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New records of crustose Teloschistaceae (lichens, Ascomycota) from the Murmansk region of Russia

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Abstract: Twenty-three species of crustose Teloschistaceae were collected from the northwest of the Murmansk region of Russia during field trips in 2013 and 2015. *Blastenia scabrosa* is a new combination supported by molecular data. *Blastenia scabrosa*, *Caloplaca fuscorufa* and *Flavoplaca havaasii* are new to Russia. *Blastenia scabrosa* is also new to the Caucasus Mts and Sweden. Detailed morphological measurements of the Russian specimens of these species are provided. *Caloplaca exsecuta*, *C. grimmiae* and *C. sorocarpa* are new to the Murmansk region. The taxonomic position of *C. alcarum* is briefly discussed.

Key words: Arctic, Rybachy Peninsula, *Caloplaca* s. lat., *Blastenia scabrosa*.

Introduction

Although the Murmansk region is one of the best studied regions of Russia in terms of lichen diversity, there are numerous reports in recent literature of new discoveries there (*e.g.* Fadeeva *et al.* 2013; Konoreva 2015; Melechin 2015; Urbanavichus 2015). Several localities in the northwest of the Murmansk region, mainly on the Pechenga Tundra Mountains and the Rybachy Peninsula, were visited in 2013 and 2015. The Rybachy Peninsula is a plateau that mainly consists of sandstones and shales and reaches 229 m in altitude. It has steep slopes to the Barents Sea and is mainly covered by tundra with low trees (*Betula* spp., *Juniperus sibirica*, *Populus tremula*, *Salix* spp., *Sorbus gorodkovii*) only along river banks and on the southern slopes of the plateau. The Pechenga Tundra

Mountains reach an altitude of 631 m and are composed mainly of diabasic rock. They are located mainly in forest tundra dominated by *Betula* spp. with aditional *Juniperus sibirica*, *Picea obovata*, *Pinus sylvestris*, *Populus tremula* and *Sorbus gorodkovii*. Peaks of hills are covered by tundra.

Materials and methods

Collected samples are mainly deposited in the private herbarium of I. Frolov (herbarium numbers indicated with "IF" in the list of species) or in the herbarium of the Polar-Alpine Botanical Garden and Institute, Kirovsk, Murmansk region (KPABG). Species were identified on the basis of morphological and in some cases molecular data (ITS region of the ribosomal nuclear DNA was used). Measurements of morphological characters and terminology follow Vondrák *et al*. (2013a). All microscopical observations are based on hand-cut sections mounted in water, without chemical treatments. Spores were mainly viable (with badly visible septa) and thus measured after heating (Steiner and Peveling 1984). Measurements are accurate to 0.5 µm for cells and 5–10 µm for larger structures. At least five measurements were made for each sample, with results given as (min.)–X–(max.), where min. / max. are extremes and X is an arithmetic mean of all measurements. The number of measurements for each character is provided as [*N*] and where the number of measurements is less than five, only extremes of all measurements are provided.

DNA was extracted with a CTAB-based protocol (Aras and Cansaran 2006); primers for PCR amplification of ITS were ITS1F (Gardes and Bruns 1993) and ITS4 (White *et al*. 1990). The PCR parameters included an initial hold at 94°C for 5 min., and then 45 cycles with denaturating at 94°C (30 seconds), annealing at 62°C with the touchdown to 56°C during the first 7 cycles (30 seconds), and extension at 72°C (60 seconds). Obtained sequences were uploaded into the NCBI (GenBank); accession numbers are provided (Table 1).

Alignment of the genus *Blastenia* was undertaken in BioEdit 7.2.5 free software (Hall 1999) with the use of ClustalW application (Thompson *et al*. 1997) and adjusted by hand. Maximum likelihood reconstruction was carried out in RAxML (Stamatakis *et al*. 2005) through the RAxMLGUI interface (Silvestro and Michalak 2012); the GTR+G model was chosen with jModelTest 0.1.1 (Guindon and Gascuel 2003; Posada 2008). Bootstrap supports were calculated on 500 bootstrap replicates.

List of localities in the Murmansk region of Russia:

I. Zapolarny, c. 11 km SSE of town, siliceous outcrops and boulders on left bank of Pechenga river, alt. 60 m, 69° 19'28.0"N, 30° 52'39.9"E; 17.09.2013.

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II. Nikel', c. 15 km SW of town, waterfall Shuonijoki, pyroxenite outcrops along stream, alt. 100m, 69° 20'41.9"N, 30° 02'40.9"E; 19.09.2013.
III. Kola, c. 4 km W of Murmashi, P'ayve brook, under bridge on road "Verhnetulomskiy–Kola", alt. 105 m, 68° 48'46.4"N, 32° 40'21.4"E; 22.09.2013.
IV. Khibiny Mts, Kirovsk, Polar-Alpine Botanical Garden and Institute, Botanical cirque, alt. 650 m, 67° 38'42.4"N, 33° 37'57.6"E; 24.09.2013.
V. Rybachy Peninsula, coast of Guba Skorbeyevskaya Bay, alt. 0–20 m, 69° 53'23.4"N, 32° 13'54.1"E; 4.9.2015.
VI. Rybachy Peninsula, coast NW from Guba Skorbeyevskaya Bay, coastal hills with shale outcrops, alt. 20–40 m, 69° 54'N, 32°12'E; 4.9.2015.
VII. Rybachy Peninsula, coast NW from Guba Skorbeyevskaya Bay, shale cliffs in supralittoral zone, alt. 0–5 m, 69° 55'13.4"N, 32° 09'34.8"E; 4.9.2015.
VIII. Rybachy Peninsula, coast SE from Guba Skorbeyevskaya Bay, alt. c. 20 m, 69° 53'02"N, 32° 17'E; 5.9.2015.
IX. Rybachy Peninsula, shale outcrops in tundra, near road from Guba Bolshaya Volokovaya Bay to deserted settlement Mys Skorbeevsky, alt. 80 m, 69° 52'41''N, 32° 5'11''E; 6.9.2015.
X. Rybachy Peninsula, coast of Guba Bolshaya Volokovaya Bay, coastal hills with shale outcrops, alt. 30–100 m, 69° 47'N, 32° 04'E; 8.9.2015.
XI. Rybachy Peninsula, coast of Ozerko Bay, alt. 0–5 m, 69° 44'02.1"N, 32° 08'20.7"E; 9.9.2015.
XII. Sredny Peninsula, forest with *Betula tortuosa* and *Populus tremula* in floodplain of Korabelny Brook, alt. c. 30 m, 69° 42'51'' N, 32° 6'22''E; 10.9.2015.

Results and discussion

Twenty-three species of crustose lichens from the family Teloschistaceae were discovered during our visits, three of which, *Blastenia scabrosa*, *Caloplaca fuscorufa* and *Flavoplaca havaasii*, are new to Russia, and three others, *Caloplaca exsecuta*, *C. grimmiae* and *C. sorocarpa*, are new to the Murmansk region. An annotated list of the taxa with detailed descriptions of the species new to Russia is provided below.

Species new to Russia

Blastenia scabrosa (Søchting, Lorentsen *et* Arup) Frolov *et* Vondrák comb. n.
(Figs 1A, B)

MycoBank No. — MB817716

Basionym. — *Caloplaca scabrosa* Søchting, Lorentsen *et* Arup, *Nova Hedwigia* 87 (1–2): 89. 2008.

Type. — Svalbard, Nordenskiöld Land, Reindalen N of Sørhytta. 77° 59'40"N, 15° 52'10"E, alt. 100 m, on and under overhanging sandstone, 1986, *Søchting 5513* (holotype C; isotypes BG, LD, PRA!).

Occurence. — Russia, Murmansk region: X (IF1187 — on siliceous outcrops, in deep crevice).

Observation of specimen IF1187. — Thallus rimose to irregularly cracked areolate, blastidiate; areoles contiguous, whitish, more or less flat, (0.21)–0.31–(0.36) × (0.13)–0.22–(0.32) mm [10], 0.2–0.4 mm thick; blastidia grey with dark grey tips, c. 50 µm in diam., arise from edge of areoles, covering entire surface of areoles or sometimes absent. Apothecia occur regularly, scattered, sessile or raised, more or less round to irregular, biatorine, (0.40)–0.49–(0.53) mm [9] in diam.; disk dark red, flat; true exciple c. 70 µm thick, paler than disk, raised above disk, often tortuous, prosoplectenchymatous in upper part, but some uppermost cells broadly ellipsoid; thalline exciple absent; hymenium c. 70–95 µm tall, not inspers; hypotecium not inspers, brownish; paraphyses with inner oil droplets, often abundantly brunched in upper part, widest cells of paraphyses (3.0)–3.4–(4.0) µm [10] wide; spores usually ellipsoid, (13.0)–14.3–(15.5) × (5.5)–6.6–(8.0) µm [5], with septa (3.5)–4.3–(5.0) µm [5] wide, some spores narrowly ellipsoid to rhomboid. Pycnidia very rare, with dark red caps; pycnoconidia bacilliform, c. 3 x 1 µm. Apothecia K+ purple, C+ purple (chlorinated anthraquinones), reaction with C can quickly disappear, on some apothecia indistinct, N–; upper part of alveolate cortex green-grey in water (in cross-sections), N+ dark rusty red (Cinereorufa-green); thallus K+ yellow (atranorin).

Our measurements correspond to observations of other authors (Søchting *et al*. 2008, Vondrák *et al*. 2013b). However, diameter of apothecia and size of blastidia are noticeably less in our sample.

In an ITS-analysis (Fig. 2), the sample from the Rybachy Peninsula groups with the isotype of *Blastenia scabrosa*, Abkhazian and Czech samples. The samples form a well-supported clade that is nested within the *Blastenia* clade.

Blastenia scabrosa was previously known from four localities in the following regions: Czech Republic (Jeseníky Mts), Poland (Tatra Mts) and Svalbard (Søchting *et al*. 2008; Vondrák *et al*. 2013b; Vondrák and Malíček 2015; Wilk 2016). We also found the species on the Caucasus Mts (Abkhazia) and in herbarium GZU from Sweden (as *Caloplaca* sp.). *Blastenia scabrosa* is an Arctic and alpine species that is known from sandstone and mylonite rocks in habitats exposed to sun or partly shaded (Søchting *et al*. 2008, Wilk 2016); in both Abkhazia and Russia it occurs on base-rich siliceous outcrops under overhangs.

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Additional specimens examined. — Abkhazia: Ritsinsky National Park, hospital Auadkhara, c. 3 km SE of hospital, c. 1.5 km SW of pass Pyv, siliceous outcrops in glacier cirque, subalpine belt, alt. 2050 m, 43°28'29.25"N, 40°40'54.77"E, on large base-rich siliceous stone, under overhang, 2014, coll. I. Frolov (IF668, IF676); hospital Auadkhara, c. 4.5 km SE of hospital, Lake Chkhy, siliceous outcrops in glacier cirque, subalpine belt, alt. c. 2050 m, 43°27'53.4"N, 40°41'30.1"E, on large base-rich siliceous stone, under overhang, 2014, coll. I. Frolov (IF685). Sweden: Torne Lappmark, Stenbacken, Luopakte, alt. 820 m, 68°13'N, 19°27', on siliceous rock, 1972, coll. J. Poelt (GZU).

Caloplaca fuscorufa H. Magn.
(Fig. 1C)

Occurence. — Russia, Murmansk region: IX (IF1186 — on vertical surfaces of shale outcrops, not close to water).

Observation of specimen IF1186. — Thallus rimose to irregularly cracked areolate, forms several cm large spots, areoles scattered to contiguous, whitish, more or less flat, (0.23)–0.37–(0.49) × (0.15)–0.25–(0.32) mm [10], 0.6–0.7 mm thick; alveolate cortex 45–60 µm thick; algal layer 30–35 µm thick. Apothecia abundant, scattered, sessile, more or less round, (0.57)–0.73–(0.89) mm [10] in diam.; disk dark brown-red, slightly to strongly convex; true exciple 20–35 µm thick, paler than disk, slightly raised above or level with disk, visible even on strongly convex apothecia, prosoplectenchymatous in upper part; thalline exciple present only on lower side of apothecia; hymenium c. 65–70 µm tall, not inspers, but often with crystals of anthraquinones and hence brownish; hypotecium without oil drops and crystals; paraphyses branched in upper part, widest cell of paraphyses (3.0)–3.6–(4.5) µm [10] wide; spores ellipsoid, (14.0)–16.0–(19.0) × × (7.5)–8.3–(10.0) µm [10], with septa (4.0)–4.9–(6.0) µm [10] wide. Pycnidia not observed. Apothecia K+ purple, C+ red (chlorinated anthraquinones), reaction with N not observed; thallus cross-section N–.

Our measurements correspond to observations of Arup *et al*. (2007), but we did not observe reaction of apothecia's cross-sections with N.

The ITS sequence of the sample from the Rybachy Peninsula is identical with two sequences of Swedish samples (Fig. 2).

Caloplaca fuscorufa is known from Norway, Svalbard and Sweden and probably rather common there (Arup *et al*. 2007); it is also known from Ukrainian Carpathians (Vondrák *et al*. 2010). The species seems to have a variable ecology and growing on various kinds of rock, on vertical to horizontal rock surfaces, and on pebbles, often close to water (Arup *et al*. 2007).

Flavoplaca havaasii (H. Magn.) Arup, Frödén *et* Søchting
(Fig. 1D)

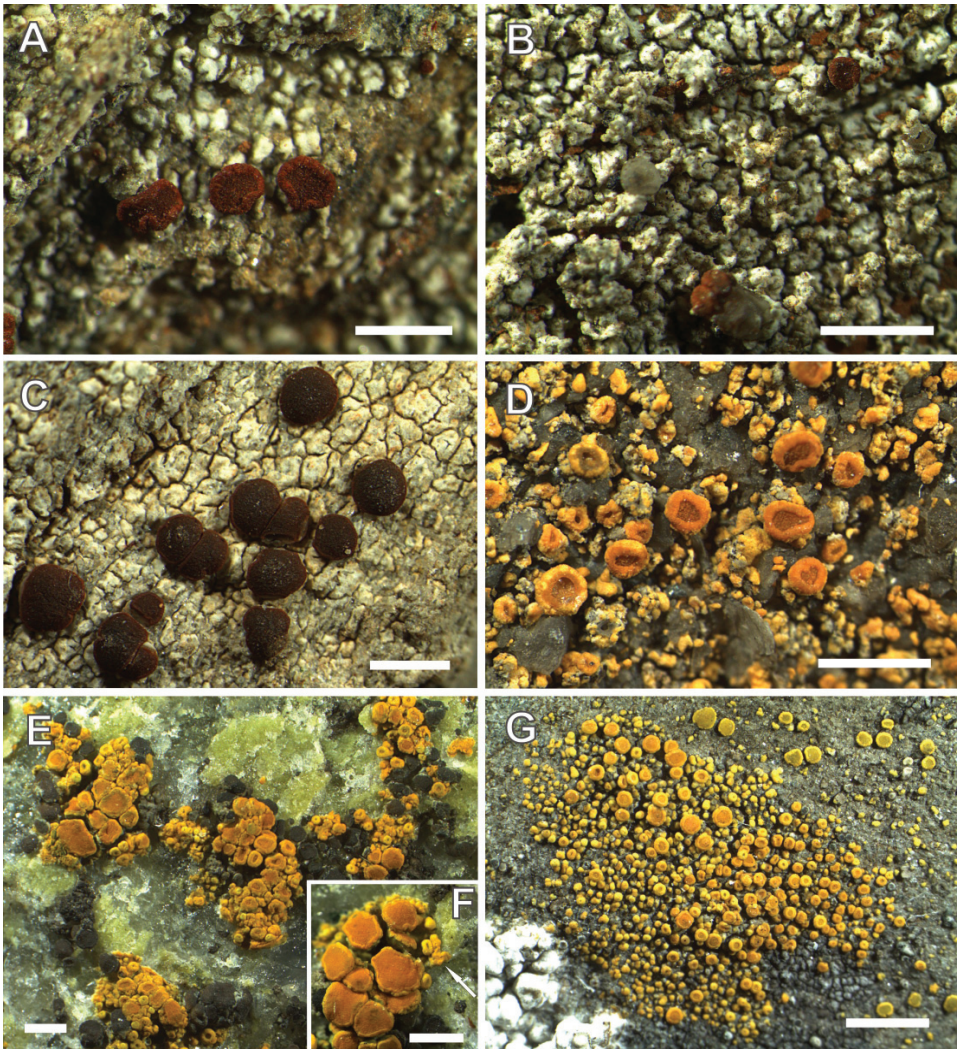

Fig. 1. **A.** *Blastenia scabrosa* (IF1187), part of thallus with apothecia and without blastidia; **B.** *B. scabrosa* (IF1187), part of thallus with blastidia; **C.** *Caloplaca fuscorufa* (IF1186); **D.** *Flavoplaca havaasii* (IF1174); **E.** *Caloplaca alcarum* (IF1168); **F.** *Caloplaca alcarum* (IF1168), subglobose thallus with a clearly distinguishable reduced lobe (pointed out with an arrow); **G.** *Caloplaca alcarum* (IF1150), dispersed thallus without lobes. Bars: 1 mm.

Occurence. — Russia, Murmansk region: X (IF1174 — on slightly calcareous sandstones, on vertical surface under overhang).

Observation of specimen IF1174. — Thallus composed of scattered yellow to orange, strongly verrucose areoles (0.3–0.5 × 0.2–0.4 mm) or flat or isidia-like cylindrical (0.04–0.1 mm in diam.) squamules forming several cm large spots. Apothecia abundant to rare, sessile or raised, more or less round, (0.34)–0.45–(0.64) mm [10] in diam., zeorine; disk orange, flat; true exciple 45–75 μm thick, slightly paler or of the same color as disk, raised above disk, paraplectenchymatous in upper part; thalline exciple mostly present, 17–45 μm thick, colored as thallus, rarely slightly crenulate; hymenium c. 85 μm tall,

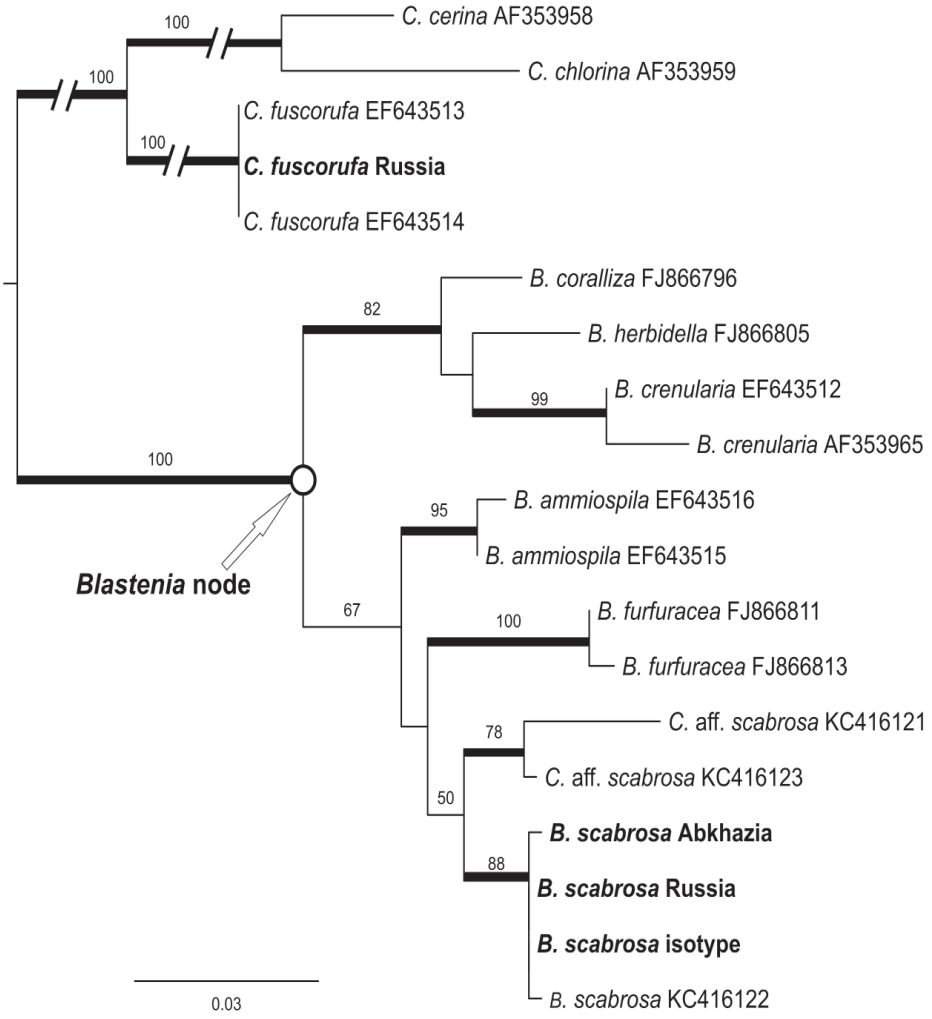

Fig. 2. Maximum likelihood ITS phylogeny of the genus *Blastenia* and *Caloplaca fuscorufa*. Numbers at branches represent bootstrap values ≥ 50%. Branches with bootstrap values ≥ 70% are thick. Newly sequenced samples are in bold.

not inspers, colorless; paraphyses mostly simple, with oil droplets, two upper cells much wider than others, widest cells (5.5)–6.8–(8) µm [10] wide; spores ellipsoid, (11)–12–(14) × (5)–6.2–(7) µm [7], with septa (3.5)–4.1–(5) µm [7] wide. Pycnidia not observed. Apothecia and thallus K+ purple.

Table 1

List of ITS sequences. New sequences are in bold. The sequences marked with an asterisk were not used in the molecular analysis presented in the paper.

species	voucher data	GB accession numbers
**Athallia holocarpa*	Russia, IF390	KX641468
Blastenia ammiospila	Sweden (see Arup *et al*. 2007)	EF643516
B. ammiospila	Sweden (see Arup *et al*. 2007)	EF643515
B. coralliza	Greece (see Arup and Åkelius 2009)	FJ866796
B. crenularia	Sweden (see Arup *et al*. 2007)	AF353965
B. crenularia	Sweden (see Arup *et al*. 2007)	EF643512
B. furfuracea	Sweden (see Arup and Åkelius 2009)	FJ866811
B. furfuracea	Sweden (see Arup and Åkelius 2009)	FJ866813
B. herbidella	Austria (see Arup and Åkelius 2009)	FJ866805
B. scabrosa	Czech Republic (see Vondrák *et al*. 2013)	KC416122
B. scabrosa	**Svalbard, isotype PRA**	**KX022975**
B. scabrosa	**Abkhazia, IF685**	**KX022973**
B. scabrosa	**Russia, IF1187**	**KX022974**
****Caloplaca alcarum***	**Russia, IF1150**	**KX216683**
****C. alcarum***	**Russia, IF1168**	**KX216684**
****C. alcarum***	**Russia, IF1172**	**KX216685**
****C. borealis***	**Russia, IF1176**	**KX216688**
****C. borealis***	**Russia, IF1176 (black apothecial margin)**	**KX216686**
****C. borealis***	**Russia, IF1184**	**KX216687**
C. cerina	Sweden (see Arup *et al*. 2007)	AF353958
C. chlorina	Sweden (see Arup *et al*. 2007)	AF353959
C. fuscorufa	Sweden (see Arup *et al*. 2007)	EF643513
C. fuscorufa	Sweden (see Arup *et al*. 2007)	EF643514
C. fuscorufa	**Russia, IF1186**	**KX022972**
C. aff. *scabrosa*	Ukraine (see Vondrák *et al*. 2013)	KC416121
C. aff. *scabrosa*	Ukraine (see Vondrák *et al*. 2013)	KC416123
****Flavoplaca havaasii***	**Russia, IF1174**	**KX022976**

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There are some differences between our measurements and observations of Arup (2006). Size of areoles, diameter of apothecia and thickness of the thalline exciple are noticeably less in our sample. According to Arup (2006) upper cells of paraphyses just slightly wider than other paraphyses cells, up to 4(–5) μm. In our sample, two upper cells much wider than others, up to 8 μm.

The ITS sequence of the sample from the Rybachy Peninsula (Table 1) is identical with that of the specimen from the Norwegian *locus classicus* of *F. havaasii* (GB accession number DQ647649).

Flavoplaca havaasii was previously known only from two localities in Norway (Arup 2006, Arup *et al*. 2014), namely Hordaland and Nordland at altitudes of 560–580 m and 115 m respectively, where it was collected from under overhangs. Phylogenetically it is closely related to the southern maritime species *F. communis* and *F. maritima* (Vondrák *et al*. 2009).

Species new to the Murmansk region

Caloplaca exsecuta (Nyl.) Dalla Torre *et* Sarnth.

Occurence. — IV (IF414 — on large siliceous stone near the vertical wall of cirque, under overhang), VIII (IF1181 — on acidic siliceous stones in periodically dry brook). Arctic and alpine lichen. It seems to occur quite regularly along brooks on the Rybachy Peninsula.

Caloplaca grimmiae (Nyl.) H. Olivier

Occurence. — II (IF391, KPABG 11191 — on thallus of *Candelariella vitellinula*, on vertical surface of pyroxenite cliff). Parasitic lichen that prefers siliceous rocks in sunlit conditions. The locality is one of the northernmost in the world. It seems to be rare in the Murmansk region.

Caloplaca sorocarpa (Vain.) Zahlbr.

Occurence. — X (IF1177 — on bark of small shrubs of *Sorbus gorodkovii*). Arctic and alpine lichen. Probably rare in the Murmansk region.

Other species

Athallia holocarpa (Hoffm.) Arup, Frödén *et* Søchting

Occurence. — II (IF390, IF410, IF412, IF413 — on vertical surface of pyroxenite cliffs). Observed only once.

Remarks. — According to morphological (presence of yellow thallus and narrow spores septa) and molecular (for GB accession number of the ITS sequence see Table 1) data our samples belong to *Athallia vitellinula* (Nyl.) Arup, Frödén *et* Søchting. However, Vondrák *et al*. (2016b) placed the latter name in synonymy with *A. holocarpa*. When authors used additional material from Turkey and Alaska,

they realised that morphological characters stated by Arup (2009) as differences between *A. holocarpa* and *A. vitellinula* do not fit the sequence data.

Athallia pyracea (Acharius) Arup, Frödén *et* Søchting

Occurrence. — II (IF395 — on bark of *Populus tremula*). Observed only once.

Athallia scopularis (Nylander) Arup, Frödén *et* Søchting

Occurrence. — VII (IF1152), XI (IF1166). The species occurs quite regularly in the supralittoral zone of the Rybachy Peninsula.

Blastenia ammiospila (Wahlenb.) Arup, Søchting *et* Frödén

Occurrence. — II (IF640 — wood of old bridge stand), V (IF1188, 1190 — on driftwood), VI (IF1161 — on saxicolous mosses, under overhang), XI (IF1169 — wood of old dock). On the Rybachy Peninsula it is a very common lichen on driftwood and wooden constructions along the coastline, but it seems to be quite rare inland.

Caloplaca alcarum Poelt

Occurrence. — V (IF1153, IF1160 — on siliceous stones of artificial construction, close to the coast, but not in the supralittoral zone), VII (IF1149, IF1150), X (IF1178, IF1179, IF1180 — on shale outcrops in the supralittoral zone), XI (IF1172 — on driftwood, IF1167, IF1168). It is a very common species in the supralittoral zone of the Rybachy Peninsula where it occurs together with *Athallia scopularis*.

Remarks. — Søchting *et al*. (2008) noted that according to their unpublished molecular studies *C. alcarum* is very close to *A. scopularis* and probably represents an extreme form of the latter. In contrast Vondrák *et al*. (2016b) mean that some authors (including Søchting *et al*., 2008) erroneously use the name *C. alcarum* for poorly developed thalli of *A. scopularis* with reduced lobes, but the type specimen of the former lacks lobes. They placed *C. alcarum* in synonymy with *A. holocarpa*. Specimens from the Rybachy Peninsula that we assign to *C. alcarum* are variable from a morphological point of view: some thalli are almost subglobose with very small reduced lobes (Fig. 1E, F), but other thalli are dispersed and lack lobes (Fig. 1G). According to our molecular data (for GB accession numbers of ITS sequences see Table 1), both morphotypes form a supported clade that is very close to *A. scopularis*. We therefore decided to use the name *C. alcarum* for our samples, because they are not closely related to *A. holocarpa*, but separated from *A. scopularis* and some of them do not have lobes at all (*cf*. type of *C. alcarum*).

Caloplaca borealis (Vain.) Poelt

Occurrence. — X (IF1176 — on bark of small shrubs of *Sorbus gorodkovii*), XII (IF1184 — on bark of *Populus tremula*). It occurs sporadically on Rybachy and Sredny Peninsulas.

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Remarks. — We collected two morphotypes of the species: 1) with orange true exciple that sometimes blackened, 2) with completely black-green to almost black true exciple (similar to *C. exsecuta*) – both have identical ITS sequences (Table 1).

Caloplaca caesiorufella (Nyl.) Zahlbr. / *Caloplaca spitsbergensis* H. Magn.

Occurrence. — V (IF1155, IF1156, IF1190 — driftwood), VIII (IF1183 — on bark of shrubs of *Salix* sp.), X (IF1176 — on bark of small shrubs of *Sorbus gorodkovii*). On the Rybachy Peninsula it is very common on driftwood and wooden constructions along the coastline, but sometimes occurs on shrubs.

Remarks. — There are only slight differences in size of apothecia and spores between *C. caesiorufella* and *C. spitsbergensis*, suggesting that they may be conspecific (Søchting *et al*. 2008).

Caloplaca chlorina (Flot.) H. Olivier

Occurrence. — XI (IF1170 — on siliceous stone on the ground). Observed only once.

Caloplaca diphyodes (Nyl.) Jatta

Occurrence. — I (IF 396 — on vertical siliceous rocks near water), III (IF393 — on siliceous boulders near and in the stream).

Remarks. — Known in the Murmansk region only from old collections (as *Callopisma helygeoides* and *Lecanora helygeoides* in Vainio 1881 and Räsänen 1943). Probably *C. diphyodes* occurs sporadically in the vicinity of water in the Murmansk region.

Caloplaca fraudans (Th. Fr.) H. Olivier

Occurrence. — VI (IF1162 — on vertical surfaces of rocks). Observed only once.

Caloplaca isidiigera Vězda

Occurrence. — VII (IF1152 — sterile thallus). Observed only once together with *Athallia scopularis* and *C. alcarum* in the supralittoral zone.

Remarks. — It was synonymised with *C. chlorina* (Wetmore 1997, Khodosovtsev *et al*. 2004), however Šoun *et al*. (2011) showed that this is a distinct species. In the Murmansk region, it was known from the Bolshoy Aynov Island (Vondrák *et al*. 2016a).

Caloplaca magni-filii Poelt

Occurrence. — VI (precise coordinates 69°54’19.2”N 32°12’02.3”E, IF1165), VIII (precise coordinates 69° 53’00.7”N 32° 17’05.0”E, KPABG *s.n.*), IX (KPABG *s.n.*), X (KPABG *s.n.*), between X and XI (precise coordinates 69° 45’35.6”N 32° 04’47.5”E, not collected), on *Miriquidica nigroleprosa*. It occurs

regularly on the Rybachy Peninsula on the different distances from the seashore (but not in the supralittoral zone).

Remarks. — It is included into the Red data book of the Murmansk region (2014).

Caloplaca nivalis (Körb.) Th. Fr.

Occurrence. — X (IF1173 — on saxicolous mosses, under overhang). Observed only once.

Caloplaca stillicidiorum (Vahl) Lynge

Occurrence. — V (IF1154 — driftwood; IF1157 — on siliceous stones of artificial construction), XI (IF1171 — wood of old dock). It is quite common on driftwood and wooden constructions along the coastline on the Rybachy Peninsula.

Caloplaca tornoensis H. Magn.

Occurrence. — VIII (IF1182 — on saxicolous mosses, on stones in periodically dry brook). It seems to occur quite regularly along brooks on the Rybachy Peninsula together with *C. exsecuta*.

Leproplaca obliterans (Nyl.) Arup, Frödén *et* Søchting

Occurrence. — II (IF388, IF394, IF408, IF411 — on vertical surface of pyroxenite cliffs). Observed only once.

Polycauliona verruculifera (Vainio) Arup, Frödén *et* Søchting

Occurrence. — VII (IF1151). It is very common species in the supralittoral zone of the Rybachy Peninsula.

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