

# Coralline Red Algae (Corallinales, Rhodophyta) of the Faroe Islands

Koraltarar (Corallinales, Rhodophyta) í føroyskum øki.

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## Úrtak

Víðfevnandi innsavningar í Føroyum av skorpualgum (Corallinales, Rhodophyta) hava avdúkað hesi sløg, sum hoyra til undirættina Melobesioideae: *Clathromorphum circumscriptum*, *Lithothamnion glaciale*, *Melobesia membranacea*, *Phymatolithon laevigatum*, *P. lenormandii*, *P. purpureum* og *P. tenue*. Av undirættini Lithophylloideae vórðu funnin hesi sløg: *Lithophyllum crouanii*, *L. incrustans*, *L. orbiculatum*, *Titanoderma corallinae*, *T. laminariae* og *T. pustulatum*, tað seinasta við trimum víðurkendum frábrigdum: *T. pustulatum* var. *pustulatum*, var. *confine* og var. *macrocarpum*. Eisini varð koralltari, *Corallina officinalis* (Corallinoideae) staðfestur. Trý av hesum slögum og frábrigdum vórðu funnin fyrri fyrstu ferð í Føroyum. Útbreiðsla av teimum funnu slögum verður samanborin við úrslitunum frá øðrum nýligum kanningum av skorpualgum í NE Atlantshavi (Danmark, Bretsku Oyggjunum og einum øki í Vesturnoregi).

## Abstract

A study of coralline red algae, based on extensive collections from the Faroe Islands, has revealed the following species of the subfamily Melobesioideae: *Clathromorphum circumscriptum*, *Lithothamnion glaciale*, *Melobesia membranacea*, *Phymatolithon laevigatum*, *P. lenormandii*, *P. purpureum* and *P. tenue*. Of the subfamily Lithophylloideae the following species were recorded: *Lithophyllum crouanii*, *L. incrustans*, *L. orbiculatum*, *Titanoderma corallinae*, *T. laminariae* and *T. pustulatum*, the latter with three recognized varieties: *T. pustulatum* var. *pustulatum*, var. *confine* and var. *macrocarpum*. Furthermore, *Corallina officinalis* (Corallinoideae) was observed. Three of the taxa are new records for the Faroe Isles. The distribution of the record-

ed species is discussed in relation to other recent studies of coralline red algae in the northeastern North Atlantic, (Denmark, the British Islands and a district in Western Norway).

## Introduction

Between 1994 and 1997 extensive collections were made of the marine algae and fauna in shallow water around the Faroe Islands as part of the BIOFAR project. The aim was to produce an inventory of all the species present.

The most comprehensive study of the coralline red algae at the Faroe Islands was published by Børgesen (1902). He recorded 11 crustose species identified by H. M. Fossli and *Corallina officinalis*. A check list of the macroalgae at the Faroe Islands, based on collections in 1980 (Irvine, 1982), includes the coralline species reported by Børgesen (1902) and confirms some of the records with new observations.

This paper presents the identified taxa of coralline red algae, observed in the extensive BIOFAR collections and represents epilithic species and larger epiphytic species. The identified species belong to the subfamilies Corallinoideae, Lithophylloideae and Melobesioideae.

### Material and methods

Algae were collected selectively by hand from the littoral to 30 m depth, in the sublittoral by SCUBA diving; in addition material was obtained by dredging at a few of the 265 stations. Collections were made at all seasons, but less in the winter months, with only a small collection from January, and none from November, December and March. The localities visited were distributed on most of the larger islands and included places on the open coasts with different exposure to waves as well as more or less sheltered places in the fjords. Information about the localities with details of collection dates, depth and geographical coordinates for each station, are available in Sørensen *et al.* (2001) while a map showing the locations is available in Nielsen and Gunnarsson (2001). The main part of the obtained material was dried immediately after collection, but a smaller fraction was stored in a 7:2:1 solution of ethanol, distilled water and glycerol to keep it moist. For identification it is often necessary to decalcify and section the specimens.

The material was decalcified overnight in dilute (2-5%) acetic acid, then rinsed once in distilled water. Part of the material was embedded in Cryo Embed (AX-LAB A/S, Copenhagen, Denmark). Sections of 8 µm were cut on a Reichert-Jung 2800 Frigocut microtome (freeze microtome), collected on a slide, stained with few drops of 1% Cotton Blue dissolved in lacto glycerol (875 ml lactic acid, 63 ml glycerol, 62 ml distilled water) and mounted in 35-50 % KARO® (corn syrup). Another part was embedded in LR-White resin (London

Resin Company, UK), cut on a Reichert-Jung 2050 Supercut microtome in sections of 7 µm and mounted for permanent slides in Eukitt (Bie and Berntsen, Denmark). This method is modified after Woelkerling (1988); for methodological details see Düwel and Wegeberg (1996).

Voucher specimens are kept in the Botanical Museum, Copenhagen (C) with duplicate collections in the Museum of Natural History, Tórshavn and the Marine Research Institute, Reykjavik, Iceland.

### Results

Taxonomy and nomenclature generally follow Chamberlain and Irvine (1994a, b) and Irvine and Johansen (1994). Authors of plant names are abbreviated according to Brummit and Powell (1992). Included in the list as synonyms are names used by Børgesen (1902), Irvine (1982) and Simmons (1897). For each species at least one reference indicates a good description, illustration, or other specific information. The BIOFAR stations where the respective species were collected are listed as well as notes recording depth distribution, month(s) of collection and observations of reproductive structures.

The list of species includes the following symbols:

\*: new or previously unpublished records for the Faroe Islands.

( ): collection from a wide depth range. Depth distribution: Only handpicked material included.

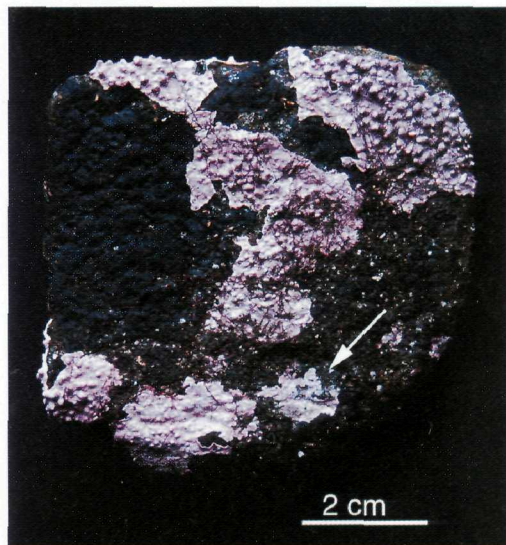


Fig. 1. *Lithophyllum orbiculatum* (arrow) and *Lithothamnion glaciale*

### *Clathromorphum circumscriptum* (Strömf.)

Foslie

Synonym: *Phymatolithon compactum* (Kjellm.) Foslie.

Reference: Lebednik (1976)

Station: 1364.

Littoral.

Remarks: collected in May with tetrasporangia.

### *Corallina officinalis* L.

Reference: Irvine and Johansen (1994).

Stations: 1007, 1016, 1017, 1019, 1020, 1032, 1034, 1035, 1045, 1048, 1049, 1110, 1124, 1126, 1142, 1174, 1175, 1187, 1228, 1231, 1234, 1236, 1278, 1280, 1281, 1285, 1305, 1347, 1348, 1349, 1351, 1352, 1353, 1354, 1357, 1358, 1359, 1360, 1363, 1365, 1366, 1371, 1372, 1375, 1376, 1379, 1380, 1532, 1683, 1687, 1688, 1689, 1690, 1691, 1692, 1693, 1695, 1696, 1697, 1700, 1701, 1712, 1716, 1717, 1719, 1720, 1721, 1722, 1723, 1727, 1732, 1733, 1738, 1739, 1759, 1760, 1761, 1762, 1763, 1764, 1766, 1767, 1768, 1769, 1773, 1774, 1775, 1776, 1777, 1778, 1779, 1781, 1782, 1783, 1784, 1785, 1850, 1852, 1903, 1911, 1912, 1913, 1914.

Littoral to 20 m depth.

Remarks: collected in February and April-October.

Conceptacles in April, May, September and October and tetrasporangia in May.

### *Lithophyllum crouanii* Foslie

Synonym: *Dermatolithon crouanii* (Foslie) Hamel & Lemoine.

Reference: Chamberlain and Irvine (1994a).

Stations: 1011, 1014, 1022, 1023, 1026, 1027, 1029, 1127, 1277, 1286, 1294, 1295, 1352, 1364, 1690, 1727, 1768, 1773, 1774, 1781, 1850.

Littoral to 25 (25-30) m depth.

Remarks: collected in May-October. On rocks, epiphytic on stipe of *Laminaria hyperborea* (Gunnerus) Foslie and epizoid on *Patella vulgata* (L.).

### *Lithophyllum incrustans* Phil.

Reference: Chamberlain and Irvine (1994a).

Station: 1296.

(20-25) m depth.

Remarks: collected in September.

### \* *Lithophyllum orbiculatum* (Foslie) Foslie (Fig. 1)

Reference: Chamberlain and Irvine (1994a).

Stations: 1011, 1014, 1021, 1022, 1365.

10-25 (25-30) m depth.

Remarks: collected in May and July.

### *Lithothamnion glaciale* Kjellm. (Fig. 1)

Reference: Chamberlain and Irvine (1994b).

Stations: 1011, 1015, 1021, 1022, 1023, 1025, 1026, 1027, 1029, 1030, 1040, 1127, 1128, 1138, 1139, 1276, 1290, 1295, 1366, 1713, 1715, 1719, 1734, 1779, 1851.

Littoral to 20 m depth.

Remarks: collected in February and May-September.

### \* *Melobesia membranacea* (Esper) J.V.F.Lamour. (Fig. 2)

Reference: Chamberlain and Irvine (1994b).

Stations: 1027, 1036, 1276, 1296, 1363, 1365, 1366.

Littoral to 20 (20-25) m depth.

Remarks: collected in May, July and September. Conceptacles throughout, tetrasporangia in July and

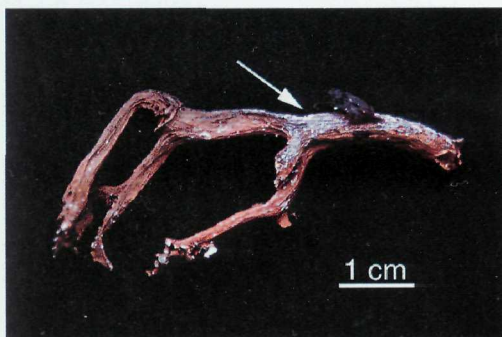


Fig. 2. *Melobesia membranacea* (arrow) on holdfast of *Laminaria* sp.

September. Epiphytic on *Furcellaria lumbricalis* (Huds.) J.V.F.Lamour.

*Phymatolithon laevigatum* (Foslie) Foslie

Reference: Chamberlain and Irvine (1994b).

Stations: 1026, 1029, 1041, 1127, 1296, 1365, 1775, 1779, 1781.

Littoral to 20 (20-25) m depth.

Remarks: collected in May-September.

*Phymatolithon lenormandii* (Aresch.)

W.H.Adey

Synonym: *Lithothamnion lenormandii* (Aresch.) Foslie.

Reference: Chamberlain and Irvine (1994b).

Stations: 1358, 1363, 1364, 1686, 1781, 1783, 1784.

Littoral.

Remarks: collected in May, August and October.

Tetrasporangia throughout.

*Phymatolithon purpureum* (P.Crouan &

H.Crouan) Woelk. & L.M.Irvine

Synonyms: *Lithothamnion polymorphum* (L.) Aresch., *Phymatolithon polymorphum* (L.) Foslie.

Reference: Chamberlain and Irvine (1994b).

Stations: 1020, 1296, 1360, 1363, 1364, 1713, 1768, 1775, 1779, 1850, 1851, 1852.

Littoral to 20 (20-25) m depth.

Remarks: collected in February, May and July-September.

*Phymatolithon tenue* (Rosenv.) Düwel & Wegeberg

Synonyms: *Lithothamnion laeve* (Strömf.) Foslie, *Lepidophytum laeve* (Strömf.) W.H.Adey

Reference: Düwel and Wegeberg (1996).

Stations: 1026, 1027, 1040, 1128, 1713.

10-20 m depth.

Remarks: collected in February and June-July.

Tetrasporangia throughout.

*Titanoderma corallinae* (P.Crouan & H.Crouan)

Woelk., Y.M.Chamb. & P.C.Silva

Synonyms: *Dermatolithon corallinae* (P.Crouan & H.Crouan) Foslie, *Lithophyllum corallinae* (P.Crouan & H.Crouan) Heydr.

Reference: Chamberlain and Irvine (1994a).

Stations: 1034, 1351, 1360, 1363, 1365, 1366, 1701, 1738, 1903.

Littoral to 15 (15-20) m depth.

Remarks: collected in May-August and October. Epiphytic on *Furcellaria lumbricalis*, *Plocamium cartilagineum* (L.) P.S.Dixon and stipe of *Laminaria hyperborea*.

*Titanoderma laminariae* (P.Crouan & H.Crouan)

Y.M.Chamb.

Synonym: *Dermatolithon macrocarpum* (Rosanoff) Foslie f. *laminariae* (P.Crouan & H.Crouan) Foslie, *Melobesia laminariae* P.Crouan & H.Crouan.

Reference: Chamberlain and Irvine (1994a).

Station: 1278.

(0-5) m depth.

Remarks: collected in September with tetrasporangia.

*Titanoderma pustulatum* (J.V.F.Lamour.) Nägeli  
var. *pustulatum*

Synonym: *Dermatolithon macrocarpum* (Rosanoff)

Foslie f. *faroensis* Foslie

Reference: Chamberlain (1991).

Stations: 1019, 1020, 1023, 1027, 1127, 1276, 1277, 1278, 1281, 1285, 1294, 1295, 1305, 1347, 1348, 1353, 1354, 1358, 1363, 1726, 1727, 1733, 1735, 1738, 1768, 1771, 1773, 1775, 1777, 1781, 1850, 1851.

Littoral to 15 (15-20) m depth.

Remarks: collected in April-September. On rocks, barnacles and epiphytic on *Chondrus crispus* Stackh., *Mastocarpus stellatus* (Stackh. in With.) Guiry in Guiry *et al.* and stipe of *Laminaria hyperborea*.

\**Titanoderma pustulatum* (J.V.F.Lamour.)

Nägeli *var. confine* (P.Crouan & H.Crouan)

Y.M.Chamb. (Fig. 3)

Reference: Chamberlain and Irvine (1994a).

Stations: 1351, 1366, 1783.

Littoral to 15 (15-20) m depth.

Remarks: collected in May, July and August. Tetrasporangia were observed in August. On rocks and epizoic on barnacles.

*Titanoderma pustulatum* (J.V.F.Lamour.) Nägeli

*var. macrocarpum* (Rosanoff) Y.M.Chamb.

Synonyms: *Dermatolithon hapalidioides* Foslie, *Dermatolithon macrocarpum* (Rosanoff) Foslie, *Melobesia macrocarpa* Rosanoff.

Reference: Chamberlain and Irvine (1994a).

Stations: 1032, 1036, 1365.

10 (10-12) m depth.

Remarks: collected in May and July. Conceptacles were present in July. On rocks and epiphytic on *Phyllophora crispa* (Huds.) P.S.Dixon.

## Discussion

In the recently collected material 14 species were identified; they belong in the subfamilies Corallinoideae, Lithophylloideae and Melobesioideae. The number is an underestimate of the diversity of coralline red algae on the Faroe Islands as species of Mastophoroideae, never reported from the area, were observed, but the identification of these species is left for future studies.

*Lithophyllum orbiculatum*, (Fig. 1), *Melobesia membranacea* (Fig. 2) and *Titanoderma pustulatum var. confine* (Fig. 3) are new records for the Faroe Islands.

The reason for the absence of *L. orbiculatum* in former publications could be diffi-



Fig. 3. *Titanoderma pustulatum var. confine*

culties with identification as in the British Isles where this species was overlooked because of nomenclatural confusion with *L. crouanii* (Chamberlain *et al.*, 1988) or it was misidentified as *Lithophyllum incrustans* or *Phymatolithon lenormandii* according to Chamberlain *et al.* (1991) and Chamberlain and Irvine (1994a).

*Melobesia membranacea* has probably been overlooked in previous studies in which small, epiphytic species have been ignored. The absence in the species lists need therefore not indicate the actual absence of this species from the area studied.

Recently, a survey of coralline red algae in Denmark and identification of species at Sogn and Fjordane, Norway were accomplished (Wegeberg, 2000, Lein *et al.*, 1998; 1999). These investigations, together with

the comprehensive work on coralline red algae from the British Isles (Irvine and Chamberlain, 1994), offer the opportunity to compare the records from the Faroe Islands with other recent investigations in the northeastern North Atlantic. Most of the reported species are common to all areas, but *Clathromorphum circumscriptum* has only been recorded from the Faroe Islands. An earlier record from the British Isles was shown to be a misidentification (Chamberlain and Irvine, 1994b). The species represents an Arctic or northern element of the flora as it is well known from western Greenland (Wegeberg, pers. obs.) and Iceland (Caram and Jónsson, 1972). *Lithophyllum incrustans* and *L. orbiculatum* are recorded from the British Isles (Chamberlain and Irvine, 1994a) and Norway (Brattegaard and Holthe, 1997) as well as the Faroe Islands. They are, however, not recorded in the recent investigation in the Sogn and Fjordane district, Norway (Lein *et al.*, 1998; 1999). The former confusion between *L. crouanii* and *L. orbiculatum*, mentioned above (see also Chamberlain *et al.*, 1988), makes it difficult to evaluate the full extent of their distribution in the northeastern North Atlantic. However, as the record of *L. orbiculatum* from Iceland by Caram and Jónsson (1972) was a misidentification of *L. crouanii* (Chamberlain *et al.*, 1991), and as both *L. incrustans* and *L. orbiculatum* are recorded as far south as the Mediterranean (Chamberlain and Irvine, 1994a), these species probably represent a southern element of the coralline flora on the Faroe Islands. *Phymatolithon laevigatum* is widespread throughout all areas, al-

though not observed in the recent investigation of the flora in the Sogn and Fjordane district of Norway (Lein *et al.*, 1998; 1999) and not recorded for Iceland (Caram and Jónsson, 1972). Therefore this species may be on the edge of its distribution in the northeastern North Atlantic and represents a more southernly element of the Faroe Islands' flora. This is in agreement with Børgesen's (1905) conclusion that the Faroe Islands represents the northern distributional limit of *P. laevigatum*.

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