Arctoa (2010) **19**: *165-170*

MOSSES OF MONCHEGORSK CITY (MURMANSK PROVINCE, NORTH-WEST RUSSIA)

МХИ ГОРОДА МОНЧЕГОРСК (МУРМАНСКАЯ ОБЛАСТЬ, СЕВЕРО-ЗАПАД РОССИИ)

TATYANA P. DRUGOVA[1]

ТАТЬЯНА П. ДРУГОВА[1]

Abstract

The list of mosses of Monchegorsk City is compiled for the first time, with 59 species included. Data on frequency of occurrence, presence of sporophytes or gemmae, habitats and substrates are provided. Peculiarities of Monchegorsk flora in comparison with the explored urban floras of the region are discussed. Rare in Murmansk Province mosses, *Aongstroemia longipes* (Somm.) Bruch et al. and *Warnstorfia pseudostraminea* (Müll.Hal.) Tuom. & T.J.Kop. were found in Monchegorsk.

Резюме

Впервые изучена бриофлора Мончегорска. Список мхов насчитывает 59 видов и содержит данные о частоте встречаемости, наличии спорофитов или выводковых почек, местообитаниях и субстратах. Обсуждаются особенности флоры мхов Мончегорска по сравнению с другими изученными урбанофлорами области. В Мончегорске зарегистрированы редкие в Мурманской области мхи: *Aongstroemia longipes* (Somm.) Bruch et al. и *Warnstorfia pseudostraminea* (Müll.Hal.) Tuom. & T.J.Kop.

KEYWORDS: Kola Peninsula, mosses, Russia, urban flora

INTRODUCTION

During 2004-2009 moss floras of four largest cities in Murmansk Province (Murmansk, Kirovsk, Apatity and Kandalaksha) were explored (Drugova, 2005, 2007, 2008). Investigation of Monchegorsk continues our special study of urban bryophytes in the region.

STUDY AREA AND VEGETATION

Monchegorsk (67°56'N – 32°54'W) is an industrial city of Cu-Ni production, it is situated in the western part of the Kola Peninsula (Fig.1). The city was established in 1937; it occupies an area of 33.4 km^2. «Severonickel» metallurgic enterprise located on the northern bank of the Nud'yavr Lake in the western part of Monchegorsk is the main industrial enterprise of the city and a source of atmospheric pollutant SO_2. The city soil is strongly polluted with Ni-Cu-Co compounds (Ecological atlas…, 1999).

Monchegorsk (130 m a.s.l.) is situated at the bottom of the northern slopes of the Monchetundra Mountains in the valley of the largest in Murmansk Province Imandra Lake.

The climate of the study area is continental (Yakovlev, 1961). The annual mean temperature is about –2° C. The average annual precipitation is 500-600 mm. The average number of frost-free days is about 70-80 (Atlas…, 1971).

The city is constrained by the banks of the lakes: the Lumbolka Lake in the north and north-west, the Imandra Lake in the north-east, east and south-east, the Nud'yavr Lake in south-west (Fig. 1). There is a natural canal in the north-east part of the city which joins the Lumbolka

[1] – Polar-Alpine Botanical Garden, Kola Sci. Centre, Russ. Acad. Sci., Kirovsk-6, Murmansk Province 184256 Russia – Россия 184256 Кировск-6 Мурманской области, Полярно-альпийский ботанический сад-институт КНЦ РАН; e-mail: darktanya@mail.ru

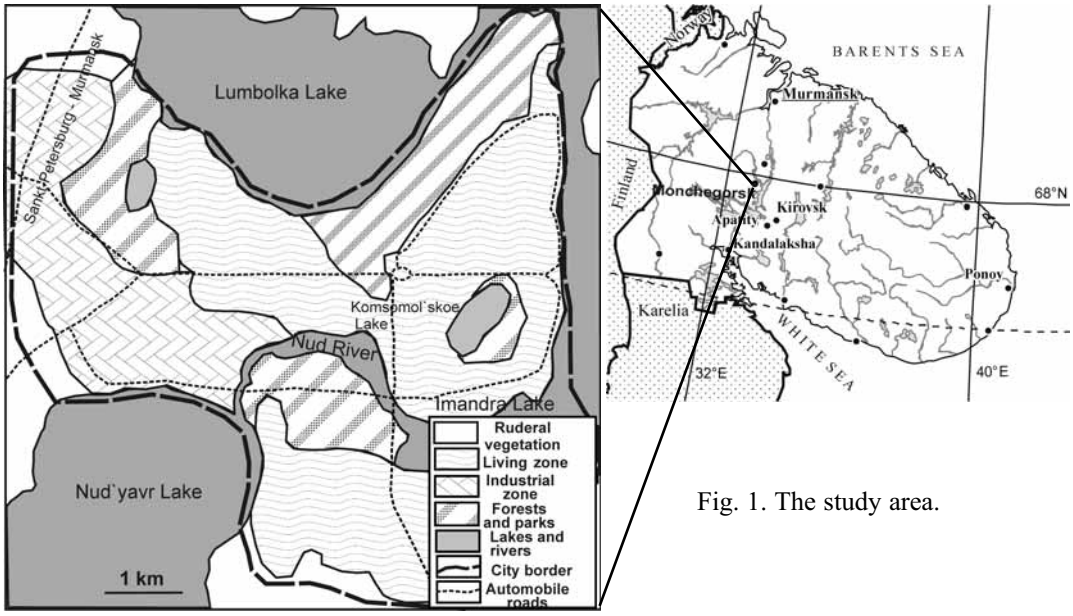

Fig. 1. The study area.

and Imandra Lakes. The Nud'yavr and Imandra Lakes are joined by the Nud River. Two relatively big lakes and a few pools are situated in Monchegorsk. There are no bogs and rock outcrops in Monchegorsk.

Monchegorsk is located within the northern taiga zone. Approximately 20% of the city territory is covered with forests and parks. Most of them are rather dry and composed of *Pinus sylvestris, Picea obovata*, *Betula pubescens*, *Salix phylicifolia*. Ground vegetation is formed by dwarf shrubs: *Vaccinium myrtillus*, *V. vitis-idaea*, *V. uliginosum* and *Empetrum hermaphroditum*. Moist mixed forests with *Ledum palustre*, *Betula nana*, *Equsetum* spp. are located within the northern and north-eastern parts of the city. Moist and flooded meadows and osier-beds of *Salix glauca*, *S. caprea*, *S. lapponum*, *S. myrsinifolia*, with *Carex* spp., *Juncus* sp., *Eriophorum* sp., *Rubus chamaemorus*, are situated along the south-eastern banks of Lumbolka Lake and banks of the canal. Most of hygrophites were found in these habitats. Plantings of *Populus tremula*, *Larix sibirica*, *Salix* spp., *Syringa* sp., *Spiraea salicifolia*, *S. chamaedryfolia*, *S. media* are also represented in the city.

METHODS

In total about 400 specimens were collected during August 2009. For the easily identified in the field species we registered all habitats without sampling. The city has been subdivided into 4 zones: living zone (L) comprises the built-up area and adjacent territories (yards, front gardens, flower-beds, roads, waste grounds); industrial zone (IZ) includes territories of enterprises; forest and park zone (FP) includes parks, forests, tree plantings; wet habitats (W) comprise territories along river and lake banks, river beds and lakes (Fig. 1). Within each zone all types of habitats and substrates were examined many times. More than 70% of area of L, FP and W zones was studied in details, whereas only a small part of IZ was investigated because of its inaccessibility. All collected specimens are deposited in KPABG.

ANNOTATED LIST OF MOSSES

The list comprises 59 species with distributional data (including city zones and habitats) and frequency of occurrence. Genera and species are given alphabetically. The nomenclature follows Ignatov, Afonina, Ignatova et al. (2006) for mosses and Cherepanov (1981) for vascular plants. After species names presence of sporophytes (S+) is indicated. Frequency of occurrence is scaled: Com (11-15 localities), Com-Sp (8-10), Sp (6-7), Sp-Rr (4-5), Rr (2-3) and Un (1). Habitats and substrates are listed, and collecting numbers are cited in brackets (all numbers for rare species and selected ones for common mosses).

Amblystegium serpens (Hedw.) Bruch et al.; S+ – **L, W** (Sp-Rr); **L**: building bases and walls of buildings; concrete; **W**: bank of Lumbolka Lake; concrete berth [6-43, 6-70, 6-88, 6-157].

Aongstroemia longipes (Somm.) Bruch et al.; S+ – **L, W** (Com); banks of lakes, open willow-beds, moist meadows, recreation lawns, eroded slopes, waste grounds, trails; exposed clay and peat soil and cracks of boulder [6-1, 6-19, 6-125, 6-133].

Aulacomnium palustre (Hedw.) Schwägr. – **FP** (Un): northern outskirts of Monchegorsk, open willow-beds; on moist soil [6-15].

Barbula convoluta Hedw.; S+ – **L** (Com), **W** (Un); waste grounds, roadsides, banks of Lumbolka Lake, trails, asphalted grounds; exposed or disturbed clayish soil, in cracks of boulder with fine soil [6-1, 6-85, 6-106, 6-107].

Brachythecium salebrosum (F.Weber & D.Mohr.) Bruch et al.; S+ – **W, FP, L** (Com); banks of lakes and river, forests, willow-beds, tree plantings, meadows, waste ground, lawns, trails, roadsides; rotten wood, soil, tree bases, concrete, asphalt [6-2, 6-6, 6-14, 6-15].

Bryum amblyodon Müll Hal.; S+ – **W** (Rr); bank of Nud River, moist meadow; on sandy soil near water among *Carex* sp. stems [6-9, 6-21].

B. argenteum Hedw.; S+ – **L** (Com), **W** (Rr); banks of lakes, constructions, buildings, building bases, lawns; exposed and disturbed soil, fine soil, asphalt, concrete, brick [6-23, 6-27, 6-28, 6-37].

B. caespiticum Hedw.; S+ – **L** (Rr); waste ground and yard; disturbed soil [6-107, 6-163].

B. creberrimum Taylor; S+ – **L** (Rr); roadside with *Poa* sp.; on soil bank; hospital territory, waste ground near buildings; on soil with debris [6-66, 6-106].

B. elegans Nees – **W, L** (Rr); **W**: bank of Lumbolka Lake; on sandy soil; **L**: lawn; on soil under *Trifolium pratense* and *Poa* sp. [6-11, 6-91].

B. intermedium (Brid.) Blandow; S+ – **W, L** (Rr); **W**: bank of Imandra Lake; eroded clayish soil; **L**: exposed clayish soil of trail. [6-53, 6-125]

B. lonchocaulon Müll. Hal.; S+ – **L, W** (Sp), **FP** (Un); banks of lakes, spruce-birch forest, waste ground, open willow-beds, constructions; soil and concrete [6-1, 6-19, 6-60, 6-84].

B. pallens Sw. ex anon.; S+. – **L, FP** (Rr); **L**: flooded willow stand with *Poa* spp. and *Equsetum pratense*; soil; **FP**: edge of pine-birch forest, open willow stand with *Betula nana* and *Eriophorum* sp.; wet soil [6-44, 6-138].

B. pallescens Schleich. ex Schwägr.; S+ – **L, W** (Sp); banks of Nud River, willow stand, open meadow in forest, waste ground, lawns, roadsides, trails; bare soil [6-8, 6-17, 6-24, 6-33].

B. pseudotriquetrum (Hedw.) P.Gaertn., B.Mey. & Scherb. – **W, L, FP** (Com); tree plantings, forests, willow stands, banks of lakes and river, lawns, moist meadows, yards, roadsides, trails, building bases; soil, asphalt, concrete, rotten wood, tree trunks and bases [6-28, 6-48, 6-57, 6-70].

B. purpurascens (R.Br.) Bruch et al.; S+ – **W** (Un); bank of Imandra Lake, on moist soil between boulders [6-143].

Calliergon cordifolium (Hedw.) Kindb. – **W** (Sp), **FP** (Rr), **L** (Un); banks of lakes, moist and flooded meadows, forests, willow plantings, ditches; soil, rotten wood [6-2, 6-46, 6-98, 6-104, 6-137].

C. giganteum (Schimp.) Kindb. – **L, W** (Rr); **L**: east outskirts of Monchegorsk, in ditch with water; on moist sandy soil; **W**: bank of Komsomol'skoe Lake; on wet soil between stems of *Carex* sp. [6-46, 6-72].

Ceratodon purpureus (Hedw.) Brid.; S+ – **L, FP, W, IZ** (Com); banks of lakes and river, tree plantings, forests, willow stands, yards, waste ground, roadsides, trails, buildings, building bases, lawns, ditches; soil, tree bases, rotten wood, concrete, asphalt, brick [6-2, 6-6, 6-8, 6-12].

Dicranella cerviculata (Hedw.) Schimp.; S+ – **L** (Un); exposed clayish soil [6-1].

D. grevilleana (Brid.) Schimp.; S+ – **L** (Sp), **FP, W** (Un); bank of Nud River, willow plantings, waste grounds, trails, roadsides; soil [6-32, 6-85, 6-114, 6-133].

D. schreberiana (Hedw.) Hilf. ex H.A.Crum & L.E. Anderson; S+ – **W, L** (Rr); **W**: bank of Lumbolka Lake; on boulder in cracks with fine soil; **L**: hospital territory; on trail, exposed clayish soil [6-65, 6-125].

Didymodon fallax (Hedw.) Zander.; S+ – **L** (Sp), **W** (Un); bank of Imandra Lake, recreation lawn, yards, waste ground, roadsides, trails; exposed soil [6-1, 6-28, 6-142, 6-160].

Drepanocladus aduncus (Hedw.) Warnst. – **W** (Sp-Rr); bank of Imandra Lake, flooded meadow; on moist soil between *Carex* sp. and *Eriophorum* sp. stems; banks of Komsomol'skoe Lake; on moist and flooded soil [6-40, 6-98, 6-147].

Funaria hygrometrica Hedw.; S+ – **L** (Com-Sp), **W** (Rr), **IZ** (Sp-Rr); bank of Lumbolka Lake, recreation lawns, constructions, waste ground, building bases, lawns, yards; soil, concrete [6-1, 6-75, 6-91, 6-120].

Hylocomium splendens (Hedw.) Bruch et al. – **FP** (Un); east outskirts of Monchegorsk, willow forest; on poorly turfed soil_with *Sciuro-hypnum* spp. and *Sanionia uncinata* [6-45].

Hymenoloma crispulum (Hedw.) Ochyra – **W** (Un); bank of Lumbolka Lake; on concrete block, in cracks [6-130].

Leptobryum pyriforme (Hedw.) Wils.; S+ – **L, W, FP, IZ** (Com); banks of lakes and river, lawns, moist

meadows, tree plantings, willow stands, forests, waste ground, roadsides, trails, ditches, lawns, buildings, constructions, building bases; soil, fine earth, concrete, asphalt [6-5, 6-9, 6-13, 6-16].

Philonotis fontana (Hedw.) Brid.; S+ – **W, FP** (Sp-Rr); **W**: banks of lakes and canal, flooded meadows; moist soil; **FP**: moist willow stand; on soil [6-74, 6-98, 6-122, 6-143].

Plagiomnium ellipticum (Brid.) T.J.Kop. – **FP** (Rr); north-east outskirts of Monchegorsk, willow forest, on poorly turfed soil; roadside, on soil among other mosses; willow plantings, on soil [6-15, 6-77, 6-94].

Pleurozium schreberi (Brid.) Mitt. – **W, FP** (Sp); **W**: bank of Lumbolka Lake; on rotten stump; **FP**: willow forests, pine forests, plantings of *Populus tremula* and *Salix* sp.; on soil and rotten wood [6-2, 6-26, 6-45, 6-172].

Pogonatum dentatum (Brid.) Brid.; S+ – **W** (Un); bank of Lumbolka Lake; on exposed soil between rocks [6-113].

Pohlia andalusica (Höhn.) Broth. – **L, FP** (Com), **W** (Rr); bank of Lumbolka Lake, forests, tree plantings, waste ground, ditches, lawns, roadsides, cracks in building bases and constructions; soil, fine soil, asphalt, concrete [6-5, 6-8, 6-12, 6-16].

P. andrewsii A.J. Shaw – **FP** (Rr); east outskirts of Monchegorsk, birch-spruce mossy forest near suburb settlement; on soil bank; tree plantings near «Laplandia» Hotel; on exposed soil [6-29, 6-86].

P. annotina (Hedw.) Lindb. – **L** (Un); hospital territory, waste ground; on clayish, poorly turfed soil [6-1].

P. drummondii (Müll. Hal.) A.L. Andrews – **L, FP, W** (Rr); **L**: hospital territory, waste ground; on clayish, poorly turfed soil; **FP**: *Populus tremula* plantings; on exposed soil; **W**: bank of Imandra Lake; on eroded soil near water [6-1, 6-175, 6-180].

P. filum (Schimp.) Mårtensson – **L, W, FP** (Com); banks of lakes and river, flooded meadows, tree plantings, willow stands, yards, lawns, waste grounds, ditches, roadsides, trails, lawns, building bases, constructions; soil, concrete, fine soil [6-1, 6-9, 6-13, 6-16].

P. lescuriana (Sull.) Ochi; S+ – **W** (Un); banks of Nud River, open willow stand; on soil under *Trifolium pratense*, *Equsetum pratense* and *Carex* sp [6-24].

P. ludwigii (Spreng. ex Schwägr.) Broth. – **L, W** (Rr); **L**: waste ground with willows; on moist clayish soil between *Juncus* sp. hummocks; **W**: bank of Lumbolka Lake; in cracks of boulder [6-19, 6-117].

P. nutans (Hedw.) Lindb.; S+ – **W, FP, L** (Com); forests, willow stands, tree plantings, banks of lakes and river, meadows, waste ground, lawns, trails, roadsides, building bases; rotten wood, soil, stones, tree bases, trunks, concrete, asphalt [6-2, 6-3, 6-25, 6-26].

P. proligera (Kindb.) Lindb. ex Broth. – **W, FP, L** (Com); banks of lakes and river, lawns, meadows, tree plantings, willow stands, constructions, building bases, yards, waste ground, ditches, roadsides, trails, lawns; soil, rotten wood, tree bases, concrete, asphalt, fine soil, boulders and stones [6-5, 6-6, 6-12, 6-13].

Polytrichastrum alpinum (Hedw.) G.L.Sm. – **W** (Un); bank of Lumbolka Lake; on exposed soil between stones along coastal line [6-113].

Polytrichum commune Hedw. – **W, FP** (Sp); banks of Lumbolka Lake and canal, flooded meadows, open forests, moist willow stand; soil, stump base, and hummocks [6-4, 6-73, 6-99, 6-113, 6-118].

P. juniperinum Hedw. – **FP** (Un); willow forest with grass cover; on soil with *Cladonia* spp. [6-153].

P. strictum Brid. – **FP, W** (Rr); **FP**: north outskirts of Monchegorsk, spruce-birch forest with dwarf shrubs; on soil; **W**: bank of Lumbolka Lake, flooded meadow with *Carex* sp. and *Eriophorum* sp.; moist soil. [6-136, 6-182].

Rhizomnium pseudopunctatum (Bruch & Schimp.) T.J. Kop. – **FP** (Rr); east outskirts of Monchegorsk, moist willow stand; on soil, north outskirts of Monchegorsk, willow forest; on moist soil [6-49, 6-152].

Sanionia uncinata (Hedw.) Loeske; S+ – **W, FP** (Com.); **L** (Sp); banks of lakes and river, flooded meadows, lawns, willow stands, forests, tree plantings, trails, roadsides, ditches, constructions, building bases; tree bases, rotten wood, soil, concrete [6-2, 6-7, 6-23, 6-45].

Sciuro-hypnum curtum (Lindb.) Ignatov; S+ – **FP, L** (Com); forests, willow stands, tree plantings, lawns; tree bases, stones, soil, rotten wood [6-3, 6-7, 6-10, 6-11].

S. reflexum (Starke) Ignatov & Huttunen; S+ – **W, FP, L** (Com); banks of lakes and river, meadows, forests, willow stands, tree plantings, recreation lawns; rotten wood, soil, tree trunks and bases, stones, brick, concrete [6-2, 6-6, 6-12, 6-187].

S. starkei (Brid.) Ignatov & Huttunen; S+ – **W, FP, L** (Com); banks of lakes and river, forests, willow stands, lawns, tree plantings, trails; tree bases and trunks, stones, soil, rotten wood [6-2, 6-7, 6-10, 6-12].

Scorpidium revolvens (Sw. ex anon.) Rubers; S+ – **W** (Sp-Rr); banks of Lumbolka Lake and canal, flooded meadows with *Betula nana*, *Eriophorum* sp., *Carex* sp.; on moist soil [6-4, 6-73, 6-97, 6-184].

Sphagnum capillifolium (Ehrh.) Hedw. – **FP** (Un); northern part of Monchegorsk, wet spruce-birch forest with dwarf shrubs, *Carex* sp. and *Equsetum* sp.; on moist soil [6-99].

S. russowii Warnst. – **W, FP** (Sp-Rr); **W:** banks of Lumbolka Lake and canal between Lumbolka and

Table 1. Comparioson of moss floras of cities in Murmansk Province

city	Murmansk	Kirovsk	Apatity	Kandalaksha	Monchegorsk
area, km^2	150	20.4	30	30.6	33.7
number of species	138	111	109	129	59
specific for city	23	7	9	28	3
living zone	31	49	39	39	31
forest and park zone	120	89	87	92	29
wet habitats	63	21	29	61	44
industrial zone	49	38	58	53	4

Imandra lakes, flooded meadows with *Ledum palustre*, *Betula nana*, *Eriophorum* sp. and *Carex* sp.; soil; **FP**: wet spruce-birch forest with dwarf shrubs, *Carex* sp. and *Equsetum* sp.; in moist ditch on soil; wet open birch forest with dwarf shrubs; moist soil [6-4, 6-73, 6-105, 6-118].

S. squarrosum Crome; S+ – **FP, W** (Rr); **FP**: northern part of Monchegorsk, open pine-birch forest with dwarf shrubs, moist depression; soil, submerged in water; **W**: banks of canal between Lumbolka and Imandra lakes, flooded meadows; moist soil [6-119, 6-134].

Straminergon stramineum (Dicks. ex Brid.) Hedenäs – **W** (Sp-Rr); banks of Lumbolka Lake and canal, flooded and moist meadows; on soil and submerged in water [6-4, 6-69, 6-73, 6-184].

Tetraplodon mnioides (Hedw.) Bruch et al. S+ – **FP** (Rr); spruce-birch forest with dwarf shrubs; on peaty soil; east outskirts of Monchegorsk, willow forest; on poorly turfed soil [6-25, 6-62].

Warnstorfia exannulata (Bruch et al.) Loeske – **W** (Sp); banks of Lumbolka Lake and canal, flooded and moist meadows; on moist soil and submerged in water [6-4, 6-121, 6-122, 6-127].

W. fluitans (Hedw.) Loeske – **W** (Rr); banks of Lumbolka Lake, flooded meadows; on moist soil and submerged in water [6-134, 6-183].

W. pseudostraminea (Müll.Hal.) Tuom. & T.J.Kop. – **W** (Rr); banks of Lumbolka Lake and canal, flooded meadow with *Carex* sp., *Betula nana* and *Eriophorum* sp.; on moist soil and submerged in water [6-69, 6-121].

Discussion

The list of Monchegorsk mosses includes 59 species. It is the poorest one among the studied urban floras of Murmansk Province, in spite of comparatively large size of its territory (Table 1).

Practically all mosses of Monchegorsk (56 species) were recorded in other cities of the region. Only 3 mosses are specific for this city: *Bryum amblyodon*, *Dicranella schreberiana* and *Pohlia lescuriana.* These species are very small and could be missed in other cities.

We recorded 31 species in the living zone of Monchegorsk; among them gemmiferous species of *Pohlia* (*P. filum*, *P. proligera*, *P. andalusica*) and such species as *Brachythecium salebrosum*, *Bryum pseudotriquertum*, *Ceratodon purpureus*, *Leptobryum pyriforme,* and *Sanionia uncinata* are common. They are widespread in disturbed habitats in other cities, too. Species composition of the living zones is quite similar in compared cities. The biggest number, 49, was registered in Kirovsk. This city is located at the foothills and partly on the slopes of the Khibiny Mountains, and a rich species composition is caused by high diversity of moss flora in surrounding natural ecosystems.

29 species were registered in forests and parks of Monchegorsk. Commonly, forests and parks in other cities have the richest species composition as compared to other city zones. Poor moss flora in numerous Monchegorsk parks and forests is the result of low moisture of upper soil layer. Although there are many lakes in Monchegorsk, most of its territory is rather dry.

In the vicinity of "Severonickel" enterprise (industrial zone) only 4 mosses were registered: *Ceratodon purpureus*, *Funaria hygrometrica*, *Leptobryum pyriforme* and *Bryum* sp. In compared cities species number of technogenic habitats varies from 38 to 58.

Wet habitats are the richest ones in Monchegorsk: 44 mosses were revealed there. However, many species of wet habitats were registered in the northern and north-eastern parts of the city only. Moist forests and flooded areas along the banks of the Lumbolka Lake and of the canal are located there. These territories according to the wind rose are most distant from "Severonickel" emissions (Ecological atlas…, 1999). Practically all hygrophytes grow in these habitats (*Aulacomnium palustre*, *Bryum purpurascens*, *Philo-*

notis fontana, *Sphagnum* spp., *Scorpidium revolvens*, *Warnstorfia* spp.). Such species as *Polytrichum strictum*, *P. juniperinum*, *Polytrichastrum alpinum*, *Pogonatum dentatum* were found in the city northern part only.

Most mosses registered in Monchegorsk grow on soil. On tree trunks we found 4 species in a small amount: *Bryum pseudotriquetrum, Pohlia nutans, Sciuro-hypnum reflexum* and *S. starkei*. On stones and rocks only widespread species grow: *Pohlia nutans*, *P. proligera*, *Sciuro-hypnum curtum*, *S. reflexum* and *S. starkei.* On stone we also collected *Pohlia ludwigii;* this species usually grows in moist and cold habitats in the region (snow beds, cold streams). Low species diversity and absence of epiphytes and epilithes probably is caused by high atmospheric and soil pollution.

21 species common in other province cities were not found in Monchegorsk, among them epilithes: *Andreaea rupestris*, *Bucklandiella microcarpa*, *Cynodontium tenellum*, *Schistidium apocarpum*, and mosses of wet habitats: *Bryum weigelii*, *Pohlia wahlenbergii*, *Rhizomnium magnifolium*, *Sciuro-hypnum latifolium*, *Warnstorfia* spp. Several species common in disturbed habitats in the region, i.e. *Pogonatum urnigerum*, *Polytrichum piliferum*, *Niphotrichum canescens*, *Brachythecium mildeanum* do not occur in Monchegorsk. Some common mosses of urban parks and forests found in other cities (*Dicranum majus*, *D. scoparium*, *Climacium dendroides*, *Plagiothecium denticulatum*) are also absent here.

Two species found in Monchegorsk (*Aongstroemia longipes* and *Warnstorfia pseudostraminea*) are included into Red Data Book of Murmansk Province (2003). Distribution of *Aongstroemia longipes* in Murmansk Province is restricted mainly to cities, while in natural ecosystems this moss is quite rare. *Warnstorfia pseudostraminea* occurs in boggy habitats. Earlier this taxon was not distinguished from *Warnstorfia fluitans*. We expect *W. pseudostraminea* to be not rare in Murmansk Province.

ACKNOWLEDGEMENTS

I am very grateful to N.A. Konstantinova and V.A. Kostina for the help and inestimable advises during this study, to A. Ivanova for improving English. The work was partly supported by the Biodiversity Program of the Russian Academy of Sciences.

LITERATURE CITED

[ATLAS OF MURMANSK PROVINCE] – АТЛАС МУРМАНСКОЙ ОБЛАСТИ 1971. *Москва* [*Moscow*] : *33 pp*.

[CHEREPANOV, S.K.] ЧЕРЕПАНОВ С.К. 1981. Сосудистые растения СССР. – [Vascular plants of the USSR] *Л.* [*L*]: *509 pp*.

[DRUGOVA, T.P.] ДРУГОВА Т.П. 2005. Флора листостебельных мхов города Кировска (Мурманская область, север Европейской России). – [Moss flora of Kirovsk Town, north of European Russia] *Arctoa* **14**: *203-209.*

DRUGOVA, T. P. 2007. Mosses of Kandalaksha City (Murmansk Province, North-West Russia). – *Arctoa* **16**: *145-152*.

[DRUGOVA, T.P.] ДРУГОВА Т. П. 2008. Сравнительный анализ флор мхов городов Кировска и Апатитов (Мурманская область, север Европейской России). – [Comparative analysis of moss floras of Kirovsk and Apatity cities (Murmansk Province, North-West of Russia)] *Бюлл. МОИП, отд. биол.* [*Bull. MOIP, otd. boil.*] **113**(4)*: 45-55.*

[ECOLOGICAL ATLAS OF MURMANSK PROVINCE] – ЭКОЛОГИЧЕСКИЙ АТЛАС МУРМАНСКОЙ ОБЛАСТИ 1999. – *Москва-Апатиты* [*Moscow-Apatity*]: *48 pp*.

HALLINGBÄCK, T., N. LÖNNELL, H. WEIBULL, L. HEDENÄS & P. VON KNORRING 2006. Nationalnyckeln till Sveriges flora och fauna. Bladmossor: Sköldmossor– blåmossor. Bryophyta: Buxbaumia–Leucobryum. – *ArtDatabanken, SLU, Uppsala*, *416 pp*.

IGNATOV, M.S., O.M. AFONINA, E.A. IGNATOVA, A. ABOLINA, T.V. AKATOVA, E. Z. BAISHEVA, L.V. BARDUNOV, E.A. BARYAKINA, O.A. BELKINA, A.G. BEZGODOV, M.A.BOYCHUK, V.YA. CHERDANTSEVA, I.V. CZERNYADJEVA, G.YA. DOROSHINA, A.P. DYACHENKO, V.E. FEDOSOV, I.L. GOLDBERG, E.I. IVANOVA, I. JUKONIENE, L. KANNUKENE, S.G. KAZANOVSKY, Z.KH. KHARZINOV, L.E. KURBATOVA, A.I.MAKSIMOV, U.K. MAMATKULOV, V. A. MANAKYAN, O.M. MASLOVSKY, M.G. NAPREENKO, T. N. OTNYUKOVA, L.YA. PARTYKA, O.YU. PISARENKO, N.N. POPOVA, G.F. RYKOVSKY, D.YA. TUBANOVA, G.V. ZHELEZNOVA & V.I. ZOLOTOV 2006. Check-list of mosses of East Europe and North Asia. – *Arctoa* **15**: *1-130.*

[IGNATOV, M.S. & E.A. IGNATOVA] ИГНАТОВ М.С., Е.А. ИГНАТОВА 2003. Флора мхов средней части Европейской России. Т. 1. – [Bryophyte flora of Middle Part of European Pussia. Vol. 1] *М., КМК* [*Moscow, KMK*], *608 pp*.

[RED DATA BOOK OF MURMANSK PROVINCE] КРАСНАЯ КНИГА МУРМАНСКОЙ ОБЛАСТИ 2003. *Мурманск*: *Мурманское книжное издательство* [*Murmansk*: *Murmanskoe knijnoe izdatelstvo*], *400 pp*.

[YAKOVLEV, V. A.] ЯКОВЛЕВ В.А. 1961. Климат Мурманской области. – [Climate of Murmansk province] *Мурманск* [*Murmansk*], *99 pp*.