor.) – 2: on decaying wood in the shrub-grassy spruce forest.
- Chiloscyphus pallescens* (Ehrh. ex Hoffm.) Dumort. var. *pall-*

- escens* – 2: on soil in floodplain grassy-gramineous and grassy-horsetail meadows.
- \* *C. polyanthos* (L.) Corda var. *polyanthos* – 2, 8, 9, 12: on soil and rocks along forest streams; on moist soil along river banks, floodplain meadows and pebble riverside; on rocky soil of scree slope in mixed grassy-greenmoss forest; in moist fine earth under a overhanging rock on its northern side in the valley of the stream.
- Conocephalum conicum* (L.) Dumort. – 2, 8: on moist soil in the coastal area along the bank of the river; on rocks of scree slope in grassy-fern spruce forest.
- \* *C. salebrosum* Szweyk., Buczk. & Odrzyk. – 9, 12: in the valley of the stream on wet fine earth under a overhanging rock on its northern side; on soil and rocks along the bank of forest stream.
- \* *Crossocalyx hellerianus* (Nees ex Lindenb.) Meyl. (per., spor., gem.) – 4, 6C, 7A, 12: on decaying wood in fir-spruce and birch-spruce shrub-greenmoss forests; on rotting wood on transitional *Carex-Sphagnum* bog afforested by rare pine and birch.
- \* *Crossogyna autumnalis* (DC.) Schljakov – 6A: on rotting wood in *Eriophorum-Sphagnum* pine forest.
- Diplophyllum taxifolium* (Wahlenb.) Dumort. (gem.) – 13B: in the shade between stones in the shrub-lichen tundra.
- Gymnocolea inflata* (Huds.) Dumort. (andr., per.) – 6A, 6B, 6C, 13B: in the shade between stones in the shrub-lichen tundra; on pine butts in *Eriophorum-Sphagnum* forest; on large logs in a hollow in spruce-birch greenmoss forest; on soil among mosses on transitional *Carex-Sphagnum* bog afforested by rare pine and birch.
- \* *Gymnomitrium concinatum* (Lightf.) Corda (spor.) – 13B: in the shade between stones in the shrub-lichen tundra.
- \*<sup>R</sup> *Heterogemma laxa* (Jürg.) Konstant. & Vilnet – 6C: on soil among moss on transitional *Carex-Sphagnum* bog afforested by rare pine and birch.
- \* *Isopaches bicrenatus* (Schmidel ex Hoffm.) H. Buch (per.) – 5: on slightly matted loamy soil steep slope of the river bank.
- \* *Jungermannia pumila* With. (andr., per., spor.) – 12: on soil and rocks along the bank of forest stream; rocks on a stream bank in a rocky gorge.
- Leiocolea badensis* (Gottsche) Jørg. (andr., per., spor.) – 7C, 9, 11: on ledges of steep rocks faced west, southwest, southeast and north.
- L. collaris* (Nees) Schljakov (andr.) – 9: on ledges of west-faced rock.
- L. gillmanii* (Austin) A. Evans (andr.) – 2: on rocky soil of scree slope in mixed grassy-greenmoss forest.
- L. heterocolpos* (Thed. ex C. Hartm.) H. Buch (andr., per., spor., gem.) – 2, 7A, 7C, 9, 12: on rocks and screes on afforested rocky slopes or on wet ledges of rock outcrops facing west, southeast, east, north; on rotting wood in lowland fir-spruce and birch-spruce forests; on soil, stones and rotten wood along forest streams.
- Lepidozia reptans* (L.) Dumort. (per., spor.) – 9, 12, 7A, 3A, 6A, 6C: on decaying wood in lowland spruce-fir, birch-spruce, mixed small-leaved forests; on rotting wood and pine butts in *Eriophorum-Sphagnum* pine forest; on rotting wood on transitional *Carex-Sphagnum* bog afforested by rare pine and birch.
- Lophocolea heterophylla* (Schrad.) Dumort. (andr., per., spor.) – 2, 4, 7B, 9, 10, 12, 13A: on decaying wood in spruce-fir, spruce, birch-spruce forests; on stones and rotting wood in birch-aspens dead-soil cover forest on the slope at the base of the cliff; on tree butts in the floodplain for birch-aspens forest; on soil between stones on the river bank; on soil on the trail edge in birch greenmoss forest.
- L. minor* Nees (per., gem.) – 1, 7C, 9: on ledges of west-faced rocks; on rocks at the base of rock outcrops facing southeast; on fine earth in a cave and on the side surfaces of wet boulders; on stones and fine earth inversion in birch-aspens dead-soil cover forest.
- \*<sup>R</sup> *Lophozia ascendens* (Warnst.) R.M. Schust. (per., spor., gem.) – 9: on decaying wood in birch-aspens dead-soil cover forest.
- L. guttulata* (Lindb. & Arnell) A. Evans (andr., per., spor., gem.) – 2, 3A, 3B, 4, 6A, 6C, 7A, 9, 12, 13A: on decaying wood in spruce-fir, spruce-birch, spruce, pine, mixed-leaved forests; on rotting wood on transitional *Carex-Sphagnum* bog afforested by rare pine and birch.
- L. silvicola* H. Buch (andr., per., spor., gem.) – 2, 3A, 3B, 4, 6A, 6C, 7A, 9, 12: on decaying wood of spruce, spruce-fir, spruce-birch, pine, mixed-leaved forests; on decaying wood and soil trails in *Eriophorum-Sphagnum* pine forest; on rotting wood on transitional *Carex-Sphagnum* bog afforested by rare pine and birch.
- L. ventricosa* (Dicks.) Dumort. (andr., per., spor., gem.) – 1, 2, 3B, 6A, 6B, 6C, 7B, 9, 13B: on decaying wood in spruce, spruce-fir, spruce-birch forests; on soil of the trail edge in the birch greenmoss forest; on rotting wood and pine tree butts in *Eriophorum-Sphagnum* pine forest; in the shade between stones in the shrub-lichen tundra; on soil among mosses and rotting wood on transitional *Carex-Sphagnum* bog afforested by rare pine and birch; in stream valley on wet surfaces of ledges of north-faced rocks; on rotting wood on the scree.
- L. ventricosa* var. *longiflora* (Nees) Macoun (andr., per., gem.) – 2, 4, 6A, 13B: in the shade between stones in the shrub-lichen tundra; on rotting wood and soil trails in *Eriophorum-Sphagnum* pine forest; in the shade between stones on the rocky glade in birch-spruce grassy-greenmoss forest; on stony ground of scree slope in mixed grassy-greenmoss forest.
- L. wenzelii* var. *groenlandica* (Nees) Bakalin (gem.) – 13B: upstreams of the Ilych River near mouth of Yaranpasael River, Kychil-Iz Mountain (~63°05'N – 58°39'E), dwarf birch-shrub-moss tundra together with *Schljakovia kunzeana*, 18.VII.1973 Bibikova # 13328 [Bibikova] {SYKO}, det. Bakalin; shade in between stones in the shrub-lichen tundra.
- Lophozia excisa* (Dicks.) Konstant. & Vilnet (per.) – 1, 9, 10, 12, 7A, 7C: upstreams of the Ilych River near mouth of Yaranpasael River (~63°05'N – 58°39'E), blueberry-greenmoss spruce forest, in moderately moist places, 9.VII.1973 Boch # 13320 [Boch] {SYKO}, det. Bakalin; through cracks and ledges on rock outcrops facing southeast, southwest, northwest; on rotting wood and stones on screes, on soil between stones on the river bank on the rotten wood of aspens in the coastal fir-spruce blueberry-greenmoss forest; on rotting wood in the greenmoss birch-spruce forest.
- L. longidens* (Lindb.) Konstant. & Vilnet (andr., per., spor., gem.) – 2, 3A, 3B, 4, 7A, 12: on decaying wood and butts of trees in spruce, spruce-fir, birch-spruce forests; on rot-

- ting wood in rocks and on screes; on rocks on bank of a stream in a rocky gorge.
- \* *L. propagulifera* (Gottsche) Konstant. & Vilnet (andr., per.) – 3B: on rocks in a sparse spruce-fir forest with *Pinus sibirica* on south-eastern hill slope.
- \* *Mannia pilosa* (Hornem.) Frye & L. Clark (fem. re.) – 9: on ledges of west-faced rocks.
- \* *M. triandra* (Scop.) Grolle (fem. re.) – 7C: on ledges of south-east-faced rock outcrops.
- Marchantia polymorpha* L. subsp. *montivagans* Bischl. & Boissel.-Dub. (fem. re., gem.) – 12: on soil and rocks along the bank of forest stream.
- M. polymorpha* L. subsp. *ruderalis* Bischl. & Boissel.-Dub. – 2, 4, 8, 9: on wet soil in the floodplain forb meadows, on the pebble waterfront and coastal strip of the river; on the soil in the spruce and birch-spruce forests; on rotting wood, on stones and fine earth inversion in birch-aspen dead-soil cover forest, the slope at the base of the cliff.
- \* *Marsupella condensata* (Ångstr. ex C. Hartm.) Kaal. – 13B: in the shade between stones in the shrub-lichen tundra.
- Mylia anomala* (Hook.) Gray (gem.) – 6A, 6C: on decaying wood and pine tree butts in *Eriophorum-Sphagnum* pine forest; on soil among mosses and rotting wood on transitional *Carex-Sphagnum* bog afforested by rare pine and birch.
- Nardia geoscyphus* (De Not.) Lindb. (andr., per., spor.) – 5: on slightly matted loamy soil on steep slope of the river bank.
- Obtusifolium obtusum* (Lindb.) S.W. Arnell – upstreams of Ilych River near mouth of Yaranpasael River (~63°05'N – 58°39'E), little-fern blueberry-greenmoss spruce forest, in the plain, on moderately moist soil, 13.07.1973 Bibikova # 13317 [Bibikova] {SYKO}, det. Bakalin.
- \*<sup>R</sup> *Oleolophozia perssonii* (H. Buch & S.W. Arnell) L. Söderstr., De Roo & Hedd. (per., gem.) – 7C: on ledges of south-east-faced rock outcrops.
- Orthocaulis attenuatus* (Mart.) A. Evans (andr., per., gem.) – 3A, 3B, 4, 6A, 6B: on decaying wood in spruce-fir and birch-spruce forests; on rotting wood and pine tree butts in *Eriophorum-Sphagnum* pine forest; in the shade between stones on the rocky glade in birch-spruce grassy-greenmoss forest.
- O. floerkei* (F. Weber & D. Mohr) H. Buch – 3B, 13B: on rocks in a sparse spruce-fir forest with *Pinus sibirica* on south-eastern hill slope; in the shade between stones in the shrub-lichen tundra.
- Pellia endiviifolia* (Dicks.) Dumort. (andr., gyn., per.) – 2, 8: on moist soil in the coastal area along the bank of the river; on rocky soil of scree slope in mixed grassy-greenmoss forest.
- P. neesiana* (Gottsche) Limpr. (per., spor.) – 2, 5, 10, 12: on moist soil and rocks on the banks of the river and the forest streams; on moist soil of floodplain grasslands.
- \* *Plagiochila asplenioides* (L.) Dumort. – 3A, 4: on soil in the spruce-fir fern and spruce-birch grassy-greenmoss forests.
- P. porelloides* (Torr. ex Nees) Lindenb. (per.) – 2, 3B, 4, 5, 7A, 10, 12: on moist soil and rotting wood of spruce, birch-spruce, spruce forests; in moist soils and rocks on the banks of rivers and forest streams; on moist soil floodplain grasslands.
- Plectocolea hyalina* (Lyell) Mitt. – 2, 10: on soil between stones along the river bank and horsetail-grassy-moss pebble shoreline.
- Preissia quadrata* (Scop.) Nees (fem. re., m. re.) – 1, 2, 7C, 9, 10, 12: on ledges of west and south-east-faced rocks; on fine earth in the caves and in the base of the cliff; on rocks on forested talus slopes; on stones and wet soil on the banks of the river and streams.
- Ptilidium ciliare* (L.) Hampe – 2, 3B, 12, 13B: on rock ledges on the north-western slope of the valley of rapid stream; rocks in the thin spruce-fir forest with *Pinus sibirica*; between stones in the shade in shrub-lichen tundra.
- P. pulcherrimum* (Weber) Vain. (per., spor.) – 1, 2, 3A, 4, 6C, 7A, 9, 12: on decaying wood and rotten wood of trees in spruce, spruce-fir, birch-spruce and mixed small-leaved forests; on rotting wood on transitional *Carex-Sphagnum* bog afforested by sparse pine and birch; on rotting wood and lateral surfaces of wet boulder scree.
- Radula complanata* (L.) Dumort. (andr., per., spor., gem.) – 4, 9, 10: on trunks and butts of trees in old aspen in birch-aspen forest with dead-soil cover, spruce-fir fern and spruce-birch grassy-greenmoss forests.
- Scapania curta* (Mart.) Dumort. (andr., per.) – 2, 7B: on soil of the trail edge in the birch greenmoss forest; on rocky soil of scree slope in mixed grassy-greenmoss forest.
- S. cuspiduligera* (Nees) Müll. Frib. – 2: on rocky soil of scree slope in mixed grassy-greenmoss forest.
- \* *S. gymnostomophila* Kaal. (gem.) – 1, 7C, 9, 12: on rocks of screes and on ledges of north-, east- and south-east-faced rocks; on rocks along the stream bank in a rocky gorge.
- S. irrigua* (Nees) Nees (andr., per., spor., gem.) – 2, 6A, 10, 12: on wet soil floodplain meadows and pebble riverline; on soil between stones on bank of the river; on rocky soil and tree butts in mixed forests; on rotting wood on the bank of forest stream; on decaying wood and soil trails in *Eriophorum-Sphagnum* pine forest.
- \* *S. mucronata* H. Buch – 7A: on rotting wood in the greenmoss birch-spruce forest.
- S. paludicola* Loeske & Müll. Frib. – 6A, 6C: on soil of the trail in the *Eriophorum-Sphagnum* forest; on soil among moss on transitional *Carex-Sphagnum* bog afforested by rare pine and birch.
- S. subalpina* (Nees ex Lindenb.) Dumort. (per., gem.) – 2, 5, 10, 12: on wet soil floodplain meadows and pebble riverline; on ground and on rocks along the banks of rivers and streams.
- S. undulata* (L.) Dumort. (andr.) – 2: on the river bank.
- Schistochilopsis incisa* (Schrad.) Konstant. (andr., per., spor., gem.) – 3A, 4, 6A, 7A, 9, 12, 13A: on decaying wood in spruce-fir, birch-spruce, pine and mixed small-leaved forests; on rocks on the eastern slope talus in the valley of rapid stream.
- Schljakovia kunzeana* (Huebener) Konstant. & Vilnet – 4, 6A, 6B, 6C, 7B, 9, 13A, 13B: on decaying wood, tree butts, fine earth in the shade between stones, on soil of the trail edge in the birch-fir, spruce-fir, pine and birch forests; in the valley of the creek on wet ledges of north-faced rocks; in the shade between stones in the shrub-lichen tundra; on soil among mosses and rotting wood on transitional *Carex-Sphagnum* bog afforested by rare pine and birch.
- Schljakovianthus quadrilobus* (Lindb.) Konstant. & Vilnet (andr., per., spor.) – 12: on ledges of northwest-faced cliffs and on rocks on scree on eastern slope in the valley of a rapid stream; on rocks on the bank of a stream in a rocky gorge.
- Solenostoma confertissimum* (Nees) Schljakov (andr., per., spor.) – 10, 12: on soil between stones on a river bank; on

soil and stones on the bank of a forest creek.

*Sphenobolus minutus* (Schreb.) Berggr. (andr., per.) – 9, 13B: on rocks, on the talus at the base of rocks on western side; in the shade between stones in the shrub-lichen tundra.

*Tetralophozia setiformis* (Ehrh.) Schljakov – 13B: in the shade between stones in the shrub-lichen tundra.

*Tritomaria exsectiformis* (Breidl.) Loeske (per., spor., gem.) – 2, 6B, 6C, 7A on rotting wood in birch-spruce greenmoss forest; on large logs in a hollow in spruce-birch greenmoss forest; on rotting wood in grassy-sorrel-sedge spruce forest; on rotting wood on transitional *Carex-Sphagnum* bog afforested by rare pine and birch.

*T. quinquedentata* (Huds.) H. Buch (andr., per., spor.) – 1, 2, 4, 9, 12: on rocks and wet lateral surfaces of boulders on west- and east-faced screes; on wet ledges and steep surfaces of north-faced rocks; on rocks along the shore of the creek in a rocky gorge; in shade between stones on the rocky glade in birch-spruce grassy-greenmoss forest and on stones in birch-aspens dead-soil cover forest.

*T. scitula* (Taylor) Jørg. (andr., per., gem.) – 9, 12: on rocks on the west- and east-faced screes; on stones, rotten wood along forest streams; in the valley of the stream on wet surfaces and steep ledges of north-faced rocks; on rocks in birch-aspens forest with dead-soil cover.

#### RESULTS AND DISCUSSION

The present exploration revealed 83 species, 2 varieties and 1 subspecies of liverworts, of which 24 species and one variety are new for the Ilych River basin. The majority of newly discovered species is relatively widespread in the region: *Aneura pinguis*, *Calypogeia suecica*, *Chiloscyphus polyanthos*, *Crossocalyx hellerianus*, *Crossogyna autumnalis*, *Gymnomitron concinatum*, *Isopachetes bicrenatus*, *Jungermannia pumila*, *Lophozia propagulifera*, *Mannia pilosa*, *Schljakovianthus quadrilobus*, *Plagiochila asplenoides*, *Scapania gymnostomophila*, *Scapania mucronata*. Some taxa, including *Blepharostoma trichophyllum* var. *brevirete*, *Conoccephalum salebrosum*, *Mannia triandra*, are only recently found in the flora of the Komi Republic, so their distribution is still little known (Dulin, 2008; Andreeva, 2009).

*Marsupella condensata* is an arctic-montane disjunctive liverwort previously found in the Komi Republic only in Bolshezemel'skaya Tundra (Zheleznova, 1982). Two species, *Cephalozia elegans* and *C. arctogena*, are reported in the Komi Republic for the first time. Five species from the Ilych River valley are officially protected and included in the Red Data Book of the Komi Republic (Taskaev, 2009): *Arnellia fennica*, *Cephalozia macounii*, *Heterogemma laxa*, *Lophozia ascendens*, *Oleolophozia perssonii*. Four of the first-mentioned species (i.e. excluding only *Oleolophozia perssonii*), *Cephalozia elegans* and *Mannia triandra* are included in the list of protected bryophytes of Europe (Schumacker & Matriny, 1995).

#### ACKNOWLEDGEMENTS

The author is grateful to A.A. Kustysheva for the collection provided for the studies, V.M. Schanov for assistance in creating maps, and to S.V. Balina for the paper

translation. The study was partially supported by the RAS Program "World Life: Current State and Development", project No. 12-P-4-1018 «Specific, cenotic and ecosystem diversity of landscapes in the UNESCO World Heritage Site "Virgin Komi Forests"», and by the Russian Foundation for Basic Research (grant No. 12-04-01476).

#### LITERATURE CITED

- [ANDREJEVA, E.N.] АНДРЕЕВА Е.Н. 2009. Новые находки редких видов печеночников из регионов России. – [New rare liverwort records from Russian Federation Regions] *Arctoa* 18: 281-286.
- [BAKALIN, V.A., N.A. KONSTANTINOVA & G.V. ZHELEZNOVA] БАКАЛИН В.А., Н.А. КОНСТАНТИНОВА, Г.В. ЖЕЛЕЗНОВА 2001. К флоре печеночников Северного Урала (Республика Коми). – [On the liverwort flora of Northern Urals (Komi Republic)] *В кн.: Ботанические исследования на охраняемых природных территориях европейского северо-востока. Тр. Коми науч. центра УрО РАН, № 165. Сыктывкар* [In: *Botanicheskie issledovaniya na ohranяемых territoriyah evropejskogo severo-vostoka. Trudy Komi nauchnogo centra UrO RAN, No. 165, Syktyvkar*]: 200-207.
- [DULIN, M.V.] ДУЛИН М.В. 2008. Новые находки печеночников в республике Коми. 2. – [New liverwort records from Komi Republic. 2] *Arctoa* 17: 200-201.
- KONSTANTINOVA, N.A., V.A. BAKALIN et al. 2009. Checklist of liverworts (Marchantiophyta) of Russia – *Arctoa* 18: 1-63.
- [KORCHAGIN, A.A.] КОРЧАГИН А.А. 1940. Растительность северной половины Печоро-Ильчского заповедника. – [The vegetation of the northern half of the Pechora-Ilych Nature Reserve] *В кн.: Труды Печоро-Ильчского заповедника. Вып. 2. Москва* [In: *Trudy Pechoro-Ilychskogo zapovednika. Vyp. 2. Moskva*]: 416 pp.
- [LAVRENKO, A.N., ULLE, Z.G. & N.P. SERDITOV] ЛАВРЕНКО А.Н., УЛЛЕ З.Г., Н.П. СЕРДИТОВ 1995. Флора Печоро-Ильчского биосферного заповедника. – [The flora of Pechora-Ilych Biosphere Reserve] *Л., Наука* [Leningrad, Nauka]: 256 pp.
- SCHUMACKER, R. & PH. MATRINY 1995. Threatened bryophytes in Europe in Macronesia. – In: E. C. C. B. (ed.) *Red Data book of European bryophytes. Part. 2. Trondheim*, 29-193.
- [STOLPOVSKIY, P.M.] СТОЛПОВСКИЙ П.М. 1999. Республика Коми: Энциклопедия. – [The Komi Republic: Encyclopaedia] *Сыктывкар, Коми книжное издательство* [Syktyvkar, Komi Book Publishers], 576 pp.
- [TASKAEV, A.I.] ТАСКАЕВ А.И. 2009. Красная книга Республики Коми. – [Red Data Book of Komi Republic] *Сыктывкар, Коми республиканская типография* [Syktyvkar, Komi Republican Printing], 791 pp.
- [VOROB'YEV, YU.M.] ВОРОБЬЕВ Ю.М. 1983. Бриологические заметки. – [Bryological notes] *Москва, Ден. в ВИНТИ, № 6244-83* [Moscow, Msc. reserved in VINITI, № 6244-83]: 31 pp.
- [ZELEZNOVA, G.V.] ЖЕЛЕЗНОВА Г.В. 1982. Бриофлора юго-восточной части Большеземельской тундры. – [Bryoflora of southeastern part of Bolshezemel'skaya tundra] *В сб.: Споровые растения тундровых биогеоценозов. Сыктывкар, Ротапринт Коми филиала АН СССР* [In: *Sporovye rasteniya tundrovuyh biogeocenov. Syktyvkar, Rotaprint Komi filiala AN SSSR*]: 95-108.
- [ZELEZNOVA, G.V. & T.P. SHUBINA] ЖЕЛЕЗНОВА Г.В., Т.П. ШУБИНА 1998. Мохообразные Печоро-Ильчского заповедника. – [Bryophytes of Pechora-Ilych Reserve] *Флора и фауна заповедников. Вып. 65. Москва* [Flora i fauna zapovednikov. 65. Moscow]: 34 pp.
- [ZELEZNOVA, G.V. & T.P. SHUBINA] ЖЕЛЕЗНОВА Г.В., Т.П. ШУБИНА 1997. Бриофлора Печоро-Ильчского биосферного заповедника. – [Bryoflora of Pechora-Ilych Biosphere Reserve] *В кн.: Флора и растительность Печоро-Ильчского биосферного заповедника (ред. Дегтева, С.В.). Екатеринбург, Типография УрО РАН* [In: *Degteva, S.V. (ed.). Flora i rastitel'nost' Pechoro-Ilychskogo biosfernogo zapovednika. Ekaterinburg, Tipografija UrO RAN*]: 177-210.