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Additions to the lichen biota of Berezovye Islands, Leningrad Region, Russia

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Abstract: 66 species of lichens, 9 lichenicolous fungi and 4 non-lichenized saprobic fungi are reported as new to the Berezovye Islands (Leningrad Region, Russia). The updated lichen biota of the archipelago comprises 356 species. *Caloplaca maritima*, *Lecanora compallens*, *Verrucaria boblensis* and *Xanthoriicola physciae* are reported for the first time for Russia, *Lecanora aitema* – for European Russia, *Lecanora semipallida* and *Lichenodiplis lecanorae* – for North-Western European Russia. *Absconditella sphagnorum*, *Chaenothecopsis vainioana*, *Lempholemma polyanthes* and *Opegrapha niveoatra* are new to the Leningrad Region, *Arthonia byssacea* and *Lecanora subrugosa* – to the Western Leningrad Region.

Kokkuvõte: Täiendusi Koivisto saarte (Leningradi oblast, Venemaa) samblike elustikule

66 liiki lihheniseerunud, 9 liiki lihhenikoolseid ja 4 liiki mittelihheniseerunud saproobseid seeni on uued Koivisto saartele (Leningradi oblast, Venemaa). Selle saarestiku samblike täiendatud nimekiri sisaldab nüüd 356 liiki. *Caloplaca maritima*, *Lecanora compallens*, *Verrucaria boblensis* ja *Xanthoriicola physciae* on esmasleiud Venemaal; *Lecanora aitema* on esmasleid Venemaa Euroopa-osas; *Lecanora semipallida* ja *Lichenodiplis lecanorae* – Venemaa Euroopa-osa loodepiirkonnas. *Absconditella sphagnorum*, *Chaenothecopsis vainioana*, *Lempholemma polyanthes* ja *Opegrapha niveoatra* on uued Leningradi oblastile ning *Arthonia byssacea* ja *Lecanora subrugosa* – Leningradi oblasti lääneosale.

INTRODUCTION

The history of botanical studies on the Berezovye Islands archipelago is not very long, but rather rich (see Tzvelev, 2007; Uotila & Ahti, 2009). In contrast, early lichenological exploration is only connected with A. E. Nylander who visited the area in 1851. His manuscript (archives of the Botanical Museum of University of Helsinki, see Nylander, 1851) includes seven lichen species from Maly Berezovy Island (Vasikkasaari); specimens of only two of them, and additionally two new species were found in the Herbarium of the Botanical Museum, University of Helsinki (H) (Alexeeva & Himelbrant, 2007).

The first comprehensive inventory of the lichen flora of Berezovye Islands started in 1999 by the third author. As the result of several excursions (until 2005), a checklist of lichen-forming and calicioid fungi of Berezovye Islands comprising 277 species was presented (Alexeeva & Himelbrant, 2007).

In this paper, a list of 79 species of lichen-forming, lichenicolous and allied fungi new to the Berezovye Islands is presented, of which four taxa are new for Russia, one for European Russia, two for North-Western European Russia, four for the Leningrad Region and two for the Western Leningrad Region. The paper is the outcome of two excursions in 2008 and 2010 and the revision of collections from 2000–2005.

STUDY AREA

The Berezovye Islands archipelago (Koivistonsaaret) is situated in the north-eastern part of the Gulf of Finland (Baltic Sea) near the town Primorsk within the Vyborg District (Leningrad Region, Russia) (Fig. 1). It includes three large islands: Bol'shoy Berezovy Island (Koivusaari or Koivistonsaari), Zapadny Berezovy Island (Tiurinsaari) and Severny Berezovy Island (Pisaari), and more than 50 small islands and islets with a total land area of ca. 8400 ha.

The archipelago belongs to the East Fennoscandian biogeographical province *Karelia australis* (Ka). The potential dominating natural vegetation is cowberry-pine forest (*Vaccinio vitis-idaeo-Pinetum*) (Bohn & Neuhäusl 2000/2003). Today, pine (60–80 year-old in average, individual trees of 150–180 years) and birch forests cover the main part of the islands. Spruce forests are widely distributed only on the Severny Berezovy Island. Aspen and grey alder forests are small and extremely rare, and black alder forests

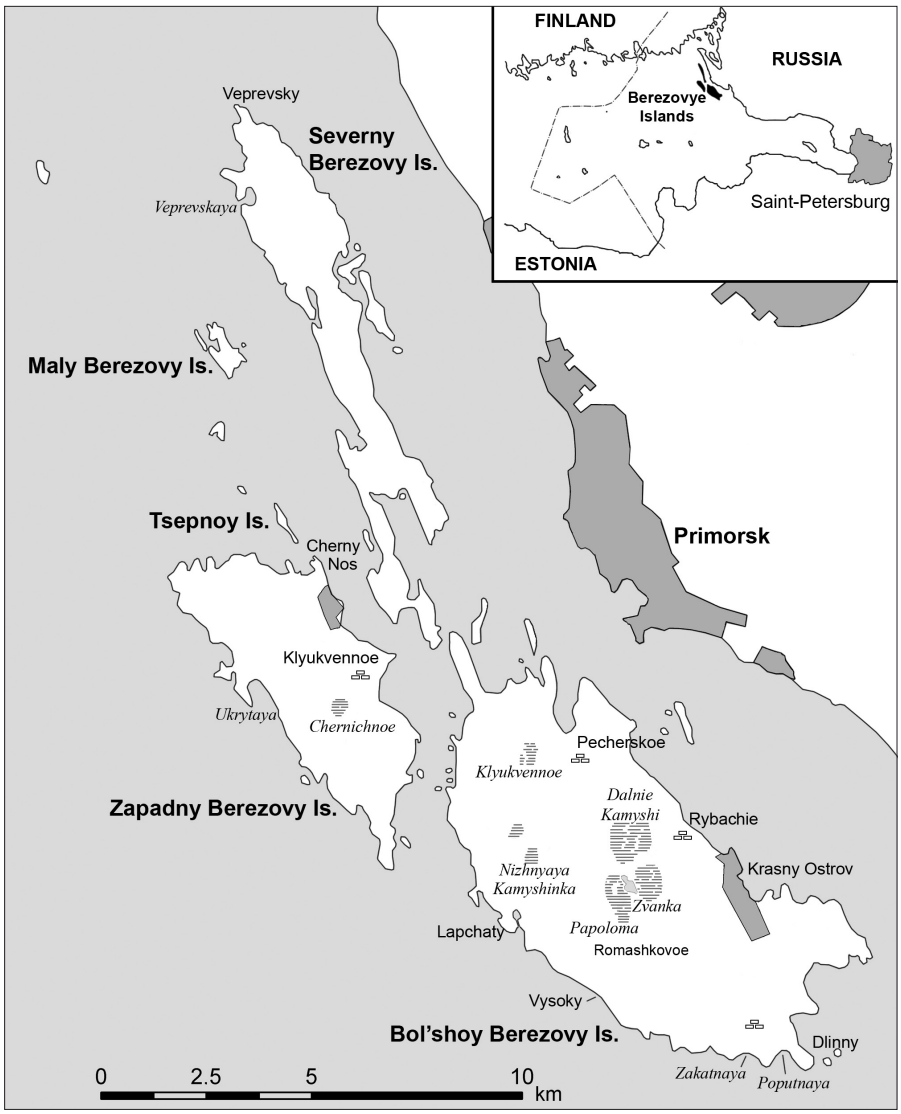

Fig. 1. Location of the study area.

stretch mainly along the shores of the bays. Broad-leaved forests occur exclusively on the Maly Berezovy Island. These most probably natural and relict forests are composed of oak, ash, lime, maple and elm. Some stands are mixed with pine, spruce, aspen, birch and black alder. Different types of peatlands are represented on the archipelago, but raised bogs evidently prevail. Upland meadows remain in the areas of former settlements and agricultural lands; different littoral communities occur on marine terraces along the seashore (Tzvelev, 2007).

The Berezovye Islands together with the adjacent marine area were included in the Nature Reserve "Vyborgsky" in 1976, and in 1996 they were recognized as an independent Nature Reserve "Berezovye Islands". At present, the archipelago is one of the largest protected areas in the Leningrad Region; it also has international protection statuses as Wetland of International Importance (Ramsar Site) under the Ramsar Convention and as Baltic Sea Protected Area (BSPA) under the Helsinki Convention.

MATERIAL AND METHODS

The material was collected on Berezovye Islands during several field trips by: D. Himelbrant & N. Alexeeva (2000), N. Alexeeva (2000–2005), T. Ahti & N. Alexeeva (2008), and I. Stepanchikova, N. Alexeeva & U. Schiefelbein (2010). Cited specimens are deposited in the herbaria of the Botanical Museum of University of Helsinki (H), St. Petersburg State University (LECB) and in the private herbarium of Ulf Schiefelbein (herb. US). Lichen substances were analyzed by standard technique of thin-layer chromatography with using of solvent systems A, B, C and G (Orange et al., 2001) by the first and fifth authors. Illustrations were made by using dissecting microscope Carl Zeiss STEMI-2000 CS with camera AxioCam ICc 3.

LIST OF SPECIES

Abbreviations and symbols: # – lichenicolous fungus; (#) – facultatively lichenicolous fungus; + – non-lichenized saprobic fungus; LR – Leningrad Region; WLR – Western Leningrad Region; Islands of the Berezovye archipelago (Fig. 1): BB – Bol'shoy Berezovy Island (Koivusaari or Koivistonsaari), MB – Maly Berezovy Island (Vasikkasaari), SB – Severny Berezovy Island (Piisaari), Ts – Tsepnoy Island (Leppäsaari), ZB – Zapadny Berezovy Island (Tiurinsaari); collectors: DH – Dmitry Himelbrant, IS – Irina Stepanchikova, NA – Nadezhda Alexeeva, TA – Teuvo Ahti, US – Ulf Schiefelbein. In the following list only Russian names are given for settlements (most of them do not exist nowadays), and their Finnish names are (in brackets): Krasny Ostrov or Krasnoostrovsky (Saarenpää), Pecherskoe (Patala), Rybachie (Hyttälä or Hyttölä), Klyukvennoe (Vanhakylä).

Absconditella sphagnorum Vězda & Poelt – BB: Dalnie Kamyshi bog, 60°18'24"N, 28°37'25"E and 60°18'21"N, 28°36'53"E, open, active raised bog with cotton-grass, dwarf shrubs and pines, on *Sphagnum* spp., 16.09.2010, leg. IS, US & NA (H, LECB, herb. US); Klyukvennoe bog, 60°19'34"N, 28°34'27"E, raised bog with dwarf shrubs and pines, on *Sphagnum* spp., 17.09.2010, leg. IS, US & NA (LECB). – New to LR. Distribution in Fennoscandia and Baltic countries: Norway, Sweden, Finland (Santesson et al., 2004), Estonia (Aptroot et al., 2005), Lithuania (Motiejūnaitė et al., 2007); the northernmost localities are in the northern boreal zone in Lapland (Santesson et al., 2004). Distribution in North-Western European Russia: Republic of Karelia (Fadeeva et al., 2007). *Absconditella sphagnorum* is widely distributed, but rarely reported. The species is characterized by whitish to yellowish or pinkish apothecia 0.2–0.4 mm in diameter (Foucard, 2001), gelatinous greyish-green thallus and one-septate spores (Fig. 2). It covers decaying *Sphagnum* mosses in oligotrophic bogs (Smith et al., 2009). Fruit bod-

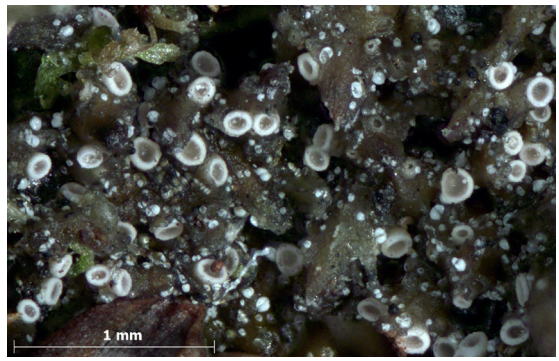

Fig. 2. *Absconditella sphagnorum*, thallus with apothecia.

ies of this species probably develop mainly in autumn and spring.

Anisomeridium polypori (Ellis & Everh.) M. E. Barr – MB: S part, 60˚24'35"N, 28˚26'24"E, mixed broad-leaved-coniferous forest, on bark of *Populus tremula*, 14.09.2010, leg. IS, US & NA (H).

Arthonia byssacea (Weigel) Almq. – MB: central part, 60˚25'N, 28˚26'E, broad-leaved forest with lime, maple and oak, on bark of *Acer platanoides*, 12.07.2005, leg. NA (H, LECB). First confirmed record from WLR; rare in Eastern LR (Stepanchikova et al., 2009). Habitat specialist of biologically valuable forests in the LR (Andersson et al., 2009).

Arthonia patellulata Nyl. – BB: former village Rybachie, 60˚18'35"N, 28˚38'43"E, stand of young aspens near the road, on bark of *Populus tremula*, 17.09.2010, leg. IS, US & NA (H).

Arthrosporum populorum A. Massal. – BB: former village Rybachie, 60˚18'35"N, 28˚38'43"E, stand of young aspens near the road, on bark of *Populus tremula*, 17.09.2010, leg. IS, US & NA (H).

Bacidia circumspecta (Nyl. ex Vain.) Malme – MB: edge of forest on the W shore, 60˚25'N, 28˚26'E, on bark of young *Fraxinus excelsior* and *Acer platanoides*, 14.07.2005, leg. NA (H).

Bacidina chloroticula (Nyl.) Vězda & Poelt – MB: S part, 60˚24'35"N, 28˚26'12"E and 60˚24'35"N, 28˚26'24"E, mixed broad-leaved-coniferous forest, on bark of *Quercus robur* and on fruit bodies of polypores on *Betula* sp., 14.09.2010, leg. IS, US & NA (H, herb. US).

Buellia griseovirens (Turner & Borrer ex Sm.) Almb. – BB: western side of the road along the western margin of Papoloma bog, 60˚18'N, 28˚36'E, several grey alders in birch forest, on bark of *Alnus incana*, 05.09.2004, leg. NA (H); N part of Krasny Ostrov village, 60˚18'N, 28˚40'E, on worked timber of a well, 13.09.2010, leg. IS, US & NA (H); Ts: W shore, 60˚23'N, 28˚28'E, stripe of black alders along the shore, on bark of *Alnus glutinosa*, 04.07.2004, leg. NA (H); ZB: W shore, 60˚20'N, 28˚28'E, stripe of black alders along the shore, on bark of *Alnus glutinosa*, 05.07.2004, leg. NA (H). – All specimens contain atranorin and norstictic acid; in three specimens connorstictic acid was also detected.

Caloplaca maritima (B. de Lesd.) B. de Lesd. – BB: Poputnaya bay, S shore of cape Dlinny, 60˚15'55.5"N, 28˚41'18"E, littoral meadow, on granite boulder, 15.09.2010, leg. US, IS & NA, det. U. de Bruyn (herb. US); MB: S shore, 60˚24'26"N, 28˚26'21"E, littoral meadow, on granite boulder, 14.09.2010, leg. US, IS & NA, det. U. de Bruyn (herb. US). New to Fennoscandia and to Russia, not known from Baltic countries. The species is much confused with *C. marina* (Wedd.) Zahlbr. The thallus is truly crustose, the areoles get smaller towards the margin and isodiametric lobules are lacking (Smith et al., 2009).

Catillaria chalybeia (Borrer) A. Massal. – BB: Poputnaya bay, S shore of cape Dlinny, 60˚15'55.5"N, 28˚41'18"E, littoral meadow, on granite boulder, 15.09.2010, leg. US, IS & NA (herb. US).

Catillaria nigroclavata (Nyl.) Schuler – MB: S part, 60˚24'35"N, 28˚26'24"E, mixed broad-leaved-coniferous forest, on bark of *Populus tremula*, 14.09.2010, leg. IS, US & NA (H).

Cetraria islandica (L.) Ach. ssp. islandica "f. sorediata (Schaer.) Arnold" – BB: Romashkovoe (c. 0.6 km to the south from southern edge of Papoloma bog), 60˚16'N, 28˚36'E, on path in pine-spruce forest, 12.08.2008, leg. TA & NA (H 9202191, LECB). This conspicuously sorediate morph was forming a large patch. No lichenicolous fungi were detected.

Chaenotheca brachypoda (Ach.) Tibell – MB: S part, 60˚24'35"N, 28˚26'12"E, mixed broad-leaved-coniferous forest, on lignum of *Betula* sp. (stump), 14.09.2010, leg. IS, US & NA (H). Indicator of biologically valuable forests in LR (Andersson et al., 2009).

Chaenotheca chlorella (Ach.) Müll. Arg. – MB: central part, 60˚24'39"N, 28˚26'11"E, spruce forest, on lignum of standing dead *Picea abies*, 14.09.2010, leg. IS, US & NA (H, herb. US). Habitat specialist of biologically valuable forests in LR (Andersson et al., 2009).

Chaenotheca xyloxena Nádv. – BB: W shore, vicinity of cape Vysoky, 60˚16'35"N, 28˚36'21"E, sandy shore, on driftwood, 12.08.2008, leg. NA (H).

Chaenothecopsis consociata (Nádv.) A. F. W. Schmidt – SB: N part, 60˚26'N, 28˚27'E, spruce forest, on thallus of *Chaenotheca chrysocephala* (Turner ex Ach.) Th. Fr. growing on bark of *Picea abies*, 03.05.2000, leg.

DH & NA (H). Indicator of biologically valuable forests in LR (Andersson et al., 2009).

Chaenothecopsis epithallina Tibell – MB: S part, 60˚24'35"N, 28˚26'24"E, mixed broad-leaved-coniferous forest, on thallus of *Chaenotheca trichialis* (Ach.) Th. Fr. growing on bark of *Quercus robur*, 14.09.2010, leg. US, IS & NA (H, herb. US); SB: N part, 60˚27'N, 28˚27'E, glade around ruins of house in birch-black alder forest, on lignum of standing dead *Picea abies*, 03.05.2000, leg. DH & NA (H). Indicator of biologically valuable forests in LR (Andersson et al., 2009).

(#) Chaenothecopsis pusilla (Ach.) A. F. W. Schmidt – MB: S part, 60˚24'35"N, 28˚26'24"E, mixed broad-leaved-coniferous forest, on thallus of *Hypocenomyce scalaris* (Ach.) M. Choisy growing on bark of *Pinus sylvestris*, 14.09.2010, leg. IS, US & NA (H).

Chaenothecopsis subparoica (Nyl.) Tibell – BB: western side of the road along the western margin of Papoloma bog, 60˚18'N, 28˚36'E, birch forest with admixture of pine and undergrowth of rowan, on thallus of *Haematomma ochroleucum* (Neck.) J. R. Laundon growing on bark of young *Sorbus aucuparia*, 05.09.2004, leg. NA (H). Habitat specialist of biologically valuable forests in LR (Andersson et al., 2009).

+ Chaenothecopsis vainioana (Nádv.) Tibell – MB: SE shore, 60˚24'36"N, 28˚26'36"E, old oak in mixed broad-leaved-coniferous forest, on bark of old *Quercus robur*, 14.09.2010, leg. IS, US & NA (H); S part, 60˚24'35"N, 28˚26'24"E and 60˚24'36"N, 28˚24'36"E, mixed broad-leaved-coniferous forest, on bark of *Quercus robur*, 14.09.2010, leg. IS, US & NA (H, LECB). – New to LR. Distribution in Fennoscandia and Baltic countries: Norway, Sweden, Finland (Santesson et al., 2004), Estonia (Randlane & Saag, 1999). Distribution in North-Western European Russia: Republic of Karelia (Fadeeva et al., 2007). *C. vainioana* is widely distributed up to the northern boreal zone. Characteristic anatomical features are the one-septate, large spores with distinct septum, the usually aeruginose hypothecium and the reddish brown colour of the epithecium, excipulum and outer part of the stalk (Tibell, 1999). It is associated with *Trentepohlia* and grows usually on bark of *Quercus* (Tibell, 1999; Titov, 2006).

Circinaria caesiocinerea (Nyl. ex Malbr.) A. Nordin, S. Savić & Tibell – BB: Poputnaya bay, S shore of cape Dlinny, 60˚15'55.5"N, 28˚41'18"E, littoral meadow, on granite boulder, 15.09.2010, leg. US, IS & NA (herb. US).

Cladonia acuminata (Ach.) Norrl. – BB: SE margin of Krasny Ostrov village, 60˚17'N, 28˚40'E, on mosses over concrete of house ruins, 13.08.2008, leg. TA & NA (H 9202189).

Cladonia scabriuscula (Delise) Nyl. – BB: between Krasny Ostrov village and Zvanka Lake, 60˚18'N, 28˚37'E, sandy pine forest, on bare soil (scarce), 12.08.2008, leg. TA & NA (H 8003250).

Clauzadea monticola (Schaer.) Hafellner & Bellem. – BB: cape between Zakatnaya and Poputnaya bays, 60˚15'52"N, 28˚40'42"E, old artillery battery, on concrete wall, 15.09.2010, leg. IS, US & NA (H); SE margin of Krasny Ostrov village, 60˚17'N, 28˚40'E, on concrete of house ruins, 13.08.2008, leg. TA (H 9202168).

Clypeococcum hypocenomycis D. Hawskw. – MB: S part, 60˚24'32"N, 28˚26'16"E and 60˚24'35"N, 28˚26'24"E, mixed broad-leaved-coniferous forest, on thalli of *Hypocenomyce scalaris* growing on bark of *Pinus sylvestris*, 14.09.2010, leg. IS, US & NA (H, herb. US).

Fuscidea arboricola Coppins & Tønsberg – BB: ca. 0.5 km to the south from southern edge of Papoloma bog, 60˚17'N, 28˚37'E, several trees of spruce and grey alder in depression along brook within pine-birch forest, on bark of young *Sorbus aucuparia*, 04.09.2004, leg. NA (H). – The specimen contains fumarprotocetraric acid.

Haematomma ochroleucum (Neck.) J. R. Laundon – BB: western side of the road along the western margin of Papoloma bog, 60˚18'N, 28˚36'E, birch forest with admixture of pine and undergrowth of rowan, on bark of young *Sorbus aucuparia*, 05.09.2004, leg. NA (H).

Hypocenomyce friesii (Ach.) P. James & Gotth. Schneid. – BB: Dalnie Kamyshi bog, 60˚18'24"N, 28˚37'25"E, active raised bog with cotton-grass, dwarf shrubs and pines, on lignum of standing dead *Pinus sylvestris*, 16.09.2010, leg. IS, US & NA (H, herb. US); N part, Klyukvennoe bog, 60˚19'34"N, 28˚34'27"E, raised bog with dwarf shrubs and pines, on lignum of standing dead *Pinus*

sylvestris, 17.09.2010, leg. IS, US & NA (H, herb. US).

Illosporiopsis christiansenii (B. L. Brady & D. Hawksw.) D. Hawksw. – BB: former village Rybachie, 60˚18'35"N, 28˚38'43"E, stand of young aspens near the road, on thallus of *Xanthoria parietina* (L.) Th. Fr. growing on bark of *Populus tremula*, 17.09.2010, leg. US, IS & NA (herb. US).

Lecania cyrtellina (Ach.) Th. Fr. – BB: N part of Krasny Ostrov village, 60˚18'N, 28˚40'E, shrubbery, on bark of *Sambucus nigra*, 13.09.2010, leg. US, IS & NA (herb. US).

Lecanora aitema (Ach.) Hepp – BB: bog E from Zvanka Lake, 60˚18'18"N, 28˚37'35"E, pine bog woodland, on lignum, 16.09.2010, leg. US, IS & NA (herb. US). – New to European Russia. Distribution in Fennoscandia and Baltic countries: Norway, Sweden, Finland (Santesson et al., 2004). *L. aitema* is a boreal species occurring in Fennoscandia from the temperate to the northern boreal zone. The species is probably overlooked, and many records of *L. symmicta* (Ach.) Ach. from the Nordic countries may belong to this species. *L. aitema* differs from *L. symmicta* in darker apothecia with N(+) red pigment in epihymenium (Foucard, 2001).

Lecanora compallens van Herk & Aptroot – MB: S part, 60˚24'35"N, 28˚26'24"E, mixed broad-leaved-coniferous forest, on bark of *Alnus glutinosa*, 14.09.2010, leg. IS, US & NA (herb. US); ZB: W shore, 60˚18'N, 28˚28'E, stripe of black alders along the shore, on bark of *Alnus glutinosa*, 05.07.2004, leg. NA (H). – New to Russia (see also Stepanchikova et al., this volume). – The specimen contains usnic acid and zeorin. Distribution in Fennoscandia and Baltic countries: Estonia (Suija et al., 2009), Latvia (Czarnota & Kukwa, 2010), Lithuania (Prigodina-Lukošienė et al., 2003).

Lecanora crenulata Hooker – BB: N part of Krasny Ostrov village, 60˚18'N, 28˚40'E, on slate (broken pieces removed from a roof and piled on the ground), 13.09.2010, leg. US, IS & NA (H, herb. US).

Lecanora expallens Ach. – BB: ca. 0.5 km to the south from southern edge of Papoloma bog, 60˚17'N, 28˚37'E, several trees of spruce and grey alder in depression along brook within a pine-birch forest, on bark of *Picea abies*, 04.09.2004, leg. NA (H); SB: cape Veprevsky, 60˚28'N, 28˚27'E, birch-black alder-aspen forest, on bark of *Alnus glutinosa*, 05.05.2000, leg. DH & NA (H); Ts: W shore, 60˚23'N, 28˚28'E, stripe of black alders along the shore, on bark of *Alnus glutinosa*, 04.07.2004, leg. NA (H). – All specimens contain usnic acid, thiophanic acid, zeorin, cf. arthothelin and expallens-unknown.

Lecanora helicopis (Wahlenb.) Ach. – BB: Poputnaya bay, S shore of cape Dlinny, 60˚15'55.5"N, 28˚41'18"E, littoral meadow, on granite boulder, 15.09.2010, leg. US, IS & NA (herb. US); cape Lapchaty, 60˚17'30"N, 28˚33'46"E, littoral meadow, on granite boulder, 16.09.2010, leg. US, IS & NA (herb. US); MB: S shore, 60˚24'36"N, 28˚26'41"E and 60˚24'26"N, 28˚26'21"E, littoral meadow, on granite boulders, 14.09.2010, leg. US, IS & NA (H, herb. US).

Lecanora rimicola H. Magn. – BB: Poputnaya bay, S shore of cape Dlinny, 60˚15'55.5"N, 28˚41'18"E, littoral meadow, on granite boulder, 15.09.2010, leg. US, IS & NA, conf. U. Arup (herb. US); cape Lapchaty, 60˚17'30"N, 28˚33'46"E, littoral meadow, on granite boulder, 16.09.2010, leg. US, IS & NA (herb. US).

Lecanora semipallida H. Magn. (syn. *L. xanthostoma* Cl. Roux ex Fröberg) – BB: SE margin of Krasny Ostrov village, 60˚17'N, 28˚40'E, on concrete of house ruins, 13.08.2008, leg. TA (H 9202178). – New to North-Western European Russia. Distribution in Fennoscandia and Baltic countries: Norway (Śliwa, 2007a), Sweden, Finland (Santesson et al., 2004; Pykälä, 2007), Estonia (Jüriado et al., 2002). This is a common species of the *L. dispersa* group inhabiting concrete structures (Śliwa, 2007a, 2007b).

Lecanora subrugosa Nyl. – BB: former village Rybachie, 60˚18'35"N, 28˚38'43"E, stand of young aspens near the road, on bark of *Populus tremula*, 17.09.2010, leg. US, IS & NA, conf. U. de Bruyn (herb. US). – New to WLR, known from Eastern LR (Kuznetsova et al., 2007).

Lecidea turgidula Fr. – BB: bog E from Zvanka Lake, 60˚18'18"N, 28˚37'35"E, pine bog woodland, on lignum of *Pinus sylvestris* (lower part of standing dead tree), 16.09.2010, leg. IS, US & NA (H); Romashkovoe (c. 0.6 km to the south from southern edge of Papoloma

bog), 60˚16'N, 28˚36'E, on pine log in dry to mesic pine-birch-spruce forest, 12.08.2008, leg. TA (H 9202169).

Lempholemma polyanthes (Bernh.) Malme – BB: SE margin of Krasny Ostrov village, 60˚17'N, 28˚40'E, on concrete of house ruins, 13.08.2008, leg. TA (H 9202184). – New to LR. Distribution in Fennoscandia and Baltic countries: Norway, Sweden, Finland (Santesson et al., 2004), Estonia (Randlane & Saag, 1999). Distribution in North-Western European Russia: Republic of Karelia (Fadeeva et al., 2007). *L. polyanthes* is widespread from the temperate to the arctic zone. The species is characterized by having spreading foliose thallus, apothecia with one-celled almost globose ascospores. It usually grows on mosses over limestone and mortar (Smith et al., 2009).

Lepraria eburnea J. R. Laundon – MB: central part, 60˚25'N, 28˚26'E, broad-leaved forest with lime, maple and oak, on bark of *Acer platanoides*, 12.07.2005, leg. NA (H). – The specimen contains alectorialic and protocetraric acids.

Lepraria elobata Tønsberg – BB: N part of Krasny Ostrov village, 60˚18'N, 28˚40'E, open glade with scattered trees around house, on bark of *Betula* sp., 09.07.2000, leg. NA (H); MB: S part, 60˚25'N, 28˚27'E, pine-birch forest, on bark of *Betula* sp.; 23.07.2003, leg. NA (H); SB: N part, 60˚27'N, 28˚27'E, birch-black alder forest, on bark of *Betula* sp., 04.05.2000, leg. DH & NA; Ts: W shore, 60˚23'N, 28˚28'E, stripe of black alders along the shore, on bark of *Alnus glutinosa*, 04.07.2004, NA (H); ZB: cape Cherny Nos, 60˚22'N, 28˚29'E, glade in pine forest, on bark of old *Quercus robur*, 29.07.2000, leg. NA (H). – Totally, 14 specimens were investigated; the specimens contain atranorin, zeorin, stictic, constictic and cryptostictic acids.

Lepraria jackii Tønsberg – BB: ca. 0.6 km to SE from cape Vysoky, 60˚16'N, 28˚37'E, spruce forest with admixture of pine and birch, on lignum of *Juniperus communis*, 02.07.2001, leg. NA (H); ca. 0.5 km to the south from southern edge of Papoloma bog, 60˚17'N, 28˚37'E, several trees of spruce and grey alder in depression along brook within pine-birch forest, on bark of *Picea abies* and *Alnus incana*, 04.09.2004, leg. NA (H); western side of the road along the western margin of Papoloma bog, 60˚18'N, 28˚36'E, group of spruces in birch forest with admixture of pine, on bark of *Picea abies*, 05.09.2004, leg. NA (H); road from Krasny Ostrov village to former village Pecherskoe, 60˚19'07"N, 28˚36'52"E, pine forest, on bark of *Pinus sylvestris*, 17.09.2010, leg. IS, US & NA (herb. US); MB: central part, 60˚25'N, 28˚26'E, wet spruce forest, on bark of *Pinus sylvestris*; 12.07.2005, leg. NA (H). – All specimens contain atranorin, roccellic and jackinic/rangiformic acids.

Lepraria lobificans Nyl. – BB: ca. 0.5 km to the south from southern edge of Papoloma bog, 60˚17'N, 28˚37'E, in depression along brook within pine-birch forest, on bark of *Betula* sp., 04.09.2004, leg. NA (H); MB: central part, 60˚25'N, 28˚26'E, spruce forest with admixture of aspen, bark of *Populus tremula*, 23.07.2003, leg. NA (H); ZB: E shore, 60˚21'N, 28˚30'E, swampy birch-black alder forest, on bark of *Betula* sp., 27.07.2000, leg. NA (H). – Totally, 7 specimens were investigated.

Lepraria neglecta (Nyl.) Lettau – ZB: E shore, former village Klyukvennoe, 60˚20'N, 28˚29'E, on mosses over stone, 14.08.2008, leg. TA (H 8003957). – The specimen contains alectorialic and roccellic/angardianic acids.

+ Leptorhaphis atomaria (Ach.) Szatala – BB: former village Rybachie, 60˚18'35"N, 28˚38'43"E, stand of young aspens near the road, on bark of *Populus tremula*, 17.09.2010, leg. IS, US & NA (H).

Lichenodiplis lecanorae (Vouaux) Dyko & D. Hawksw. – BB: former village Pecherskoe, 60˚19'37"N, 28˚36'07"E, stand of young aspens near the road, on *Caloplaca pyracea* (Ach.) Th. Fr. growing on bark of *Populus tremula*, 19.09.2010, leg. US, IS & NA (herb. US). – New to North-Western European Russia. Distribution in Fennoscandia and Baltic countries: Norway, Sweden, Finland (Santesson et al., 2004), Estonia (Suija, 2005), Lithuania (Motiejūnaitė, 1999). The northernmost locality is situated in the northern boreal zone in Torne Lappmark (Santesson et al., 2004). This coelomycete is characterized by smooth-walled, 1-septate conidia which are truncate at the base. In Fennoscandia it has been hitherto known from *Caloplaca flavorubescens*, *C.* cf. *vitellinula*, *Mycoblastus affinis*, *M. sanguinarius* and *Tephromela atra* (Ihlen & Wedin 2008).

Melanelia sorediata (Ach.) Goward & Ahti – BB: N part of Krasny Ostrov village, 60˚18'N, 28˚40'E, glade with scattered trees around house, on granite boulder, 09.07.2000, leg. NA (H); ca. 0.8 km to the North from Zakatnaya bay, 60˚16'N, 28˚40'E, glade near forest road with several basements overgrowing with pine and birch, on granite stone, 11.07.2000, leg. NA (H); ZB: Ukrytaya bay, 60˚21'N, 28˚27'E, littoral meadow, on granite boulder, 23.07.2000, leg. NA (H); E shore, former village Klyukvennoe, 60˚21'N, 28˚30'E, meadow with remnants of buildings, on granite stone, 24.07.2000, leg. NA (H); E shore, vicinity of former village Klyukvennoe, 60˚20'N, 28˚29'E, on pebble stones along old artillery trail by sand dunes, 14.08.2008, leg. TA (H 9202198). Red-listed (status: rare) in LR (Tzvelev, 2000).

Micarea misella (Nyl.) Hedl. – BB: bog E from Zvanka Lake, 60˚18'18"N, 28˚37'35"E, pine bog woodland, on lignum of *Pinus sylvestris* (lying deadwood), 16.09.2010, leg. US, IS & NA (H, herb. US).

+ Microcalicium ahlneri Tibell – MB: S part, 60˚24'35"N, 28˚26'24"E, mixed broad-leaved-coniferous forest, near the edge of pine bog woodland, on rotten lignum of *Pinus sylvestris* (standing dead tree), 14.09.2010, leg. IS, US & NA (H). Habitat specialist of biologically valuable forests in LR (Andersson et al., 2009).

+ Microcalicium arenarium (Hampe ex A. Massal.) Tibell – BB: E part, road from Krasny Ostrov village to former village Pecherskoe, 60˚19'07"N, 28˚36'52"E, pine forest, on rootlets of *Pinus sylvestris*, 17.09.2010, leg. US, IS & NA (herb. US).

(#) Microcalicium disseminatum (Ach.) Vain. – MB: S part, 60˚24'35"N, 28˚26'24"E, mixed broad-leaved-coniferous forest, on thalli of calicioid lichens growing on bark of *Quercus robur,* 14.09.2010, leg. IS, US & NA (H, herb. US). Indicator of biologically valuable forests in LR (Andersson et al., 2009).

Mycobilimbia hypnorum (Lib.) Kalb & Hafellner – BB: SE margin of Krasny Ostrov village, 60˚17'N, 28˚40'E, on mosses over concrete of house ruins, 13.08.2008, leg. TA (H 9202186).

Mycoblastus fucatus (Stirt.) Zahlbr. – BB: central part, stand of grey alders in pine-birch-black alder forest, on bark of *Alnus incana*, 04.08.2001, leg. NA (H); western side of the road along the western margin of Papoloma bog, 60˚18'N, 28˚36'E, birch forest with admixture of pine and undergrowth of rowan, on bark of *Betula* sp., 05.09.2004, leg. NA (H); MB: S part, 60˚24'31"N, 28˚26'19"E, mixed broad-leaved-coniferous forest, on bark of *Alnus glutinosa*, 12.07.2005, leg. NA (H); ZB: Chernichnoe bog, 60˚20'N, 28˚29'E, pine bog woodland, on bark of *Pinus sylvestris*, 05.07.2004, leg. NA (H). – All specimens contain atranorin and fumarprotocetraric acid.

Ochrolechia alboflavescens (Wulfen) Zahlbr. – BB: S edge of Dalnie Kamyshi bog, 60˚18'N, 28˚37'E, transition between pine forest and raised bog, bark of *Pinus sylvestris*, 03.09.2004, leg. NA (H). – Specimen contains lichesterinic, protolichesterinic, variolaric acids and two substances called "microstictoides unknowns" (see Kukwa, 2008).

Ochrolechia arborea (Kreyer) Almb. – MB: S part, 60˚24'31"N, 28˚26'19"E, mixed broad-leaved-coniferous forest, on bark of *Alnus glutinosa*, 12.07.2005, leg. NA (H); SB: N part, 60˚27'N, 28˚27'E, aspen-birch forest, on bark of *Populus tremula*, 04.05.2000, leg. DH & NA (H); Veprevskaya bay, 60˚26'42"N, 28˚26'57"E, stripe of black alders along the shore, on bark of *Alnus glutinosa*, 04.05.2000, leg. DH & NA (H). – All specimens contain lecanoric acid, gyrophoric acid and lichexanthone.

Ochrolechia mahluensis Räsänen (syn. *O. androgyna* A sensu Tønsberg 1992) – BB: central part, 60˚17'N, 28˚37'E, several trees of spruce and grey alder in depression along brook within pine-birch forest, on bark of *Pinus sylvestris*, 04.09.2004, leg. NA (H); N part of Krasny Ostrov village, 60˚18'N, 28˚40'E, on worked timber of a well, 13.09.2010, leg. IS, US & NA (herb. US). – Both specimens contain lecanoric and gyrophoric acids. *O. mahluensis* Räsänen is the oldest name for *O. androgyna* A sensu Tønsberg 1992 (Kukwa, 2011).

Ochrolechia microstictoides Räsänen – BB: ca. 0.5 km to the south from southern edge of Papoloma bog, 60˚17'N, 28˚37'E, several trees of spruce and grey alder in depression along brook within pine-birch forest, on bark of *Sorbus aucuparia*, 04.09.2004, leg. NA (H); N part of Krasny Ostrov village,

60˚18'N, 28˚40'E, on worked timber of a well, 13.09.2010, leg. IS, US & NA (H, herb. US). – All specimens contain variolaric and lichesterinic acids, two additionally contain two substances called "microstictoides unknowns" (see Kukwa, 2008).

Opegrapha niveoatra (Borrer) J. R. Laundon – MB: S part, 60˚24'35"N, 28˚26'24"E, mixed broad-leaved-coniferous forest, on *Quercus robur*, 14.09.2010, leg. US, IS & NA (herb. US). – New to LR. Distribution in Fennoscandia and Baltic countries: Norway, Sweden, Finland (Santesson et al., 2004), Estonia (Randlane & Saag, 1999), Lithuania (Motiejūnaitė, 1999). Distribution in North-Western European Russia: Republic of Karelia (Fadeeva et al., 2007). *O. niveoatra* is a temperate species, its northernmost locality is in southern Finland (Santesson et al., 2004). The species is distinguished from the similar *O. vulgata* (Ach.) Ach. by the shorter worm-like conidia and the K(+) olivaceous exciple.

Peltigera extenuata (Nyl. ex Vain.) Lojka – BB: central part, on trail to Zvanka Lake, 60˚18'N, 28˚37'E, bare sand in pine forest, 12.08.2008, leg. TA, conf. O. Vitikainen (H).

Pertusaria coccodes (Ach.) Nyl. – MB: S part, 60˚25'N, 28˚26'E, mixed broad-leaved-coniferous forest, on bark of *Quercus robur*, 12.07.2005, leg. NA (H). Indicator of biologically valuable forests in LR (Andersson et al., 2009).

Pertusaria pupillaris (Nyl.) Th. Fr. – ZB: E shore, 60˚21'N, 28˚30'E, swampy birch-black alder forest with admixture of pine, rowan and aspen, on bark of *Populus tremula*, 27.07.2000, leg. NA (H). – Specimen contains fumarprotocetraric acid.

Piccolia ochrophora (Nyl.) Hafellner – BB: N part of the Krasny Ostrov village, 28˚39'37"E, 60˚18'40"N, shrubs around the house, on bark of *Sambucus nigra*, 13.09.2011, leg. IS, US & NA (H, herb. US).

Placynthium nigrum (Huds.) Gray – BB: cape between Zakatnaya and Poputnaya bays, 60˚15'52"N, 28˚40'42"E, old artillery battery, on concrete floors, 15.09.2010, leg. IS, US & NA (H, herb. US).

Protothelenella sphinctrinoidella (Nyl.) H. Mayrhofer & Poelt – BB: Dalnie Kamyshi bog, 60˚18'21"N, 28˚36'53"E, open, active raised bog with cotton-grass, dwarf shrubs and pines, on mosses and plant debris, 16.09.2010, leg. IS, US & NA (H).

Psilolechia lucida (Ach.) M. Choisy – BB: ca. 0.6 km to SE from cape Vysoky, 60˚16'N, 28˚37'E, spruce forest with admixture of pine and birch, on bark of *Picea abies*, 02.07.2001, leg. NA (H).

Rinodina gennarii Bagl. – BB: Poputnaya bay, S shore of cape Dlinny, 60˚15'42"N, 28˚41'39" E, littoral meadow, on granite boulder, 15.09.2010, leg. US, IS & NA (H, herb. US); MB: S part, 60˚24'26"N, 28˚26'21"E and 60˚24'36"N, 28˚26'41"E, littoral meadow, on granite boulder, 14.09.2010, leg. US, IS & NA (herb. US).

Rinodina pyrina (Ach.) Arnold – BB: former village Pecherskoe, 60˚19'45"N, 28˚35'44"E, stand of trees along the road through the meadow, on bark of *Sambucus* sp., 19.09.2010, leg. IS, US & NA (H).

Ropalospora viridis (Tønsberg) Tønsberg – BB: ca. 0.5 km to the south from southern edge of Papoloma bog, 60˚17'N, 28˚37'E, several trees of spruce and grey alder in depression along brook within pine-birch forest, on bark of young *Sorbus aucuparia*, 04.09.2004, leg. NA (H). – Specimen contains perlatolic acid.

Sarcosagium campestre (Fr.) Poetsch & Schied. – BB: SE margin of Krasny Ostrov village, 16˚17'N, 28˚40'E, on soil at house ruins, 13.08.2008, leg. NA & TA (H).

Sclerophora coniophaea (Norman) J. Mattsson & Middelb. – MB: S part, 60˚24'35"N, 28˚26'24"E, mixed broad-leaved-coniferous forest, on bark of *Quercus robur*, 14.09.2010, leg. IS, US & NA (H, herb. US); S part, 60˚24'32"N, 28˚26'16"E, mixed broad-leaved-coniferous forest, on bark of *Quercus robur*, 14.09.2010, leg. IS, US & NA (H, LECB). Habitat specialist of biologically valuable forests in LR (Andersson et al., 2009).

Scoliciosporum umbrinum (Ach.) Arnold – BB: cape Lapchaty, 60˚17'30"N, 28˚33'46"E, littoral meadow, on granite boulder, 16.09.2010, leg. US, IS & NA (H, herb. US); MB: SE shore, 60˚25'N, 28˚27'E, on path in mixed forest, on rusty iron 14.09.2010, leg. IS, US & NA (H).

Stereocaulon saxatile H. Magn. – BB: ca. 0.8 km to the North from Zakatnaya bay, 60˚16'N, 28˚40'E, glade near forest road with several basements overgrowing with pine and birch, on stone, 13.08.2008, leg. TA & NA

(H); S part, dunes at the root of the cape Dlinny, 60˚16'04"N, 28˚41'15"E, open sand dune, on sand, 15.09.2010, leg. US, IS & NA (herb. US); W shore, vicinity of cape Vysoky, 60˚16'N, 28˚36'E, sand dunes by sea, locally abundant, 12.08.2008, leg. TA, conf. M. Oset (H). – Perhaps all records of *S. alpinum* from the area belong to the soil-dwelling morphs of *S. saxatile*.

Strangospora moriformis (Ach.) Stein – BB: Dalnie Kamyshi bog, 60˚18'24"N, 28˚37'25"E, open, active raised bog with cotton-grass, dwarf shrubs and pines, on lignum of standing dead *Pinus sylvestris*, 16.09.2010, leg. IS, US & NA (H).

Thelocarpon intermediellum Nyl. – BB: vicinity of Nizhnyaya Kamyshinka bog, 60˚18'N, 28˚34'E, spruce forest, on rotten lignum, 16.09.2010, leg. IS, US & NA (H).

Verrucaria boblensis Servít – BB: SE margin of Krasny Ostrov village, 60˚17'N, 28˚40'E, on concrete of house ruins, 13.08.2008, leg. TA (H 9202188) det. J. Pykälä. – New to Russia. Described from Romania, but recently reported from Austria by Breuss & Brand (2010). Distribution in northern Europe is waiting to be studied. The species is morphologically close to *V. muralis* Ach., but the spores are smaller (15–20×8–11 µm).

Verrucaria bryoctona (Th. Fr.) Orange – BB: cape between bays Zakatnaya and Poputnaya, 60˚15'52"N, 28˚40'42"E, old artillery battery, on soil and plant debris over walls and floor, 13.08.2008, leg. NA & TA (H).

Verrucaria xyloxena Norman – BB: SE margin of Krasny Ostrov village, 16˚17'N, 28˚40'E, on soil and plant debris at house ruins, 13.08.2008, leg. NA & TA (H).

Xanthoriicola physciae (Kalchbr.) D. Hawksw. – BB: former village Rybachie, 60˚18'35"N, 28˚38'43"E, stand of young aspens near the road, on *Xanthoria parietina*, on bark of *Populus tremula*, 17.09.2010, leg. US, IS & NA (herb. US). – New to Russia. Distribution in Fennoscandia and Baltic countries: Norway, Sweden, Finland (Santesson et al., 2004), Estonia (Randlane & Saag, 1999), Latvia (Czarnota & Kukwa, 2010), Lithuania (Motiejūnaitė, 1999). This species is widely distributed from the temperate to the southern boreal zone. *X. physciae* is a hyphomycete mainly parasiting on apothecia of *Xanthoria parietina*. The conidiophores are immersed in the hymenium of the host and do not form sporodochia. The apothecia of the host turn sooty black, and the thallus is killed eventually (Hawksworth & Punithalingam, 1973).

Xylographa vitiligo (Ach.) J. R. Laundon – BB: Dalnye Kamyshi bog, E margin, 60˚18'N, 28˚37'E, raised bog with pines, on log, 12.08.2008, leg. TA & NA (H); central part, on road to Zvanka Lake, 60˚18'N, 28˚37'E, sandy pine forest, on log, 12.08.2008, leg. TA (H 9202195).

DISCUSSION

The presented list contains 66 lichen-forming, 9 lichenicolous and 4 saprobic fungi (altogether 79 species) which are new to the Berezovye Islands archipelago. Of them, 56 are reported from the Bol'shoy Berezovy Island, 27 from Maly Berezovy Island, 5 from Severny Berezovy Island, 8 from Zapadny Berezovy Island and 3 from Tsepnoy Island. In the result, the lichen biota of the archipelago comprises 356 species.

The new findings can be divided into four groups according to their habitat. Most of the species (41) occur predominantly in forests. Within this group 21 species have been discovered in broad-leaved forests of Maly Berezovy Island. Altogether 10 species reported in the present paper are considered as indicators or habitat specialists of biologically valuable forests in the North-Western European Russia (Andersson et al., 2009), in general they are restricted to old-growth forest communities. Mostly such species were found on Maly Berezovy Island (8 species), among them *Arthonia byssacea* and *Pertusaria coccodes* are particularly characteristic for old broad-leaved forests.

Species of the second group were found in rural landscapes (28 species). They inhabit man-made substrates, worked timber, exposed boulders, single trees or small stands of trees and shrubs, in former and present villages. Nine of the species occur on artificial substrates (directly or over mosses) and seven on *Populus tremula* in small aspen stands.

The third group is formed by lichens of the seashore (8 species), which inhabit boulders occurring in salt meadows and on boulder beaches. Three of them (*Caloplaca maritima*, *Lecanora helicopis*, *Lecanora rimicola*) require proximity to sea spray, and consequently occur exclusively on seashores.

The fourth group consists of ten species which have been recorded in active, open raised bogs or pine bog woodlands. Two species (*Absconditella sphagnorum* and *Protothelenella sphinctrinoidella*) grow directly on *Sphagnum* mosses, the others inhabit deadwood or the bark of *Pinus sylvestris* (e.g. *Hypocenomyce friesii*, *Lecanora aitema*, *Lecidea turgidula*, *Ochrolechia alboflavescens* and *Strangospora moriformis*).

Taking into account the new findings, habitat groups of lichens and allied fungi on Berezovye Islands can be described as follows: 250 species occur in forests (125 species in deciduous forests without admixture of broad-leaved trees,120 species in broad-leaved forests on Maly Berezovy Island, 101 species in pine forests, 83 species in mixed pine-birch forests, 41 species in spruce forests), 194 species occur on seashore (including boulders in salt meadows, boulder beaches, sand dunes and beaches, trees growing along the seashore), 166 species occur in rural and other human made habitats (including former and present villages, old abandoned constructions), 34 species occur on open raised bogs or pine bog woodlands. Numbers of species restricted on Berezovye Islands to one type of habitat are as follows: 47 species are restricted to rural and other human made habitats, 35 species are restricted to broad-leaved forests on Maly Berezovy Island, 34 species to seashore, 18 species to deciduous forests (without admixture of broad-leaved trees), 10 species to open raised bogs or pine bog woodlands, 6 species to pine forests, 5 species to birch-pine forests, 5 species to spruce forests.

Due to the high total numbers of species and numbers of species restricted to one type of habitat, seashores and broad-leaved forests of Maly Berezovy Island have distinctive nature conservation value. Rural and other human made habitats are also characterized by high total number of species and number of habitat-specific species, which can be explained by significant diversity of substrates in such habitats. Some of them have very limited distribution on Berezovye Islands, e.g. broad-leaved trees and calcareous substrates.

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