Arctoa (2006) **15**: *237-247*

NOTES ON DISTRIBUTION OF SCHISTIDIUM SPECIES (GRIMMIACEAE, BRYOPHYTA) IN MURMANSK PROVINCE AND KARELIA

ЗАМЕТКИ О РАСПРОСТРАНЕНИИ ВИДОВ SCHISTIDIUM (GRIMMIACEAE, BRYOPHYTA) В МУРМАНСКОЙ ОБЛАСТИ И КАРЕЛИИ

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Abstract

Collections of *Schisitdium* species from Karelia and Murmansk Province (NW European Russia) are revised using the narrow species concept introduced by Hans Blom. Habitats of 27 species and one variety are provided, specimens are listed and also distribution is mapped.

Резюме

Проведена критическая ревизия рода *Schisitdium* в Карелии и Мурманской области с использованием узкого понимания видов, предложенного Х. Бломом. Описаны особенности экологии и распространения 27 видов и одной разновидности, выявленных на данной территории, даны карты распространения.

The genus *Schistidium* is one of the most controversial regarding to its taxonomy. Nyholm (1956) accepted 6 species in Fennoscandia and Bremer (1980a, b; 1981) – 6 species in Europe. Contrary to this, Blom (1996) recognized 31 species in the *S. apocarpum* complex just for Norway and Sweden, and the whole genus in Nordic countries includes 38 species (Blom, 1998). A recent study of the genus using molecular markers (Goryunov & al., 2007) supports the narrow species concept of Blom (1996).

Previous publications report only 6 species for Karelia (Volkova & Maksimov, 1993) and 7 species for Murmank Province (Schljakov & Konstantinova, 1982). Blom (1996, 1998), however, reported for both regions as much as 13 species from the *S. apocarpum* complex only. The further application of the Blom' species concept allows to increase the numer of species of the genus in Karelia and Murmansk Province up to 27 species and one variety.

The main base for the present study were the recent collections of Maksimov & Maksimova from Karelia (ca. 200 specimens). All the material from KPABG, LE, MHA, MW, PTZ from the study area has been revised, and collections from H, revised by Blom, were also included in this study. Some recent collections in H (by Huttunen and Wahlberg) were revised as well. Recent colections of T.Drugova who studied urban moss floras of Murmansk Province and added several interesting records of *Schistidium* to its flora (Drugova, 2007) were included, too. Two new species were added by J. Kučera who collected and identified a number of specimens of *Schistidium* in Lovozerskie Tundry Mts. and kindly put his data and specimens to our disposal.

Distribution of species are given according to floristic regions: for Karelia by Ramenskaya (1960; cf. also Volkova & Maksimov, 1993), and for Murmansk Province by Ramenskaya (1976, cf. also Schljakov & Konstantinova, 1982).

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Collections from Karelia are mostly in PTZ and those from the Murmansk Province are mostly in KPABG. Herbarium acronyms are cited only for specimens from other herbaria listed above. Specimens cited in Blom (1996) are marked with asterisk.

Schistidium agassizii Sull. & Lesq.

Rather frequent, throughout the territory.

Murmansk Province: I, Rybachiy Peninsula, Motka Mt., *Likhachev # 20/1*; **II,** Voronjya River basin, *Belkina # Б126-10-04, Б149-1-04*; same place, *Schljakov # 644-77*; Dal'nie Zelentsy, *Belkina # 28-01, 26-1-01*; Teriberskaya Guba, *Belkina # Б118-1-04*; Kil'din Island, *Schljakov # 373*; **IV,** Gremyakha-Vyrmes, Belkina *# 106-13-02*; Kharyukha River (north of Tulomskoe water reservoir), *Likhachev # 14/1*; Lavna-Tundra Mts., *Belkina # 53-15-87, 199-87;* **V,** Sal'nye Tundry, *Belkina # Б35-16-04, Б70-1-04, 127-5-01*; south of Khibiny Mts., Chernoe Lake, *Schljakov # 29*; Kandalaksha, 25.VII.2006, *Drugova s.n.*; Nivskiy channel, VII.2006, *Drugova s.n.*; Kandalakshskie Mts., Chernaya River, *Likhachev # 100/3*; Kolvitskie Mts., Belaya Lambina Lake, *Likhachev # 190/3*; Kandalakshskiy Bay, Kolvitskaya Guba, *Belkina # 1-7-02, Б 28-2-02, Б 30-1-02*; **VI,** Khibiny Mts., Vudjavrchorr Mt., *Schljakov # 1841*; Vudjavrjok River, *Schljakov # 379*; Lovozerskie Mts., Il'majok Stream, *Belkina # 81/7,* Lovozerskie Mts., Elmarajok Stream, *Belkina # 87-32-84; VII,* Tumcha River, *Schljakov # 282*; **VIII,** Kandalakshskiy Bay, Por'ya Guba (coastal area and islands), *Likhachev # 76-3-91; 76-4-91, 218-4-91 , 128-6-91, 128-11-91, 128-13-91; 154-1-91; 230-3-91*; **IX,** Kandalakshskiy Bay, Oleniy Island, *Belkina & Likhachev # 263-11, 263-12, 301-1, 301-2*; Kandalakshskiy Bay, Velikiy Island, *Likhachev # 73-1-92, 73-2-92, 73-6-92, 81-4-92*.

Karelia: II, Paanajärvi National Park, Oulanka River, Kivakkakoski Waterfall, *Maksimov # Паа-03/4-123*; **III**, Kostomukshskiy Nature Reserve, Kontokki Creek, 21.VII.1998, *Boychuk s.n.*; Lendery, Lenderka River, *Maksimov & Maksimova # L-03/2-67a*; Kepa River, Yuma Waterfall, *Maksimov # J-03/11-44*; Volоma River mouth, *Maksimov & Maksimova # 41-154*; **VI,** former Kuolismaa Village, Koitajoki River, *Maksimov # Кой-97/42-107*; **VII,** SW shore of Segozero Lake, rapids at Gormozerka River mouth and at Luzhma River, *Maksimov & Maksimova # 44-328, 43-197*; Kumsa River, near the bridge along road from Osterech'e to Chebino, *Maksimov & Maksimova # 3ao-00/75-1041*; **X,** Petrozavodsk, Agricultural Station of Karelian branch of RAS, Lososinka River, 5.X.1997, *Maksimov s.n.*; **XI,** Kolatsel'ga, Kovozha River, *Maksimov # 38-84*; **XII,** Tokhmajoki River, *Maksimov & Maksimova # Пр-99/51-100a*; Soskuanjoki River, *Maksimov & Maksimova # 19-575*.

Ecology: on rocks in rivers, streams and brooks, in rapids, along banks just above the water, at channel bank on boulder; on cliffs at The White Sea shore, in moist crevices and on walls with creeping water.

Schistidium apocarpum (Hedw.) Bruch & al.

Rare species in Murmansk Province, known from few localities in central (Lavna-tundra, Lovozerskie Mts.) and southern part (Kandalaksha); more frequent in Karelia, throughout the territory.

Murmansk Province: IV, Lavna-tundra, *Belkina # 97/14; 97-64-87, 97-102-87*; **V,** Kandalaksha, VII.2006, *Drugova s.n.*; Nivskiy Channel, VII.2006, *Drugova s.n.*; Niva River bank, VII.2006, *Drugova s.n.*; **VI,** Lovozerskie Mts., Seidozero Lake, *Belkina # 94-11-84*; **IX,** Kandalakshskiy Bay, Velikiy Island, *Likhachev # 81-4-92*, *81-10-92.*

Karelia: I, Paanajärvi National Park, Paanajärvi Lake, Oulanka River sources, *Maksimov # Паа-96/1-158*; **II,** Kuopsujärvi Lake, 16.VII.1978, *Volkova s.n.* (LE); **III,** Maslozero Lake, Yukkoguba, 18.VIII. 1978, *Volkova s.n.* (LE); **V,** Shuezhero Lake, Lekhta, 30.VII.1977, *Volkova s.n.* (LE); **VII,** Shun'ga, Bolshoy Dvor, *Maksimov & Maksimova # 3ao-00/74-630*; Tolvuya (Vyrozero), *Maksimov # 3ao-01/67-Б*; Kivach Nature Reserve, *Maksimova #* K-02/2; Kivach Nature Reserve, VII.1974, *Volkova s.n.* (LE); southern shore of Sundozero Lake, 4.VIII.2004, *Maksimov s.n.*; Kosalma, Sampo Mt., *Maksimov # 3ao03-25*; **X,** Petrozavodsk, Agricultural Station of Karelian branch of RAS, Lososinka River, *Maksimov & Maksimova # Пе-97/3*; Petrozavodsk, *Kravchenko # Пе-05/1(1)*; Sheltozero, *Maksimov # V-04/60-126*; **XI,** Kindasovo, *Maksimov & Maksimova # 250*; Kolatsel'ga, Suonjärvi Lake, *Maksimov # 3-129*; Tulomozero Lake, *Maksimov # 36-393*; eastern bank of Suonjärvi Lake, *Maksimov # 57-207*; **XII,** *Suistamo, Ahvenlampi, Huuskonen s.n., 31.V.1936 (H); Ruskeala, Kirjavalakhti Bay of Ladoga Lake, *Maksimov # X-98/36-63*.

Ecology: on rocks in brooks and streams, above water level; at lake shores, in open places, more rarely in shade, on rocks, boulders, rock outcrops, mostly siliceous, and on artificial substrates (concrete paths and blocks, broken concrete pieces, etc.).

Schistidium boreale Poelt

Known by a single collection in south-west of Murmansk Province; more frequent in Karelia. Reported for Karelia by Maksimov (2003).

Murmansk Province: VII, Pyukhakuru Gorge, *Schljakov # 72 # 73b*.

Karelia: I, Paanajärvi National Park, Ruskeakallio (Red Cliff), *Pesola # H 4216251* (H); same place, *Maksimov # Паа-90/42 # Паа-03/10-21*; Neris Lake, *Maksimov # Паа-96/6-312*; Paanajärvi Lake shore near Oulanka River source, *Maksimov # Паа-96/10-130*; Myantyujoki River mouth, *Maksimov # Паа-97/21-88, Паа-97/31-24*; **III,** Hukkakallio, *Bergroth # H 4216272* (H); **VII,** Tivdie, marble pit at Belaya Gora, *Maksimov & Maksimova # 3ao-00/12-289*; Kumsa River near the bridge along road from Ostrech'e to Chebino, *Maksimov & Maksimova # 3ao-00/81-129*; Tivdie, Krasnaya Gora, *Maksimov & Maksimova # 3ao-00/38-509, 3ao-00/39-190*; Ussuna, dolomite outcrops at Sundozero Lake shore, *Maksimov & Maksimova # 3ao-00/52-383*; Kivach Nature Reserve, southern shore of Sundozero Lake, *Kucherov # K-03/95(3)*; Sundozero Lake, Rudnik Island, *Kucherov # K-03/89(3), K-04/21-6*; **XII,** *Sortavala, Kirjavalakhti, *Pesola # H 4216270* (H); Pyalkjärvi, Korkaniemi, *Brotherus # H 4216263* (H); western end of Kirjavalakhti Bay of Ladoga Lake, *Maksimov & Maksimova # Пр-99/ 71-733*.

Ecology: on rock outcrops (mostly dolomites), dry cliffs, on fine soil at rock base.

Schistidium confusum H.H. Blom

Newly recorded for Karelia, known by a single collection.

Karelia: XII, Impilakhti, 4 km SE, Sumerianjoki River, Raukkianmyaki, *Huttunen & Wahlberg # 759* (H).

Ecology: on amphibolite slate.

Schistidium crenatum H.H. Blom

Rare species, mentioned for Karelia by Blom (1998), known by two collections in eastern and southern parts of Murmansk Province and two collections from SW Karelia.

Murmansk Province: III, Ponoy, Mel'nichnyy Brook, *Schljakov # 276*; **V,** Kandalaksha, Nivskiy Channel bank, VII.2006, *Drugova s.n.*

Karelia: II, Dvinskie Ludy, Vysokiy Island, *Maksimov,# Б-06/75-278;* **XII,** Sortavala, *Wecksell # H 421660* (H); Sortavala, Suur-Siikasaari, *Pankakoski # H 4217268* (H).

Ecology: on wet rock outcrops, in cracks of boulder at channel bank; on S-facing cliff at shore on the island (in The White Sea).

Schistidium dupretii (Thér.) W. A. Weber

Rare in Murmansk Province (central and northern parts), sporadic in Karelia.

Murmansk Province: II, Murmansk, *Drugova # 3/10/263*; **V,** Sal'nye tundry, *Belkina # Б 115-1-03*.

Karelia: III, Tulos Lake, Guba Shuopogojya, *Maksimov # Ty-97/26-146*; **V,** southern shore of Elmozero Lake, *Maksimov & Maksimova # E00/26-281*; **VI**, Suojärvi, Varpakyla, *J.S.W. Koponen # H 4216612* (H); **VII,** Tivdie, *Selin # H 216608* (H); Tivdie, marble pit at Belaya Gora, *Maksimov & Maksimova # 3ao00/3-281*; Tolvuya (Lisitsino), dolomite pit, *Maksimov & Maksimova # 3ao-00/54-285*; Tolvuya (Savinskaya), *Maksimov # 3ao-01/64-A*; Prionezhskij District, Shujskaya Chupa, 23.VII.1973, *Volkova s.n.* (LE)**; XII,** *Pälkijärvi, Ullankalliot, 17.VII.1905, *J.W.S.Koponen s.n.* (H); Ruskeala, marble pit, *Maksimov & Maksimova # Пр-99/44-986*; Khiisjärvi Lake, northern part of the former Khiisjärvi National Park, Kaliojya Brook, *Maksimov # X-04/22-116*.

Ecology: on marble and dolomite outcrops and boulders, mostly in open places.

Schistidium elegantulum H.H. Blom

Newly recorded for Karelia, known by a single collection from its southern part.

Karelia: X, Petrozavodsk, *Kravchenko # Пе-05/ 1(2)* (PTZ).

*Ecology***:** collected on concrete block in city.

Schistidium flaccidum (De Not.) Ochyra

Reported for Karelia by Brotherus (1923). Known by a single collection.

Karelia: **XII**, *Impilakhti, Pullinvuori, *Brotherus & Hjelt # H 4216617* (H, LE).

Erroneously recorded for Murmansk Province (Belkina & Likhachev, 1997).

Ecology: on dry cliff.

Schistidium flexipile (Lindb. ex Broth.) G.Roth

Sporadic, mostly at sea and lake shores.

Murmansk Province: **II**, *Lapponia Murmanica, ad fl. Olenka, VII.1914, *Brotherus s.n.* (H); **III**, *Lapponia ponoensis, Orlow, 26.V. 1989, 25.V.1892, *Kihlman s.n.* (H); **V**, *Kantalaks, VII.1885, *Brotherus s.n.* (H).

Karelia: II, White Sea, Sharapikha Island, *Maksimov # Б-06/63-33, Б-06/63-250*; Dvinskie Ludy, Vysokiy Island, *Maksimov # Б-06/75-38, Б-06/75-278*; Sonostrov Island, *Maksimov # Б-06/55-102*; Pezhostrov Island, *Maksimov # Б-06/70-239, Б-06/70-241*; Pestyanoiy Island, *Maksimov # Б-06/ 93-305*; **IV,** White Sea, Syrovatka landscape reserve *# Б-03/147-25*; Chernetskiy Island, *Maksimov # Б-06/33-298, Б-06/33-305*; **XII,** *Hhiitola, Kopsala, Patasaari, *Wecksel # H 4216624l* (H); Ladoga Lake, Valaam Island, *Tuomikoski # H 4216619* (H); Kurkijoki, *Räsänen & Laurila # H 4216621* (H).

Ecology: in mainland and especially on islands of The White Sea, once on Valaam Island at Ladoga Lake, on cliffs at sea shore, dry or wet, on rock surface and in crevices, on boulders in pine forest near sea shore and on rock outcrops at lake shore.

Schistidium frigidum H.H. Blom

Sporadic; known by two collections from Murmansk Province and from several localities in southern Karelia. Reported for Karelia by Maksimov (2003).

Murmansk Province: II, Teriberka River, *Belkina, Б87-4-04*; **III,** *Ponoj, 15.VI.1863, *Brenner s.n.* (H); Ponoj, Mel'nichnyy Brook, *Schljakov # 276*; **V,** Lavna-Tundra, *Belkina, 261-3-87;* **VI,** Lovoserskie Tundry Mts., Revda, *Kučera # 11491* (CBFS).

Karelia: I, Paanajärvi National Park, Ortzastunturi (Ortsas), *Vaarama # H 4071644* (H); **II,** Sonostrov Island, *Maksimov # Б-06/57-151;* **VII,** *Karelia onegensis, Säininen, Suisaari, *Kotilainen # H 4216638* (H); **XII**, Ladoga Lake, Valaam Island, *Nylander # H 4216631* (H); *Ruskeala, Korpikallio, *Brotherus # H 4216630* (H).

Ecology: in vertical crevice of cliff, at base of smooth cliff surface, on inclined rock plates, sometimes slightly base-rich.

Schistidium frisvollianum H.H. Blom

Reported by Blom (1996) for northern Karelia, but the mentioned locality belongs to Murmansk Province. Found in two localities in Karelia.

Murmansk Province: ?I, *Lapponia petsamoensis, Salmijärvi, Pääsluppakta, 31.VII.1925, *Linkola s.n.* (H).

Karelia: II, *Kindo Peninsula, *coll. ignot.* (MW); **VII,** Tivdie, Krasnaya Gora, *Maksimov & Maksimova # 3ao-00/38-837*.

Ecology: on limestone outcrops.

Schistidium grandirete H.H. Blom

Very rare, known by a single record from central part of Murmansk Province.

Murmansk Province: **VI**, Lovoserskie Tundry Mts., Revda, *Kučera # 11515* (CBFS).

Ecology: in fissure of W-facing inclined wet rock plates, slightly base-rich.

Schistidium lancifolium (Kindb.) H.H. Blom

Very rare in Murmansk Province, one locality in southern part; in Karelia more frequent, sporadic throughout the territory. Reported for Karelia by Maksimov & Maksimova (2005).

Murmansk Province: VIII, Kandalakshskiy Bay, Porjya Guba, *Likhachev # 128-7-91*.

Karelia: I, Paanajärvi National Park, Pieni Lake, *Maksimov # Паа-88/170*; Paanajärvi Lake, Ruskeakallio, *Maksimov # Паа-03/5-110(2)*; **VII**, Tivdie, rocks at lake bank, *Maksimov & Maksimova # 3ao-00/47-256*; Padun, Kumsa River bank, *Maksimov & Maksimova # 3ao-00/76-1000*; Kivach Nature Reserve, southern shore of Sundozero Lake, *Maksimov # K-04/19-5(2)*; **X,** Petrozavodsk, Lososinka River flood valley, *Maksimov & Maksimova # Пе-95/6*; Rybreka, *Maksimov # V-04/23-125*; **XII,** *Sujstamo, Jalovaara, Riuttannori, *Kotilainen # H 4216651* (H); former National Park Khiisjärvi, 17-20.IX.1934, *Tuomikoski s.n.* (H); Kurkijeki, *Maksimov # Пр-95/4д-61*; Sortavala, Khaapalampi, 24.VI.1997, *Huttunen & Wahlberg s.n.* (H); Ruskeala, marble pit, *Maksimov & Maksimova # Пр-99/46-607*; Ruskeala, Tokhmajoki River, *Maksimov & Maksimova # Пр-99/42-602*; Taruniemi Peninsula, Sortavala botanical protected area, *Maksimov & Maksimova # 62-339*; Kirjavalakhti Bay, *Maksimov & Maksimova # Пр-99/87-328*.

Ecology: on boulders, outcrops and cliffs, both siliceous and calcareous (marble, dolomite), in shaded or exposed sites (in the forest, at lake shore, in marble pit, etc.).

Schistidium maritimum (Sm. ex R. Scott) Bruch et al. subsp. ***maritimum***

Not rare at the Barentz Sea coastal area in Murmansk Province. Newly reported for Karelia.

Murmansk Province: II, Voronja River, Podpakhtinskiy Bay, *Belkina # 63-01, 51-6-01*; Voronji Ludki Islands, *Belkina # 93-1-01*; Bolshoj Gavrilovskij Island, *Belkina # 98-2-01, 105-2-01, 106-1-01*; Dal'nie Zelenzy, *Belkina # 14-01*; Tri Ostrova Arkhipelago, Veshnjak Island, *V.P.Savicz*, *Hepaticae et Musci URSS exsiccati, Dec. I # 4*; Teriberka River, *Belkina # Б 90-04, Б 108-1-04, Б 109-1-04*.

Karelia: II, Kerjetskiy protected area, Pezhostrov Island, *Maksimov # 113-463*; Sonostrov Island, *Maksimov # Б-06/53-24*, *Б-06/53-43, Б-06/53-248*; Pestyanoj Island, *Maksimov # Б-06/95-93, Б-06/95-98*.

Ecology: in crevices of vertical cliffs and boulders at sea shore, once on boulder in a lake.

Schistidium maritimum subsp**. *piliferum*** (I. Hagen) B. Bremer

New for Karelia.

Murmansk Province: II, Dal'nie Zelentsy, *Belkina # 42-01*; Podpakhtinskiy Bay, *Belkina # 52-1-01;* **VII,** Kandalakshskiy Bay, Kem'-Ludskij Island, *Belkina & Likhachev # 108-3-89, 112-4-89*.

Karelia: II, Kerjetskiy protected area, Pezhostrov Island, *Maksimov # 110-79*; Pestyanoy Island, *Maksimov # Б-06/95-30, Б-06/95-32*; Sonostrov Island, *Maksimov # Б-06/54-56*; Cheremshikha Island, *Maksimov # Б-06/86-147*.

Ecology: in cliff crevices and on boulders at sea shore.

Schistidium papillosum Culm.

Rare in northern and central parts of Murmansk Province, more frequent at the White Sea coastal area; common in Karelia, throughout the territory. Reported for Karelia by Maksimov (2003).

Murmansk Province: II, Teriberka River, *Belkina # Б 101-2в-04*; **V,** Kandalaksha, VII. 2006, *Drugova s.n.*; Niva River bank, VII.2006, *Drugova s.n.*; **VI,** Khibiny Mts., Kukisvumchorr Range, *Schljakov # 2349*; Khibiny Mts., Vudjavrchorr Mt., Yuzhnoe Skvoznoe Gorge, *Schljakov # 2145*; **VII,** Pyukhyakuru Gorge, *Schljakov # 72*; same place, *Belkina & Likhachev # б. 27/1, б. 27/12*; same place, *Belkina # 28-6-86*; **VIII,** Kandalakshskiy Bay, Porja Guba, *Konstantinova # 171-5-91, Likhachev*, *198-14-91, 198-27-91, 198-31-91*; **IX,** Oleniy Island, *Belkina & Likhachev # 323/49, 323/37*; Ryazhkov Island, *Belkina & Likhachev # 371/13, 391-45-88*; Vuorijärvi Lake, *Schljakov # 14*.

Karelia: I, Paanajärvi National Park, Ruskeakallio, *Maksimov # Паа-90/49(1)* & *Паа-03/20-26*; Nizhnee Neris Lake, *Maksimov # Паа-96/19-212*; Paanajärvi Lake, Oulanka River sources, *Maksimov # Паа-96/5-149*; Niskavaara Mt., *Maksimov # Паа-96/17-224*; Myantyujoki River, *Kuznetsov # Паа-96/29а-490*; Oulanka River, Kivakkakoski waterfall, *Maksimov # Паа-03/4-12*; **II,** *Karelia keretensis, Kontajärvii, 26.VIII. 1863, *Brenner s. n.* (H); Chkalovskiy, *Kucherov # Б-01/19(2)*; Kindo Peninsula, White Sea Biostation of Moscow State University, 3.VIII.1987, *Abramova s.n.* (MW), 2.VII.1987, *Filin s.n.* (MW), 15.VIII.1993, *Notov s.n.* (MW), 29.VI.1994, *Notov & Spirina s.n.* (MW)**; IV**, Syrovatka protected area, *Maksimov # Б-03/130-277(3)*; Belomorskij District, Nyukhcha, Svyataya Mt., 6.VIII.1975, *Volkova s.n.* (LE); **V**, Elmozero Lake, Shalgovaary, *Maksimov & Maksimova # 3-309*; **VII,** Padun, Kumsa River bank, *Maksimov & Maksimova # 3ao-00/77-1036*; Tivdie, Krasnaya Gora, *Maksimov & Maksimova # 3ao00/38-782*; Tolvuya (Lisitsino), *Maksimov # 3ao01/69-1*; Kivach Nature Reserve, *Maksimova # K-02/60*; Kivach Nature Reserve, 3.VII.1973, *Volkova s.n.* (LE); Sundozero Lake, *Maksimov # K-04/15-13*; **X,** Rybreka, *Cajander, Lindroth # A 158* (H); **XII,** *Karelia ladogensis, Salmi, Kiisjärvii, Pallinvaara, 17-20.IX.1934, *Tuomikoski s.n.* (H); former National Park Khiisjärvi, 23.VI.1914, *Linkola s.n.* (H); Khiisjärvi Lake, Pallinvaara Mt., *Maksimov # X-98/10г-221*; Impilakhti, Viipula, 19.VII. 1914, *Kotilainen s.n.* (H); Impilakhti, Pullinvuori, 15.VI.1926, *Kotilainen s.n.* (H); Sortavala, 7.VIII.1914, *Pesola s.n.* (H); Kurkijeki, *Maksimov # Пр-95/2д-31*; Sortavala, Zaozernyy, *Maksimov # Пр-95/5д-72*; Kolatsel'ga, Tulomozero Lake western shore, *Maksimov # 36-81*.

Ecology: often on vertical walls of cliffs and in crevices, on rock outcrops and side walls of boulders, mostly calcareous (dolomite), more rarely acidic rocks, rarely on artificial substrates (concrete blocks), usually dry, more rarely wet, in shaded or exposed places (in pine forests, at sea and lake shores, river banks, on meadows).

Schistidium platyphyllum (Mitt.) H. Perss.

Known by few records in different places in Murmansk Province; sporadic in Karelia.

Murmansk Province: II, Teriberka River, *Belkina # Б101-1-04; Б 101-2д-04*; **IV,** Chil'tald Mts., *Belkina # 207-23-88*; **V,** Kandalaksha, Niva River bank, VII.2006, *Drugova s.n.*

Karelia: I, Paanajärvi National Park, Oulanka River near its sources, *Maksimov # Паа-96/4а-468*; Oulanka river, Ivan rapids, *Maksimov # Паа-03/3-115*; **II**?, Ruonjärvi, 1861, *Fellman s.n.* (H); **X,** Petrozavodsk, Agricultural Station of Karelian branch of RAS, Lososinka River, *Maksimov & Maksimova # Пе-95/39-9*; **XII,** Sortavala, Puuluoto Island, *Huttunen & Wahlberg # H 4217241* (H).

Ecology: in crevices of cliffs at sea shore, on boulders in streams and lakes, on rocks at river banks, on concrete pieces, etc.

Schistidium pulchrum H.H. Blom

Sporadic in Murmansk Province (in mountain areas), more frequent in The White Sea coastal area and islands; known by few records in Karelia.

Murmansk Province: IV, Chil'tald, *Belkina # 171-36-88*; **V,** Sal'nye Tundry, Belkina # *Б 132-2-03*; **VI,** Lovozerskie Mts., Il'majok Gorge, *Belkina # 73/22*; Khibiny Mts., Rasvumchorr, *Schljakov # 2225*; Khibiny Mts., Lovchorr, Pirrotinovoe Gorge, *Schljakov # 2072*; Khibiny railway station, *Schljakov # 2373*; Jukspor**,** *Schljakov* # 1923a (LE); **VII,** Pyukhakuru Gorge, *Schljakov # 73а*; **VIII,** Kandalakshskiy Bay, Porja Guba, *Likhachev # 198-9-91*; Porja Guba, Belozerskaya Guba, *Likhachev # 222-1-91*; Porja Guba, Ozerchanka Island, *Likhachev # 54-6-91*; Porja Guba, Khedostrov Island, *Likhachev # 102-7-91*; Porja Guba, Bolshoy Yagodnyy Island , *Konstantinova # 171-5-91*; Turiy Peninsula, *Schljakov # 14*; Kandalakshskiy shore, Korabl' Cape, *Belkina # 35-15-99*; **IX,** Kandalakshskiy Bay, Ryazhov Island, *Belkina & Likhachev # 417-18-88, 425-88*; Oleniy Island, *Belkina & Likhachev # 239/1, 319/16, 319/17, 323/22, 323/36, 319/11, 323/4*, *Belkina # 333-2-88*; Velikiy Island, *Likhachev # 71-11-92*; Kandalakshskiy Bay, Izbyanoy Island, *Belkina & Likhachev # 202-6-89, 202-15-89*; Kem'-Ludskij Island, *Belkina & Likhachev # 98-2-89, 98-3-89, 102-6-89), 102-10-*

89, 108-1-89, 188-1-89; Bolshoy Asaf'ev Island, *Belkina & Likhachev # 142-3-89*; Perejma Island, *Belkina & Likhachev # 160-7-89.*

Karelia: I, Paanajärvi National Park, Paanajärvi Lake, *Maksimov # Паа-90/95*; **II,** Kindo Peninsula, White Sea Biostation of Moscow State University, 16.VIII.1993, *Notov s.n.* (MW); Kartezh Cape, *Maksimov # Б-06/88-5, Б-06/88-194, Б-06/88-315*; Kandalakshskiy Bay, Izbyanoy Island, *Belkina & Likhachev # 202-6-89, 202-15-89*; Kem'-Ludskij Island, *Belkina & Likhachev # 98-2-89, 98-3-89, 102-6-89, 102-10-89, 108-1-89, 188-1-89*; Bolshoy Asaf'ev Island, *Belkina & Likhachev # 142-3-89*; Perejma Island, *Belkina & Likhachev # 160-7-89*; **VII,** Kivach Nature Reserve, *Maksimova # K-02/52*; Sundozero Lake southern shore, *Maksimov # K-04/16-34*; *Karelia Onegensis, Sunnu, Merezhnavolok, 18.VII.1942, *Kotilainen s.n.* (LE); Prionezhskiy District, Botanical Garden of Petrozavodsk University, *Bakalin & Bakalina*, *Bryophyta Karelica Exsiccata # 47* (MW); **VIII,** Pyal'ma River, *Maksimov # П-04/3-293(1)*; **XI,** Kolatsel'ga, Tulomozero Lake, *Maksimov # Ko-01/36-256*; **XII**, *Karelia ladogensis, Salmi, Mantelvinsaari, Sankkonen, 8.VIII.1915, *Linkola s.n.* (H).

Ecology: in crevices of cliffs at sea shore, on cliff walls, both dry and wet, on cliffs and rock outcrops in mountain gorges, up to subalpine belt, on rock outcrops at river banks and lake shores; on siliceous (granitic) and calcareous (dolomite, base-rich sandstone) rocks.

Schistidium recurvum H.H. Blom

Very rare, known by a single record both in Murmansk Province and Karelia.

Murmansk Province: VIII, Kandalakshskiy Bay, Porja Guba, Bolshoy Yagodnyy Island, *Likhachev # 182-1-91*.

Karelia: II, Tavajärvi, *Nyberg # H 4216965* (H).

Ecology: on fine soil in nishes of cliffs and on cliff wall at sea shore.

Schistidium rivulare (Brid.) Podp. (*S. alpicola* (Hedw.) Limpr. var. *rivulare* (Brid.) Limpr., *Grimmia alpicola* var. *rivularis* (Brid.) Wahlenb.)

Sporadic in Murmansk Province and Karelia, throughout the territory.

Murmansk Province: **I,** between Zypnavolok & Ozerko, *Konstantinova # 53/6*; **II,** Kil'din Island, *Schljakov # 233*; Dal'nie Zelentsy, *Belkina # 36-3-01*; Podpakhtinskiy Bay, *Belkina # 54-1-01, 54-4-01*; Voronja River basin, *Belkina # Б 137-2-04*; **IV**, Gremyakha-Vyrmes, *Belkina # 106-27-02*; **V,** Sal'nye Tundry, *Belkina # Б 35-1e-04*; **VI,** Lovozerskie Mts., Il'majok River, *Belkina # ОБ 7-1-85, 137/12*; Lovozerskie Mts., Pargway Stream, *Belkina # 22-15-84*; Lovozerskie Mts., Sengisjok River, *Belkina # 37-8-84*; Sengisjavr Lake, *Belkina # 35-6-84*; Lovozerskie Mts., El'marajok Pass, *Belkina # 85/13*; Lovozerskie Mts., Ivnyak Stream, *Belkina # 86-17-84*; Lovozerskie Mts., Kitkway Stream, *Belkina & Likhachev # 100/2*; *Vavnjok* River*, Belkina & Likhachev # 60/6;* Khibiny Mts., Yukspor Gorge, *Schljakov # 896*; Khibiny Mts., Vudjavrjok River, *Schljakov # 379*; Khibiny Mts., Kunjok River upper course, 16.IX. 1989, *Konstantinova s.n.*

Karelia: I, Paanajärvi National Park, Paanajärvi Lake, Oulanka River sources, *Maksimov # Паа-96/4-401(1)*; **III,** Lendery, Lenderka River, first rapid, *Maksimov & Maksimova # L-03/3-39a*; Kepa River, Yuma waterfall, *Maksimov # J-03/10-28*; Voloma River mouth, rapid, *Komulainen # 9-341*; **VIII,** Tikhvin Bor, Nemina River, *Maksimov # Vo-05/16-37*; **X,** Petrozavodsk, Agricultural Station of Karelian branch of RAS, Lososinka River, *Maksimov & Maksimova # Пе-95/16-5, Пе-97/1 & Пе-05/29*; **XI,** Vidlitsa River, *Maksimov & Maksimova # Пр-99/1-847*; **XII,** Khaapalampi, Savamjoki River, *Maksimov & Maksimova # 40-504*; Salmi, Tulemajoki, *Maksimov & Maksimova # 2-981.*

Ecology: in streams and rivers, on rocks (acidic or calcareous) in the water and at banks; in fissures of cliffs; on rocks at lake shores; on rock-fields with creeping water in alpine belt and on soil in mountain tundra; on rock-fields at sea shore.

Schistidium robustum (Nees & Hornsch.) H.H. Blom

Very rare, known by single record in Karelia.

Karelia: XII, *Palkjärvi, Korkioniemi, *Brotherus # H 4217099* (H).

Ecology: unknown.

Schistidium sordidum Hag.

Very rare, known by few records at The Barentz Sea coastal area and Khibiny Mts. in Murmansk Province.

Murmansk Province: II, Voronja River, *Belkina # Б 137-2-04*; **IV,** Shuonijoki River, *Belkina # Б 205-2-04*; **VI,** Khibiny Mts., Vudjavrchorr Mt., *Schljakov # 345.*

Ecology: on rocks at stream banks and in rock crevice of rock outcrops in mountain tundra.

Schistidium subjulaceum H.H. Blom

Very rare, known by single record in Karelia.

Karelia: I, Paanajärvi National Park, Pieni Lake shore, *Maksimov # Паа-88/156.*

Ecology: on rocks in spring at lake shore.

Schistidium submuticum Broth. ex H.H. Blom

Rare, in southern part of Murmansk Province, and in Karelia in several localities.

Murmansk Province: V, Kandalaksha, Niva River bank, VII.2006, *Drugova s. n.*

Karelia: I, Paanajärvi National Park, Paanajärvi Lake, *Maksimov # Пaa-96/11-11*; **VII,** Tolvuya (Lisitsino), *Maksimov # 3ao-01/69-C*; Kivach Nature Reserve, Sundozero Lake, Rudnik Island, *Maksimov # K-04/21-38*; **VIII,** Pyal'ma River, *Maksimov # П-04/3-309 (6)*; **XII,** 12 km of road from Elisenvaara – Lakhdenpokhja, *Maksimov # Пр-95/7д-1.263*.

Ecology: on limestone and dolomite rocks and rock outcrops, on artificial substrates (concrete blocks, building basements), in shade and open places (meadows, river banks, etc.).

Schistidium tenerum (J.E. Zetterst.) Nyholm

Very rare, known by single record in Karelia.

Karelia: I, Kulmakkapuro, 31.VII.1937, *Vaarama # H 4217113* (H).

Ecology: unknown.

Schistidium trichodon (Brid.) Poelt var. ***nutans*** H.H. Blom

Newly recorded for Karelia.

Karelia: I, Paanajärvi National Park, Paanajärvi Lake, *Maksimov # Пaa-96/10-36*; Myantyujoki River, waterfall near the mouth, *Maksimov # Пaa-97/9-102*.

Ecology: W- and NW-facing dolomite outcrops.

Schistidium umbrosum (J.E. Zetterst.) H.H. Blom

Very rare, known by single collection from the central part of Murmansk Province.

Murmansk Province: VI, Lovoserskie Tundry Mts., Revda, *Kučera # 11499* (CBFS).

Ecology: fissure of SW-facing somewhat base-rich rocks beneath an overhang, slightly shaded.

Schistidium venetum H.H. Blom

Very rare, known by few collections in Murmansk Province and Karelia.

Murmansk Province: **V**, *Fedoserksk (Fedoseevka?) pr. Kantalaks, VI.1885, *Brotherus s.n.* (H); **VI,** Khibiny Mts., Yukspor, *Schljakov # 1927* (LE).

Karelia: II? Blom (1998) reported this species from northern Karelia, however in H there are no specimens from the republic. It is likely, that this record was based on Kandalaksha specimen.

Ecology: on dry rock outcrop in the middle part of slope (ca. 500 m alt.)

EXCLUDED SPECIES

Schistidium confertum (Funck) Bruch et al. Reported previosly for Karelia (Volkova & Maksimov, 1993) and Murmansk Province, Kandalaksha Nature Reserve (Belkina & Likhachev, 1997). No voucher specimens were found in herbaria.

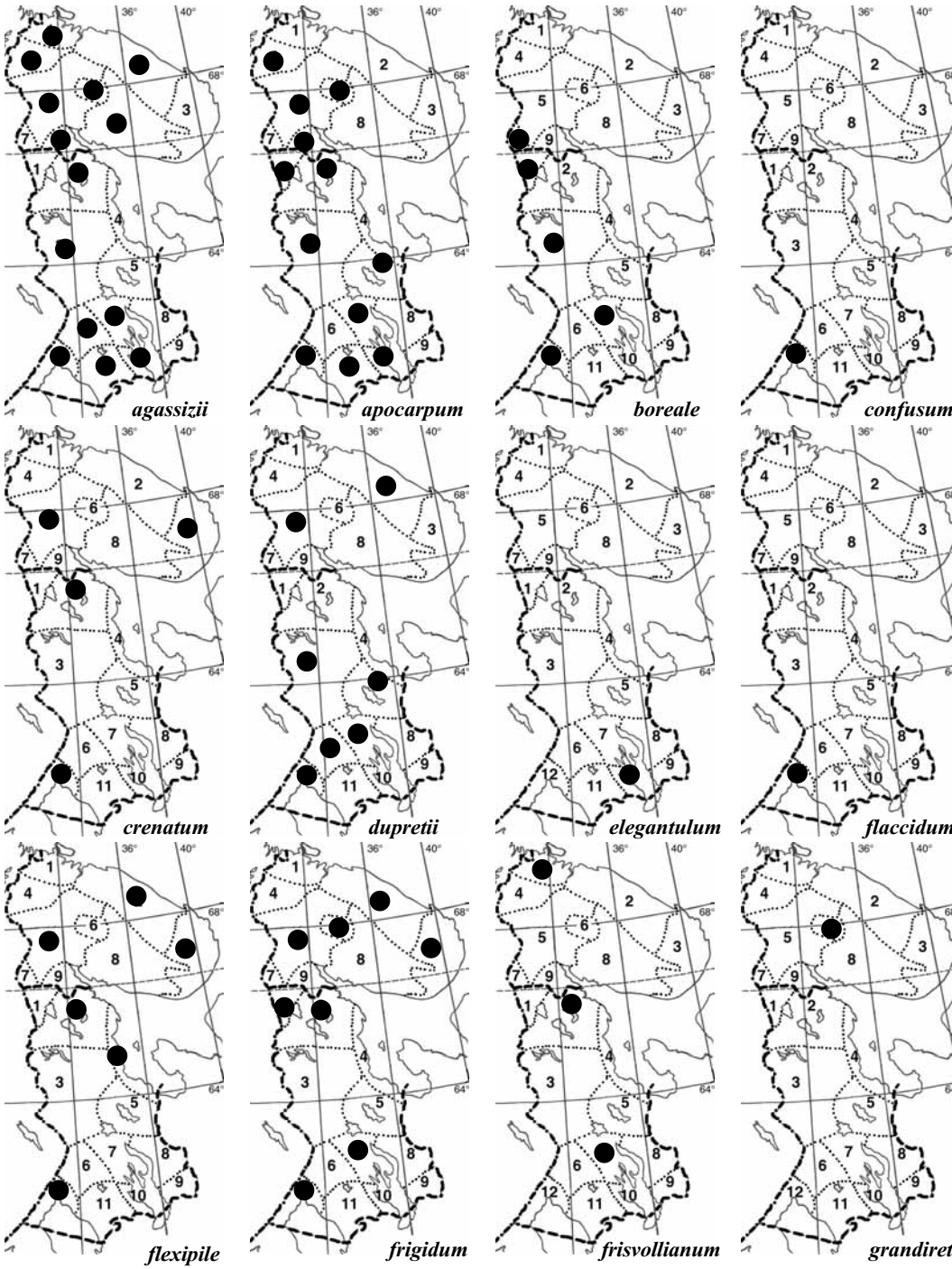
Schistidium strictum (Turner) Loeske ex Mårtensson. Previous concept of this strictly oceanic species was much broader. According to Blom (1996) all records of *S. strictum* from the study area belong in fact mostly to *S. papillosum*, more rarely to *S. boreale.*

NOTES ON DISTRIBUTION AND HABITATS

Only two aquatic and subaquatic species, *S. agassizii* and *S. rivulare*, are rather frequent throughout the study territory, including The Barents Sea coastal area; they grow on rocks in or beside brooks and rivers or on boulders at lake shores, occurring from sea level to subalpine and alpine belts.

Otherwise, the species of *Schistidium* are relatively rare in most territory of Murmansk Province where rocky substrates are occupied predominantly by *Racomitrium* s.l. or *Grimmia* species; *Schistidium* species become more frequent in appropriate habitats southwards, its southernmost part of Murmansk Province and in Karelia.

Among other, three species, *S. apocarpum*, *S. papillosum* and *S. pulchrum*, are relatively more frequent, but only *S. papillosum* reaches the northernmost part of the territory. These three species have distributional pattern and habitat preference similar to those known in Scandinavian countries according to Blom (1996, 1998). *Schistidium apocarpum* is rather rare in Murmansk Province, except Kandalaksha surroundings, and becomes more frequent in Karelia. It is a lowland plant, growing in semi-shaded or open habitats, mostly on siliceous rocks and often on artificial substrates; it also often grows along brooks and streams and at lake shores. *Schistidium papillosum* is also more frequent in southern part of Murmansk Province and throughout Karelia and grows in wide range of altitudes and bedrock types, but more frequently on base-rich rocks, mostly dry, rarely wet, shaded or exposed. *Schistidium pulchrum* is sporadic in the mountains of Murmansk Province, more frequent along White Sea coastal area and rather rare in other

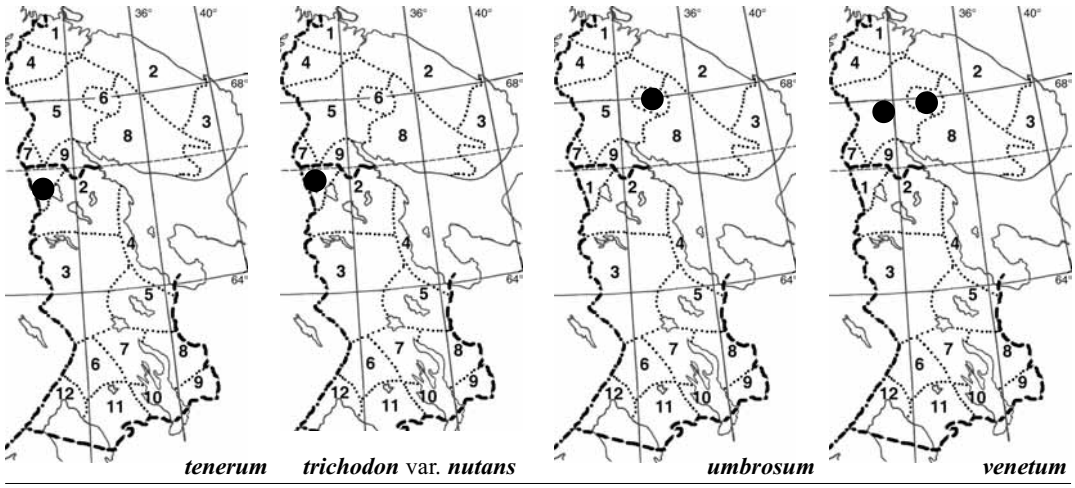


parts of Karelia; it grows from lowland to subalpine belt, on siliceous and calcareous, dry and wet rocks.

Eight species are sporadic in the studied territory: *S. boreale*, *S. dupretii*, *S. flexipile*, *S. frigidum*, *S. lancifolium*, *S. maritimum* subsp. *maritimum* and ssp. *piliferum*, *S. platyphyllum* and *S. submuticum*. They grow mainly in habitats similar to those known in Scandinavia, but some differences are observed.

Schistidium boreale prefers dry and warm calcareous rocks in Scandinavia, the same is in Karelia (in Murmansk Province only one locality in south-west of the territory), most frequent near lake shores.

Schistidium dupretii is a species of exposed calcareous rocks, from lowland to low alpine region in Scandinavia; in the study territory it avoids limestone areas and grows mostly on marble and dolomites, in open places, only in lowland.



Schistidium flexipile is more frequent in Scandinavian mountain range and rare in lowland, grows on exposed, dry or moist boulders and ledges; it is known from scattered lowland localities in Murmansk Province and Karelia, mostly in coastal area of The Barentz Sea, on islands of The White Sea and in Ladoga Lake surroundings, but its habitats are similar to Scandinavian ones.

Schistidium frigidum is mostly subalpine and alpine species in Scandinavia, in lowland it grows along rivers; in study area it was collected mostly in lowland, in coastal area of Ladoga and Onega Lakes in Karelia, eastern lowland territory of Murmansk Province, and one locality in Lovozerskie Tundry Mts.

Schistidium lancifolium is mostly a southern species in Scandinavia, rather frequent on shaded siliceous boulders in forests and river gorges, from lowland to subalpine belt; in Murmansk Province it was collected only once at The White Sea coast, in Karelia it is more frequent, grows not only on siliceous, but also on base-rich rocks (marble, dolomite), shaded or exposed (in forests, at lake shores, marble pits etc.), only in lowland.

Schistidium maritimum subsp. *maritimum* and subsp. *piliferum* are restricted to the coastal areas of The Barentz and White Sea and grow in similar habitats as in Scandinavia: sea shore cliffs and boulders, periodically irrigated; subsp. *piliferum* is more frequent along The White Sea coast, it grows in mixed stands with subsp. *maritimum*.

Schistidium platyphyllum, an aquatic species, is more frequent in subalpine and alpine regions in Scandinavia, it prefers base-rich rocks; in Murmansk Province it was collected only once in the mountains (Chiltald), all other collections are from lowland, and from different types of bedrock, including calcareous ones, and artificial substrates.

Schistidium submuticum is rather rare in Scandinavia, only in the south, on exposed dry or moist calcareous rocks; it has similar distribution and habitats in study area and also often grows on artificial substrates, but it was collected only once in calcareous area in Paanajärvi National Park where extensive collections were made.

Fourteen species are rare in Murmansk Province and Karelia, and nine of them are known by a single collection. (1) Five species, *S. crenatum, S. grandirete, S. frisvollianum, S. sordidum* and *S. tenerum*, are rare (except *S. crenatum*) northern or arctic species in Scandinavia; in Murmansk Province and Karelia only *S. grandirete* and *S. sordidum* are restricted to the northernmost parts of the territory, other species grow both in the north and south of the territory (*S. frisvollianum*, *S. crenatum*) or only in the center (*S. tenerum*). (2) Four species, *S. recurvum, S. subjulaceum, S. umbrosum* and *S. venetum*, are most frequent in the Scandinavian mountain range and rare or absent elswhere else in Scandinavia; in the study territory only *S. umbrosum* and *S. venetum* were collected in the mountains (Lovozerskie Tundry and Khibiny, respectively), but *S. recurvum* and *S. subjulaceum* grow exclusively in lowland. All species grow on similar bedrocks and in similar moisture and light conditions as in Scandinavian lo-

calities. (3) Three species, *S. confusum, S. elegantulum* and *S. flaccidum*, are restricted to the southern part of Scandinavia; they have similar distribution in our study area. (4) *Schistidium robustum* is widespread in calcareous areas in Scandinavia; it is known from one locality in southern Karelia. (5) *Schistidium trichodon* var. *nutans* is common in central and eastern part of Scandinavia, it grows on wide variety of bedrock types and mostly in rather dry and exposed habitats; in the investigated territory it was collected only in calcareous area in north-west of Karelia, on dolomite outcrops.

Eleven of thirty-eight Scandinavian species of *Schistidium* were not collected in the study territory. Ten of them are unlikely to be found here, they are more oceanic and more montane in distribution and absent or rare in Finland. At the same time, *Scistidium crassipilum* and *S. trichodon* var. *trichodon* grow in Finland close to Karelian border, and are expected in the study area.

ACKNOWLEDGEMENTS

We are grateful to Jan Kučera for proving to our study his collections from Lovozeskie Tundry Mts. The work was partly supported by RFBR 04-04-48774 and SYKE.

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