**Supplementary material**

**A comprehensive bibliography, updated checklist, and distribution patterns of Rhodophyta from the Barents Sea (the Arctic Ocean)**

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**Supplementary** **Table S2:** Records of doubtful, unchecked, and misidentified species of red algae in the Barents Sea, with discussion.

Careful verification has permitted the reliable identification of 82 red algal species for the Barents Sea, which are presented in the main text of the paper. However, there are also 36 species of Rhodophyta mentioned in publications on the Barents Sea, but are excluded from the checklist due to several reasons, which are described below. The names of the excluded species are highlighted in bold italics.

The records of ***Lithothamnion ungeri***Kjellman (Foslie 1890: 8; Sinova 1926: 41; Zinova 1955: 96) and ***Phymatolithon calcareum***(Pallas) W.H. Adey *et* D.L. McKibbin ex Woelkering *et* L.M. Irvineas *Lithothamnion calcareum* (Pallas) Areschoug (Sinova 1912: 311–313; Zinova 1955: 96–97, fig. 87) were already excluded from the Barents Sea flora by K.L. Vinogradova (2010). Current verification is not possible because the samples are absent or are in an unsatisfactory state (Vinogradova 2010: 669). The same may apply to *Phymatolithon lenormandii*, but Vinogradova (2010: 679) considered this species as a potential one for this region. Therefore, *P. lenormandii* has been included in the present checklist in accordance with recent records of this species (see Table 1 of main text of paper).

The records of ***Titanoderma pustulatum*** (J.V. Lamouroux) Nägeli in Nägeli *et* Cramer (*Lithophyllum macrocarpum* (Rosanoff) Foslie, *Melobesia macrocarpa* Rosanoff) from northern Norway (Børgesen and Jonsson 1908; Foslie 1890) have not been confirmed by later studies, so this species was excluded from the list of the flora of the Barents Sea. Recently, this species was characterized as the “southern” species on the Norwegian coast (Rueness 1997). Similarly, ***Acrochaetium kylinioides*** Feldmann was recorded from northern Norway (Jaasund 1965: 118; Rueness 1977: 35); however, the presence of this species was not confirmed later on the coast of Norway (Rueness 1997).

***Gaillona seposita*** (Gunnerus) Athanasiadis was recorded from northern Norway by Rueness (1977) as *Callithamnion arbuscula* (Dillwyn) Lyngbye without providing exact localities and by Rueness (1997) as *Aglaothamnion sepositum* (Gunnerus) Maggs *et* Hommersand only by extrapolation. In addition, ***Phymatolithon lamii*** (Me. Lemoine) Y.M. Chamberlain and ***Ceramium cimbricum*** H.E. Petersen in Rosenvinge from northern Norway were recorded only by extrapolation (Rueness 1997). Therefore, there are still no sufficient reasons to include these species in the flora of the Barents Sea.

According to the description by Foslie (1881: 3-4), the specimens of ***Carradoriella elongata*** (Hudson) Savoie *et* G.W. Saunders recorded as *Polysiphonia schuebeleri* from the Norwegian coast of the Barents Sea (Porsanger fjord) had four siphons and a cortex, except on the uppermost branches. Kjellman (1883: 122) recorded this species for the same location. This species has also been recorded as *Polysiphonia elongata* from Spitsbergen and Finnmark without providing exact localities (Agardh 1868a; Børgesen and Jonsson 1908: V; Simmons 1906: 158). This species cannot be included in the checklist because its presence in the Barents Sea has not been subsequently confirmed. Moreover, Rueness (1997) indicated *P. elongata* (Hudson) Sprengel for Norway as a species with a southern distribution (Troms county and further south).

The presence of ***Acrochaetium collopodum*** (Rosenvinge) Hamel in the Barents Sea flora is doubtful. This species was recorded twice in the White Sea (Mikhaylova 2017: 58), and in Finnmark (Rueness 1977: 38). However, the presence of this species on the Norwegian coast of the Barents Sea was not later confirmed (Rueness 1997). The presence of ***Cruoria pellita*** (Lyngbye) Fries in the Barents Sea flora (Evseeva 2018: 10, 20; Kuznetsov and Schoschina 2003: 179; Vinogradova 1964: 118) is doubtful because Rueness (1997) has classified it as a southern species for the Norwegian coast. According to Vinogradova and Jacovleva (1989: 744) the findings of this species in the White and the Barents Seas require verification. The presence of ***Halosaccion saccatum*** (Lepechin) Kützing in the Barents Sea flora is also doubtful. It has been recorded only once as some fragments (*fragmenta quaedam*) from the western coast of Novaya Zemlya as *Dumontia lepechinii* by Postels andRuprecht (1840: II). This species was also mentioned over 50 years ago in Voronka of the White Sea, but no voucher specimens have been preserved in the LE collection (Mikhaylova 2017: 61).

The single record of ***Nitophyllum punctatum*** (Stackhouse) Greville from the southeastern part of the Barents Sea (Zeller 1883: 105) is probably a misidentification. This species inhabits more southern areas. It is found along the coast in southwestern Norway (Rueness 1997: 25). Possibly, Zeller’s “*Nitophyllum punctatum* Stackhouse” may refer to *Palmaria palmata.*

The recent records of ***Melobesia membranacea*** (Esper) J.V. Lamouroux and ***Meiodiscus concrescens*** (K.M. Drew) P.W. Gabrielson in Gabrielsen *et* al. in the Barents Sea (Evseeva 2018: 19) also require verification. Evseeva (2018: 9, 10) found the first species on *Membranoptera fabriciana* in the herbarium collected in 1931 from the Murman coast by M.S. Kireeva and T.F. Shchapova and on *Phycodrys rubens* and *Coccotylus truncatus* in the Flerov’s herbarium 1921–1923 collected from Novaya Zemlya. She found the second species on *Chondrus crispus* and hydroids in the herbarium of the Russian Federal Research Institute of Fisheries and Oceanography, VNIRO (1933, 1961–1962) from the Murman coast (Evseeva 2018: 10). In both cases, the author provided only photographs without detailed descriptions. However, the photographs did not demonstrate sufficient taxonomic features for accurate identification (Evseeva 2018: fig. 3, 4). Therefore, there are still no sufficient reasons to include these species in the Barents Sea flora. In addition, Rueness (1997) classified *M. membranacea* as a “southern” species on the Norwegian coast, and *M. concrescens* was known as a widespread species except in the Arctic region (Guiry and Guiry 2021).

***Vertebrata nigra*** (Hudson) Díaz-Tapia *et* Maggs in Díaz-Tapia *et* al. (*Polysiphonia nigra* (Hudson) Batters, *P. atrorubescens* (Dillwyn) Greville) is known from southwestern Norway (Rueness 1997: 26, 29), from the west coast of Spitsbergen (Fredriksen et al. 2019) and from Spitsbergen without providing exact localities (Agardh 1868b; Gulliksen et al. 1999: 44; Kjellman 1975; Vinogradova 1995: 59). The findings of this species along Novaya Zemlya (Evseeva 2018, 21; Flerov 1932: 43; Flerov and Karsakoff 1932: 54) require verification.

***Grania pectinata*** (Kylin) Athanasiadis (*Audouinella pectinata* (Kylin) Papenfuss, *Colaconema pectinatum* (Kylin) J.T. Harper *et* G.W. Saunders) is known from southwestern Norway (Rueness 1997: 26, 29). Its first record from the Murman coast was based on a single sterile specimen (Vinogradova 1961: 93). Later, this species was listed without any comments (Kuznetsov and Schoschina 2003: 179; Malavenda et al. 2017: 343). Similarly, the first record of ***Colaconema infestans*** (M. Howe *et* Hoyt) Woelkerling (*Audouinella infestans* (M. Howe *et* Hoyt) P.S. Dixon in Parke *et* P.S. Dixon) from the Murman coast was based on a single specimen with monosporangia (Efimova 1995: 98). Later, this species was also listed without any comments (Kuznetsov and Schoschina 2003: 178). Therefore, additional studies are required to establish whether these species occur in the Barents Sea.

K.L. Vinogradova (2005a) performed taxonomic revision of the species of *Ceramium* in the northern seas of Russia, examining abundant collections from many localities. She concluded that this genus was represented in the regional flora by only two boreal species: *Ceramium deslongchampsii* and *C. virgatum*. The records of ***Ceramium diaphanum*** (*Ceramium tenuissimum* sensu auct., non (Roth) J. Agardh) from Novaya Zemlya and the southern coast of the Barents Sea (Evseeva 2018: 20; Flerov 1932: 43; Flerov and Karsakoff 1932: 56-57; Kucheruk et al. 2003: 225; Sinova 1926: 32, 1929: 110-111; Zinova 1955: 164, 166, f. 138, 141) are erroneous and may be attributed either to *C. deslongchampsii* or to *C. virgatum* (Vinogradova 2005a). The single record of ***Ceramium scandinavicum*** Petersen as “*Ceramium scandinavicum*? Henn, Peters” from Novaya Zemlya (Flerov and Karsakoff 1932: 57) was described as “Superb but sterile specimen in the Samoyed Bay”; it is probably a misidentification. The records of ***Ceramium rescissum*** Kylin (Rueness 1977: 81) from northern Norway (Finnmark) without exact localities have not been confirmed by further studies.

The indication of ***Kallymenia schmitzii*** De Toni in the Barents Sea flora (Zinova 1955: 104–105) as *Callymenia schmitzii* (Schm.) De Toni is based on a single record (Sinova 1929: 97) from Novaya Zemlya and is not confirmed by voucher specimens. Therefore, this species was excluded from the current checklist.

***Rhodomela tenuissima*** (Ruprecht) Kjellman was not included in the flora of the Barents Sea as well, although it has been reported for Novaya Zemlya after the re-identification of Flerov’s herbarium collected in 1923 (Evseeva 2018: 10, 21). The author provided only two photographs of dried specimens (Evseeva 2018: 11, fig. 5) without a description of the inner structure, i.e., no substantive data were provided. According to the original labels, B.K. Flerov identified these specimens himself as “*Rhodomela subfusca* (W) J. Ag. f. *gracilis* Farlow”. Besides, *R. tenuissima* is well known to have a Pacific distribution: the East Siberian Sea, the Chukchi Sea, the Bering Sea, the Sea of Okhotsk, and the Sea of Japan (Vinogradova 2005b, 2011). The specimens from Spitsbergen, Novaya Zemlya, and the Yugorsky Strait, mentioned as *R. tenuissima* (Kjellman 1875, 6–7, 1877: 10), in fact belong to *R. confervoides* (Vinogradova 2005b).

The presence of ***Devaleraea firma*** (Postels *et* Ruprecht) Selivanova (*Halosaccion firmum* (Postels *et* Ruprecht) Kützing) in the Barents Sea flora is very doubtful. The indication of this species for the Barents Sea (Zinova 1955: 150-151) was based apparently on records from Novaya Zemlya (Flerov 1932: 43; Flerov and Karsakoff 1932: 52). However, these data were not accompanied by the appropriate description required. LE collection stores the specimens of this species from the Russian Far East only. Indeed, this species is known as the Pacific one (Guiry and Guiry 2021). A recent record of *D. firma* from the Murman coast and Novaya Zemlya (Evseeva 2018: 12, 19) is not supported by any evidence.

The freshwater alga***Lemanea fluviatilis*** (Linnaeus) C. Agardh as *Lemania fluviatilis* L. recorded by Nylander and Saelan (1859: 74) for the Russian Laplandia (ryska Lappmarken) was not included in the present list of the flora of the Barents Sea.

In addition, Foslie (1890) and Simmons (1906) listed *Polysiphonia schuebeleri* Foslie, ***Ceramium arcticum*** J. Agardh,***Rhodochorton sparsum*** (Harvey) Kjellman,***Cruoriella Dubyi***(Crouan) Schmitz, ***Lithothamnion investiens*** Foslie, ***Lithothamnion varians*** Foslie, ***Lithothamnion flabellatum*** Rosenvinge, ***Lithothamnion fruticulosum*** (Kützing) Foslie for Northern Norway, and ***Rhodymenia pertusa***(Post. *et* Rupr.) J. Agardh, *Ceramium arcticum* J. Agardh for Spitsbergen. Børgesen and Jonsson (1908) also listed ***Scagelothamnion turneri*** (Mertens ex Roth) Athanasiadis, *Phymatolithon investiens* Foslie, ***Lithothamnion fornicatum*** Foslie, ***Lithothamnion macrocarpum*** (authors unknown) for Finnmark. These species are not included in the checklist of the Barents Sea, because no exact locations of findings were given in the publications.

***Conchocelis rosea*** Batters in G. Murray was reported for Finnmark (Børgesen and Jonsson 1908; Simmons 1906). However, this species is not cited here as an independent taxon because it is commonly considered as a synonym of *Porphyra umbilicalis* (Guiry and Guiry 2021), which is widespread along the southwestern shores of the Barents Sea.

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