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The lichen genus Physcia and allied genera in Greenland

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Moberg, R., & Hansen, E. S. 1986. The lichen genus Physcia and allied genera in Greenland. – Meddr Grønland, Bioscience 22, 32 pp. Copenhagen 1986-12-31.

Seven species of *Physcia*, six of *Phaeophyscia* and four of *Physconia* are reported from Greenland. Four taxa, *Phaeophyscia kairamoi, P. nigricans, Physcia adscendens* and *Physconia enteroxantha* are reported as new to the area.

Morphology, chemistry, distribution, habitat and ecology are discussed and a key to species is presented.

Distribution maps of all species are presented.

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Introduction

The literature dealing with *Physcia s. lat.* in Greenland comprises *c.* 40 titles. Fries (1860) and Branth & Grönlund (1888) were the first to mention collections of *Physcia* from Greenland but they dealt with only four or five taxa. Lynge (1923, 1937), Lynge & Scholander (1932) and Dahl, Lynge & Scholander (1937) described several new taxa, discussed nomenclatural and taxonomic problems, and also listed many new localities. However, in the light of modern concepts of the genera, the present taxonomic treatment differs in many respects from these earlier papers.

Some recent papers deal with the ecological and distributional features of this interesting group of lichens (Dahl 1950, Böcher 1954, Gelting 1955, K. Hansen 1962, E. S. Hansen 1978a and b, 1982), but only Thomson (1963) and K. Hansen (1971) attempt a total survey of taxonomy, ecology and distribution.

During the last two decades, intensive collecting and research work in many parts of Greenland (including the Thule and Ammassalik areas, both visited by Eric Steen Hansen) has considerably increased our knowledge of the lichen flora there. We have therefore ventured also to make a preliminary classification of the main patterns of lichen distribution in Greenland.

Over 1000 specimens from herbaria in C and UPS were examined, and as only relatively small areas remain unexplored in northwestern Greenland and along the north coast, we believe this survey presents a representative treatment of the genera *Phaeophyscia, Physcia* and *Physconia* in Greenland.

Key to species

1. Thallus greyish, colour little changed when moistened, K+ yellow (atranorin) 2
– Thallus brownish, greenish or greyish (pruina), greenish when moistened, K– 8
2. Lobes with marginal cilia, usually ascending 3
– Lobes without marginal cilia, ± adnate 4
3. Soralia mainly lip-shaped ..... 13. *Physcia tenella*
– Soralia helmet-shaped, very rare ..... 7. *Physcia adscendens*
4. Soralia absent, apothecia usually abundant 5
4. Soralia present 7
5. Thallus usually densely pruinose, spores narrowly ellipsoid with a distinct ornamentation, medulla K– ..... 11. *Physcia magnussonii*
– Thallus epruinose or weakly pruinose, spores ellipsoid, ornamentation indistinct, medulla K+ 6
6. Corticolous, lobes flat or concave, usually broader than 1 mm ..... 8. *Physcia aipolia*
– Saxicolous, lobes convex and usually less than 1 mm broad ..... 12. *Physcia phaea*
7. Soralia mainly lip-shaped, medulla K– ..... 10. *Physcia dubia*
– Soralia mainly laminal, capitate to crateriform, medulla K+ yellow .... 9. *Physcia caesia*

8. Rhizinae squarrose, pruina usually present 9
– Rhizinae simple, pruina absent 12
9. Medulla K+ yellow, with marginal soralia; very rare... 15. *Physconia enteroxantha*
– Medulla K−, with or without soralia 10
10. Without soralia, terricolous or muscicolous ..... 16. *Physconia muscigena*
– With soralia, on various substrates 11
11. Lobes usually more than 2 mm broad, soralia distinctly marginal, lower cortex present to the very tips ..... 14. *Physconia detersa*
– Lobes usually short and less than 1 mm broad, soralia lip-shaped, lower cortex absent at the tips ..... 17. *Physconia perisidiosa*
12. Without soralia or isidia 13
– With soralia or isidia 14
13. Lobes ascending, underside pale, terricolous ..... 1. *Phaeophyscia constipata*
– Lobes firmly adnate, underside black, saxicolous ..... 2. *Phaeophyscia endococcina*
14. With soralia ..... 5. *Phaeophyscia orbicularis*
– With isidia, sometimes granular and soredia-like 15
15. Very narrow-lobed (<0.3 mm), underside paler than the upper side ..... 4. *Phaeophyscia nigricans*
– Lobes broader (>0.5 mm), underside blackish 16
16. Lobes very variable in width (up to 4 mm), rhizinae distinctly projecting beyond lobe-margins, isidia often becoming rhizinate ..... 3. *Phaeophyscia kairamoi*
– Lobes narrow (<1 mm), with shorter rhizinae, rarely projecting beyond the margins .. 6. *Phaeophyscia sciastra*

Phaeophyscia Moberg

In Greenland *Phaeophyscia* is recognized by the following characters: thallus foliose to almost fruticose, brownish or greenish, rarely greyish, greenish when wet, never with a white pruina. Underside black, rarely whitish, with simple, black, rarely whitish rhizinae. Upper and lower cortex of isodiametric cells (paraplectenchymatous). Apothecia lecanorine, mostly with rhizinae on the underside (corona). Spores 1-septate (Fig. 1), brown, rarely exceeding 25 µm. Pycnoconidia ellipsoid and less than 4 µm. Atranorin absent. These characters correspond well with those presented and discussed by Moberg (1977, 1983) for material from Fennoscandia and East Africa, respectively.

1. **Phaeophyscia constipata** (Norrl. & Nyl.) Moberg

Fig. 2. Map 1.

Thallus ± fruticose. Lobes narrow, *c.* 0.5 mm broad, ascending. Without soralia or isidia. Apothecia absent. Upper side greenish brown to brown, underside whitish with greenish spots, rhizinae sparse, white.

For synonymy, detailed description and distribution in Fennoscandia, see Moberg (1977: 33). Known also from central Europe and North America. Probably circumboreal.

P. constipata is distinguished from other species of *Phaeophyscia* in Greenland, by its mainly fruticose appearance, its pale underside with green spots, originating from algal congregates close to the surface, and the

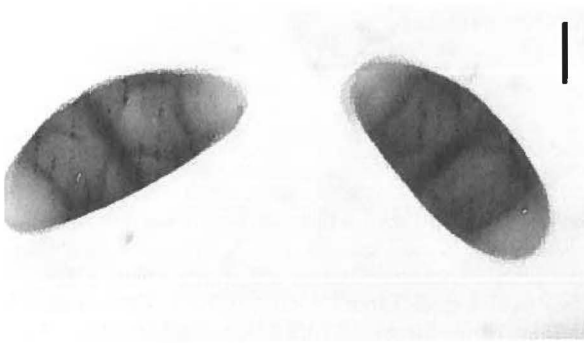

Fig. 1. One-septate spores of Phaeophyscia and Physcia. Scale 5 µm.

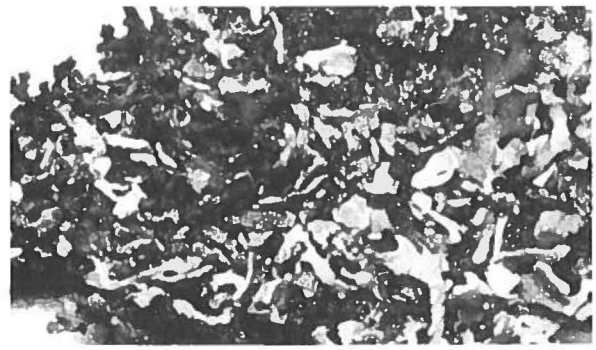

Fig. 2. Phaeophyscia constipata. × 7.

very sparse rhizinae. *P. nigricans,* its closest relative in Greenland, may also have a pale underside but it is smaller in size, rarely more than 1 cm in diam., and more narrow-lobed. Rarely other species of *Phaeophyscia* have pale undersides when growing in unfavoured habitats.

P. constipata is the only species of *Phaeophyscia* to grow directly on soil. It prefers calcareous substrates and grows on mineral soil, or on soil rich in humus in (summer-) dry, exposed localities, often associating with *Physconia muscigena* and others. Known also from bird-perching stones but then always on a thin layer of soil or among mosses.

This species is scattered but widely distributed in Greenland, being very rare in the southern part of the west coast, and rare to occasional in the Disko-Aasiaat (Egedesminde) area. A few collections were made in central East Greenland between 72°–73°N. Most records are from inland localities, with only a few from coastal sites.

Selected specimens seen: Qagssiarssuk, 61°08′N, 45°32′W; 1980 Alstrup 801199a (C). – Angujârtorfiup nunâ, Arnangarngup kûa, 66°30′N, 51°15′W; 1979 Alstrup 79815 (C). – Nuerssorfiarqap, 67°46′N, 51°37′W; 1958 K. Hansen 747 (C). – Itivdliarssuk, 67°55′N, 50°40′W; 1951 Gelting 15955c (C). – Kangersuneq, 68°50′N, 50°43′W; 1958 K. Hansen 1496 (C). – Godhavn, 69°15′N, 53°31′W; 1950 Gelting (C). – Mt north of Blomsterdal, 71°58′N, 23°43′W; 1968 Topham (C). – Blyklippen, 72°10′N, 24°07′W; 1968 Topham (C). – Kjerulf Fjord, c. 73°15′N, 27°10′W; 1929 Lynge (C).

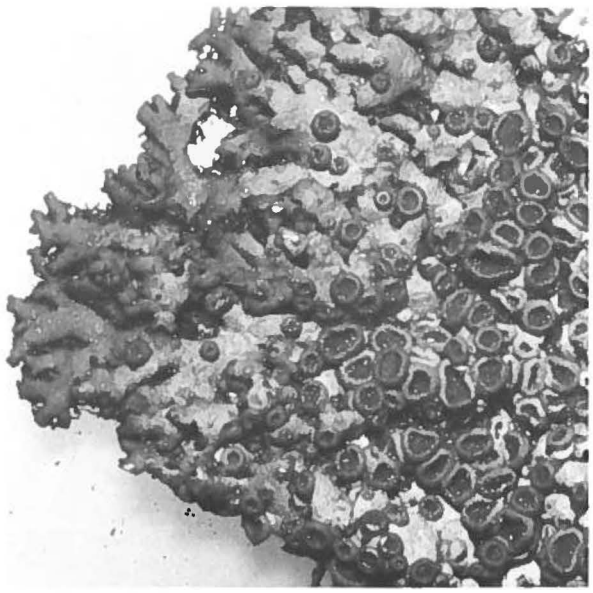

Fig. 3. Phaeophyscia endococcina. × 7.

2. **Phaeophyscia endococcina** (Koerb.) Moberg

Fig. 3. Map 2.

Thallus orbicular to irregular, up to 3 cm diam., mostly firmly adnate. Lobes radiating, narrow (less than 1 mm) and ± convex. Apothecia usually numerous and crowded. Upper side brown to dark brown, rarely greyish brown, underside black with black rhizinae. Medulla usually white, rarely red or orange coloured (skyrin). Zeorin present (TLC).

For synonymy (including *P. decolor*), detailed description and distribution in Fennoscandia, see Moberg (1977: 35). Known also from central Europe and North America *(P. decolor).* Probably circumboreal.

P. endococcina is separated from related species by the abundant, small apothecia, the usually adnate and convex lobes, and by the presence of zeorin (TLC). This latter character is important when apothecia and/or skyrin is absent. Some modifications are very similar to modifications of *P. sciastra* when the latter lacks the characteristic isidia.

The specific epithet refers to the yellow to orange pigment (skyrin) which may be present in the medulla. However, the production and quantity of this pigment seems to be more or less correlated with the type of habitat, and consequently it is not reliable as a diagnostic character. In Greenland especially, skyrin production is negligible and in most specimens skyrin cannot be detected even by TLC. Such specimens were referred to *P. decolor* by Alstrup (1979), but belong either to *P. endococcina* or to *P. sciastra.*

The colour of the medulla in *P. endococcina* varies from distinct orange to entirely white in different parts of even the same thallus (Moberg 1977: 37). It was assumed that differences in exposure were the main reason for such a variation. In Fennoscandia northern specimens often have a coloured medulla; in general, skyrin is found in specimens growing in south facing habitats with microclimatic conditions more favourable than those in many localities having the species in lower latitudes. Thus, specimens in warm sunny places usually have an orange medulla, while specimens from shaded habitats have a white medulla without, or with very low concentrations of skyrin. In accordance with this pattern, the lack of skyrin in specimens from Greenland is interpreted as a reflection of unfavourable habitat conditions.

P. endococcina grows on more or less temporarily moist, basaltic and siliceous rocks and boulders in watercourses and on seepage surfaces, sometimes also on bird stones and rocks, together with *Xanthoria candelaria, X. elegans, Physcia caesia, P. dubia* and *Phaeophyscia sciastra.* It often occurs on steeply sloping to perpendicular rock walls in amphibious zones along watercourses. Normally it grows either directly on rock or on mosses on rocks, but is found rarely on lignum.

P. endococcina is probably widely distributed in Greenland. It is common in Southwest and central West Greenland but only occasionally in the southeast. It extends as far north as Prøven (c. 72°N) on the west coast but only to the Kangerdlugssuaq area (c. 68°N) on the

Fig. 4. Phaeophyscia kairamoi. × 7.

east coast. The species appears to be equally frequent in both inland and coastal areas.

Selected specimens seen: Julianehåb, 60°43′N, 46°07′W; 1937 Dahl (C). – Kangerdluarssuk, 61°06′N, 46°12′W; 1962 K. Hansen 1637 (C). – Ilulialik, Igdlorssuit, 64°47′N, 50°36′W; 1976 Alstrup 765931 (C). – Tupilak 68°42′N, 52°53′W; 1951 Gelting 13940 (C). – Kuânerssuit, 'Store Kvanli', 69°35′N, 53°23′W; 1949 Gelting (C). – Narsarssuaq, 69°44′N, 54°38′W; 1949 Gelting (C). – Kugssinerssuaq, 69°55′N, 54°25′W, 1949 Gelting (C). – Eqalungmiut, 63°28′N, 41°55′W; 1970 Steen Hansen 701393 (C). – Paornakajît, 66°04′N, 37°38′W; 1971 Steen Hansen 711312 (C). – Miki Fjord, 68°10′N, 31°32′W; 1971 Steen Hansen 71833 (C).

3. **Phaeophyscia kairamoi** (Vain.) Moberg

Fig. 4. Map 3. First record for Greenland.

Thallus irregular, ± loosely adnate. Lobes radiating, very variable in width (up to 3 mm broad), with rhizinate isidia or lobules at margins, sometimes also becoming laminal. Upper side brown to dark brown, underside black with long, black rhizinae, often projecting several mm beyond lobe-margins.

For synonymy, detailed description and distribution in Fennoscandia see Moberg (1969, 1974 and 1977). Known also from central Europe and North America. Probably circumboreal.

P. kairamoi is distinguished from other related species by the very variable lobe width, the isidiate to lobulate lobe-margins, and the long rhizinae projecting beyond the lobe margins, giving the thallus a "shaggy" appearance. Lobules may sometimes also cover parts of the upper surface.

This very delicate species is recorded from only a few localities in Greenland.

P. kairamoi occurs on more or less dry, calcareous soils (loess), or on basalt rocks having some visible influence of guano or nutrient dust. Usually it grows over and among mosses and other lichens and is found in association with *Physconia detersa, P. muscigena, P. perisidiosa, Physcia caesia* and *Phaeophyscia sciastra.*

P. kairamoi is rather common in the Disko-Nûgssuaq area in central West Greenland but very rare in East Greenland, being known only from Clavering Ø (*c.* 74°N), but probably overlooked or undercollected. Most localities are coastal, but *P. kairamoi* is known also from inland areas, for instance Søndrestrømfjord (*c.* 67°N) in West Greenland, which has a very continental climate (Böcher 1954).

Selected specimens seen: Angujârtorfiup nunâ, Arnangarngup kûa, c. 66°30′N, 51°15′W; 1979 Alstrup (C). – Between Hundesø and Brayasø, 66°59′N, 51°02′W; 1974 Alstrup (C). – Tupilak, 68°42′N, 52°53′W; 1951 Gelting (C). – Godhavn, 69°15′N, 53°15′W; 1952 Gelting 17518 (C). – Søndre Laksebugt, 'Qasusortinguaq', 69°19′N, 53°54′W; 1951 Gelting 17627 (C). – Atâ, Tuapaussat, 70°19′N, 53°04′W; 1950 Gelting (C). – Pautût, 70°16′N, 52°45′W; 1950 Gelting (C). – Marrait, 70°32′N, 54°20′W; 1949 Gelting (C). – Mârmorilik, 71°07′N, 51°17′W; 1983 Poelt & Ullrich (C). – Eskimonæs, 74°06′N, 21°20′W; 1935 Sørensen (C).

4. **Phaeophyscia nigricans** (Flörke) Moberg

Fig. 5. Map 4. First record for Greenland.

The small thallus of *P. nigricans,* rarely more than 1 cm diam., may be difficult to detect, but usually several individuals grow together forming a larger, confluent thallus. Lobes very narrow, mostly *c.* 0.2 mm broad, loosely adnate, with isidia or isidiate soredia at the tips.

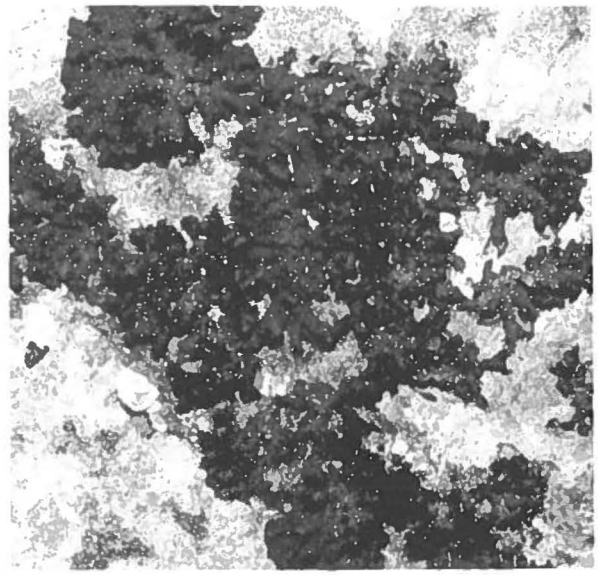

Fig. 5. Phaeophyscia nigricans. × 7.

In herbarium material these tips may be broken, which makes the specimens difficult to identify. The underside is usually pale but it may become brown although never black as in other species of *Phaeophyscia*. The upperside is normally darker than the underside, contrary to most other species of *Phaeophyscia*. Apothecia were not seen in Greenland material.

For synonymy, detailed description and distribution in Fennoscandia, see Moberg (1977: 42). Widely distributed in Europe. Known also from North America. Probably circumboreal.

The small, narrow-lobed thallus, and the brownish underside make *P. nigricans* easy to identify and separate from other species of the genus.

P. nigricans grows on gneissic or, more frequently on basaltic rocks, more or less influenced by guano. It associates with *e.g. Xanthoria sorediata, Physcia dubia* and *P. caesia* and prefers somewhat moist situations. *P. nigricans* in other parts of its range is mainly a corticolous species which undoubtedly explains the few records from Greenland.

This species is rare and known only from a few localities on Disko, West Greenland, situated in Nordfjord and Diskofjord.

Specimens examined: Eqalúnguit, 69°33'N, 53°36'W; 1949 Gelting (C). – Nordfjord, 69°55'N, 54°25'W; 1949 Gelting (C).

5. **Phaeophyscia orbicularis** (Necker) Moberg

Fig. 6. Map 5. First record from Greenland.

Thallus orbicular to irregular, ± firmly adnate. Lobes radiating, *c.* 1 mm broad with laminal soralia, sometimes reaching the margins. Upper side brownish, underside black with black rhizinae.

For synonymy, detailed description and distribution in Fennoscandia see Moberg (1977: 44) Widely distributed in Europe. Known also from North America.

P. orbicularis is separated from other species by the true soralia, which are mainly laminal, maculiform to capitate. As in northern Fennoscandia, *P. orbicularis* in Greenland is restricted to rocks manured by birds and in this habitat they differ slightly from those on tree trunks frequently present in more southern areas. The lobes also tend to be broader, (2 mm instead of *c.* 1 mm), and shorter.

P. orbicularis is known from only two localities in Greenland where it grows on basaltic rocks with visible influence of guano, together with *e.g. Xanthoria elegans* and *X. candelaria.*

Specimens examined: Qaqortoq kirkeruin, 60°48'N, 54°50'W; 1937 Dahl (UPS). – Godhavn, 'Østerli', 69°15'N, 53°31'W; 1952 Gelting 17698 (C).

6. **Phaeophyscia sciastra** (Ach.) Moberg

Fig. 7. Map 6.

Thallus orbicular to irregular, to 2 cm diam., but very variable in size and often confluent with other thalli. Lobes ± flat, radiating, usually less than 0.5 mm wide. Isidia or isidiate soredia at margins, or in central parts even laminal, sometimes covering the whole thallus. Upper side brownish grey to dark grey, underside black with black rhizinae, rarely projecting beyond lobe-margins.

For synonymy, detailed description and distribution in Fennoscandia see Moberg (1977: 47). Widely distributed in Europe. Known also from North America. Probably circumboreal.

Typically *P. sciastra* is separated from other species in Greenland by the narrow lobes (to 0.5 mm), with clustered isidia which become pseudosorediate. However, it

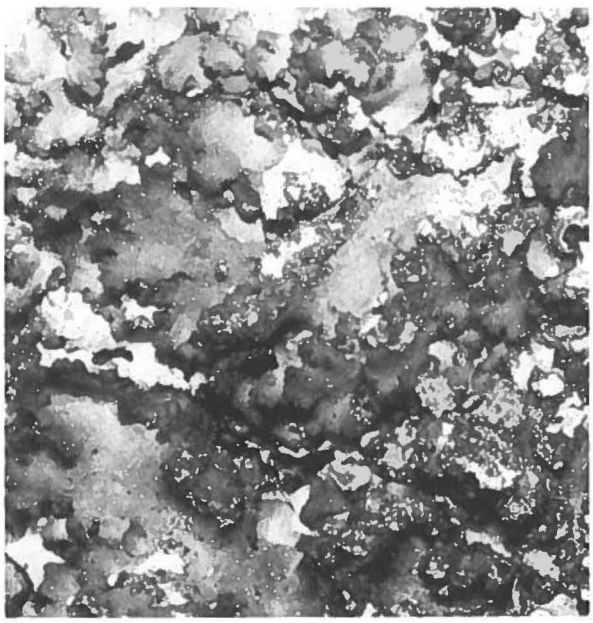

Fig. 6. Phaeophyscia orbicularis. × 7.

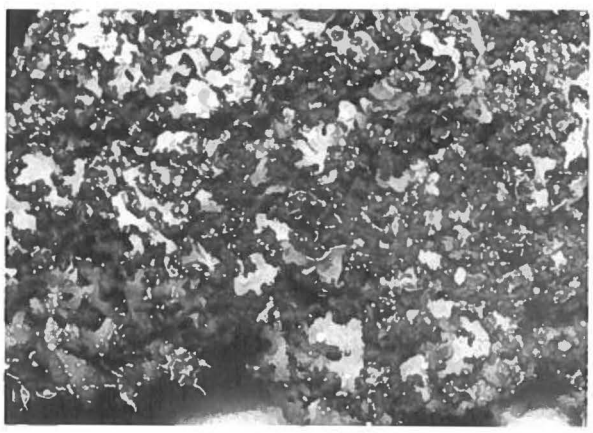

Fig. 7. Phaeophyscia sciastra. × 7.

is a variable species and may even at times lack isidia. It is then difficult to separate from specimens of *P. endococcina* without apothecia. Such specimens may be identified by TLC, since *P. sciastra* lacks zeorin. Lobes of *P. sciastra* are usually plane to concave, loosely adnate and often upwardly curved at the tips contrary to *P. endococcina,* which has more or less convex lobes mostly adnate along their whole length. Very narrow-lobed modifications may be difficult to separate from *P. nigricans,* but *P. sciastra* is always black on the underside while *P. nigricans* is dark brown or paler.

P. sciastra occurs on basaltic and siliceous rocks (rarely calcareous) more or less influenced by guano. It grows either directly on rocks or over mosses on rocks and it is usually associated with other lichens such as *Xanthoria elegans, Physcia dubia* and *Phaeophyscia endococcina. P. sciastra* has been found growing on horizontal and on strongly sloping to vertical surfaces. More rarely it grows on mineral soil, humus, lignum or bark of *Betula* and *Alnus.*

P. sciastra is widely distributed in Greenland, except for the northernmost part, but common only in Southwest and central West Greenland and East Greenland between 72–74°N. In 1986 Eric Steen Hansen collected several specimens of *P. sciastra* at Qaanaaq in the Thule area. These collections are so far the northernmost in Greenland (cf. Map 6). It shows a distinct preference for inland areas in the southernmost part, but tends to be more coastal northwards.

Selected specimens seen: Iterdlaq, 60°56′N, 45°16′W; 1962 K. Hansen 1639 (C). – Iterdlak, 61°11′N, 45°27′W; 1969 Andersen & Steen Hansen 691089 (C). – Ilulialik, Igdlorssuit, 64°47′N, 50°37′W; 1976 Alstrup 76157 (C). – Between Hundesø and Brayasø, 66°59′N, 51°02′W; 1974 Alstrup (C). – Agpaqarfik, 68°11′N, 51°46′W; 1951 Gelting (C). – Kangâtsiaq, 1 km NE of trading post, 68°19′N, 53°28′W; 1951 Gelting no. 16661b (UPS). – Sarqaq, 70°01′N, 51°57′W; 1949 Gelting (C). – Eqalungmiut, 63°28′N, 41°55′W; 1970 Steen Hansen 701762 (C). – Isertoq, 65°39′N, 38°24′W; 1971 Steen Hansen 711498 (C). – Ymer Ø, Kap Humboldt, 73°06′N, 23°00′W; 1929 Lynge (UPS). – Eskimonæs, 74°06′N, 21°20′W; 1932 Gelting (C).

Physcia (Schreber) Michaux

Physcia is recognized in Greenland by the following characters: thallus foliose, pale grey to very dark grey, unchanged when wet sometimes with a white pruina. Underside white to brownish, with whitish to black, simple rhizinae. Upper cortex of isodiametric cells, lower cortex of longitudinally arranged cells. Apothecia lecanorine, without rhizinae on the underside, spores 1-septate (Fig. 1), brown, rarely exceeding 25 µm. Pycnoconidia subcylindrical, 4–6 µm long. Atranorin always present.

7. **Physcia adscendens** (Fr.) Oliv.

Fig. 8. Map 7.

First and only record from Greenland.

Fig. 8. Physcia adscendens. × 7.

Thallus orbicular to irregular, rarely exceeding 2 cm diam., grey to dark grey. Lobes narrow, up to 0.5 mm broad except for broader terminal parts containing helmet-shaped soralia, with marginal cilia.

Upper side usually weakly maculate (×10 lens), underside whitish with white to black rhizinae. Apothecia rare, not seen in Greenland material. Cortex K+ yellow, medulla K−; atranorin.

For synonymy, detailed description and distribution in Fennoscandia see Moberg (1977: 50). Widely distributed in Europe. Known also from North America.

P. adscendens is generally easily distinguished from *P. tenella* by its helmet-shaped soralia. In young thalli, when soralia are weakly developed, they may be difficult to separate, but *P. adscendens* has usually ± involute lobe-tips, compared with the ascending lobe-tips of *P. tenella.* These two species are separated from the other species of *Physcia* in Greenland by the presence of marginal cilia.

P. adscendens was found growing on a gneissic rock at Qivâqe in the Maniitsoq (Sukkertoppen) area, Southwest Greenland.

Specimen examined: Kangerdluarssuk, Qivâqe, 65°29′N, 52°31′W; 1977 Alstrup 771022b (C).

8. **Physcia aipolia** (Humb.) Fürnrohr

Fig. 9. Map 8.

Thallus orbicular, whitish to dark grey, to 5 cm diam., rarely broader, with flat to concave lobes. Upper side distinctly maculate (×10 lens), rarely white-pruinose. Underside whitish to dark grey with white to black rhi-

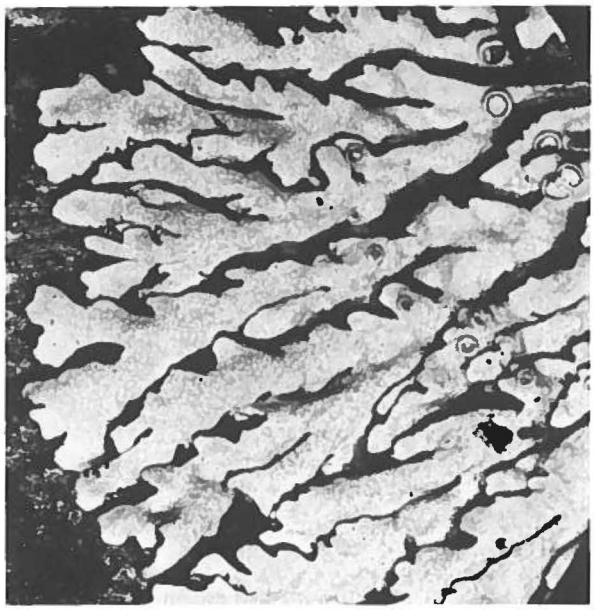

Fig. 9. Physcia aipolia. × 7.

zinae. Apothecia usually present. Cortex and medulla K+ yellow; atranorin and zeorin.

For synonymy, detailed description and distribution in Fennoscandia see Moberg (1977: 60). Widely distributed in Europe and North America. Known also from cool-temperate parts of the Southern Hemisphere.

P. aipolia is separated from the closely related *P. phaea* by the broader, flat to concave lobes and by the corticolous or lignicolous habit. It is distinguished from other *Physcia* species in Greenland by the absence of soralia, and the K+ yellow medulla. The small and untypical collection from Greenland is not suitable for a discussion of the taxonomy of this species. It was collected from trunks of Fagus (imported timber) at Qôrnoq, Godthåbsfjord, in Southwest Greenland (Alstrup 1977).

Specimen examined: Qôrnoq, 64°32'N, 51°06'W; 1976 Alstrup (C).

9. **Physcia caesia** (Hoffm.) Fürnrohr

Fig. 10. Map 9.

Thallus irregular to orbicular, grey to dark grey, very variable in size. Lobes narrow to broad, to 2 mm wide, usually convex. Soralia laminal or apical, often capitate, sometimes eroded and ± crateriform. Upper side usually maculate (×10 lens), rarely pruinose, underside whitish to dark grey or sometimes brownish, rhizinae white to black. Apothecia sometimes present. Cortex and medulla K+ yellow; atranorin and zeorin.

For synonymy, detailed description and distribution in Fennoscandia see Moberg (1977: 64). Widely distributed in Europe and North America. Known also from cool-temperate parts of the Southern Hemisphere.

This is a common and rather variable species in Greenland occupying a considerable range of habitats. In general, *P. caesia* is orbicular with a greyish colour and the lobes are 1 to 2 mm broad with laminal, capitate soralia. The occurrence of maculae should be used with caution as some specimens of other taxa also have this character.

Modifications of *P. caesia* may have narrow to broad lobes, dark to very dark grey colour and soralia that may be eroded, either marginal or laminal. As discussed and rejected by Moberg (1977) such habitat-induced modifications, were previously given separate taxonomic rank (for instance *P. wainioi* and *P. ventosa*, see Moberg 1977).

In testing the medullary reaction it is important to remove the whole algal layer. Misidentified *P. dubia* (K− medulla) is often annotated as K+ in the medulla because the algal layer and not the medulla was tested due to incomplete removal of the algal layer.

P. caesia grows on many types of substrate such as basaltic, siliceous or calcareous rocks, where it grows either directly on the rock or on mosses covering the rocks. Rarely it is found also on bones, old wood, soil, and bark of dwarf shrubs and trees. The species is particularly abundant on bird rocks, often growing together with *Umbilicaria arctica, Xanthoria candelaria, X. elegans, Physcia dubia* and *Rhizoplaca melanophthalma.* All types of rock faces, from horizontal to overhanging ones, seem to be suitable and it is found growing on dry rocks, as well as on those moistened with seepage water.

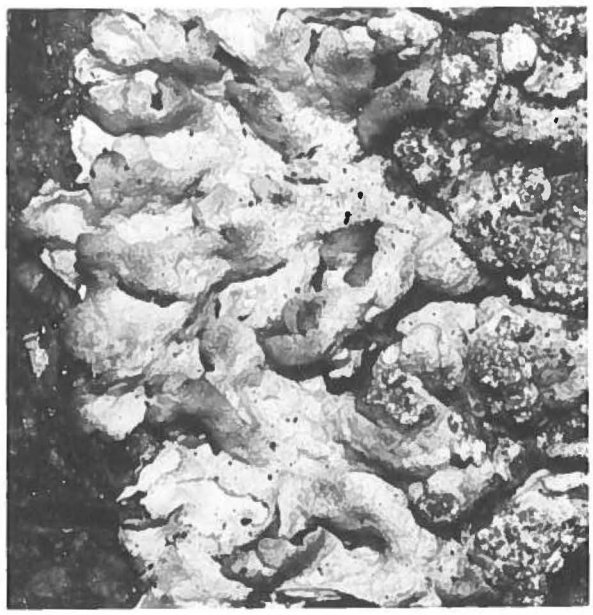

Fig. 10. Physcia caesia. × 7.

P. caesia is widely distributed in Greenland and one of the most common *Physcia*-species found there. It is common in Southwest and central West Greenland, but not in the northernmost parts. The area between Prøven (*c.* 72°N) and Dundas (*c.* 76°N) in the northwest, or the region north of Wollaston Forland are both poorly investigated. However, Eric Steen Hansen collected several specimens of *P. caesia* at Qaanaaq (Thule) in 1986. The species is sporadic on the east coast south of Clavering Ø (*c.* 74°N). In the large fjords in Southwest Greenland it is rather common but most frequent in inner parts of the large fjords in central East Greenland and at the head of Søndre Strømfjord, both areas characterized by a continental climate.

Selected specimens seen: Julianehåb, 60°43′N, 46°07′W; 1937 Dahl (UPS). – Tunugdliarfik, Sitdlisit, 61°04′N, 45°35′W; 1937 Dahl (UPS). – Arfersiorfik, Ordlerfik, 68°08′N, 50°55′W; 1951 Gelting no 16052 (UPS). – Godthåbsfjord, Sârdloq, 64°22′N, 51°39′W; 1976 Alstrup (Lich. Grønland. exs. 243) (C, UPS). – Iterdlak, 61°11′N, 45°27′W; 1969 Andersen & Steen Hansen 69340 (C). – Igdlúko, 68°49′N, 51°11′W; 1952 Gelting 19052 (C). – Skeldal, 72°15′N, 24°00′W; 1963 Spearing et al. (C). – Ymer Ø, Blomsterbugten, 73°20′N, 21°32′W; 1929 Lynge (UPS). – Myggbukta, 73°28′N, 21°30′W; 1930 Scholander (Hoels' East Greenl.-exp.) (UPS). – Centrumsø, 82°48′N, 47°00′W; 1917 Wulff (C).

10. **Physcia dubia** (Hoffm.) Lett.

Fig. 11. Map 10.

Thallus irregular, grey to very dark grey, to 5 cm diam., very variable in size. Lobes long and narrow, or short and broad, rarely exceeding 1 mm in width. Soralia apical, usually lip-shaped, occasionally marginal or laminal. Upper side usually emaculate, underside whitish to grey with white to black rhizinae. Apothecia rare. Cortex K+ yellow, medulla K−; atranorin.

For synonymy, detailed description and distribution in Fennoscandia, see Moberg (1977: 76). Widely distributed in Europe and North America. Known also from cool-temperate parts of the Southern Hemisphere.

The most distinctive features of *P. dubia* are the mainly apical, lip-shaped soralia, the emaculate upper surface, and the K− medulla. For correct test of medullary reaction, see *P. caesia*.

P. dubia, like *P. caesia,* is common in Greenland growing in various habitats and on different substrates. Variation is considerable in thallus size, lobe-width, lobe-length, and colour and is particularly noticeable on boulders manured by birds. Specimens influenced by the strongest nutrient enrichment have short, broad, often scale-like lobes, while less manured specimens develop longer and more narrow lobes (see also Hawksworth & Hill, 1984: 51). Such narrow-lobed modifications were erroneously recognized as *P. teretiuscula, P. intermedia* and *P. wahlenbergii* (Moberg 1977).

P. dubia grows on siliceous and basaltic rocks either directly on the rocks or on mosses on rocks. It is especially common on rocks manured by birds usually together with *Xanthoria candelaria.* Strongly sloping or overhanging rock walls may also be substrates for the species. More rarely it is found on the bark of dwarf shrubs, lignum (including stranded driftwood), old bones, dead plant fragments and soil. A specimen from Qaanaaq (Thule) was infested by *Buellia pulverulenta* (Anzi) Jatta (det. Roland Moberg) that is an addition to the known lichen flora of Greenland.

P. dubia is widely distributed in Greenland and it is similar to *P. caesia* in terms of frequency in most parts, but appears to be more common in the southeast. Although *P. dubia* occurs also far inland in both Southwest and central West Greenland it is more frequent in the outer coastal areas, presumably due to the occurrence of sea birds.

Selected specimens seen: Tunugdliarfik, Narssarssuaq, 69°44′N, 54°38′W; 1937 Dahl (UPS). – Tupilak, 68°42′N, 52°53′W; 1952 Gelting no 19325 (UPS). – 'Lichtenay fjeld', c. 3 km S of Sletten, 60°35′N, 45°22′W; 1937 Dahl (UPS). – Qagssimiut, 60°46′N, 47°08′W; 1937 Dahl (UPS). – Majût, 61°05′N, 45°31′W; 1969 Andersen & Steen Hansen 6939 (C). – Pingo, 65°36′N, 51°52′W; 1977 Alstrup (C). – Pautût, 70°16′N, 52°45′W; 1950 Gelting (C). – Ikáteq, 65°57′N, 36°40′W; 1971 Steen Hansen 71361 (C). – Eskimonæs, 74°06′N, 21°20′W; 1931 Gelting (C). – Falkefjeld, 82°16′N, 28°00′W; 1949 Holmen 5664 (C).

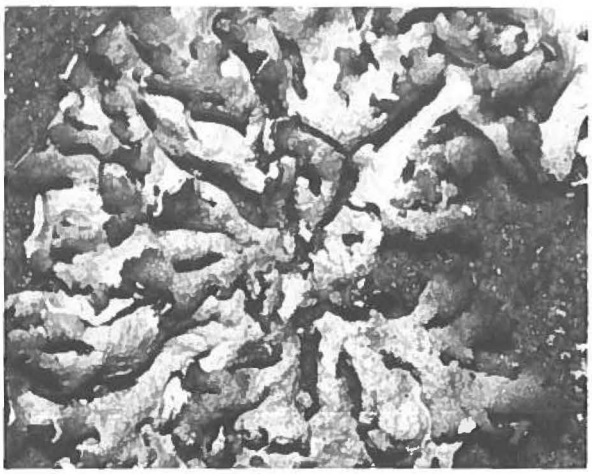

Fig. 11. Physcia dubia. × 7.

11. **Physcia magnussonii** Frey

Fig. 12. Map 11.

Thallus irregular and mostly confluent with other thalli, greyish with a yellowish tinge, mostly with a distinct pruina. Lobes usually short and broad, to 2 mm wide. Underside white to brownish with a pinkish tinge, rhizinae sparse, usually pale. Apothecia common, mostly abundant, to 3 mm diam., spores fusiform, distinctly ornamented. Cortex K+ yellow, medulla K−; atranorin. Several specimens were tested for variolaric

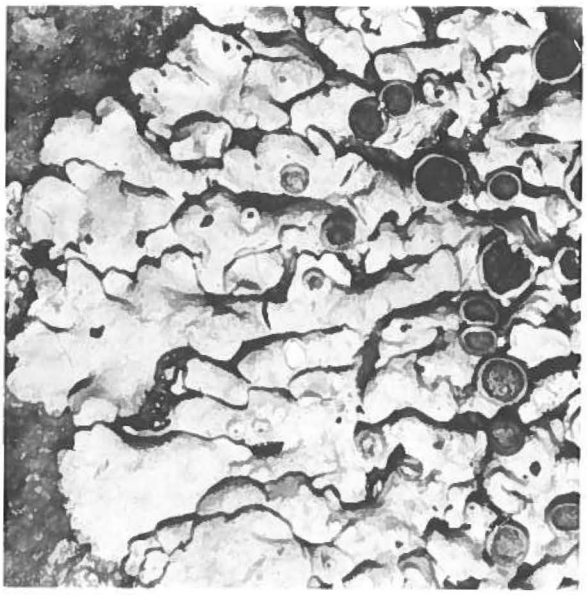

Fig. 12. Physcia magnussonii. × 7.

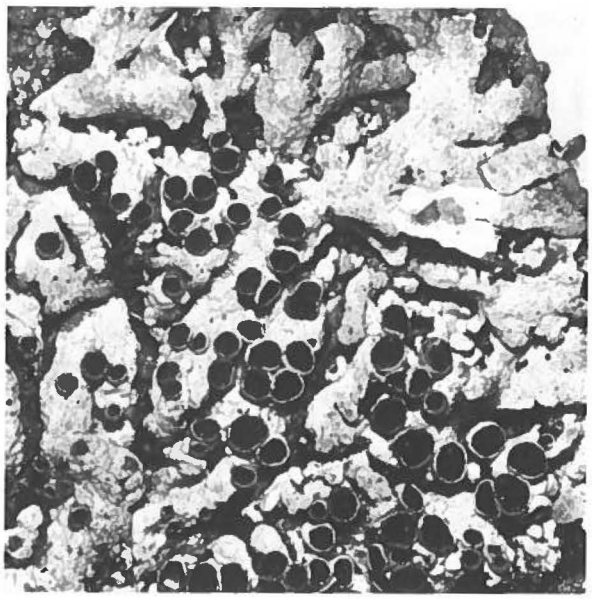

Fig. 13. Physcia phaea. × 7.

acid (see Tønsberg 1982), but this substance was not detected.

For synonymy, detailed description and distribution in Fennoscandia, see Moberg (1977: 68). Known also from central Europe.

P. magnussonii was earlier reported and discussed from Greenland by Sernander-Du Rietz (1969). It is easily separated from other species of *Physcia* in Greenland by its distinctly pruinose upper surface, the pinkish underside and the very typical spores.

P. magnussonii occurs on nutrient enriched basaltic or siliceous rocks together with *Xanthoria elegans, Physcia dubia, P. caesia* and others; also on mossy rocks and then often associated with *Physconia perisidiosa.* In Qeqertarsuaq (Godhavn), Disko, it grows on vertical to overhanging rocks.

The distribution of *P. magnussonii* is restricted to the southern half of West Greenland. It is rare in central western parts, and is present on Disko. In Southwest Greenland it is mainly an inland species but northwards it has a more coastal distribution.

Selected specimens seen: Qaqortoq kirkeruin, 60°48′N, 45°50′W; 1937 Dahl (C). – Kangerdluarssuk, Nunasarnaussaq, 60°52′N, 45°54′W; 1980 Alstrup 80928 (C). – Narssaq fjeld, 60°55′, 46°02′W; 1937 Dahl (C). – Narssarssuaq, 61°09′N, 45°25′W; 1969 Andersen & Steen Hansen 691021 (C). – Kangigdleq, 64°23′N, 51°38′W; 1976 Alstrup 769316 (C). – Godthåbsfjord, Ivnajaugtoq, 64°44′N, 50°40′W; 1976 Alstrup 76532 (C). – Kangerdluarssuk, 65°25′N, 52°30′W; 1977 Alstrup 771471 (C). – Kronprinsen Ejland, Imerigsoq, 69°01′N, 53°19′W; 1952 Gelting 19428 (C). – Godhavn 69°15′N, 53°32′W; 1953 Gelting no 19634 (C, UPS). – Fortunebay, 69°16′N, 53°44′W; 1949 Gelting (C).

12. **Physcia phaea** (Tuck.) Thomson

Fig. 13. Map 12.

Thallus orbicular, rarely exceeding 5 cm diam., grey to dark grey usually epruinose. Lobes radiating, mostly convex and less than 1 mm broad. Underside whitish to dark grey or brownish, with pale to black rhizinae. Apothecia common, usually small and crowded, margins crenulate. Cortex and medulla K+ yellow; atranorin and zeorin.

For synonymy, detailed description and distribution in Fennoscandia, see Moberg (1977: 66). Known also from central Europe and North America.

P. phaea is distinguished from the closely related *P. caesia* by the absence of soralia, the presence of small (usually less than 1 mm), abundant apothecia, and the narrow, convex lobes (less than 1 mm broad).

It occurs on more or less nutrient enriched, basaltic or gneissic rocks, and in Eqalungmiut it grows on mosses on rocks.

P. phaea is distributed mainly in the southernmost, subarctic part of Greenland and is known from as far north as 67°N. In East Greenland it is known only from one locality, Eqalungmiut (Dronning Marie Dal), situated at the head of a relatively large fjord in the Skjoldungen area (*c.* 63°N). The few records indicate a preference for inland habitats.

Selected specimens seen: Ûnartoq fjord, 60°37′N, 45°15′W; 1962 K. Hansen 1636 (C). – Narssaq Fjeld, 60°55′N, 46°02′W; 1937 Dahl (C). – Nunasarnaq, 60°58′N, 45°48′W; 1980 Alstrup 80229 (C). – Borgs Havn, 60°58′N, 48°16′W; 1937 Dahl (C). – Qagssiarssuk, 61°09′N, 45°33′W; 1937 Dahl (C). – Isarumiut, 61°10′N, 45°42′W; 1937 Dahl (C). – Kiagtût, 61°11′N,

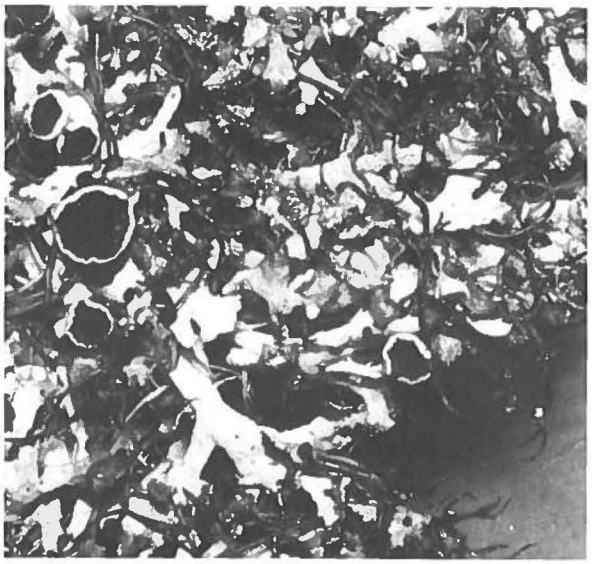

Fig. 14. Physcia tenella. × 7.

45°27′W; 1937 Dahl (C). – Kangerdluarssuk, Qivâge, 65°29′N, 52°31′W; 1977 Alstrup 771728 (C). – Angujârtorfiup nunâ, Arnangarngup kûa, 66°30′N, 51°15′W; 1979 Alstrup 79423 (C).

13. **Physcia tenella** (Scopoli) DC.

Fig. 14. Map 13.

Thallus orbicular to irregular, grey to very dark grey, very variable in size, rarely exceeding 2 cm diam., usually confluent with other thalli. Lobes narrow, to 0.5 mm broad, rarely broader, with marginal cilia. Soralia apical, lip-shaped. Upper side usually emaculate, epruinose, underside white to dark grey with white to black rhizinae. Apothecia rare. Cortex K+ yellow, medulla K−; atranorin.

For synonymy, detailed description and distribution in Fennoscandia, see Moberg (1977: 53). Widely distributed in Europe and North America.

P. tenella is one of the two species in Greenland having ciliate lobe-margins. In Fennoscandia two varieties are recognized but such a distinction cannot be maintained for material from Greenland. A re-interpretation of criteria used in segregating the two taxa is therefore necessary, and we conclude that the rank of subspecies (Hawksworth 1980: 219) cannot be maintained. The variation showed may be a matter of environmental modification. Some other species in *Physcia* and related genera change their morphology on different substrates and in different habitats. *P. adscendens,* for example, sometimes grows on seashore rocks and there becomes darker with almost black cilia, just like *P. tenella.* However, *P. tenella* var. *marina* (E. Nyl.) Lynge is very distinct in Fennoscandia and its treatment there, as a variety, is still justifiable.

P. tenella grows on both basaltic and siliceous marine, nutrient-enriched rocks together with *Xanthoria elegans, X. candelaria, P. dubia* and others. It is also known from *Alnus crispa, Salix glauca* and *Betula nana* in West Greenland (Ilulialik and Sarfartôq) but these specimens were not studied by us.

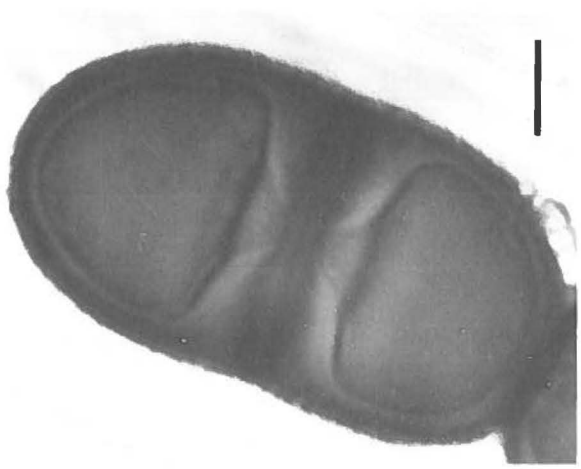

Fig. 15. One-septate spores of Physconia. Scale 5 µm.

P. tenella is mainly restricted to southern and central parts of the west coast of Greenland with only one record from the east coast. It is common in the south, but gradually decreases in abundance northwards. Like *P. magnussonii,* it is found only in the southwestern part of Disko, and it was previously not reported from the great fjord systems between Qasigiannguit (Christianshåb) (*c.* 69°N) and Sisimiut (Holsteinsborg) (*c.* 67°N). These new records may indicate that the species probably has a continuous distribution on the west coast up to Disko. In Southwest Greenland it reaches heads of large fjords contrary to the marked coastal distribution on Disko and Nûgssuaq peninsula. In the summer of 1985 *P. tenella* was found for the first time on the east coast (Ammassalik) by Eric Steen Hansen.

Selected specimens seen: Karrarmiut, 60°43′N, 45°56′W; 1980 Alstrup 80604 (C). – Mâjût, 61°04′N, 45°35′W; 1962 K. Hansen 1642 (C). – Kûngnât, 61°14′N, 48°28′W; 1937 Dahl (C). – Kangigdleq, 64°23′N, 51°38′W; 1976 Alstrup (C). – Godthåbsfjord, Ivnajaugtoq, 64°44′N, 50°40′W; 1976 Alstrup 76531 (C). – Ivnarssuaq, 65°26′N, 52°11′W; 1977 Alstrup 771362 (C). – Søndre Laksebugt, 69°19′N, 53°54′W; 1949 Gelting (C). – Blåfjeld, Nûk kitleq, 69°22′N, 54°15′W; 1951 Gelting 14388c (C). – Atanikerdluk, 70°04′N, 52°23′W; 1949 Gelting (C). – Angmagssalik, 65°36′N, 37°38′W; 1985 Steen Hansen (C).

Physconia Poelt

Physconia is recognized in Greenland as follows: thallus foliose, grey-brown to dark brown, secondarily appearing greyish because of a whitish pruina covering much of the thallus. Underside dark brown to black at least in inner parts, rhizinae squarrose, black. Apothecia when

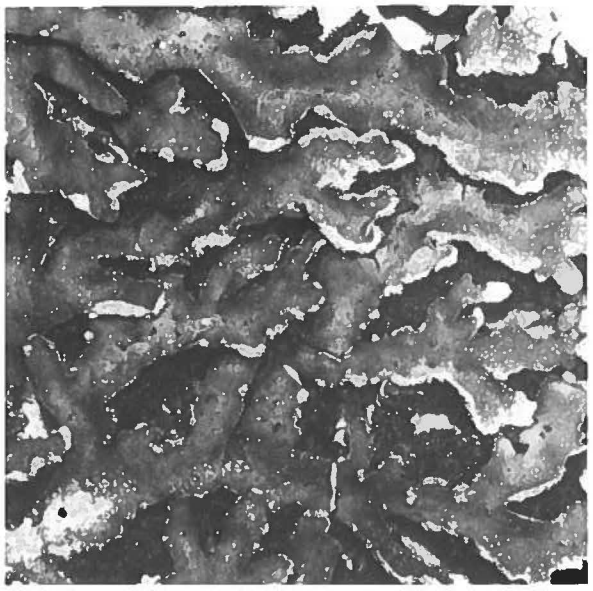

Fig. 16. Physconia detersa. × 7.

present often with lobulate margins, spores 1-septate, without thickening of the wall at the apices (Fig. 15), usually more than 27 µm long. Pycnoconidia subcylindrical, 4–6 µm long. Atranorin absent.

14. **Physconia detersa** (Nyl.) Poelt

Fig. 16. Map 14.

Thallus irregular, to 5 cm diam., dark brown and shining, sometimes white-pruinose. Lobes radiating, ± adnate, to 3 mm broad. Soralia marginal, distinct, white, often with a bluish tinge. Underside black, brown at the very tips, densely rhizinate. Medulla white. Apothecia rare.

For synonymy, detailed description and distribution in Fennoscandia see Moberg (1977: 81). Known also from central Europe and North America. Probably circumboreal.

P. detersa differs from *P. enteroxantha* in the white (K−) medulla, and the thicker, harder upper cortex (see Moberg 1977: 82). It differs from *P. perisidiosa* in the broader lobes, the marginal soralia and the brown lower cortex of the lobe-tips.

P. detersa usually grows on, or among, mosses on siliceous and basaltic rocks more or less influenced by guano, together with for instance *Physconia muscigena, P. perisidiosa, Physcia caesia, Parmelia sulcata* and *Xanthoria candelaria.* More rarely it grows on humus. It is found on all types of rock faces, from horizontal to overhanging.

The species is more or less common in Southwest and central West Greenland and reaches Nûgssuaq peninsula to the north. It is mainly an inland species in South Greenland, but seems to prefer more coastal sites in the Disko–Nûgssuaq area.

Selected specimens seen: Narssaq Fjeld, 60°57′N, 46°05′W; 1978 Alstrup 243927h (C). – Qagssiarssuk, 61°09′N, 45°33′W; 1937 Dahl (C). – Narssarssuaq, 61°10′N, 45°24′W; 1969 Andersen & Steen Hansen (C). – Sermiligârssuk, 61°32′N, 48°35′W; 1965 K. Hansen 1628 (C). – Christianshåb, Igdluko, 68°49′N, 51°11′W; 1952 Gelting 1911b (C). – Godhavn, Rødeelv, 69°15′N, 53°31′W; 1950 Gelting (C). – Taserârsuk, 69°21′N, 52°59′W; 1950 Gelting (C). – Kigdlûssat, 69°23′N, 52°45′W; 1950 Gelting (C). – Qutdligssat, 70°06′N, 53°02′W; 1950 Gelting (C). – Tupaussat, 70°18′N, 53°01′W; 1950 Gelting (C).

15. **Physconia enteroxantha** (Nyl.) Poelt

Fig. 17. Map 15.

First and only record for Greenland.

Thallus irregular to orbicular, to 3 cm diam., brown to dark brown, sometimes white-pruinose. Lobes ± adnate, to 2 mm wide. Soralia marginal, sometimes with granulated soredia, yellowish because of the exposed yellowish medulla. Underside black, brown at the very tips, usually densely rhizinate. Apothecia rare. Medulla K+ yellow (sometimes weakly), containing an unidentified substance.

For synonymy, detailed description and distribution in Fennoscandia, see Moberg (1977: 85). Widely distributed in Europe. Known also from North America.

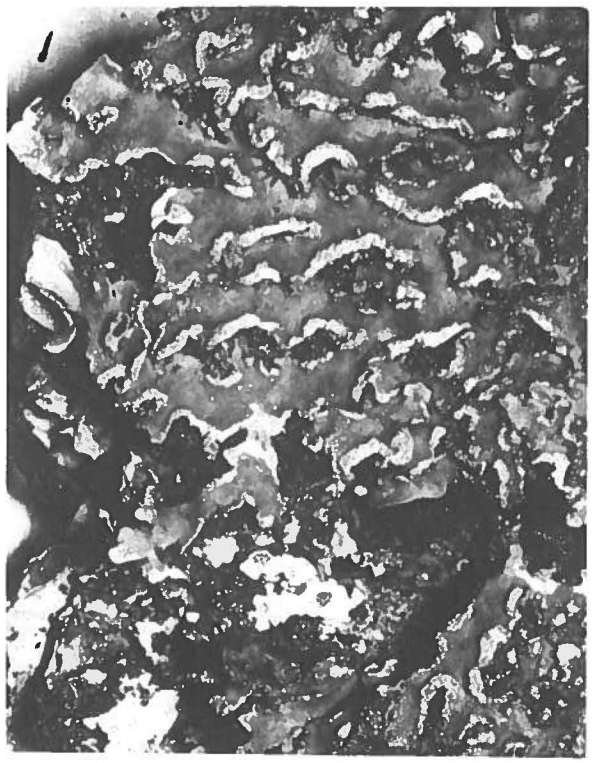

Fig. 17. Physconia enteroxantha. × 7.

Fig. 18. Physconia muscigena. × 7.

P. enteroxantha is distinguished from other sorediate species of the genus in Greenland by its yellowish medulla and the thinner, less hard upper cortex composed of ± isodiametric cells (see Moberg 1977: 82).

P. enteroxantha was collected at Ameralik in Southwest Greenland. This single specimen was first identified as *"Physcia muscigena"* growing upon mosses. The label does not give any information as to collector and date, but the handwriting suggests that J. Vahl collected it around 1830.

Specimen examined: Ameralik, 1830 Vahl (C).

16. **Physconia muscigena** (Ach.) Poelt

Fig. 18. Map 16.

Thallus irregular, to 10 cm diam., brown to dark brown, often wholly or in part white-pruinose. Lobes loosely attached, very often ascending, variable in width, to 3 mm broad. Underside black except for the brownish tips, densely rhizinate. Medulla white. Apothecia ± abundant, margins usually lobulate.

For synonymy, detailed description and distribution in Fennoscandia see Moberg (1977: 88). Known also from central Europe and North America.

P. muscigena is very variable in size and in lobe-width. The ascending lobes and the presence of apothecia are the two major characters of this species. However, apothecia are often absent and if not separated in other ways from other species of *Physconia,* a microscopic section shows the isodiametric cells of the upper cortex.

The species is primarily terricolous, growing on and among mosses on a thin layer of soil covering various types of rocks. It occurs both in (summer-) dry communities, such as *Dryas* heaths and steppe-like slopes together with *Cladonia pocillum* and *Thamnolia vermicularis,* and (more rarely) in communities influenced by seepage water.

P. muscigena is widely distributed in Greenland and is the most common species of *Physconia* there. It is common in West Greenland northwards to Prøven (*c.* 72°N) but very rare in the northwest, being known only from the Thule area, where Eric Steen Hansen found it to be a common species. Probably it is more common along the north coast than the few records indicate. In northern parts of East Greenland it is very common but more or less occasional in southern parts. *P. muscigena* is recorded from both inland and coastal sites. Southwards it has been found in inner parts of the great fjords of central East Greenland.

Selected specimens seen: Qutdligssat, Kitdlerpât, 70°06′N, 53°02′W; 1950 Gelting no 13294a (C, UPS). – Neria, head of the fjord, 61°38′N, 48°34′W; 1965 Hansen no 1634 (UPS). – Pingo, 65°36′N, 51°52′W; 1977 Alstrup 77142 (C). – Kangersuneq, 68°50′N, 50°43′W; 1958 K. Hansen 1644 (C). – Skeldal, 72°15′N, 24°00′W; 1963 Spearing et al. (C). – Kap Franklin, 73°15′N, 22°10′W; 1929 Lynge (UPS). – Renbugten, 73°20′N, 26°30′W; 1929 Lynge (UPS). – Myggbukta, 73°29′N, 21°32′W; 1929 Lynge (UPS). – 'Hvalrosodden', 77°00′N, 20°22′W; 1939 Gelting (C). – Blomsterstranden, 82°07′N, 31°15′W; 1949 Holmen 5688 (C).

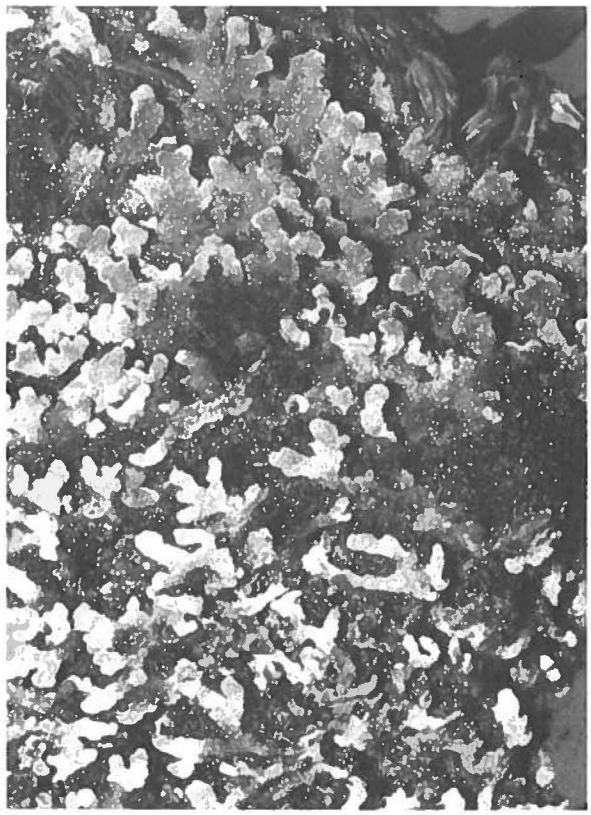

Fig. 19. Physconia perisidiosa. × 7.

17. **Physconia perisidiosa** (Erichs.) Moberg

Fig. 19. Map 17.

Thallus irregular, usually small, to 3 cm diam., dark brown and shining, often ± covered with a bluish white pruina. Lobes mostly radiating and narrow, to 1 mm wide, ± ascending. Soralia mainly apical and lip-shaped, rarely becoming marginal, white, usually with a bluish tinge. Underside black in inner parts and densely rhizinate, the lobe-tips white and lacking a lower cortex. Medulla white. Apothecia rare.

For synonymy, detailed discription and distribution in Fennoscandia, see Moberg (1977: 90). Widely distributed in Europe. Known also from North America.

Typically this species is relatively easy to identify. The short, narrow, often scale-like lobes with lip-shaped soralia, distinguishes it from other species of this genus in Greenland. Also, the pale, very tips of the underside of the lobes are typical for this species (cf. *P. detersa*). In some specimens with longer lobes, this may be difficult to see, but cross-sections of the thallus show the lack of a lower cortex. The upper cortex agrees with that of *P. detersa*.

P. perisidiosa grows on and among mosses on nutrient-enriched siliceous or basaltic rocks together with *P. muscigena, P. detersa* and *Phaeophyscia kairamoi*.

It is known from eight localities in Southwest and central West Greenland.

Specimens examined: S of Qagssiarssuk, 61°08′N, 45°32′W; 1980 Alstrup 801316 (C). – Narssaq Fjeld, 60°57′N, 46°05′W; 1980 Alstrup 80072 (C). – Godthåbsfjord, Ivnajaugtoq, 64°44′N, 50°40′W; 1976 Alstrup 76537 (C). – Ameralik, 1830 Vahl (C). – Kronprinsen Ejland, Imerigsoq, 69°01′N, 53°19′W; 1952 Gelting 19433 (C). – Godhavn, 69°15′N, 53°32′W; 1952 Gelting 17356a and 1953 Gelting 19695 (C). – 'Søndre Laksebugt', 69°19′N, 53°54′W; 1951 Gelting 17626 (C). – Qutdligssat, 70°06′N, 53°02′W; 1950 Gelting (C).

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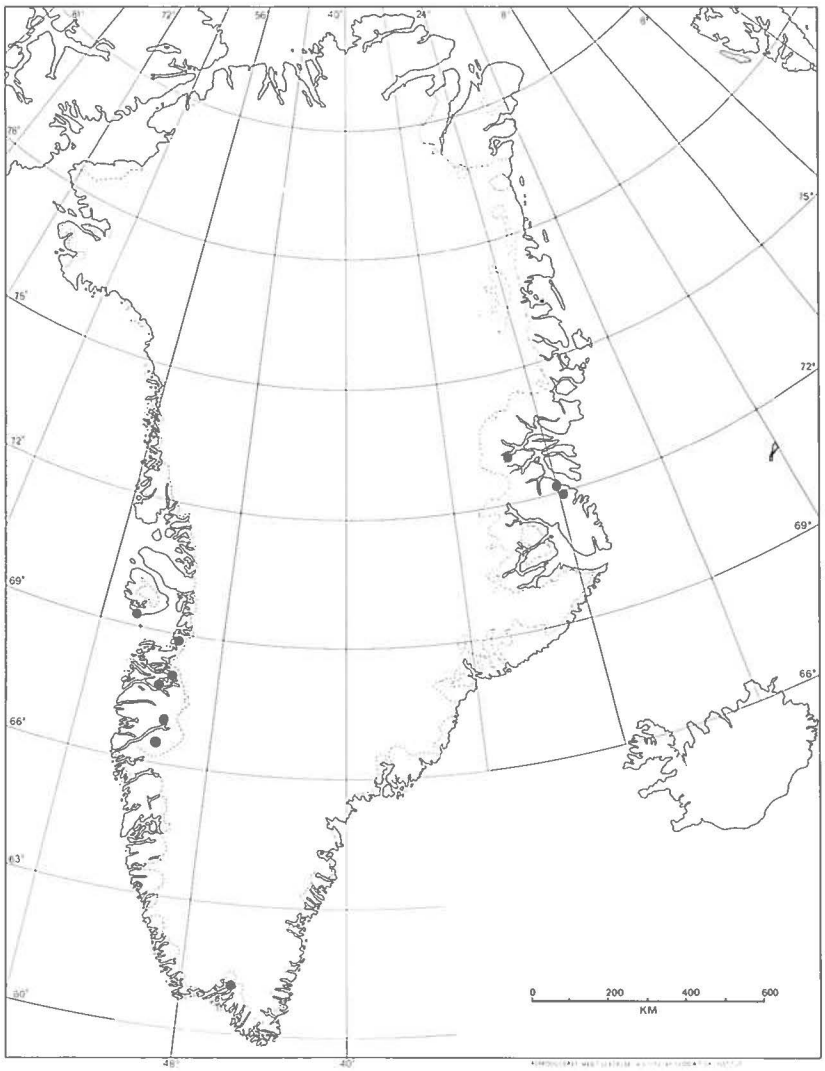
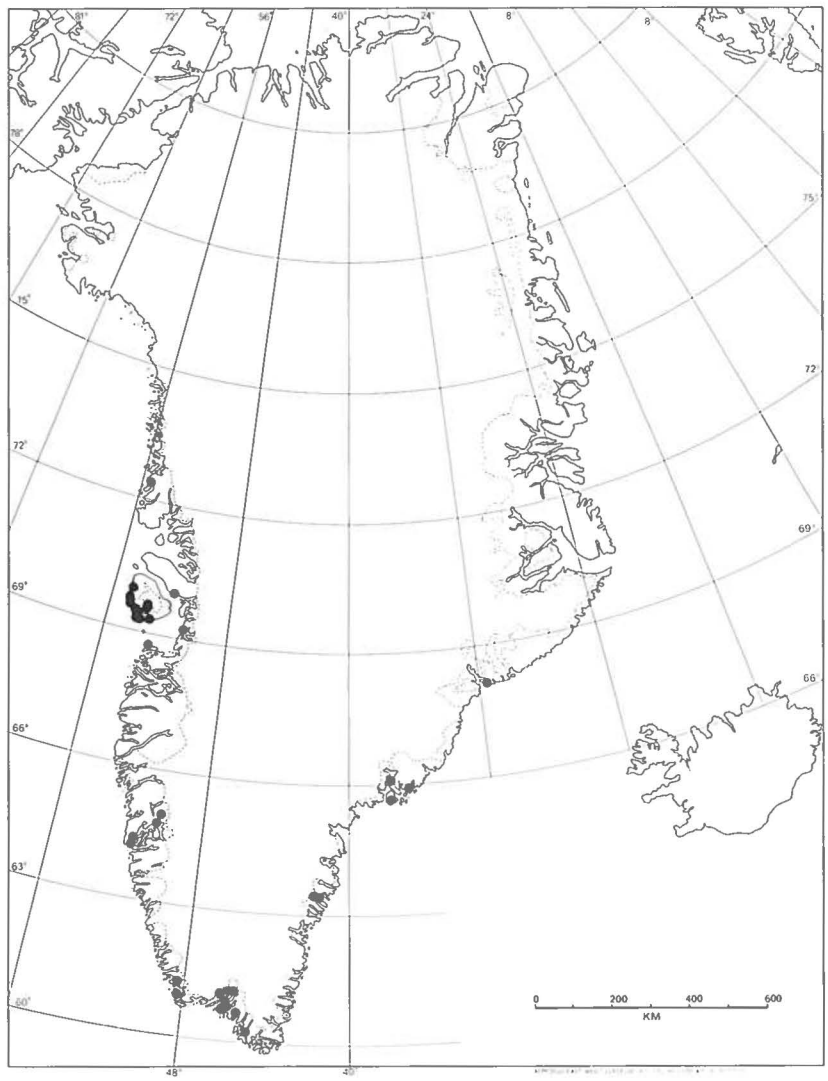
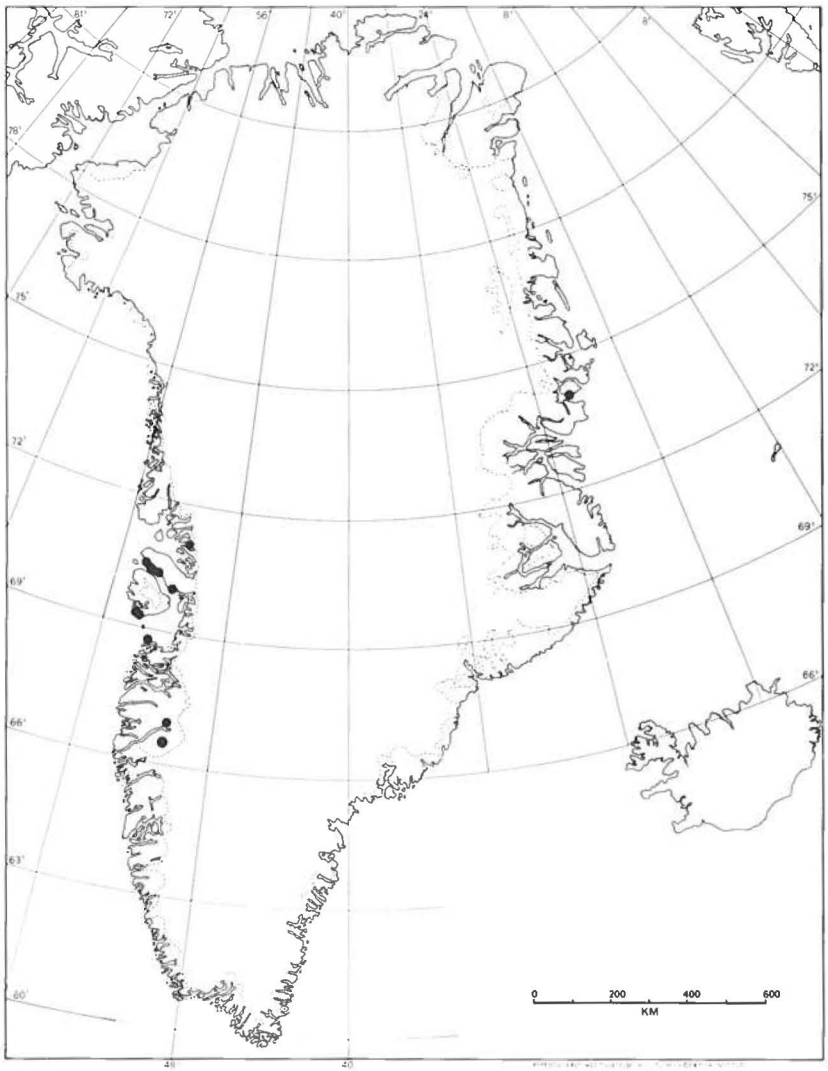


Map 1. Known distribution of *Phaeophyscia constipata* in Greenland.

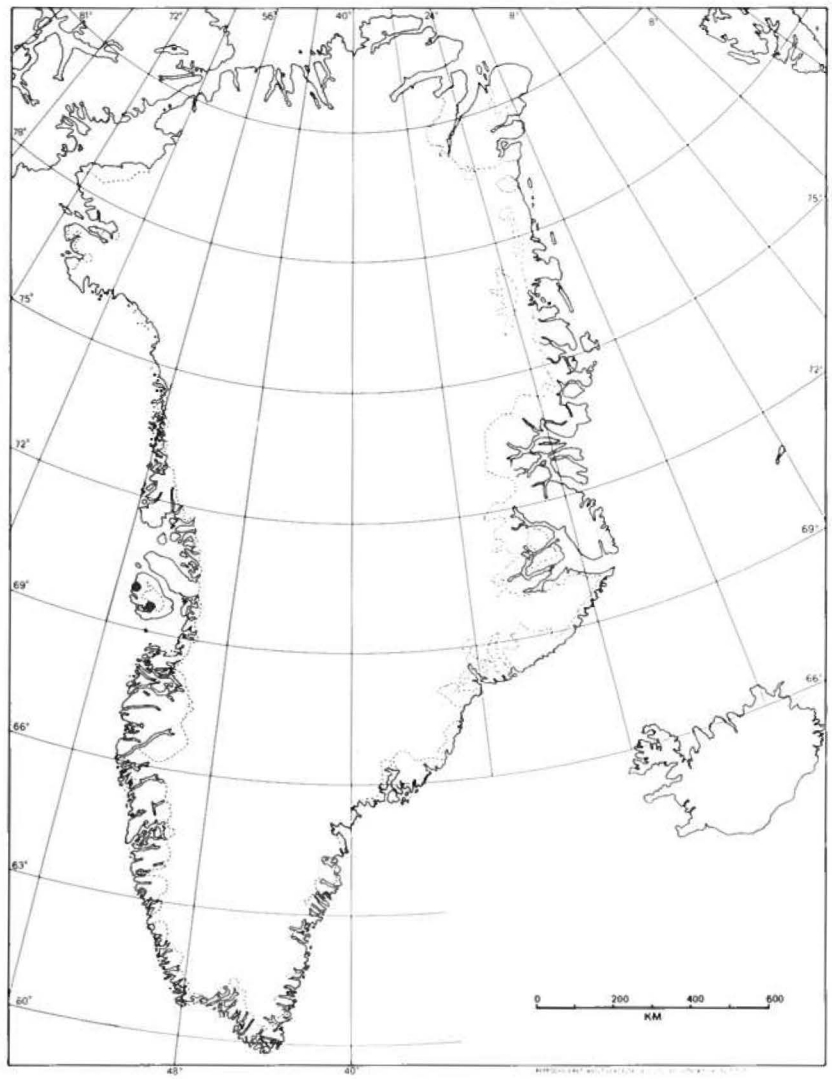
Map 2. Known distribution of *Phaeophyscia endococcina* in Greenland.



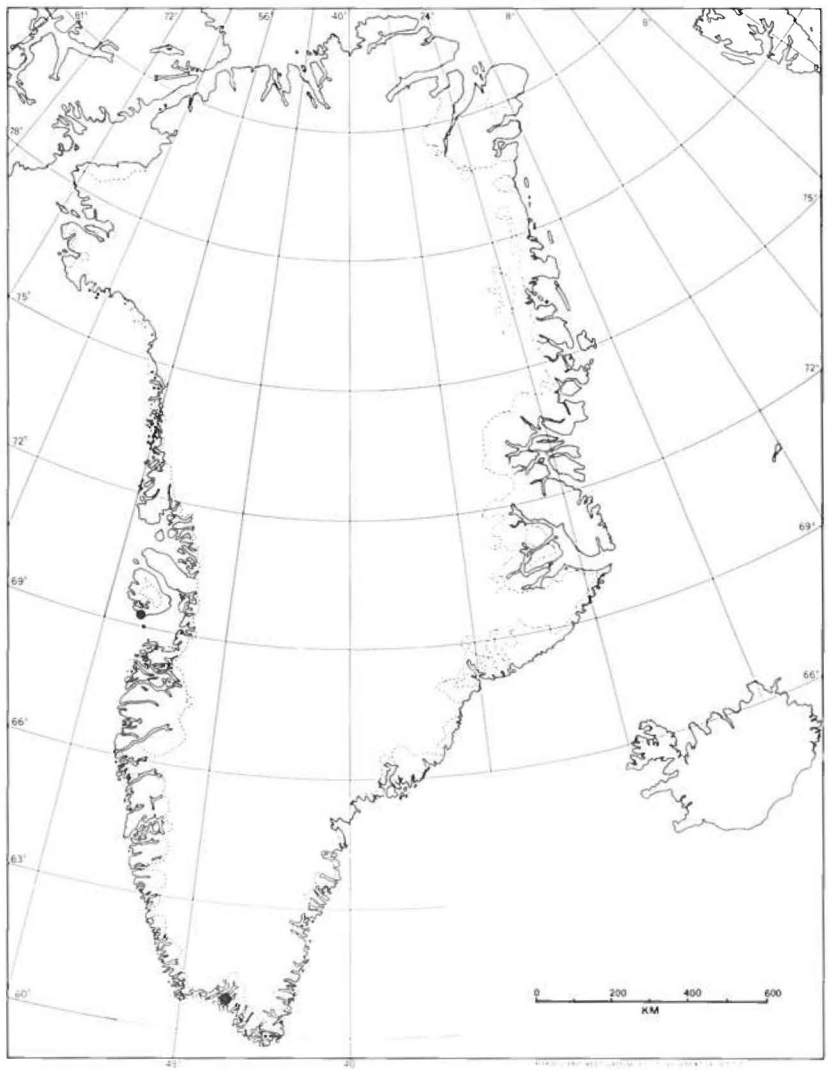


Map 3. Known distribution of *Phaeophyscia kairamoi* in Greenland.

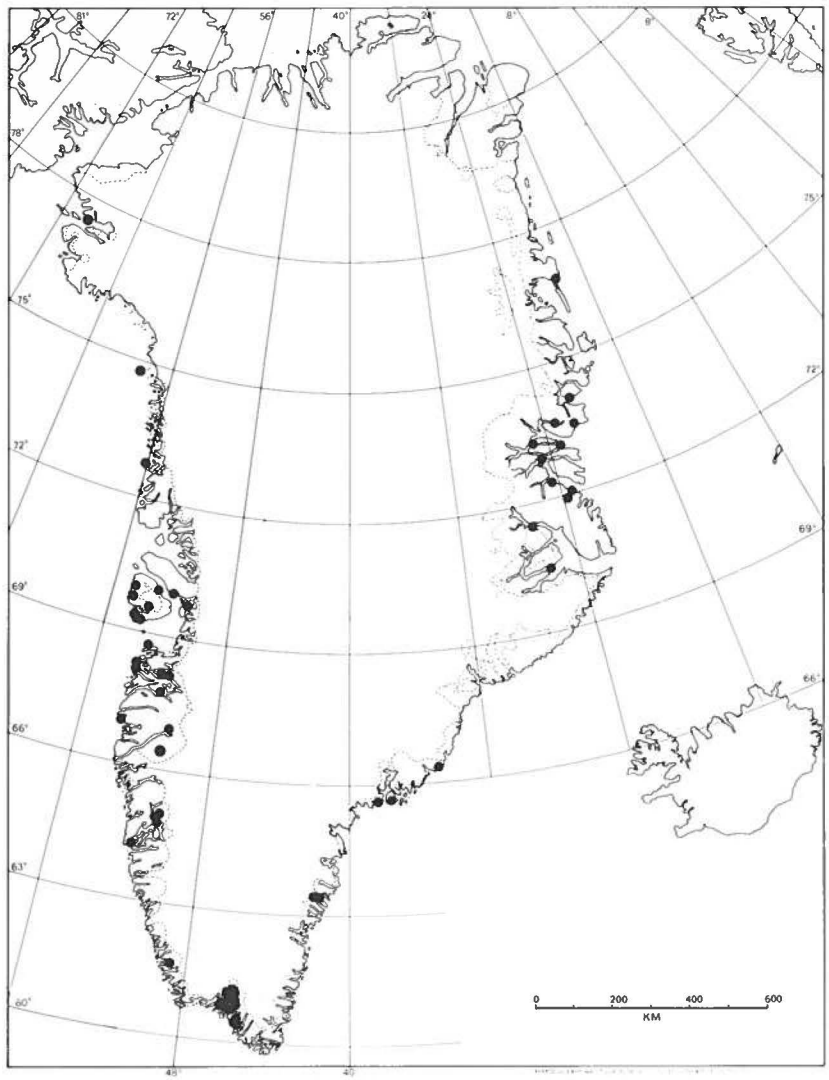
Map 4. Known distribution of *Phaeophyscia nigricans* in Greenland.

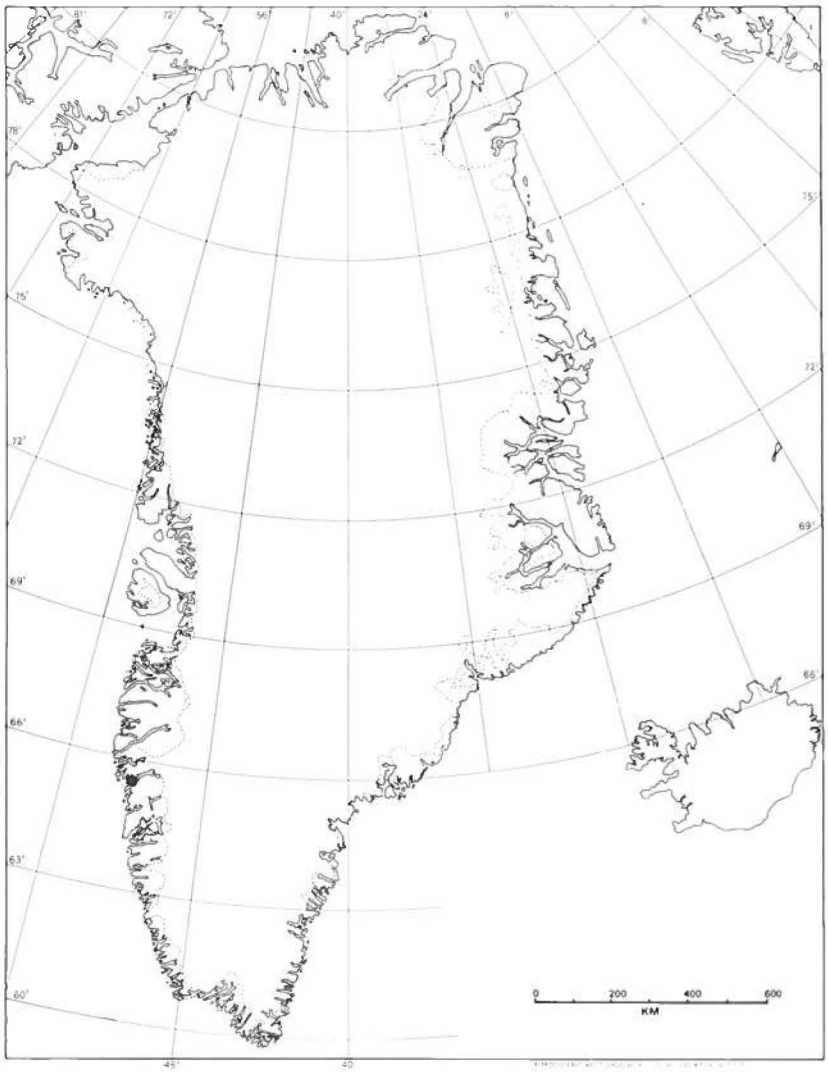


Map 5. Known distribution of *Phaeophyscia orbicularis* in Greenland.



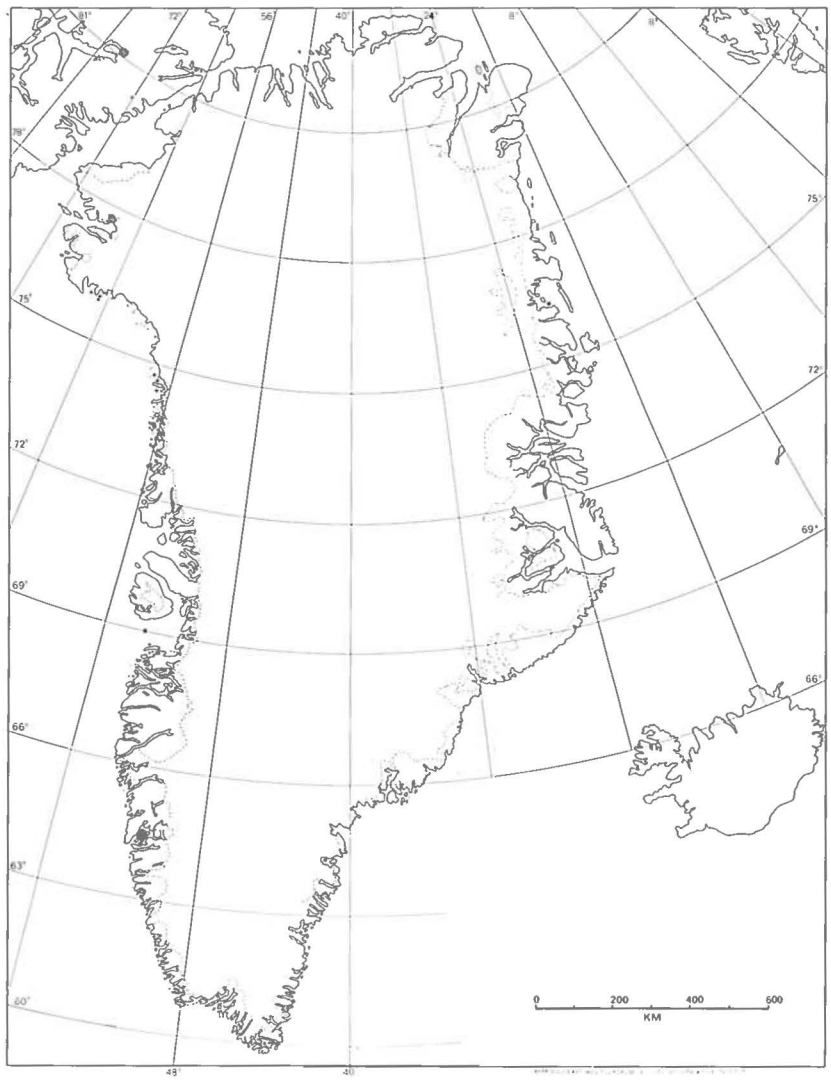
Map 6. Known distribution of *Phaeophyscia sciastra* in Greenland.

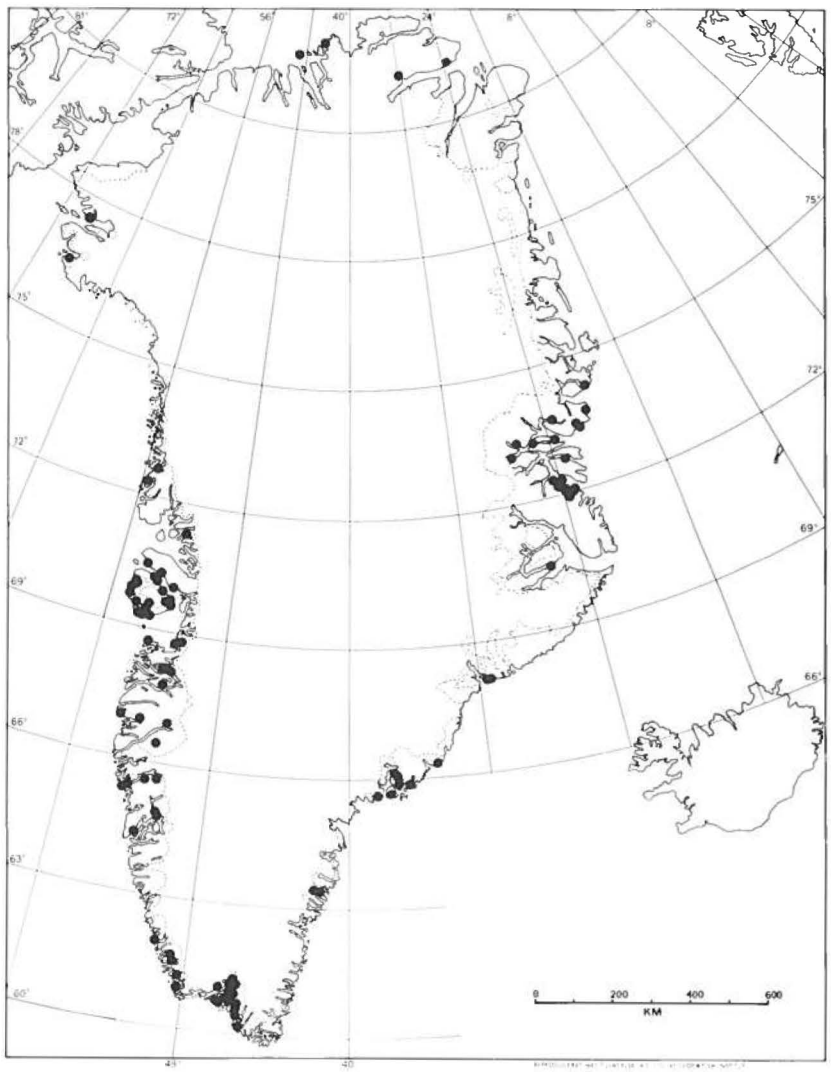




Map 7. Known distribution of *Physcia adscendens* in Greenland.

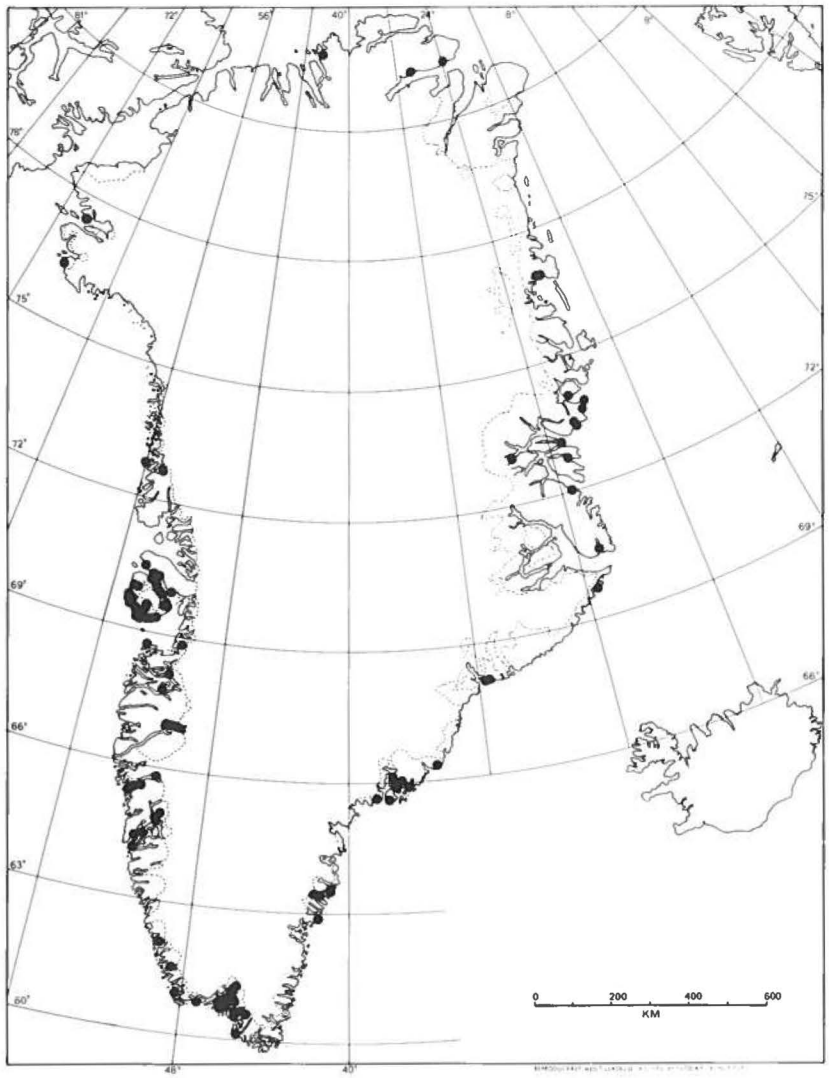
Map 8. Known distribution of *Physcia aipolia* in Greenland.

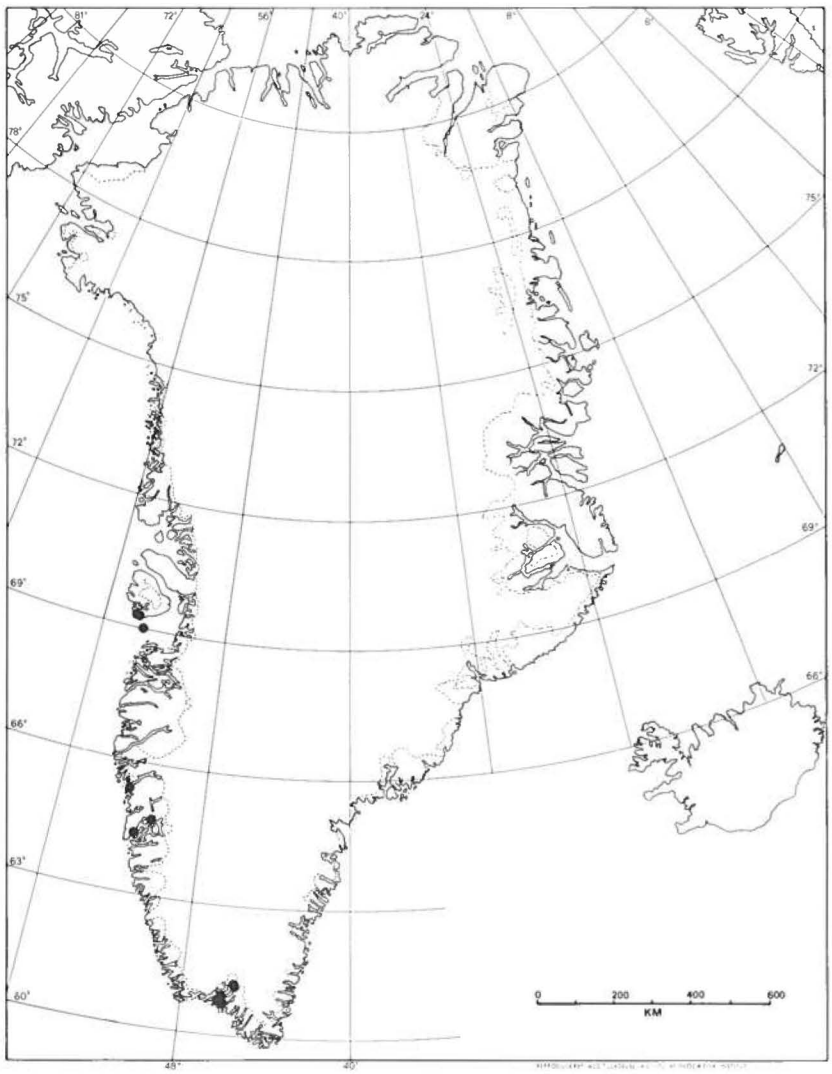




Map 9. Known distribution of *Physcia caesia* in Greenland.

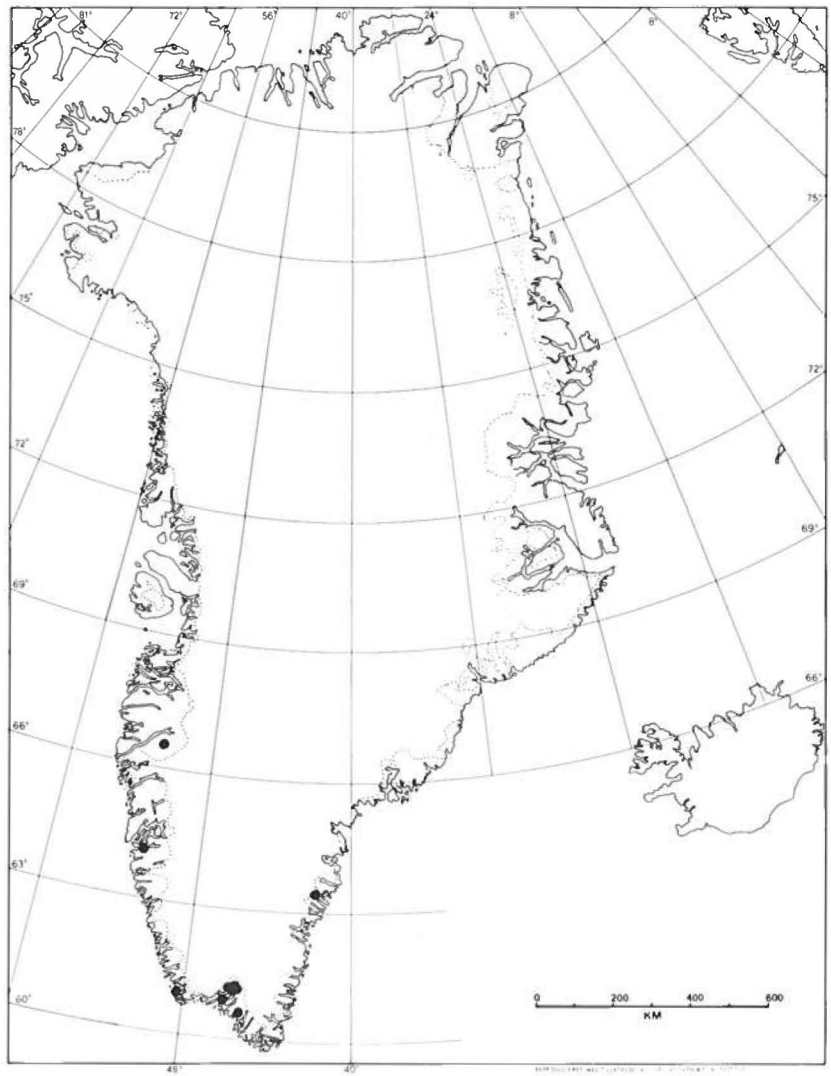
Map 10. Known distribution of *Physcia dubia* in Greenland.

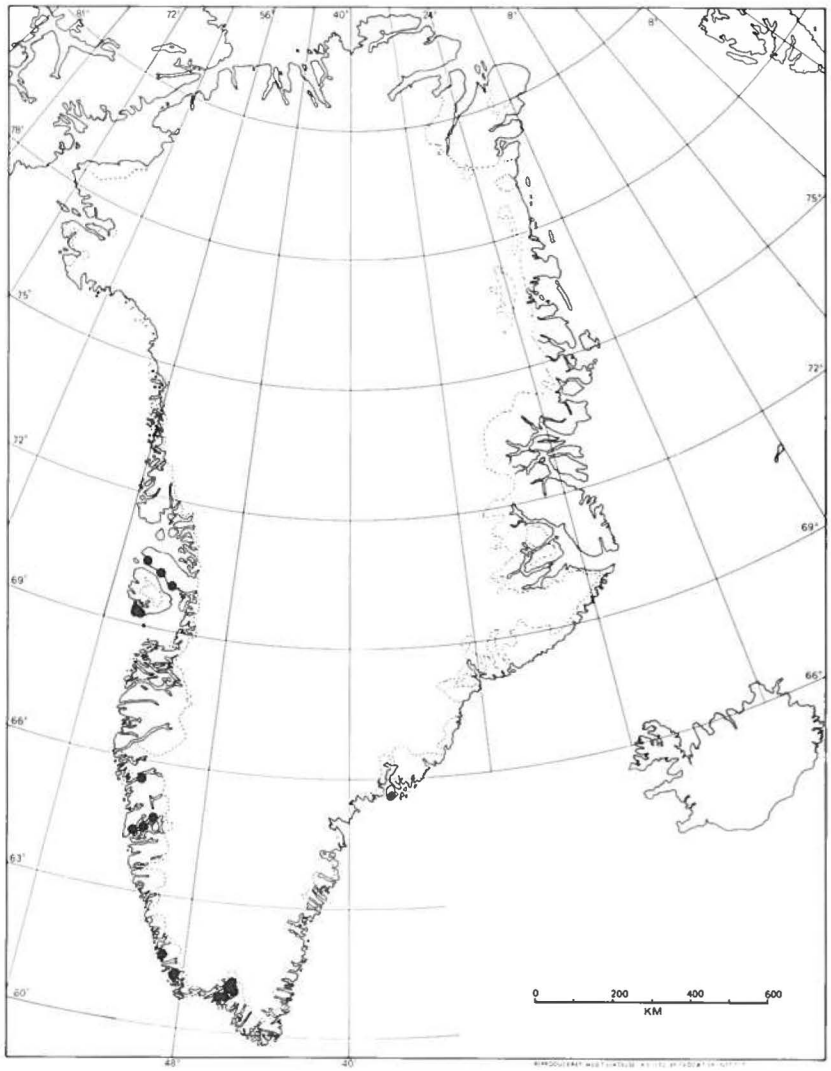




Map 11. Known distribution of *Physcia magnussonii* in Greenland.

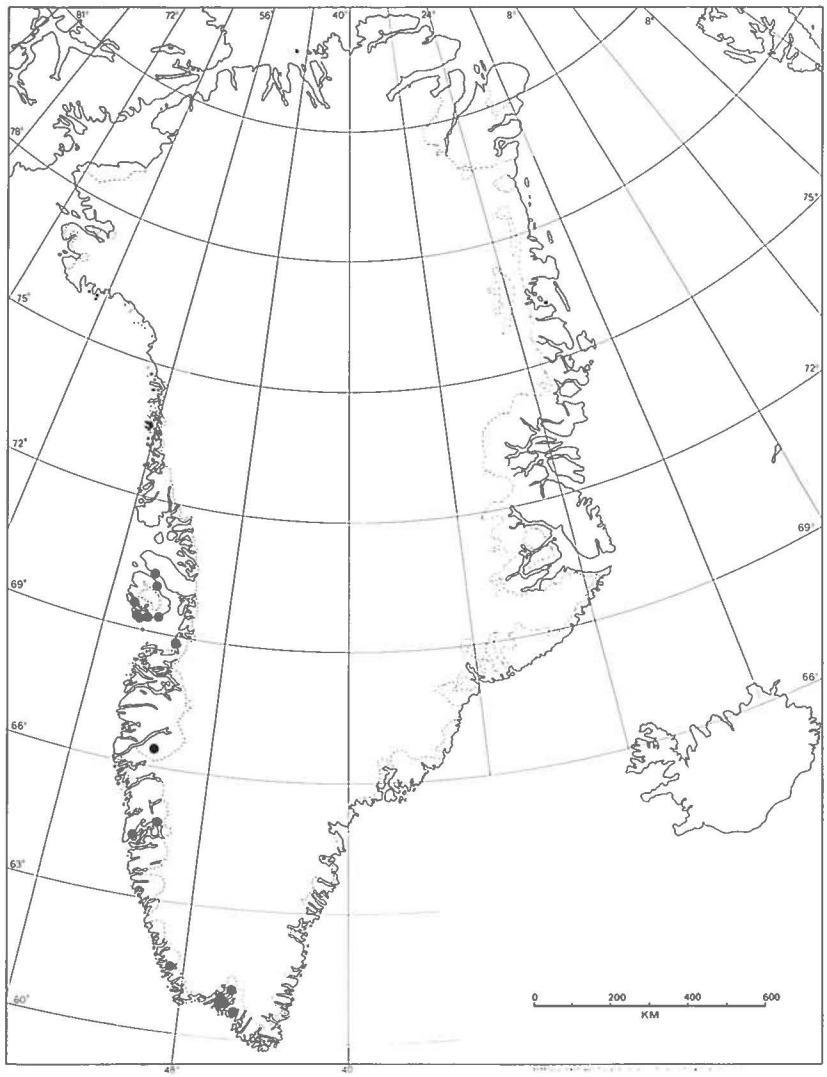
Map 12. Known distribution of *Physcia phaea* in Greenland.

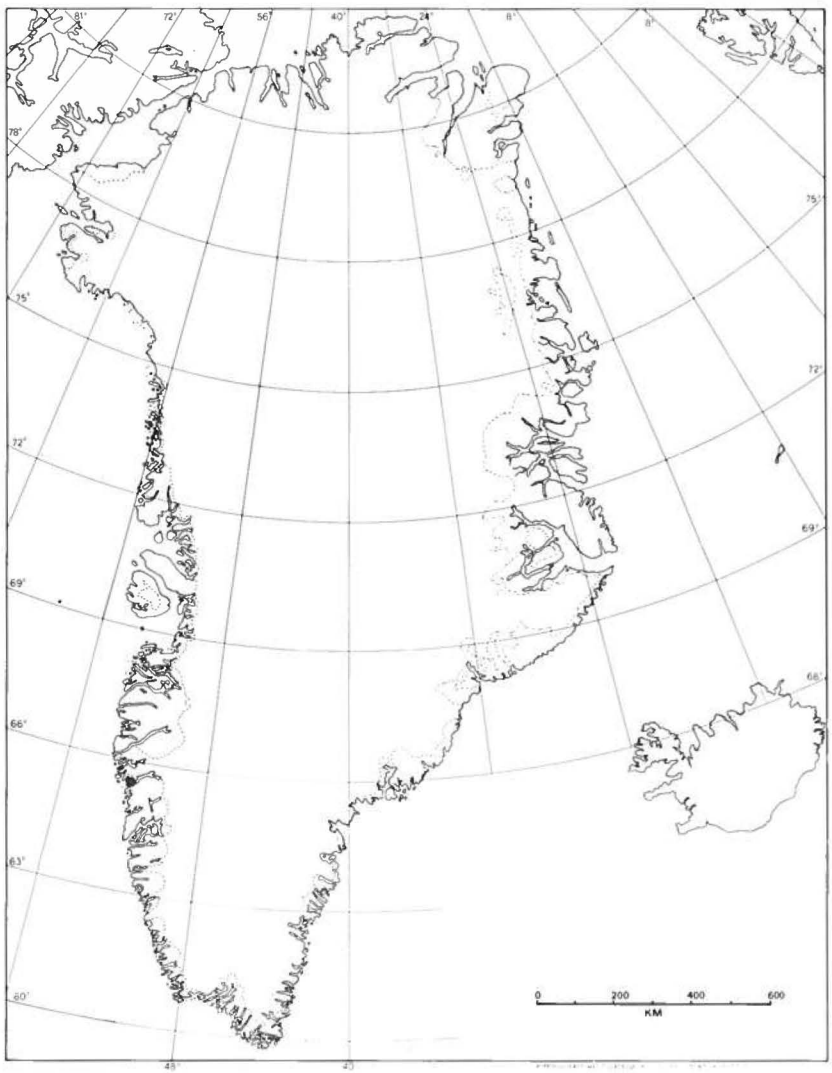




Map 13. Known distribution of *Physcia tenella* in Greenland.

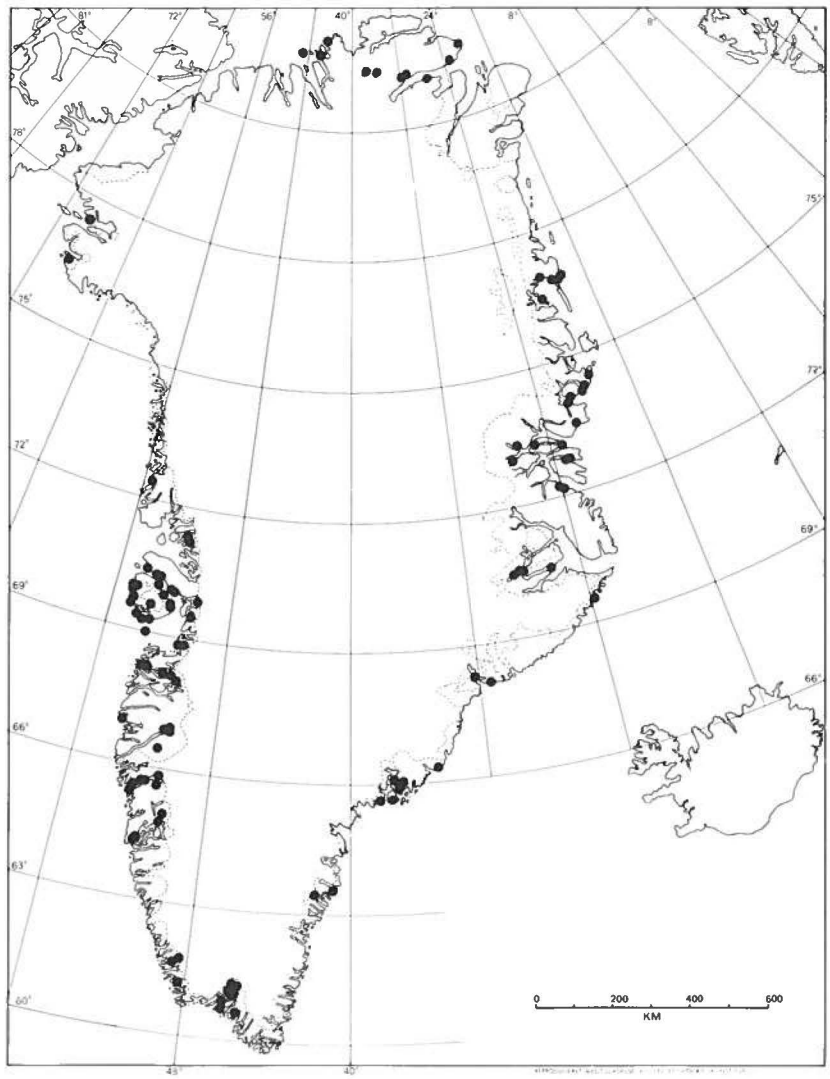
Map 14. Known distribution of *Physconia detersa* in Greenland.

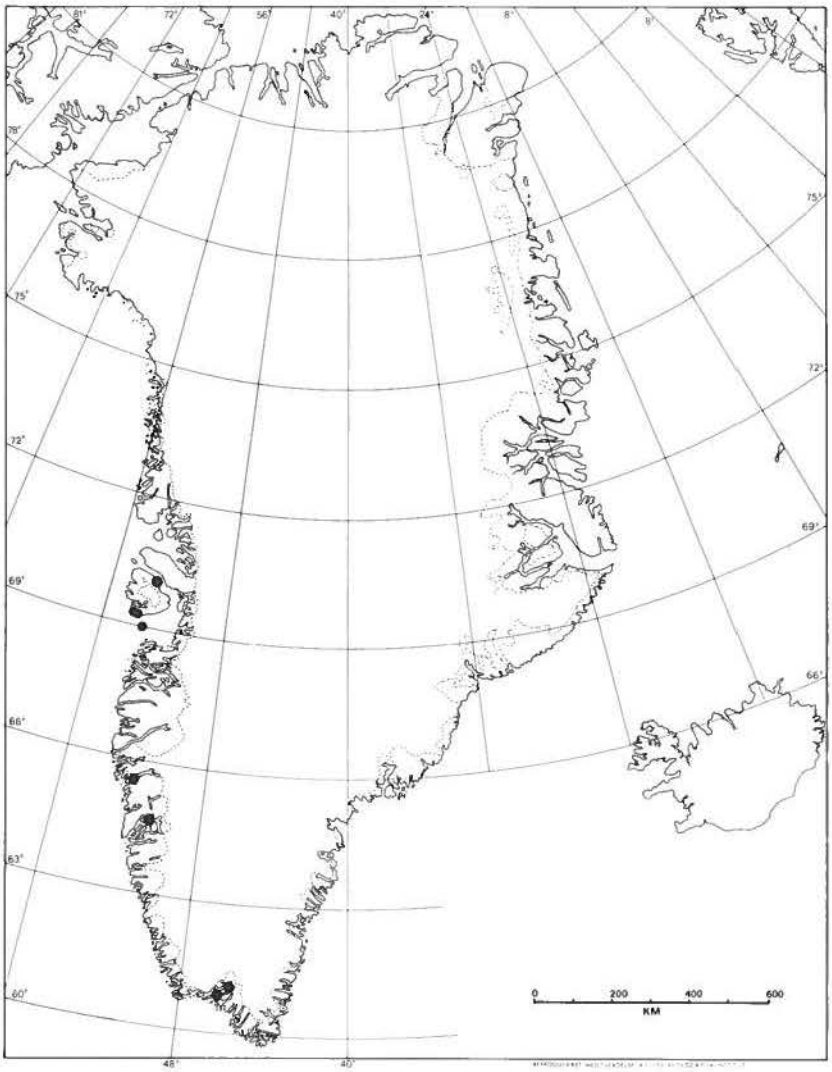




Map 15. Known distribution of *Physconia enteroxantha* in Greenland.

Map 16. Known distribution of *Physconia muscigena* in Greenland.





Map 17. Known distribution of *Physconia perisidiosa* in Greenland.

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