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MACROMYCETES

PART III

I. GREENLAND AGARICALES (PARS)
MACROMYCETES CAETERI

II. ECOLOGICAL AND PLANT GEOGRAPHICAL STUDIES

BY

MORTEN LANGE

WITH 32 FIGURES IN THE TEXT
AND 20 TABLES

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PREFACE

The present paper concludes the report on the Macromycetes of Greenland. A number of important contributions has been added to our knowledge of the arcto-alpine fungi since the two first publications (LANGE 1948, 1955) were written. SINGER (1954) has on the basis of a general survey of the literature been able to draw several conclusions, and papers by PILÁT & NANNFELDT (1955) and FAVRE (1955) have dealt with the flora of Lappland and the Alps respectively. Material has furthermore been brought home from Greenland by F. TERKELSEN, who himself has published an interesting new species of *Lactarius* (TERKELSEN 1956) and has very kindly placed all specimens belonging in groups treated in the present paper at my disposal. It is thus now possible to give a more comprehensive rapport, not only on the Greenland flora itself, but also on its relations to the flora of other arcto-alpine areas.

The present paper includes the latter half of the *Agaricales* and the "*Macromycetes caeteri*": *Aphyllophorales*, *Tremellales* and *Ascomycetes*. It also contains, as a summary of the whole series, a series of ecological observations and analyses, and some preliminary considerations on the geographical distributional types among fungi.

A list of the localities visited by me and of additional material included is given in the previous paper on the *Agaricales* (LANGE 1955). The localities visited are also shown on the maps Figs. 1, and 2 (LANGE l. c.). A detailed description is found in BÖCHER's account of the expedition (1949). The collections studied are listed for each species. Own collections marked ML followed by collection number; TERKELSEN's coll., similarily marked FT, are from the following localities: Godthåb, 64°12′, Sdr. Strömfjord, 67°, Holsteinsborg, 66°56′, Egedesminde, 68°42′, Christianshåb, 68°50′, and Godhavn, 69°14′, all on West Greenland.

On concluding the work I want to render my sincere thanks to my colleagues of the expedition, Dr. T. W. BÖCHER, Mr. M. SKYTTE CHRISTIANSEN and Mr. K. HOLMEN, who have rendered me valuable help in the preparation of the ecological section, to Miss LISE HANSEN, who has assisted me in the identification of the polyporaceous fungi, and to the Carlsberg Foundation and the Danish State Science Fund, for their economic support which made the expedition possible, and which later on gave me laboratory facilities and sufficient time to work up the material.

Strophariaceae

Pholiota (Fr.) Kummer

Pholiota groenlandica n. sp.

(Figs. 1—2)

ML 606, 607, 632, Ivigtut, 20.—25. Sept., in *Salix* copse.

Pileus 6—7 cm latus, subglobularis, deïnde subplanus vel leviter depressus, carnosus, primo albo-velatus, deïnde nudus, viscidus, argillaceus; cutis hyalina, margine velato-glutinosa, a carne facile separabilis; lamellae latae, pallidae; stipes 8 cm altus, 1.2—1.5 cm latus, cylindricus, junior viscosus, pallidus, in parte inferiore cinnamomeus, basi velutinus, carinatus; sapor nullus; sporae in cumulis argillaceae, magn. 5.3—6.7 × 3.2—4.0 μ; cheilocystidia 50—65 × 11—14 μ.

Typus die 25. Sept. in Salicto ad urbem Ivigtut Groenlandiae occidentalis sub numero ML 632 lectus, in Museo Botanico Hauniensi depositus.

Cap 6—7 cm broad, subglobose with strongly incurved margin, then convex and finally almost flat or even slightly depressed, at first covered by whitish coating, which soon disappears without breaking up in patches, leaving the cap naked, viscid-shining, pale Russet (h1)[1]; cuticle detachable, elastic, hyaline; flesh thick almost to the edge, firm, pallid watery brownish; cap margin with a dense, white, slimy veil; gills rather broad, narrow towards margin, moderately crowded, 40 L, many very short l, decurrent, pale yellowish brown (k4, Cream Buff), slightly darker and less bright when spores ripen, margin concolorous, entire; stipe 8 × 1.2—1.5 cm, cylindrical, slightly widened above, base thickned, pallid yellowish brown above, darker, Cinnamon Rufous (e4) in lower two thirds, especially where touched, hollow, flesh concolorous, base felty, apex finely white-pruinose, fibrillose downwards, somewhat slimy when young, especially above.

Smell and taste faible. Sporeprint Tawny-Olive Clay Color.

Cuticle a thick layer of strongly gelatinizing hyphae, often with banded structure; trama of loosely woven, subhyaline hyphae, in places thickned slightly and bright golden brown; gill trama similar, subregular, hyphae 6—8 μ broad, some yellowish lactifers seen; pleurocystidia

[1]) Colour names with capital letters after Ridgway (1912), code reference to J. E. Lange (1926).

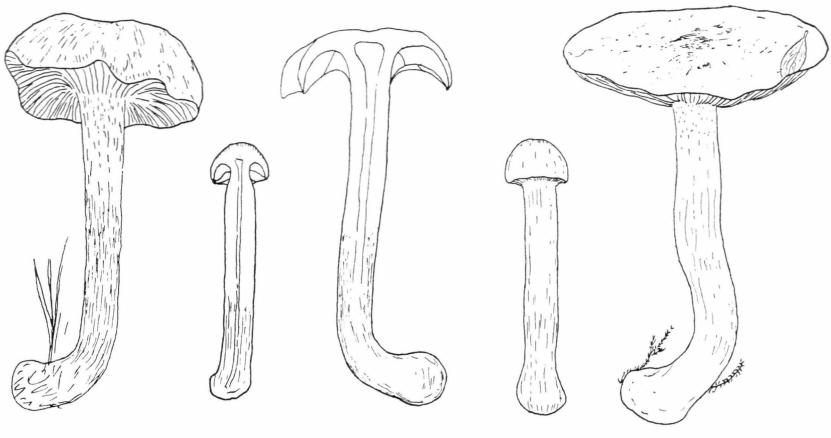

Fig. 1. *Pholiota groenlandica.* ML 606, 607, 632 ($\times$ 1/2).

numerous, springing from deep subhymenial layer, lower half inflated, tapering towards apex, some of them subcapitate or forked, upper part filled with yellowish brown, refractive content, 50—65 $\times$ 11—14 μ; cheilocystidia similar; basidia very small, about 16 + 4 $\times$ 6 μ, 4-spored, sterigmata long; spores small, 5.3—6.7 $\times$ 3.2—4.0 μ, elliptic subphasaeoliform, pale Clay Color, with very small apiculus and obscure small germpore.

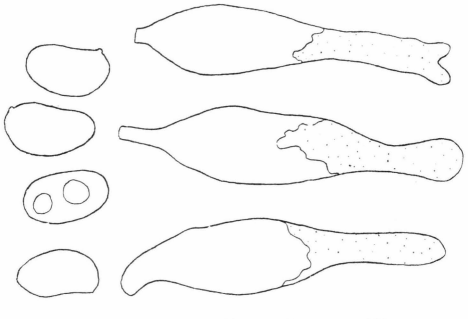

Fig. 2. *Pholiota groenlandica.* ML 632. Pleurocystidia ($\times$ 700) and spores ($\times$ 1600).

Quite closely related to *Pholiota lenta* (PERS. ex FR.) SING. from which it differs but slightly in microscopic characters, but the covering of the cap never breaks up in scales, the colours are darker, and the whole plant of coarser stature.

Distribution: Only known from the type locality, where it was found in three places in the same large *Salix glauca* copse, in deep moss with *Deschampsia flexuosa.*

Pholiota carbonaria (Fr.) Singer

syn.: *Flammula carbonaria* (Fr.)

ML35, Grönnedal by Ivigtut, 11. July, on charcoal; ML539, ibid., 19. Sept.

Distribution: Only Greenland records, both from the same burnt over spot. Also found a single time in Lappland, in the upper birch wood zone (Lange 1946).

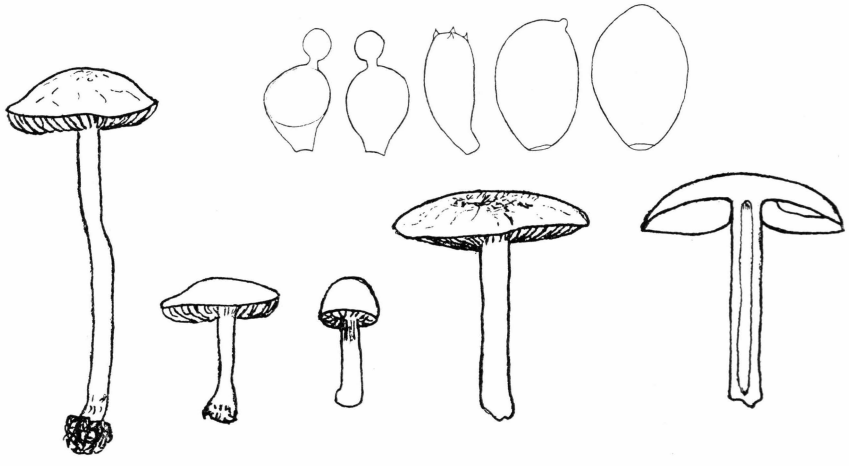

Fig. 3. *Conocybe ammophila.* ML169. Fruit bodies (× 1), cystidia (× 700), and spores (× 1600).

Bolbitiaceae

Conocybe Fayod

Conocybe ammophila n. sp.

(Fig. 3)

ML169, Sdr. Strfj., 1. Aug., on sand bank along creek, close to river, gregarious.

Pileus 1.2—3.5 cm latus, convexus, deïnde planus, pallide ochraceus, nudus, carnosus; lamellae latae, subliberae, ochraceae; stipes cylindricus, basi inflatus, pallidus, carinatus; sporae magn. 9.8—11.4 × 6.7—7.5 × 6.2—6.7 μ; cystidia capitata, 10—12 μ lata, capitulis 4.5—5 μ latis.

Typus die 1. Aug. in loco arenoso ad sinum Sdr. Strömfjord sito Groenlandiae occidentalis sub numero ML169 lectus, in Museo Botanico Hauniensi depositus.

Cap 1.2—3.5 cm broad, convex but soon expanding to almost flat, pallid (Pinkish Buff to Cinnamon Buff, g6—g7), paler when dry, smooth and naked, surface slightly cracking in dry specimens, edge sharp, gills slightly protruding; flesh concolorous or slightly paler, remarkably thick almost to the edge, 3 mm thick in central part; gills rather broad and short, moderately crowded, almost free, some with a decurrent denticle,

concolorous with the cap when young, then more vivid brown (k5, Ochraceous Tawny), finally Tawny (k7); stem 2—4.5 × 0.2—0.5 cm, cylindrical, slightly swollen below, almost white, finely striate and pruinose from cystidia when young, soon almost glabrous, hollow; flesh pallid; taste and smell indistinctive.

Cuticle of cap of pyriform cells, 9—10 μ broad, trama of inflated hyphae, 8—30 μ broad, clamp connections seen in hyphae of stem; cheilocystidia with almost globose body, 10—12 μ broad, capitate, neck 1—2 μ long, head 4.5—5 μ broad; spores broadly ovate in face view, distinctly more narrow-elliptic in side view, 9.8—11.4 × 6.7—7.5 × 6.2—6.7 μ, smooth, with distinct apiculus and germ pore.

In small flocks on clayey sand in very scattered vegetation of *Elymus*, *Puccinellia*, *Juncus arcticus*, but *Salix* and other shrubs often absent.

The species seems closest to *Conocybe antipoda* (LASCH) KÜHNER but the spores are less distinctly flattened and not truely angular-citriform, the cheilocystidia are slightly larger, the cap more thick-fleshed, and the stem is not rooting. The thick flesh of the cap seems to be a very rare feature in *Conocybe*.

Distribution: Found in a few places in the Sdr. Strfj. area, but not recorded from other localities as yet.

Conocybe rickenii (J. SCHAEFF.)

ML66, Ivigtut, 15. July, a small flock on old manure in dung heap.

The coprophilous species of *Conocybe* are a very badly known group, burdened by nomenclatorial confusion. The present specimens checked, however, well with *C. rickenii* as depicted by J. E. LANGE (1939); the only noteworthy difference was, that 4-spored basidia were found dominant, 2-spored basidia rare.

Distribution: Also known from Lappland, growing on horse dung (M. LANGE unpubl.), but probably not occuring on dung of animals native to Greenland, and hence to be considered an introduced species.

Agrocybe FAYOD

Agrocybe praecox (PERS. ex FR.) FAYOD

ML13, Grönnedal by Ivigtut, 9. July, on road bank in camp; ML31, ibid., 11. July, same habitat; ML32, ibid., 11. July, in natural vegetation near road.

ML13 and ML31 are quite typical, ML32 more like var. *paludosa* J. E. LANGE, and differs from the others in larger spores (8.8—10.8 × 5.8—6.5 μ and 9.8—11.5 × 6.0—7.8 μ respectively).

Distribution: Also met in the camp-area at Narssarssuaq (13. July), but not seen at stations further-to the north, and never found in truely natural vegetation. It may, however, be a species native to Greenland. Both LARSEN and CHRISTIANSEN (1932, 1941) record it from Iceland, MØLLER (1945) found it on the Færöes, BLYTT (1905) in the alpine zones of the Norwegian mountains, and I have found it to be a common species in the montaneous birch wood in Lappland (unpubl.) from which region it is also mentioned by PILÁT & NANNFELDT (1955). It seems to be an extremely widespread species, occuring also in the southernmost part of South America (SINGER, 1953).

Cortinariaceae

Inocybe (FR.) FR.

The field identification of the species of *Inocybe* was based on Flora Agaricina Danica (J. E. LANGE 1939) and HEIM's monograph of the genus (1931). The two works agree fairly well in nomenclature and species concept. FAVRE (1955) has described a large number of *Inocybe*'s from the Alps, including many new taxa, his treatise has been very helpful in the final determination of the material, as also has KÜHNER's various papers on the genus.

Inocybe obscura (PERS. ex FR.) GILL. sensu J. E. LANGE

ML144, Sdr. Strfj., Hassells Fjeld, 31. July, on almost naked steppe soil on south slope; ML180, ibid., 2. Aug., dry sandy heath with *Betula nana* and *Vaccinium uliginosum*.

The microscopical characters agree well with J. E. LANGE's interpretation of the species. The material was, however, in the field referred to *I. relicina*, and the identification is slightly dubious.

Distribution: No other Greenland records. (Lappland (Lange)); HEIM (1931) describes an alpine form of *I. obscura*, attached to *Salix*, his concept of the species is probably differing from that of J. E. LANGE, but may well cover a specimen found on the top of Mt. Nakajanga.

Inocybe flocculosa (BERK.) SACC.

ML52, Narssarssuaq, 13. July, in birch wood; ML139, Sdr. Strfj., Hassells Fjeld 30. July, low heath at the foot of the mountain; ML149, ibid., 31. July, similar locality.

ML52 forms a transition to *I. abjecta* KARST.

Distribution: Probably not uncommon in low heath areas in Sdr. Strfj., and besides that recorded from Narssarssuaq and from

Ivigtut. ROSTRUP (1888, 1894) has referred three Greenland finds to *I. flocculosa* (W. Gr., Ujaraqsuit, 70°30′ N., Nuk, E. Gr., 61°28′ N., Danmark Ö., 70° N.) and DEARNESS (1923) records it from Arctic Canada. Especially the ROSTRUP records must be looked upon with great reserve. It is not improbable that *I. abjecta*, recorded from Iceland by both LARSEN and CHRISTIANSEN, could be referred to *I. flocculosa*—the two species are very badly seperated. FAVRE (1955) has a single record from the Alps, while HEIM gives no mention of alpine occurrence.

Inocybe auricoma (BATSCH ex FR.) QUÉL.

ML140, Sdr. Strfj., Hassells Fjeld, 30. July, moist heath at the foot of the mountain; ML311, ibid., 18. Aug., springy area on south slope.

ML140 has basidia mostly 2-spored, spores 12—13 × 6—7 μ, ML311 has 4-spored basidia mixed with a small number of 2-spored ones, spores mostly 9.5 μ long, a few considerably longer, 12 μ.

Distribution: The species was noted a few times in the Sdr. Strfj. lowland, in moist places, but not found in other Greenland localities.

PILÁT & NANNFELDT (1955) mention a find from Abisko, Lappland, while it is not on record from other arcto-alpine areas.

Inocybe decissa (FR.) QUÉL. var. **brunneoatra** HEIM

ML145, Sdr. Strfj., 31. July, in heath near camp; ML147, ibid.; ML181, ibid., 2. Aug., in moist moss and grass.

Distribution: Noted a few times in the Sdr. Strfj. lowland. The typical form is recorded from Iceland by LARSEN, while HEIM gives no indication of alpine records, nor is the species mentioned by FAVRE.

Inocybe geophylla (SOW. ex FR.) QUÉL.

ML185, Sdr. Strfj., Hassells Fjeld, 2. Aug., on small path through *Betula nana*—*Salix* heath; ML337, ibid., 21. Aug., in boggy *Salix* scrub on south slope.

Distribution: Only met a few times in the lowland localities at Sdr. Strfj. The species seems, however, to have its main distribution towards the north (cp. HEIM) and is on record from Svalbard (KARSTEN 1872, DOBBS 1942), from Iceland (LARSEN), the Norwegian mountains (BLYTT), Lappland (LANGE, unpubl.) and also from the Alps (FAVRE).

Inocybe posterula (BRITZ.) SACC.

ML552, Ivigtut, 14. Sept.

Distribution: This large and conspicuous *Inocybe* was only noted once, in the Ivigtut area, which otherwise is rather poor hunting ground for species of this genus. It seems unreported from other arcto-alpine areas.

Inocybe eutheles (Berk. & Br.)

ML354, Sdr. Strfj., Hassells Fjeld, 22. Aug., in *Rhododendron—Betula nana* heath, 250 m alt.

Distribution: Only one single specimen was found, but it was well developed and typical. Heim found alpine forms growing in considerable altitude, but for the rest it seems unreported from arcto-alpine areas, while recorded by Singer (1953) from Tierra del Fuego.

Inocybe langei Heim

ML161, Sdr. Strfj., near camp, 31. July, in moist heath.

Distribution: Only Greenland record. Christiansen mentions it from Iceland, while neither Heim nor Favre found it in alpine stations.

Inocybe hirtella Bres.

ML258, Sdr. Strfj., Ravneklippen, 8. Aug., in moss.

The material could probably better be referred to *Inocybe lucifuga* var. *lutescens* (Vel.) sensu Favre, at least as far as it can be judged from the microscopic details.

Distribution: Noted a few times in the Sdr. Strfj. area, up to an altitude of 700 m (Nákajanga), but not known from other places in Greenland. *I. hirtella* is known from Iceland (Larsen, Christiansen) and also from the Færöes (var. *paupera* Møller). It is not quite clear to me whether *I. lucifuga* var. *lutescens*, recorded from the Alps by Favre, should be regarded as a taxon distinct from *I. hirtella*.

Inocybe lacera (Fr.) Kummer

ML94a, b, Godthåb, 18. July, on low cliffs; ML104, Sdr. Strfj., Itivdlínguaq, 24. July, in wet moss (*Meesia triquetra*, *Philonotis fontana*); ML231a, Sdr. Strfj., 6. Aug.; ML374, Sdr. Strfj., Sandflugtdalen, 24. Aug., in sand.

Distribution: The species was found to be common in the Godthåb region, and not infrequent at Sdr. Strfj., where it was found in several forms and in very different habitats, varying from wet moss to dune sand. There are several previous records from Greenland (Rostrup 1888, 1904; Ferdinandsen 1910), but no material is preserved. *I. lacera* seems to be common in arcto-alpine areas, noted from Iceland (Larsen, Christiansen), the Færöes (Møller, forma *subsquarrosa*, hardly anything but a phaenotype), from Norwegian mts. (Henning), from Lappland (Lange), and from the Alps (Favre).

Inocybe longispora n. sp.

(Figs. 4—5)

ML162, Sdr. Strfj., 31. July, moist heath near camp; ML178, ibid., 2. Aug., in *Salix* scrub on sandy soil with scattered vegetation; ML209, Hassells Fjeld, 4. Aug., in *Salix* scrub, 250 m alt.

Pileus 2.5—3.5 cm latus, convexus, deïnde planus, leviter umbonatus, primo fibrilloso-pruinosus, deïnde subnudus, cinnamomeo-fuscus, rimosus, carnosus, carne alba; lamellae subdistantes, liberae; stipes 2.5—3.5 cm altus, 0.6—0.8 cm latus, farctus, cylindraceus, basi leviter inflatus, fibrilloso-striatus, apice cystidiosus; cystidia coronata, magn. 50—75 × 10—23 μ; sporae magn. 10.3—14.5 × 4.7—5.4 μ, subregulariter ovato-elongatae.

Typus die 2. Aug. ad sinum Sdr. Strömfjord Groenlandiae occidentalis sub numero ML178 lectus, in Museo Botanico Hauniensi depositus.

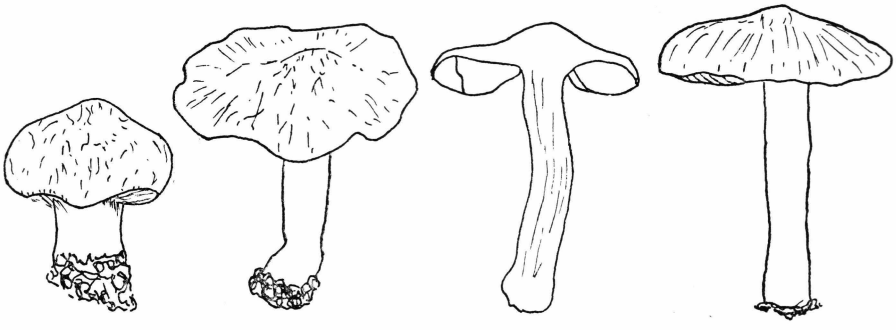

Fig. 4. *Inocybe longispora.* ML178. Fruit bodies (× 1).

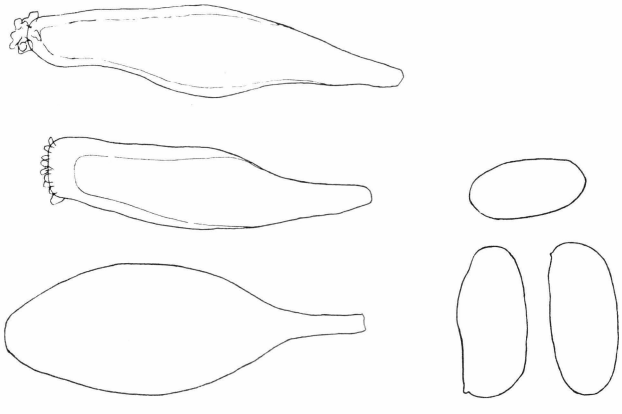

Fig. 5. *Inocybe longispora.* ML178. Pleurocystidia (× 700) and spores (× 1600).

Cap 2.5—3.5 cm broad, low convex, then almost flat, obscurely umbonate, young cap covered by pale buff, fibrillose-pruinose veil, soon disappearing except on umbo, leaving cap dark brown (Cinnamon Brown, g8), rimose; margin incurved, slightly fibrillose, velate; flesh thick, whitish, turning slightly reddish brown; gills rather short and distant, broadest near margin, almost free, whitish gray, then dull brownish; stipe 2.5—3.5 × 0.6—0.8 cm, stout, cylindrical, slightly swollen below, densely covered with fine white fibrills when young, then fibrilloso-striate, slightly cystidiose on top, flesh solid.

Smell and taste slight, earthy-farinaceous.

Cuticle of cap of radially arranged hyphae, 5—15 μ broad, with incrusting brown pigment, clamp connections on some septa; trama proper very compact, hyaline, gill trama regular, hyaline, hyphae 4—9 μ broad; pleurocystidia hyaline, thickwalled, crested, 10—25 × 50 —75 μ, no distinct neck, apex rounded, cheilocystidia similar; basidia 4-spored, 35 × 6 μ; spores 10.3—14.5 × 4.7—5.4 μ, narrow cylindrical-elliptic or with slightly irregular outline, apiculus distinct.

In *Salix* scrubs and on heaths, in small flocks.

The species recalls *I. pruinosa* HEIM both in stature and in microscopical characters, but the young cap is more obtuse, the old cap less distinctly squamulose, and the stipe only sparingly cystidiose if at all, the gill trama is furthermore of more narrow elements than in *I. pruinosa* and other species of the *I. lacera* group.

Distribution: Found several times in the Sdr. Strfj. lowland, but hitherto not recorded from other stations.

Inocybe ursinella n. sp.

(Fig. 6)

ML300, Sdr. Strfj., Örkendalen, 15. Aug., on lake shore.

Pileus 2.5—4.5 cm latus, convexus deïnde subplanus, subumbonatus, obscure fusco-cinnamomeus, fibrilloso-squarrosus, margine incurvus, tomentoso-fibrillosus, velo fusco, carne pallida; lamellae latae, emarginatae, subdistantes, fusco-argillaceae; stipes crassus, 2—2.5 cm altus, 0.5—0.8 cm latus, eodem ut pileus colore, fibrilloso-squarrosus. Pleurocystidia coronata, magn. 60—80 × 11—14 μ, cheilocystidia dimorpha, alia pleurocystidiorum similia, alia clavata; sporae ovatae, magn. 11—12.5 × 5.7—6.1 μ.

Typus die 15. Aug. ad sinum Sdr. Strömfjord Groenlandiae occidentalis sub numero ML300 lectus, in Museo Botanico Hauniensi depositus.

Cap 2.5—4.5 cm broad, broadly convex at first then expanded flat with low umbo, the margin somewhat wavy, dark brown (Tawny-Olive to Cinnamon Brown (h2—g8)), centre darker, Bistre (c3), cuticle of coarse recurved fibrillose scales, often rather regularly arranged, rimose-fibrillose between scales; margin fibrillose felty with a distinct brownish veil, long remaining strongly incurved, often splitting in age; flesh pale brown, when wet almost concolorous with cap, rather thick; gills broad, broadest within, emarginate, rather distant, brown (Clay Color to Tawny Olive, h3—h2), darker and more olivaceous in age, and then also with brownish margin; stem stout and thick, 2—2.5 × 0.5—0.8 cm, concolorous with cap, strongly fibrillose to almost scaly, flesh slightly darker than in cap, stem basis narrow, paler.

Smell and taste faint.

Cuticle of 7—20 μ broad elements with incrusting pigments and clamp connections, trama compact, of short celled elements without

lactifers; gill trama similar, regular, elements 5—9 μ broad; pleurocystidia 60—80 $\times$ 11—14 μ, brown, rather thickwalled, slightly inflated below, attenuated upwards, sometimes with a small head, crested; cheilocystidia similar but smaller and mixed with a large number of clavate pseudocystidia; basidia 4-spored; spores 11—12.5 $\times$ 5.7—6.1 μ, some of them smaller and almost globose, a few larger and irregular,

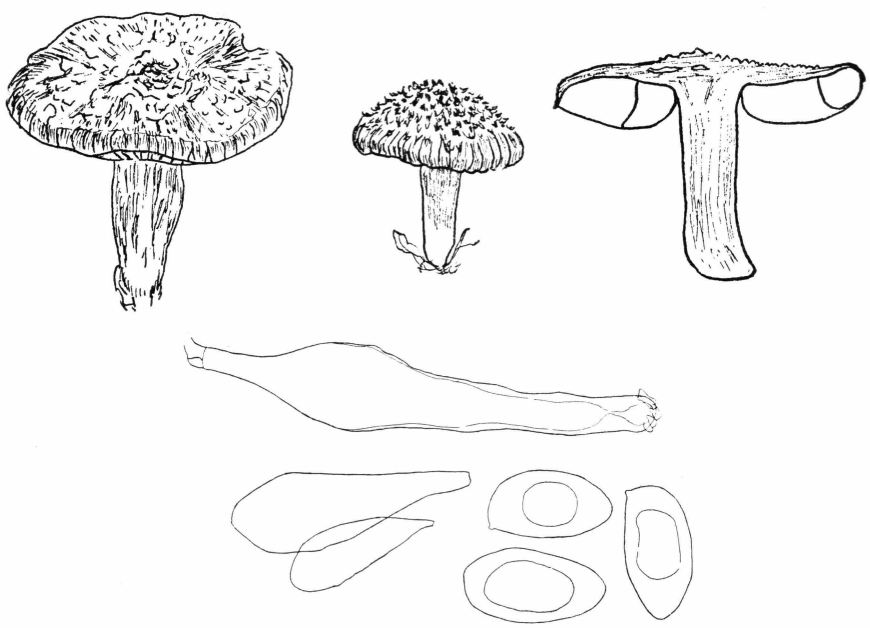

Fig. 6. *Inocybe ursinella*. ML300. Fruit bodies ($\times$ 1), pleurocystidium and cheilocystidia ($\times$ 700), spores ($\times$ 1600).

but main part elliptical with inconspicuous suprahilar depression and more or less pointed distal end, large central oildrop.

Gregarious on sandy-stony lake shore with scattered vegetation.

The species recalls a stout *I. lacera*, but the microscopical characters distinguish it quite sharply.

Distribution: Only recorded from the type locality.

Inocybe serotina PECK

(Fig. 7)

ML372, Sdr. Strfj., Sandflugtdalen, 24. Aug., in sand dunes.

The present specimens agree with *I. serotina* in microscopical characters: broad, crested, thickwalled pleurocystidia, 40—55 $\times$ 14.5—25 μ, and large thickwalled spores, 13.0—19.7 $\times$ 6.7—8.6 μ, but the fruit

bodies are slightly smaller than usually found, and also considerably darker brown (Cinnamon Brown, g8). It may be a distinct taxon, related closely to *I. serotina*, but I hesitate in ascribing any definite rank to it, when it shares the peculiar ecological characters and also the outstanding microscopical features with the species as described from both America and Europe.

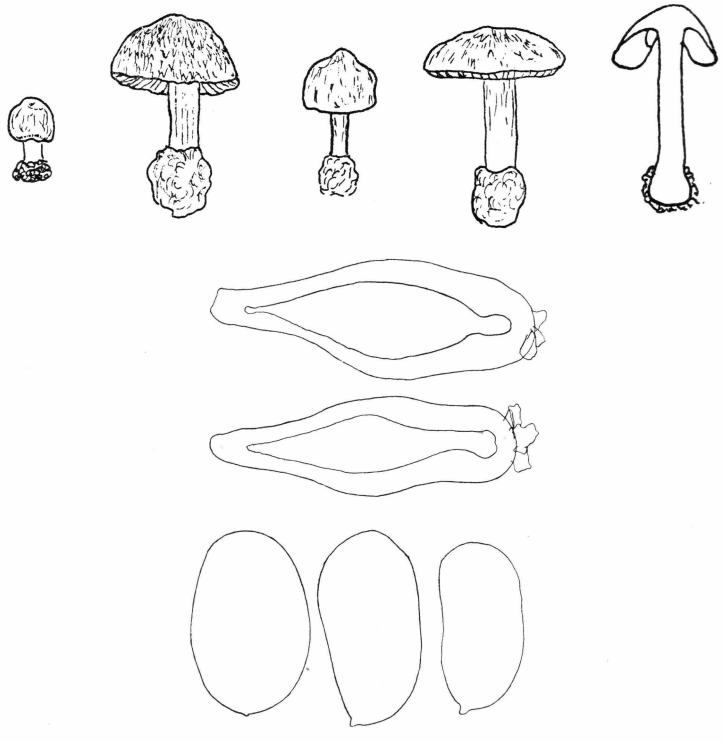

Fig. 7. *Inocybe serotina*. ML372. Fruit bodies (×1), pleurocystidia (×700), and spores (×1600).

Distribution: Found in large number on humid sand among dunes on a few localities in Sandflugtdalen. The species is known from sand dunes on both sides of the Atlantic, but not previously recorded from far northern stations.

Inocybe calamistrata (Fr.) Gill.

ML277, Sdr. Strfj., Nákajanga, 10. Aug., fell field, 700 m alt.

A small but quite typical specimen.

Distribution: Only recorded twice from Greenland (Sdr. Strfj.; Kangâmiut), but otherwise it seems widely distributed and common

in arcto-alpine areas. LARSEN found it to be frequent on Iceland, where it was also recorded by CHRISTIANSEN, I have found it in rather high altitudes in the Lappland mountains, and FAVRE records it from the Alps.

Inocybe fastigiata (SCHAEFF. ex FR.) QUÉL.

ML102, Sdr. Strfj., Itivdlínguaq, 24. July, very dry steppe with slight incrustations of salt on top of soil; ML117a, ibid., Hassells Fjeld, 28. July, dry south slope under *Salix*; ML138, ibid., 30. July, heath at foot of mountain; ML146, ibid., 31. July, similar locality (several finds); ML378, ibid., Sandflugtdalen, 24. Aug., in almost naked sand.

This very variable species is often split up in a number of taxa. The present material is rather heterogeneous, but cannot easily be distributed on described taxa. ML117a forms a transition to *I. cookei* BRES.

Distribution: The species is not known from other Greenland localities. It has a very wide ecological amplitude in Sdr. Strfj. and seems to be the species which can penetrate furthest into the arid steppe region, often springing from deep soil layers.

It is widely distributed in arcto-alpine areas, being recorded from Jan Mayen (HAGEN 1950), Iceland (LARSEN, CHRISTIANSEN), the Færöes (MØLLER, small forms under the names *I. nana* MØLLER and *I. pusilla* MØLLER), from Norwegian mountains (BLYTT), from Lappland (LANGE, unpubl.), and from the Alps (FAVRE). HEIM records several forms from the upper alpine regions in France, both from paludine regions and from arid places, as well as a number of arenicolous types from the lowland.

Inocybe dulcamara (A. & S. ex FR.) KUMMER

ML51, Narssarssuaq, 13. July, sandy soil in birch wood; ML106, Sdr. Strfj., Itivdlínguaq, 24. July; ML130, ibid., Hassells Fjeld, 29. July, foot of the mountain in moist heath; ML150, ML151, ibid., 31. July, similar loc.; ML179; ibid., 2. Aug., in rather dry *Vaccinium uliginosum—Betula nana* heath; ML299, ibid., Bredestrand, 14. Aug., in dune sand; ML357, ibid., Hassells Fjeld, 22. Aug., in deep wet moss with *Betula nana* and *Salix*, 250 m alt.; ML373, ibid., Sandflugtdalen, 24. Aug., in sand.—Also from several localities in East Greenland between 71° and 75° N. (Claveringfjord, Kap Stosch, Kap Petersens, Antarctic Havn, Sofia Sund, Kap Herschel) July—Aug. 1930, leg. SCHOLANDER & VAAGE.

The species is often divided up in several taxa. The Greenland material could be distributed on three of these units. A luxurious, very large form is found in moist localities in moss. It seems identical with *Flammula agardhii* as described by J. E. LANGE (ML130, ML151, ML 357). The typical form is found mostly on moderately humid heath areas (ML51, ML106, ML150). A small and somewhat darker, more or

less scaly form, corresponding to *I. relicina* (Fr.) is met most frequently on very dry localities (ML179, ML299). The last mentioned form has always a dense brim of globose paracystidia on the gills edge, while paracystidia in the other forms are clavate pyriform, globose ones being rare or absent.

Distribution: The most common species of the genus in Greenland, noted by me at all main stations. I have seen a specimen from Svalbard (Grumant City, 12. Aug. 1928, leg. Tornöe, det. M. Lange) and it is also on record from Iceland (Larsen, Christiansen), the Færöes (Møller), Lappland, in high altitudes, up to 1050 m (Lange, unpubl.) and from the Alps (Heim, several forms, Favre, do.).

Inocybe asterospora Quél.

ML160, Sdr. Strfj., Ravneklippen, 26. July, sandy soil by *Salix*.

The identification is somewhat dubious as the specimen was rather old, although it still seemed quite typical.

Distribution: Only Greenland record. Known from Iceland (Christiansen) but not from other arcto-alpine stations.

Inocybe maritima (Fr.)

(cp. Fig. 30, p. 100)

ML288, Sdr. Strfj., Bredesand, 14. Aug., in dunes.

Distribution: The only other Greenland record of this easily distinguishable species is given by Rostrup (Qutdligssat, W. Gr. 70° N., Rostrup, 1891, no material left). It seems confined to sand dune areas, but has not been recorded from other far nothern stations of this type.

Inocybe borealis n. sp.

(Figs. 8—9)

ML156b, Sdr. Strfj., 31. July, heath near camp; ML387, ibid., Sandflugtdalen near Ice Cap, 26. Aug., in deep moss on north slope.

Pileus 2.5—6 cm latus, expanso-umbonatus, adpresse fibrillosus, rimosus, badius, umbone tamen initio pallide fibrilloso, margine rimosus, carnosus, carne pallide argillacea; lamellae subdistantes, emarginatae; stipes 2—4 cm altus, 0.2—0.4 cm latus, farctus, basi leviter inflatus, apice cystidiosus; cystidia coronata, magn. 40—77 × 12—19 μ; sporae magn. 10.7—11.7 × 5.9—6.9 μ, rhomboïdes vel irregulares.

Typus die 26. Aug. ad sinum Sdr. Strömfjord Groenlandiae occidentalis sub numero ML387 lectus, in Museo Botanico Hauniensi depositus.

Rather large, cap 2.5—6 cm broad, expanded with a small but rather distinct umbo, coarsely adpressed fibrillose-rimose, distinctly

rimose on margin which often splits, dark brown (Sepia to Bistre, g8, c2—3) with pallid fibrils on umbo of younger specimens, and some paler fibrils among the dark ones on margin; flesh moderately thick, pale grayish brown; gills broadest on middle, rather distant, emarginate

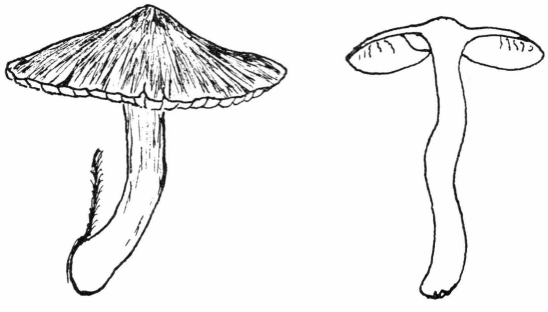

Fig. 8. *Inocybe borealis*. ML387. Fruit bodies (×1).

with decurrent denticle, brownish (Russet to Tawny Olive, h1—2), edge even; stipe 2—4 × 0.2—0.4 cm, base up to 0.6 cm, cylindric, slightly swollen below, paler than cap with yellowish brown fibrils, cystidiose on top, solid.

Smell and taste faint.

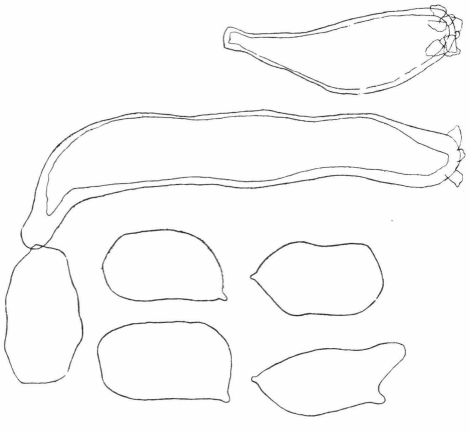

Fig. 9. *Inocybe borealis*. ML387. Pleurocystidia (×700) and spores (×1600).

Cuticle with thin, 3—4 μ broad hyaline hyphae over coarse brown hyphae, not visibly incrusted with pigment, similar but paler brown hyphae in trama proper; gill trama subregular, hyphae 5—11 μ broad, a few inflated elements up to 20 μ, lactifers very few, hymenium appearing brownish; pleurocystidia 40—77 × 12—19 μ, very variable from inflated clavate and short to long and cylindric-irregular, hyaline, a few

of them brownish, cheilocystidia similar; basidia 4-spored, 30—40 × 11 μ; spores 10.7—11.7 × 5.9—6.9 μ, almost rhombic in side view, with median constriction in face view, some more irregular and then often longer than indicated above.

The description is based on 7 fruit bodies (ML387) none of which were very young. The species is related to *I. boltonii* HEIM, but distinguished on its darker colours and the longer cystidia. The spore shape separates it from *I. giacomi* FAVRE.

Distribution: Only records.

Inocybe praetervisa QUÉL.

ML159, Godthåb, 22. July, on rocks near Skibshavn; ML103, Sdr. Strfj., Itivdlínguaq, 24. July, in *Camptothecium lutescens*; ML183, ibid., Hassells Fjeld, 250 m alt., 2. Aug.

Distribution: Also recorded from Kangâmiut (1. Sept.). Found on Iceland by LARSEN and in the Alps by FAVRE, but no other information about arcto-alpine occurrence is known to me.

Inocybe lanuginella (SCHROET.) J. E. LANGE

ML501, Godthåb, 6. Sept., in low heath with *Salix*; ML603, Ivigtut, 18. Sept., snowbed vegetation.—FT33, Holsteinsborg, 15. Aug. 1955, on heath; FT41, Egedesminde, 16. Aug., 1955, in heath; FT47, Godhavn, 17. Aug., 1955, in heath.

Distribution: Frequent at Godthåb and Ivigtut but not found in the Sdr. Strfj. area, and probably confined to oceanic stations, inhabiting humid heath areas with *Salix herbacea*. Also recorded from Lappland (LANGE) and from the Alps (FAVRE).

KÜHNER (1932) and FAVRE use the name *I. decipientoides* PECK for this species. The Greenland material corresponds best to the var. *taxocystis* FAVRE.

Inocybe rennyi (BERK. & BR.)

(Fig. 10)

ML241, Sdr. Strfj., Hassells Fjeld, 8. Aug., in dry *Dryas—Vaccinium—Betula* socc., 400 m alt.

Cap about 2 cm broad, convex with a small umbo, Cinnamon Buff (g7) or paler, umbo and low fibrillose scales darker (Ochraceous Tawny, g2), edge slightly rimose, incurved, flesh pallid; gills broadest near margin, free, Clay Color (h3), edge paler, eroded; stipe 4 × 0.4 cm, cylindrical, pallid, flushed with colour of cap, cystidiose, slightly striate, solid, flesh pallid.

Smell and taste faint.

Cuticle of narrow, pale brown hyphae not visibly incrusted, trama with some brown lactifers, gill trama regular compact, of long elements 4—10 μ broad; pleurocystidia 50—70 $\times$ 12—16 μ, hyaline without distinct neck, apex rounded crested, cheilocystidia similar; spores

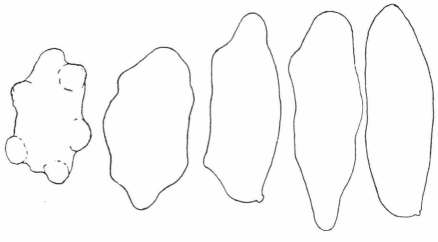

Fig. 10. *Inocybe rennyi*. ML241. Spores ($\times$ 1600).

10.8—18.8 $\times$ 5.5—7.6 μ, thickwalled, some of them almost regular, long elliptical, others more irregular in outline, either long or most often short and then distinctly nodulose.

Distribution: Only Greenland record. Most of the previous records seem according to HEIM, to be from subalpine stations. Also found a single time in Lappland (LANGE, unpubl.).

Inocybe calospora QUÉL.

ML267, Sdr. Strfj., Nákajanga, 10. Aug., fell field, 700 m alt.

Distribution: The above find seems to be the only record from arcto-alpine stations.

A few collections of *Inocybe* remain unidentified, and a large number of the finds discussed above have been referred to species which in fact usually are split up in several taxa. The *Inocybe* flora at Ivigtut and Godthåb was rather poor while a great number of species were found at Sdr. Strfj. A closer study of the genus in this area is most desirable.

Hebeloma (FR.) KUMMER

Hebeloma longicaudum (PERS. ex FR.) QUÉL. sensu J. E. LANGE

ML126, 137, 153, Sdr. Strfj., 29.—31. July, main valley, in rather dry heath; ML415, ibid., Hassells Fjeld, 28. Aug., dry south slope with *Betula nana*, 350 m alt.—FT19, ibid., Hassells Fjeld, 13. Aug. 1955.

Distribution: Frequent on dry south slopes and heaths, less abundant on the north slopes, but altogether one of the typical species of the Sdr. Strfj. area, while not recorded with certainty from other stations, nor known from other arcto-alpine areas.

The specimens cited above are all very typical. Two collections made by TERKELSEN (FT28, Holsteinsborg, FT46, Godhavn) may belong here too, but seem more like *H. crustuliniforme* (BULL. ex FR.) KUMMER. A few unpreserved specimens collected by me in the Sdr. Strfj. area also had more likeness to *H. crustuliniforme*, which species may be represented too by a collection from Clavering Ö (E. Gr. 75°15′ N.) leg. SCHOLANDER. ROSTRUP (1891) records *H. crustuliniforme* from Patut (W. Gr., 70°13′ N.) but its occurrence in Greenland lacks definite proof.

Hebeloma pusillum J. E. LANGE

ML53, Narssarssuaq, 13. July, in birch wood; ML78, Godthåb, 17. July, in moist heath, two finds.

The specimens were typical in macroscopic characters. The epicutis slightly gelatinous, terminal part of hyphae suberect, slightly widened, 4 μ broad, hyaline; cystidia flexuose, inflated above, but not below, tips about 8—12 μ broad, basidia 4-spored, spores 10—12.5 (14.5) × 6—7.5 μ, minutely rough.

The species checks best with *H. pusillum*, but the spore size and cystidia suggest a transition to *H. helodes* FAVRE. Further studies are necessary to decide on the status of the two species.

Distribution: Only above records from Greenland can be regarded as certain, although some badly preserved specimens from East Greenland localities (leg. SCHOLANDER & VAAGE) may belong here. Also found in Lappland, in the upper birch wood zone (LANGE, unpubl.).

Hebeloma mesophaeum (PERS. ex FR.) KUMMER

ML105, Sdr. Strfj., Itivdlínguaq, 24. July, in dried-up creek, in deep moss, *Vaccinium uliginosum*, *Betula nana*, and *Salix glauca*; ML135, ibid., Hassells Fjeld, 28. July, south slope in scattered *Salix*; ML227, ibid., 6. Aug., in edge of *Betula nana* bog; ML287, ibid., Bredesand, 14. Aug., in sand dunes.—FT70, Godhavn, 20. Aug. 1955, subfasciculate under *Salix* in moss. Kap Humboldt (E. Gr. 73°10′ N.), 3. July 1930, leg. SCHOLANDER; Storfjorden, Brandal, 21. Aug. 1931, leg. TORNÖE. Peary Land, Jörgen Brönlund Fjord (82°10′ N.), 7. Aug., 1947, by *Salix arctica*; leg. K. HOLMEN.

The delimitation of this species towards *H. versipelle* (FR.) is unclear to me. The present specimens have cystidia slightly inflated at base (6—8 μ broad) and at top (5—6 μ broad), main part 4 μ broad, length 35—45 μ; the spores are very minutely roughned, 9—10 × 5.5—6.5 μ or more slender, 11.5—13 × 5.5—6 μ. ML287, from deep sand in a dune, differs in having cystidia with broader base (7—10 μ) and head (6—8 μ), it may belong in *H. dunense* CORB. & HEIM, but the material is insufficient for an accurate determination.

Distribution: *Hebeloma mesophaeum* is widely distributed and common in Greenland. It was noted in all main stations visited by me, and material from far northern stations seems to proove this species to be among those reaching furthest to the north.

I have seen a specimen from Svalbard (Eidenbukta, 22. Aug. 1928, leg. TORNÖE) which also must be referred here (cp. also KARSTEN). It is known from Iceland (LARSEN), the Færöes (MØLLER) and probably

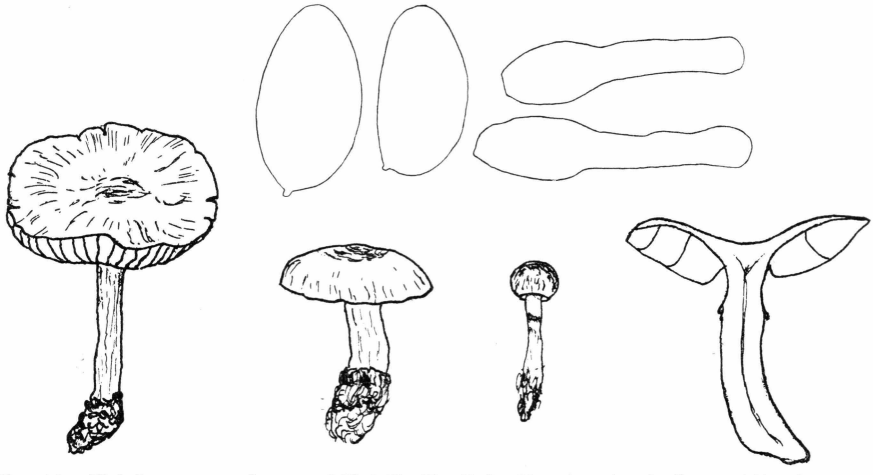

Fig. 11. *Hebeloma strophosum*. ML375. Fruit bodies (× 1), cheilocystidia (× 700), and spores (× 1600).

also (sub nom. *H. fastibile* (FR.)) from Jan Mayen (LARSEN, HAGEN), and Arctic Canada (ROSTRUP 1906, DEARNESS 1923). BLYTT found it in high alpine zones in Norway, I have met it at high altitudes in Lappland, and FAVRE finds both this species and the very closely allied or identical *H. versipelle* in the Alps.

Hebeloma strophosum (FR.) SACC.

(Fig. 11)

ML93, Godthåb, 18. July; ML375, Sdr. Strfj., Sandflugtdalen, 24. Aug., in deep, almost naked sand.—FT45, FT57, Godhavn, 17. Aug. 1955.

Hebeloma strophosum is not too well defined, and especially not well delimitated towards *H. mesophaeum*, from which species it is separated on a more copiously developed veil. ML93 and FT45 represents quite well this form in macroscopical characters, but the spores are absolutely smooth, 11—12 × 6—6.5 μ, and the cystidia have a prominently swollen base, 8—12 μ broad. ML375 differs considerably in habitus, which may be explained from its arenicolous habitat, but the spores are much larger, 12.5—16 × 6.8—8.6 μ.

The large spored arenicolous form invites certainly to a closer study, if similar specimens are encountered again.

Distribution: CHRISTIANSEN mentiones *H. strophosum* from Iceland, dealing probably with the same species as the Greenland form, while MØLLER ascribes small rough spores to his *H. strophosum* from the Færöes.

Naucoria (FR.) QUÉL.

Naucoria (Alnicola) escharoides (FR.)

ML612, Grönnedal by Ivigtut, 18. Sept., in *Alnus* thicket.

Distribution: Only record from Greenland, where the species must be limited to the *Alnus* copses in the southernmost part, where it probably occurs but infrequently, as a suitable thick layer of *Alnus* leaves rarely accumulates. Not on record from other arcto-alpine areas, but probably found in other regions as far to the north, and as high up as the *Alnus* species form regular stands.

Naucoria (Alnicola) scorpioides (FR.) KARST.

ML512, Godthåb, 6. Sept., in *Salix herbacea* mats.

A small 2-spored form with distinctly rough spores, 12—16 × 6.5—8.5 μ. The name is used here in the sense of J. E. LANGE. It is occasionally used for a species referred to *Pholiota*.

Distribution: Only Greenland record. MØLLER found a large form of the species on the Færöes.

Naucoria (Phaeomarasmius) arida (PERS.) comb. nov.

Agaricus aridus PERS.
Naucoria erinacea (FR.) QUEL.

ML10, Grönnedal by Ivigtut, 9. July, on dead branch of *Alnus*.

The present specimen has 4-spored basidia and accordingly smaller spores (9—10.5 × 6—7.2 μ) than ascribed to the 2-spored form most frequently met with.

Distribution: Only record from Greenland, and probably not common in the arcto-alpine areas. I have found it in Lappland, in the upper birch-wood zone, and BLYTT met it in the same zone in Norwegian mts.

Naucoria carpophiloides KÜHNER & ROMAGN.

ML15, Grönnedal by Ivigtut, 7. July, in deep *Mnium* in springy area; ML28, ibid., 11. July, in deep, wet moss under *Salix* and *Alnus*; ML253, Sdr. Strfj., Ravneklippen, 8. Aug., under *Salix*.

Cap 0.5—1.0 cm broad, subglobose when young, then broadly convex with a very inconspicuous umbo, Tawny (g1) when young, soon paler, Ochraceous Salmon (g3), densely powdery-scaly from small, suberect submicaceous scales; margin of cap slightly incurved when young, with fine brownish veil, seen as small triangular denticles, soon disappearing, flesh very thin and fragile, brown; gills moderately crowded, slightly decurrent, concolorous with cap or slightly darker when ripe, edge brownish; stem 1.5—2 × 0.15—0.2 cm, cylindric, concolorous with cap, darker at base, floccose-pruinose above, minutely scaly below, flesh brown, base attached to leaves and moss by white mycelium.

Surface of cap with globose-elliptic elements with slightly thickned brownish walls, 20—30 μ broad; trama of inflated cells 10—20 μ broad, dull pale yellowish-hyaline; gill trama regular, similar to cap trama, hymenium pale brownish; cheilocystidia numerous, 30—60 × 5—9 × 2—3 μ, lower part inflated, brownish, neck long, often flexuose, subhyaline, base with clamp connection; pleurocystidia similar or somewhat shorter, scattered; basidia 4-spored, 26 × 6 μ, a few 2-spored seen; spores subhyaline, very variable, mostly 9—10 × 7 μ, but some very narrow long ones also present (10 × 4 μ), many spores collapsed.

The species checks with *N. carpophiloides* as far as it can be judged from the key description (KÜHNER & ROMAGNESI 1953), which, however, does not mention the characteristic colour of the cystidia. The subhyaline spores distinguish it from *N. granulosa* LANGE, while *N. rhombispora* ATK. is distinguishable on its citriform spores.

Distribution: Found at several stations at Ivigtut and in the Sdr. Strfj. area, always under *Salix* and mostly in moist places. Not known from other areas outside France, but probably overlooked.

Rozites KARST.

Rozites caperata (PERS. ex FR.) KARST.

ML523, Ivigtut, 11. Sept., under *Betula tortuosa*; ML613, ibid., 21. Sept., under *Betula tortuosa* in moss and *Deschampsia flexuosa*.

Distribution: A rare plant in the Ivigtut area and not met in stations further to the north. Recorded from Iceland (LARSEN) and found up to rather high altitudes in the Norwegian mountains (1100 m, HENNING 1885, BLYTT) and in Lappland (LANGE).

Cortinarius FR.

Species of *Cortinarius* occur in almost all arcto-alpine plant communities, and quite a few of them are undoubtedly strictly confined to

these regions. However, most of the species are small inconspicuous *Telamonia* and *Hydrocybe* species, difficult to identify even in regions where the flora is thoroughly studied, and still more troublesom in arcto-alpine areas, where early (or late) frosts often change the important characters. FAVRE's recent study of the Cortinaria of the Alps has given new possibilities for correct identification and also a firmer basis for the description of new taxa. It has been possible to locate some of his species among the collections from Greenland, and I have no doubt that further studies will add to this list, but a much larger material must be collected before we can get a full picture of the Greenland *Cortinarius* flora and its relation to that of the Alps. Further studies are also necessary to find out to what extend the species described from the Alps are truely and strictly alpine, or occur also in lowland regions. The indications given below regarding the arcto-alpine distribution of the species must be rather vague, based mostly on records from literature.

Cortinarius (Phlegmacium) multiformis FR.

ML134, Sdr. Strfj., Hassells Fjeld, 28. July, in *Salix glauca* scrub in low altitude on south slope.

The specimens, all rather young, are referred to *C. multiformis* with some doubt. Spores 9—10.5 × 6 μ, distinctly but not coarsely warty, cystidia absent.

Distribution: Only Greenland record. Neither this species nor any of its close relatives seem to be known from other arcto-alpine stations.

Cortinarius (Myxacium) mucosus BULL. ex FR.

(Fig. 12)

ML92, Godthåb, 18. July, on north-west slope of cliffs; ML98, Sdr. Strfj., Itivdlínguaq, 24. July, in rather dry *Cassiope tetragona* heath; ML122, Sdr. Strfj., 29. July, heath near camp; ML220, ibid., 4. Aug., ML232, ibid., Hassells Fjeld, 6. Aug., in deep moss with *Ledum—Betula nana*.—FT38, Egedesminde, 16. Aug., 1955; FT48, Godhavn, 18. Aug., 1955, under *Salix*; FT131, Egedesminde, 5. Sept., 1955, under *Salix*. Myggbugta (E. Gr., 73°30′ N.) 30. and 31. July, 1930, leg. SCHOLANDER.

The species is always more short stemmed and smaller than the typical form from temperate regions, some forms even dwarfish, but always characterized by bright colours of the cap (Deep Chrome to Ochraceous Tawny, b5—g2) and almost white to somewhat brownish stem. Spores 11.5—14 × 7—8 μ, irregularly nodulose, but not punctate rough.

The nomenclature of the *C. collinitus* group is highly controversial. I believe that J. E. LANGE rightly uses the name *C. collinitus* (PERS.

ex FR.) FR. for the blue-stemmed species found mostly under conifers, as this species agrees best with FRIES' original description. The present species is well distinguished from *C. collinitus* on the white stem and smaller and less distinctly punctate spores.

Distribution: Quite common in mossy heaths both at Sdr. Strfj., Godthåb and Ivigtut. According to TERKELSEN (in litt.) also frequent at Godhavn. It is almost certainly the same species which FERDINANDSEN (1911) records from three localities around Danmarks Havn

Fig. 12. *Cortinarius mucosus*. ML220. Fruit bodies (× 2/3).

(E. Gr., 76—77° N.) legit LUNDAGER. I have seen a specimen from Svalbard (Bellsund, Axeløya, 16. Aug. 1928, leg. TORNÖE, det. M. LANGE), and have found it frequent in Lappland (LANGE 1946, *C. collinitus*) BLYTT records it from the Norwegian mountains and it may well be this species which LARSEN and also CHRISTIANSEN describes from Iceland. FAVRE does not record it from the Alps.

Cortinarius (Myxacium) alpinus BOUD.

(Fig. 13)

ML565, Ivigtut, 15. Sept., in snow bed with *Salix herbacea*, 400 m alt.

Small, cap 1.5—3.5 cm broad, convex flattened when in bud, then almost flat with a low inconspicuous umbo, dark brown (Maroon, c1) darker in the middle (Bistre, c3) with a more or less distinct olivaceous hue all over, slimy, slightly fibrillose-scaly under the mucilage, cuticle detachable; margin incurved, not striate, slightly veiled when young, and then almost white; flesh concolorous with cap or somewhat paler; gills short and broad, narrow towards margin, thick, not crowded, 25—40 L, 3 l, adnato-decurrent, whitish with faint violet-grayish cast, then dull clay colour (like a *Hebeloma*), edge paler; eroded; stem 2—4 × 0.4—1 cm, cylindric-clavate or somewhat flattened, base thicker,

pallid brownish with a more or less distinct ring, slimy from pallid to olivaceous mucilage and scaly-white below the ring, solid-spongy or becomming irregularly hollow, flesh paler and more yellowish than in cap.

Cuticle of hyaline gelatinous hyphae, upper trama layer of pallid brown hyphae with large brown pigment bodies incrusted, deeper layer pallid brown with no incrusting pigments; gill trama similar, regular; spores 11.9—16 × 6.7—7.6 μ, low warty nodulose.

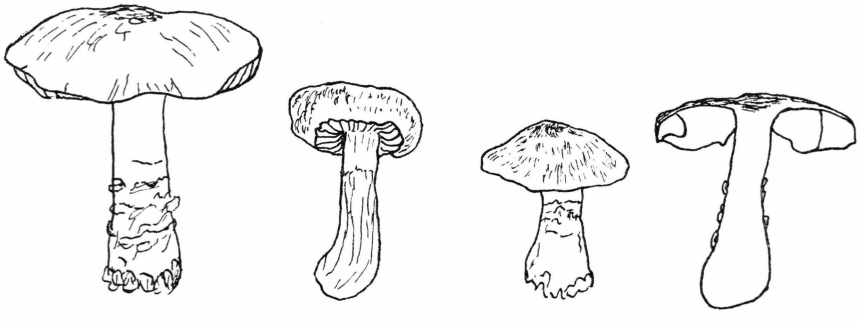

Fig. 13. *Cortinarius alpinus*. ML565. Fruit bodies (× 1).

Distribution: Found at Kangâmiut, Godthåb, and Ivigtut, always growing in snow beds with *Salix herbaceae*. Known also from Svalbard (Rundhaugen, Hinlopenstredet, 79°40′ N., det. M. Lange, cp. Hagen 1950). Frequent in similar habitats in Lappland, up to 1250 m alt. or higher, and also met frequently in *Salix herbacea* vegetation in the Alps (Favre). The species seems to be a truely specialized member of the arcto-alpine flora, apparently confined to *Salix herbacea*.

Cortinarius (Myxacium) trivialis J. E. Lange

ML608, Ivigtut, 21. Sept., in *Salix glauca* thicket, in deep moss.

Distribution: Only Greenland record, but a very well developed and typical specimen, growing in the richest *Salix* copse in the Ivigtut area. Not known from other arcto-alpine stations.

Cortinarius (Myxacium) delibutus Fr.

ML271, Sdr. Strfj., Nákajanga, 10. Aug., in deep moss on north slope; ML309, ibid., Hassells Fjeld, 18. Aug., on north slope; ML534, Ivigtut, 11. Sept., edge of *Salix* thicket with *Betula glandulosa*.

Distribution: Not common in Greenland, met only a few times at Sdr. Strfj., and once at Ivigtut. The specimens from Sdr. Strfj. were rather small and may well correspond to the forma *gracilentus* which

CHRISTIANSEN describes from Iceland, also the specimens found in the alpine zones in Lappland (LANGE) are generally small, while the Ivigtut specimen corresponds to the typical form found in the upper *Betula* woods in Norway (BLYTT) and in Lappland (LANGE).

Cortinarius (Inoloma) argutus FR.

ML283, Sdr. Strfj., Nákajanga, 10. Aug., fell field on top of mountain, 700 m alt.

The specimen was first referred to *C. turgidus*, but the spores are larger, 11—12.5 × 6.5—8 μ, and also other characters support the present determination. The specimen is, however, small and not very characteristic.

Distribution: Only Greenland record, and not known from other arcto-alpine stations.

Cortinarius (Dermocybe) decoloratus FR.

ML548, Ivigtut, 14. Sept., in *Salix* thicket.

Distribution: Only Greenland record, and not known from other arcto-alpine stations.

Cortinarius (Dermocybe) anomalus FR.

ML272, Sdr. Strfj., Nákajanga, 10. Aug., fell field on top of mountain, 700 m alt.; ML533, Ivigtut, 11. Sept., edge of *Salix* thicket, with *Betula glandulosa*.

The specimen from Ivigtut seems quite typical, while the small form from Sdr. Strfj. has longer spores, 10—11 × 7 μ, mixed with a few quite smooth and very long ones, up to 18 μ.

Distribution: Only records from Greenland. Found in Iceland by both LARSEN and CHRISTIANSEN, occurring in high alpine zones in Norway and Lappland (BLYTT, LANGE), and also frequent in the Alps (FAVRE).

Cortinarius (Dermocybe) cinnamomeus (L. ex FR.) FR.

ML9, Grönnedal by Ivigtut, 9. July; ML99, Sdr. Strfj., Itivdlínguaq, 24. July, in dry *Cassiope tetragona* heath; ML201, ibid., Hassells Fjeld, 4. Aug., in *Sphagnum* and other mosses, 400 m alt.; ML622, Ivigtut, 22. Sept., in dwarf shrub heath.

All specimens seem to belong in the typical form; spores 7.5—10 × 5—6 μ, vacuolar pigments vivid cherry red in KOH especially in basidia.

Distribution: Rather common in all stations visited, including also Kangâmiut and Godthåb. In the Sdr. Strfj. area mostly found in heaths rich in moss and in boggy areas with *Sphagnum*, but also in

snow beds up to 600 m alt. Recorded from most other arcto-alpine areas such as Svalbard (KARSTEN), Jan Mayen (HAGEN), Iceland (LARSEN, CHRISTIANSEN), Norwegian mountains (BLYTT), Lappland up to 1150 m alt. (LANGE) and the Alps (FAVRE), thus being one of the more common species on acid soil in these areas.

Cortinarius (Telamonia) hinnuleus var. **gracilis** MAIRE

ML326, Sdr. Strfj., Hassells Fjeld, 20. Aug., in *Kobresia* vegetation near *Salix*.

The variety is very much smaller than the type, but the microscopic characters seem to be exactly the same; cap covered with narrow hyphae with incrusting pigment, trama of almost pseudoparenchymatic—inflated brownish not visibly incrusted cells, gill trama with incrusted, 3—6 μ broad hyphae in outer layer, central layer of 10—20 μ broad hyphae, spores verrucose-rough, 9×6 μ. The variety is excellently described and illustrated by FAVRE (1955).

Distribution: The typical form has not been met with in Greenland. The var. *gracilis* was found in a few places on the south slope of Hassells Fjeld under *Salix* in rather moist places, gregarious. I know of no other records from far northern localities, while FAVRE found both this variety and the type in the Alps.

Cortinarius (Telamonia) punctatus PERS. ex FR. sensu J. E. LANGE

ML231, Sdr. Strfj., Hassells Fjeld, 6. Aug., in moist *Salix* copse with tall *Calamagrostis*.

Distribution: Very rare in the Sdr. Strfj. area but found not infrequently in the *Salix* copses at Ivigtut. No other arcto-alpine records.

Cortinarius (Telamonia) hemitricus (PERS. ex FR.) FR.

ML278, Sdr. Strfj., Nákajanga, 10. Aug., snow bed, in *Sphagnum*; ML424, 425, ibid., Hassells Fjeld, 28. Aug., in *Salix* copse; ML648 Ivigtut.—FT143, Holsteinsborg, 12. Sept., 1955.

Distribution: The species was quite frequent in moss in *Salix* copses both at Sdr. Strfj., and Ivigtut. The specimen from Nákajanga was not quite typical and also some other specimens found were somewhat aberrant forming transitions to *C. paleaceus* and *C. flexipes*. *C. hemitricus* is recorded from Iceland by both LARSEN and CHRISTIANSEN, found also in Lappland (LANGE, unpubl.) and in the Alps (FAVRE). It is not unlikely that some of the related species, described from the Alps by FAVRE, may also have been collected in Greenland by me, although not represented in the preserved collections.

Cortinarius (Telamonia) paleaceus WEINM. ex FR.

ML100, Sdr. Strfj., Itivdlínguaq, 24. July, in *Sphagnum* tussock in heath with scattered *Salix glauca* and *S. arctophila*; ML549, Ivigtut, 14. Sept., in moss in *Salix* copse.

Distribution: Typical specimens were found at a few localities in the Sdr. Strfj. area and at Ivigtut, but more often did the specimens show characters intermediate with *C. hemitricus*. The same holds true for specimens found by me in Lappland.

Cortinarius (Hydrocybe) saturninus FR.

ML260, Sdr. Strfj., Ravneklippen, 8. Aug., in *Salix* copse in rather dry moss, fasciculate; ML340, ibid., Hassells Fjeld, 21. Aug., in *Salix* copse with close vegetation of *Calamagrostis*.

Distribution: Found a few times in the *Salix* copses at Sdr. Strfj. but encountered also up to about 500 m alt. associated with low *Salix* shrubs. Also noted a few times in *Salix* copses at Ivigtut. Two specimens collected by TERKELSEN, at Godhavn and Egedesminde, may possibly belong here also. CHRISTIANSEN records the species from Iceland, but besides that I know of no arcto-alpine records.

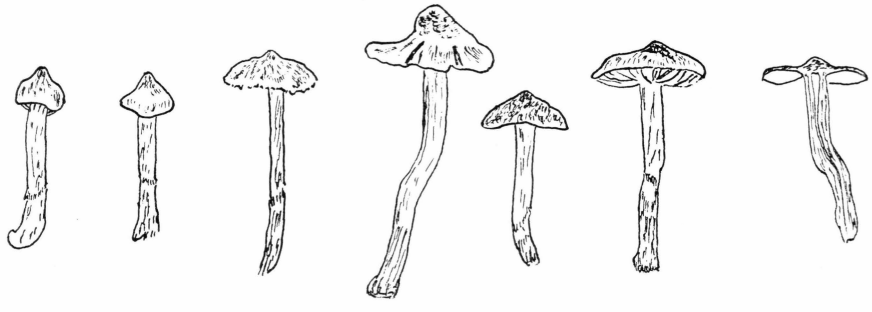

Fig. 14. *Cortinarius phaeopygmaeus*. ML141. Fruit bodies (×1).

Cortinarius (Hydrocybe) phaeopygmaeus FAVRE

(Fig. 14)

ML141, Sdr. Strfj., 30. July, low heath near camp; ML247, ibid., Ravneklippen, 8. Aug., *Salix* copse in deep moss.

The species resembles a small *C. psammocephalus* FR. Its microscopic characters check in all detail with FAVRE's description (1955) viz. cap with an upper layer of closely woven dark vinaceous brown hyphae with scattered large pigment incrustations; main trama layer of coarser, inflated hyphae, paler and pigments more scattered, gill trama similar, of short inflated elements; spores 10—11.5 × 6—7 μ, finely to moderately

coarse verrucose. ML141 has slightly smaller spores (8.5—10.5 × 6 μ) thus indicating a transition to *C. scotoides* FAVRE.

Distribution: Found here and there in the Sdr. Strfj. area, mostly in *Salix* thickets. Also noted from Godthåb. Common in the Alps (FAVRE).

Cortinarius (Hydrocybe) glandicolor var. exilis FAVRE

ML89, Godthåb, 18. July, on low cliffs; ML101, Sdr. Strfj., Itivdlínguaq, 24. July.

The variety is small and with short stipe. The gill trama finely incrusted, of up to 20 μ broad hyphae, spores 9—11 × 6.5—7 μ, rather coarsely sculptured.

Distribution: Specimens referred to the vicinity of *C. glandicolor* were found in several places at Godthåb, Sdr. Strfj., and Ivigtut. ML89 and ML101 could be referred with certainty to var. *exilis*. The variety in question is not yet reported from other stations outside the Alps, but it is not unlikely that *C. rigidus*, found on Iceland by CHRISTIANSEN and LARSEN, and also specimens so named by me, found in Lappland, may belong here.

Cortinarius (Hydrocybe) psammouraceus n. sp.

(Fig. 15)

ML377, Sdr. Strfj., Sandflugtdalen, 24. Aug., in dune sand.

Pileus 1.5—2.5 cm latus, subglobulari-planus, deïnde plano-convexus, leviter umbonatus vel depressus, badius, subhygrophanus, margine rimoso-fibrillosus, velo pallido, carne pallide fusco-purpurea; lamellae subdistantes, emarginatae, argillaceae, deïnde cinnamomeae; stipes 1.0—1.7 cm altus, 0.2—0.4 cm latus, colore pileï vel pallidior, cinnamomeo-fibrillosus, basi attenuatus; sporae magn. 8.4—10 × 4.8—5.3 μ, laeves.

Typus die 24. Aug. ad sinum Sdr. Strömfjord Groenlandiae occidentalis sub numero ML377 lectus, in Museo Botanico Hauniensi depositus.

Cap 1.5—2.5 cm broad, flattened subglobose at first, then expanded low convex, the margin decurved, centre ± depressed or rarely with low umbo, dark brown (Bone Brown to Bistre, c2—3), slightly hygrophaneous, cuticle in central part cracking up in indistinct polygones, towards margin cracking to appear almost as rimoso-fibrillose or even fibrillose scaly, margin proper yellowish-brownish fibrose, on young specimens with distinct grayish white veil; flesh comparatively thick, pallid purplish brown; gills rather broad and thick, not crowded, broadly emarginate, pale grayish brown when young, then Tawny Olive to Cinnamon Brown (h2—g8); stipe short, 1.0—1.7 × 0.2—0.4 cm, terete or somewhat compressed, concolorous with cap or paler, covered with yellowish brown fibrils, substriate, solid, slightly hollow when old, flesh purplish brown, base sometimes slightly attenuated, covered with

whitish to faintly flesh coloured felt. Trama of cap with upper layer of hyphae with dark brown walls, not visibly incrusted, inner layer with distinct fine incrustations; gill trama regular, brown from incrusting pigments, hyphae up to 24 μ broad; basidia 25—30 $\times$ 6—6.5 μ, 4-spored, a few 2-spored, clamp connections present; spores 8.4—10 $\times$ 4.8—5.3 μ, elliptic oblong, very pale brown, appearing quite smooth, apiculus small, suprahilar depression faint, rather many twin-spores.

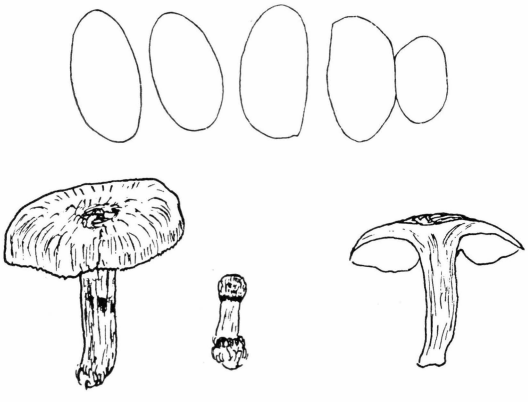

Fig. 15. *Cortinarius psammouraceus*. ML377. Fruit bodies ($\times$ 1), spores ($\times$ 1600).

The species belongs in the group around *C. uraceus*. It seems quite distinct, recognisable on dark colours, smooth, very pale spores and very likely also on habitat.

Distribution: Only known from the type locality, where it grew in large flocks in dune sand, with small scattered *Salix* shrubs.

Cortinarius (Hydrocybe) saniosus Fr.

ML248, Sdr. Strfj., Ravneklippen, 8. Aug., *Salix* copse in deep moss, fasciculate.

Distribution: Only record from Greenland, not known from other arcto-alpine areas.

Cortinarius (Hydrocybe) obtusus Fr.

ML550, Ivigtut, 14. Sept., in *Salix* copse.

Distribution: A few small Cortinaria from various Greenland stations may possibly belong in *C. obtusus*, but typical specimens were only met at Ivigtut, a few finds in deep moss in *Salix* copses. I have found typical specimens also in the lower montaneous zones at Abisko, Lappland.

Cortinarius (Hydrocybe) acutus (Pers. ex Fr.) Fr.

ML511, Godthåb, 6. Sept., in low heath with *Salix glauca* and *S. herbacea*.

The material belongs in the pallid very sharply acuminate form which has been described and illustrated by Favre and by M. Lange (cp. M. Lange 1946).

Distribution: Locally very common at Godthåb, in humid heath areas, and also met at Kangâmiut. Not recorded from other arcto-alpine stations.

Cortinarius (Hydrocybe) pulchellus J. E. Lange

ML590, Grönnedal by Ivigtut, 18. September, in *Alnus* copse; ML627, Ivigtut, 22. Sept. in snow bed with *Salix herbacea*.—FT60, Godhavn, 18. Aug., 1955, in moss under *Salix*.

Distribution: Only records from Greenland, and only ML590 quite typical, the other two collections slightly dubious. No other arcto-alpine records.

Several collections of Cortinaria have not been definitively identified. 4 specimens (ML21, ML69, Ivigtut, ML88, Godthåb, and ML136, Sdr. Strfj.) represent a species related to *C. torvus*, but differing somewhat in stature, and microscopically not all identical, ML128, Sdr. Strfj. was in the field referred to *C. incisus*, but seems to check in microscopical details with *C. pauperculus* Favre, in which species it may well belong, ML242, with rough spores and distinct clavate cheilocystidia is close to *C. inops* Favre, while ML246, Sdr. Strfj. is a form of the *C. uraceus*-group, close to *C. inconspicuus* Favre, but with larger spores, ML532 is close to *C. junghuhnii* while finally ML376, Sdr. Strfj. is a very distinct, arenicolous form of the *C. incisus* group, probably representing an undescribed species. The material and field descriptions of these species did not permit a final classification. I have seen several specimens collected by Terkelsen, mostly *Hydrocybe* and *Telamonia* spp., but the identification of these has not been possible, as the field descriptions are imperfect or lacking.

Galerina Earle

Galerina clavata (Vel.) Kühner

ML61, Narssarssuaq, 13. July, in *Sphagnum*-bog, gregarious; ML75, Ivigtut, 15. July, in wet moss; ML79, Godthåb, 17. July, in wet moss, gregarious; ML229a, Sdr. Strfj., Hassells Fjeld, 6. Aug., in deep, wet moss, 400 m alt. — FT13, Godthåb, 12. Aug., 1955; FT71, Godhavn, 20. Aug., 1955, in moss by small lake; FT89, ibid., 26. Aug., 1955, in moss along creek; FT128, Egedesminde, 5. Sept., 1955, in moss under *Salix*. Lock Fyne Fjord (E. Gr., 73°0′ N.) 27. July 1930, leg. Scholander.

Most specimens found were typical in all respects, but including both 2- and 4-spored forms. FT71 is a very dark form, and FT128 a short-stemmed form, the latter differing somewhat in microscopic characters.

Distribution: A common species in Greenland, often growing gregarious in the wet moss carpets. Noted at several places at the main stations visited by me, and also found at Kangâmiut (1. Sept.), but much less common in the Sdr. Strfj.-area than in the stations close to the ocean. Probably also widely distributed in other arcto-alpine areas. FAVRE reports it from high altitudes in the Alps, I have collected it myself in Lappland, up to about 1300 m alt., and MØLLER found it on the Færöes. *G. mycenopsis*, found on Iceland by POUL LARSEN and reported also from Jan Mayen by the same author (1924) should probably also be considered as belonging in *G. clavata*, as far as it can be judged from the description.

Galerina vittaeformis (FR.) SING.

ML12, Grönnedal by Ivigtut, 7. July; ML33, ibid., 11. July; ML108, Itivdlínguaq, Sdr. Strfj., 24. July, in deep moss along creek; ML215, Sdr. Strfj., 4. Aug.; ML254, Ravneklippen, 8. Aug., in *Salix* copse; ML343a, ibid., Hassells Fjeld, 22. Aug., wet moss on lake shore, 400 m alt.; ML514, Godthåb, 6. Sept.— FT157, Sdr. Strfj., 17. Sept., 1955.

Almost all specimens studied were devoid of pilocystidia, found sparingly in ML12 only, which specimen also in other respects was found different from the rest. ML33, 215, 514 were 2-spored, the remaining specimens 4-spored. KÜHNER (1935) has used the name *G. muricellospora* (ATK.) for the 2-spored form, and this name may well be applied to the entire Greenland material, as the type of *G. muricellospora* according to SMITH (1954) is devoid of pilocystidia, thus differing from the typical *G. vittaeformis* sensu J. E. LANGE. Most modern authors prefer the name *G. rubiginosa* (FR.) KÜHNER but the original description of *G. vittaeformis* seems more appropriate, clearly indicating the pilosity of the stem, while *G. rubiginosa* originally was discribed with smooth stem ("stipes nitido, glabro, rubiginoso" FRIES 1838).

Distribution: A common species in Greenland as in other arcto-alpine areas. FAVRE found it to be frequent in the high Alps, DENNIS (1955) reports it from the mountain tops in Scotland, and I have collected it in Iceland (LANGE 1949) and Lappland (unpubl.). It has most likely been overlooked by other students of the arcto-alpine flora, or they have included it in *G. hypnorum*. SINGER (1953) records it from Tierra del Fuego, Altai, and Novaya Zemlya.

Galerina badipes (Fr.) Kühner

ML541, Grönnedal by Ivigtut, 12. Sept., on burned over area.

Numerous specimens were found together, probably growing on charcoal. The specimens seem very much like *G. badipes* as described by Kühner (1935) but differs in slightly larger size and paler colours. Smith (1954) mentions two species of *Galerina* from charcoal (*G. carbonicola* Smith and *G. ferruginea* Smith) but both seem clearly different from the Greenland species through lack of pleurocystidia and paler stipe.

Distribution: Not known from other Greenland localities, nor from other arcto-alpine stations.

Galerina pumila (Fr.)

ML125, Sdr. Strfj., main valley, 29. July, in low, moist heathy area.—FT14, Godthåb, 12. Aug., 1955; FT42, Egedesminde, 16. Aug., 1955; FT76, Godhavn, 23. Aug., 1955, in moss near pond; FT127, Christianshåb, 4. Sept., 1955, in moss under *Salix*. Mygbugten (E. Gr., 73°30′ N.) 2. Aug., 1930, leg. Scholander; Landingsdalen (E. Gr., 74°30′ N.) 21. July, 1930, leg. Scholander.

Part of the Greenland material may eventually be referred to *Pholiota praticola* Møller, if this taxon is found sufficiently different from *G. pumila*.

Distribution: A common species in low moist areas in Greenland, already included in Rostrup's list from 1888 (Godhavn, leg. Warming) and noted by me also from Ivigtut and Godthåb. Common also in Iceland (Larsen, Christiansen, sub *Phol. marginata*, Lange 1949, sub *P. praticola*) and in the Færöes (Møller). In the high alpine zones of Norway (Blytt), Lappland (M. Lange, unpubl.) and the Swiss Alps (Favre).

Galerina marginata (Batsch ex Fr.) Kühner

ML551, Ivigtut, 14. Sept., on imported wood.

The specimen found could be referred to *G. unicolor* (Vahl ex Fr.) if this taxon deserves any independent rank.

Distribution: Recorded already by Rostrup (1891) from Ritenbenk (W. Gr., 69°44′ N.) growing on old imported logs. I have not met this species on birch wood in Greenland, where suitable old logs are rare, but it may well occur in such habitats in the southernmost stations. It is quite common in the upper birch wood zone in Lappland (Lange, unpubl.).

My field notes include three further species of *Galerina* from various Greenland stations, viz. *G. hypnorum* (Schrank ex Fr.) Kühner,

G. mycenopsis (FR.) KÜHNER, and *G. mniophila* (LASCH ex. FR.). The material of the two first species represented *G. vittaeformis* and *G. clavata* respectively, while the material of *G. mniophila* was too poor to proove its identity. All three species were, however, noted from several stations, both at Ivigtut and in the Sdr. Strfj. area, and it is highly probable that some of these records have been correct. *G. hypnorum* is included in a very large number of lists from arctic stations but the more detailed presentations indicate doubt as to the identification. Also *G. mycenopsis* and *G. mniophila* are mentioned from localities in the far north, but the inclusion of these species in the arcto-alpine flora must await definite proof based on better material.

Crepidotaceae

Tubaria (W. G. SMITH) GILL.

Tubaria furfuracea (PERS. ex FR.) GILL. sensu J. E. LANGE

ML11, Grönnedal by Ivigtut, 9. July, on clayey road side in camp; ML36, ibid., 11. July, similar locality; ML152, Sdr. Strfj., main valley near camp, 31. July, in dry heath near the houses.

Distribution: The species was found on or close to places where natural vegetation had been removed by man, and may be introduced. There are some previous records from Greenland (ROSTRUP 1888, FERDINANDSEN 1910) but they might as well represent the following species. The same holds true for a record from Svalbard (DOBBS 1942).

Tubaria pellucida (BULL. ex FR.) GILL. sensu J. E. LANGE

ML244, Sdr. Strfj., Ravneklippen, 8. Aug., a small flock on wet *Salix* leaves; ML426, ibid., Hassells Fjeld, 28. Aug., in *Salix* scrub on leaves and sticks.

Distribution: Found only in the Sdr. Strfj. area, and not common. Also recorded from Iceland (CHRISTIANSEN), cp. note under *T. furfuracea*.

Ripartites KARST.

Ripartites tricholoma (A. & S. ex FR.) KARST.

ML121, Sdr. Strfj., 29. July, main valley in boggy heath with *Salix* and *Betula nana*.

Distribution: Found twice in the Sdr. Strfj. area, but not noted elsewhere in Greenland. Known also from the upper birch wood zone in Lappland (LANGE, unpubl.), and from the *Dryas* regions in the Alps (FAVRE).

Crepidotus (Fr.) Staude

Crepidotus longisporus n. sp.

(Fig. 16)

ML537, Ivigtut, 12. Sept., on moist soil; ML596, 629, 649, ibid., 18.—28. Sept., on *Salix* branches.

Sessilis vel subsessilis. Pileus 0.3—2 cm latus, reniformis vel lobatus, saepe substrato adpressus, albus, fibrilloso-hispidus; lamellae latae, distantes, albae, deïn pallide argillaceae, hyphis superficialibus hyalinis, 3—6 μ latis, efibulis, hyphis tramalibus similibus earum vel usque ad 14 μ latis; cheilocystidia attenuata, magn. 30×3 μ, basi inflata, 6 μ lata; sporae 9.0—14.6 $\times$ 4.8—6.5 μ.

Typus die 12. Sept. in ramo Salicis ad urbem Ivigtut Groenlandiae occidentalis sub numero ML537 lectus, in Museo Botanico Hauniensi depositus.

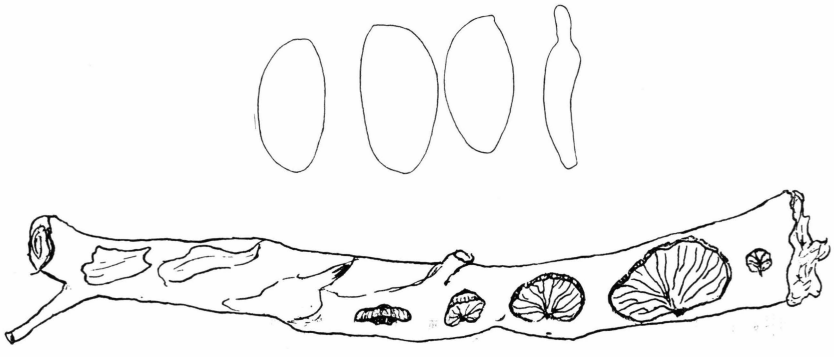

Fig. 16. *Crepidotus longisporus*. ML596. Fruit bodies ($\times$ 1), spores ($\times$ 1600), and cheilocystidium ($\times$ 700).

Cap 0.3—2 cm broad, reniform or irregularly lobed, often with surface appressed to substratum when older, almost pure white, covered with white, silky hairs; margin incurved when young; flesh thin; gills rather broad, distant, white at first, then pale brown from spores; stem very short or absent, densely hairy when present.

Cap covered by loose weft of hyaline hyphae, 3—6 μ broad, sparingly branched, septated, without clamp connections, rather few hyphae near margin, thick coating further behind; trama proper of similar hyphae, more densely woven and also with some more inflated hyphae up to 14 μ broad, entire pileus trama only about 200 μ thick; gill trama of similar hyphae, the broader ones more predominant and up to 25 μ broad, subhymenium of 3—4 layers of almost isodiametric cells, 6—10 μ diam., all trama layers subhyaline to hyaline; cheilocystidia hairshaped, about 30×3 μ or with base swollen and up to 6 μ broad; basidia about 30×8—9.5 μ, 4-spored, rarely 2-spored; spores pale brown, smooth, even when carefully studied at strong magnification, but contents somewhat granular.

The species seems well distinguished from other small Crepidoti by the long smooth spores and clampless hyphae. It recalls *C. lundellii* PILÁT and *C. versutus* (PECK) SACC., both with minutely punctate somewhat shorter spores. It seems also close to the genus *Pleurotellus*, but is distinguished from *P. pubescens* (FR.) sensu SCHROETER and J. E. LANGE on broader and truely brown spores.

Distribution: Found in a few places in the Ivigtut area growing on *Salix* branches, or sometimes on moist soil under branch heaps. Not reported as yet from other localities.

Rhodophyllaceae

Clitopilus (FR.) QUÉL.

Clitopilus septicoides (HENN.) SING.

syn.: *Pleurotus chioneus* (PERS. ex FR.) sensu J. E. LANGE
Clitopilus pleurotelloides (KÜHNER) JOSS.

ML332, Sdr. Strfj., Hassells Fjeld, 20. Aug., on *Salix* leaves.

Distribution: Found twice, in *Salix* copses on Hassells Fjeld, but not noted from other Greenland stations nor from other arcto-alpine areas.

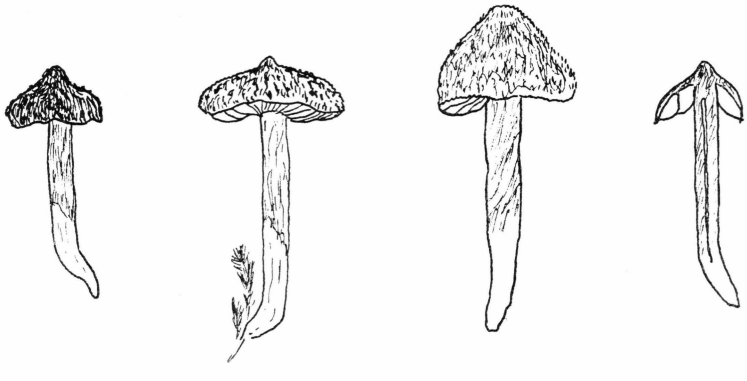

Fig. 17. *Rhodophyllus jubatus*. ML235. Fruit bodies (× 1).

Rhodophyllus QUÉL.

Rhodophyllus jubatus (FR.) QUÉL.

(Fig. 17)

ML235, Sdr. Strfj., Hassells Fjeld, 6. Aug., several finds, in *Sphagnum*-bog.

The material checks well with *R. jubatus*, as described by FAVRE (1948), but the species is probably not too clearly separated from *R. por-*

phyrophaeus (Fr.). The cystidia are about $60 \times 16 \times 11\ \mu$ distinctly capitate; the spores 9—10.5 × 6.5—7 μ; clamp connections are present at base of basidia only, the cap covered with suberect, broadly rounded hyphal ends, 10—13 μ broad, pigment vacuolar. It is extremely likely that *Entoloma fusco-tomentosa* Møller, described from the Færöes (Møller 1945) is identical with the Greenland form.

Distribution: Only Greenland record, but known also from Lappland, where it reaches high altitudes (1150 m, M. Lange, unpubl.) and probably from the Færöes (cp. above).

Rhodophyllus clypeatus (L. ex Fr.) Quél.

ML262, Sdr. Strfj., Ravneklippen, 8. Aug., in deep cave, facing north west, with very scant vegetation of phanerogames.

Very well developed fruit bodies growing fasciculate, to be referred to the typical form, and not reminding of *R. clypeatus* var. *alpicolum*, described by Favre from the Alps.

Distribution: Only Greenland record.

Rhodophyllus speculus (Fr.) Quél.

ML428, Sdr. Strfj., Hassells Fjeld, in *Salix* thicket.

Distribution: Only record from Greenland, and not known from other arcto-alpine areas.

Rhodophyllus radiatus J. E. Lange

ML233, Sdr. Strfj., Hassells Fjeld, 6. Aug., in wet moss on steep rock; ML245, ibid., Ravneklippen, 8. Aug., in deep moss in *Salix* thicket.

Distribution: Only Greenland records, but probably overlooked at some of the other stations, esp. Godthåb. Known also from Lappland, in the upper birch wood zone, and very likely included among the numerous forms referred to *R. sericeus*, mentioned by Favre from the Alps.

Rhodophyllus sericeus (Bull. ex Fr.) Quél.

ML236, Sdr. Strfj., Hassells Fjeld, 6. Aug., in moss on edge of bog with *Salix*.

The species was in the field referred to the vicinity of *R. nidorosus* (Fr.), but microscopic characters, such as the strongly incrusted hyphae, agree better with *R. sericeus*.

Distribution: Found a few times in the Sdr. Strfj. region, and probably also at Godthåb and Ivigtut.

Known from Iceland (LARSEN, CHRISTIANSEN), from the Færöes (MØLLER), and from Lappland (LANGE). Several small forms are on record from the Alps (FAVRE, cp. also *R. radiatus*).

Rhodophyllus cetratus (FR.) QUÉL.

ML276, Sdr. Strfj., Nákajanga, 10. Aug., in deep moss on north slope.

Very typical material of the usual 2-spored form.

Distribution: Only noted once, but probably confused with *R. nitens*. Found in Lappland up to 1025 m alt. (LANGE, unpubl.), and recorded from mountain tops in the Scottish highland (DENNIS 1955).

Rhodophyllus anthracinellus n. sp.

(Fig. 18)

ML202, 218, Sdr. Strfj., Hassells Fjeld, 4. Aug., in moss and *Sphagnum*-carpet. Pileus 2—2.5 cm latus, subplanus, nigro-cinereus, leviter fibrillosus; lamellae confertae, cinereae; stipes 3—3.5 × 0.2—0.4 cm, cinereus; hyphis efibulis, basidiae fibulatae, sporae 7.4—10.3 × 5.2—7.1 μ. Typus (ML218, 4. Aug. 1956) in Mus. Bot. Haun.

Cap 2—2.5 cm broad, expanding to almost flat with slightly depressed centre, dark ashy grey, almost black when moist, pale grayish brown when dry, nearly glabrous, finely appressed silky fibrillose, margin incurved when young; flesh thin, grey; gills narrow, rather crowded

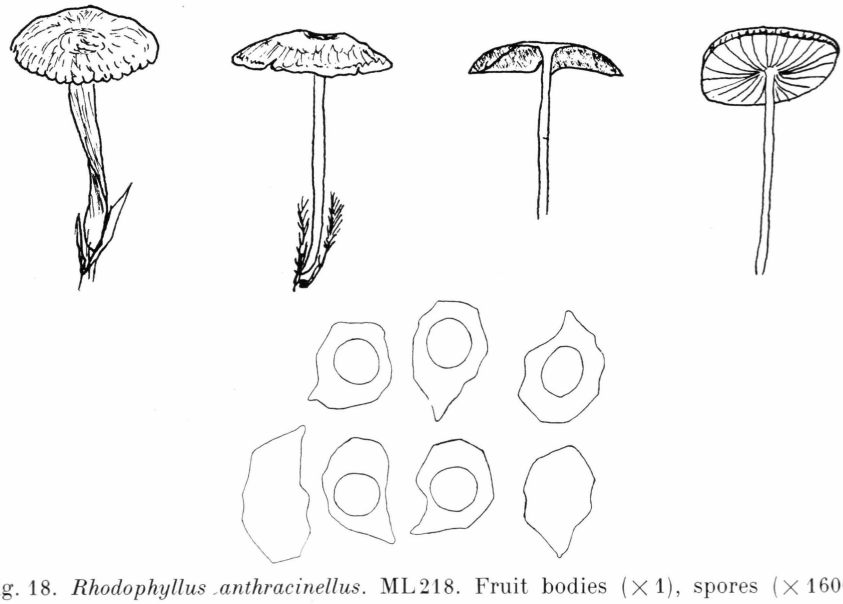

Fig. 18. *Rhodophyllus anthracinellus*. ML218. Fruit bodies (× 1), spores (× 1600).

with a decurrent denticle, ashy grey like the cap, reddening from ripening spores; stem 3—3.5 × 0.2—0.4 cm, cylindric or somewhat flattened, con-

colorous with cap, slightly paler above, with fine white puberulence, flesh grey, solid, base with white felt. Smell and taste not distinctive.

Epicutis thin, of several layers of poorely differentiated hyphae, hyaline, brownish in lower part; cap trama cinnamon, darkest in outer part, of interwoven hyphae, 5—10 μ broad, walls with incrusted pigment, scattered oleiferous vessels also present, their walls strongly incrusted; gill trama regular, brownish, especially towards hymenium, clamp connections absent on hyphae, but present on base of basidia, 4-spored, about $35 \times 8\,\mu$, content granular; spores 7.4—10.3 × 5.2—7.1 μ, very variable in size and shape, cystidia absent.

The species is difficult to place in the subsections of *Rhodophyllus*. It resembles *R.* (*Entoloma*) *anthracinus* FAVRE, but the hyphae have incrusted walls and lack clamp connections, and the fungus here described is all together more *Nolanea*-like, in which subgenus it may find its place close to *R. infulus* (FR.) LANGE, which, however, is much paler.

Distribution: Only known from a few finds on Hassells Fjeld.

Rhodophyllus junceus (FR.) QUÉL.

ML188, Sdr. Strfj., 31. July, in moist place in *Salix-Vaccinium uliginosum* heath.

Distribution: Only Greenland record. Iceland (LARSEN), Lappland in the upper birch wood zone (LANGE, unpubl.).

Rhodophyllus nitens (VEL.) KÜHNER & ROMAGN.

ML119, Sdr. Strfj., 29. July, main valley, in moist heath; ML263, ibid., Ravneklippen, 8. Aug., several places in deep moss.

The specimens were originally refered to *R. hirtipes* (SCHUM. ex FR.) LANGE, but lack cystidia and check well with *R. nitens* in short, thickwalled spores and other microscopical characters.

Distribution: Not uncommon, in mossy places on north slopes and in *Salix* thickets at Sdr. Strfj. Also noted at Godthåb. I have not as yet been able to demonstrate its occurrence in other arcto-alpine areas.

Rhodophyllus cancrinellus n. sp.

(Fig. 19)

ML652, Ivigtut, Nordlandet, 27. Sept., on needles of *Juniperus*. *R. cancrinus* similis, sed statura subgenus Eccilia. Sporae 7—7.5 × 5.5—6 μ. Typus (ML652, 27. Sept. 1946) in Mus. Bot. Haun.

Cap 1 cm broad, distinctly infundibuliform, slightly fibrillose, white with a flush of cream colour, edge somewhat incurved; gills rather deeply decurrent, pinkish from spores; stem 2.5 × 0.2 cm, finely fibrillose.

Cap covered by layer of 3—4 μ broad, loosely woven hyaline hyphae,

cap trama similar, more closely woven and faintly coloured from incrusting pigment; gill trama regular, all hyphae without clamp connections; cystidia absent, basidia without clamp connections at base, mostly 4-spored, 20—30 × 6 μ, a few 2-spored ones with very long sterigmata; spores short elliptic-subglobose, with irregular wavy outline but not truely angular, 6.0—7.5 × 5.5—6.0 μ.

The species recalls *R. cancrinus* (FR.), but is still more eccilioid and slender, the spores have the same wavy outline, but are much shorter, and clamp connections are absent.

Distribution: Only known from the type locality, a single find.

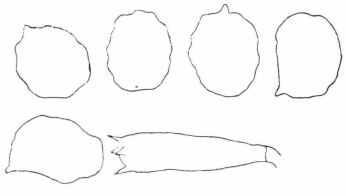

Fig. 19. *Rhodophyllus cancrinellus*. ML652. Spores (× 1600).

Paxillaceae

Paxillus FR.

Paxillus involutus (BATSCH ex FR.) FR.

ML520, Ivigtut, 11. Sept., under *Betula glandulosa* in heath.

Distribution: Found in a few places in the Ivigtut area, associated with *Betula glandulosa* or *Betula tortuosa*, up to 400 m alt., not noted in the stations further to the north. Not known from Iceland and the Færöes, and in Norway and Lappland not found above the timber line (BLYTT, LANGE). SINGER reports it from the *Nothofagus*-regions in South America (1953).

Boletaceae

Leccinum S. F. GRAY

Leccinum scabrum (BULL. ex FR.) GRAY

ML109, Sdr. Strfj., Itivdlinguaq, 24. July, in *Betula nana* heath; ML356, ibid., Hassells Fjeld, 22. Aug., in *Betula nana* heath on lake shore, 400 m alt.—Vega Sund (E. Gr., 72°40′ N.) 15. Aug., 1930, leg. SCHOLANDER; Moskusoksefjord (E. Gr., 73°40′ N.) 4. Aug. 1930, leg. KNABEN; Clavering Ö (E. Gr., 74°10′ N.) 27. July 1930, leg. VAAGE & SCHOLANDER.

The Greenland specimens could probably be referred to *L. scabrum* var. *rotundifoliae* (SING.) SING. Large forms are, however, quite common and hard to distinguish from the type.

Distribution: The species seems almost exclusively confined to *Betula* spp., thus absent at Kangâmiut, and only found once at Godthåb, where *Betula* is rare in the area of survey. It was very common both at Ivigtut and Sdr. Strömfjord and on the latter locality also found a single time without any possible connection with *Betula* (cp. p. 99). ROSTRUP records it from several Greenland localities (1888, 1891, 1894), as far north as Upernavik (W. Gr., 72°47′ N.); it is known from Iceland (LARSEN, CHRISTIANSEN) and there is an old record from Svalbard, where HESSELMAN (1900) found the species growing at the only *Betula nana*-stand in the area. It is not included in the lists from the Færöes and Jan Mayen. There is but a single record from Arctic Canada (Herschel Island, DEARNESS 1923), while it is common in Lappland (up to 1100 m alt. M. LANGE, unpubl.). It is also known from Norway (BLYTT) and from Siberia (SINGER 1954).

Leccinum testaceoscabrum (SECR.) SING.

ML569, Ivigtut, 15. Sept., Taylers Havn, south slope in *Betula glandulosa* heath.

Distribution: The only confirmed record from Greenland. According to SINGER (1954) a common species in the *Betula* heaths in Siberian tundra regions. Frequent in the upper birch wood zone in Lappland, but not met over the timber line.

Russulaceae

Russula PERS. ex S. F. GRAY

The genus *Russula* was abundantly represented at all stations visited. In a low heath at Godthåb, I met not less than seven species in or near 10 quadrats of 1 sq. m (Tab. 8, p. 85) but the species could not all be identified on the spot, and preservation was not possible. At the skerries by Kangâmiut a *Russula* flora was found which was still more abundant and rich in species, several of which seemed quite distinct from previously described forms. The material was lost in bad weather on the ship. Also the remaining collections from other areas include specimens which probably represent new taxa, some of the identifications listed below are tentative and given with some reserve, while a few specimens have remained unidentified. The Greenland *Russula* flora needs badly a renewed study by a specialist, before it can be compared with the floras described from Altai by SINGER (1938) and from Lappland by SCHAEFFER (1939) who studied the large Lappland collection gathered by ROMELL, but only published as a series of footnotes by him (ROMELL 1912).

Russula delica FR.

ML111, Sdr. Strfj., 27. July, in low heath in main valley. — FT83, FT103, Godhavn, 25., 28. Aug. 1955.

All specimens are rather small, and the spores not fully ripe, making it difficult to exclude the possibility that they may represent *R. pseudodelica* LANGE.

Distribution: Only found twice in Greenland by me, (Strömfjord, Godthåb) and a rare species also in Lappland (LANGE) and in Iceland (LARSEN). On record (as var. *bresadolae* SING.) from the Alps, Caucasus, and Altai (SINGER 1938).

Russula alpina (BLYTT) MÖLLER & SCHAEFF.

ML39, Grönnedal by Ivigtut, 11. July; ML166, Sdr. Strfj., 31. July, main valley, in moss in low heath; ML190, ibid., 2. Aug., under *Betula nana*; ML307, ibid., Ravneklippen, 18. Aug., on north slope with *Betula nana*. — FT4, Godthåb, 11. Aug. 1955; FT35, Egedesminde, 16. Aug. 1955; FT134, Holsteinsborg, 12. Sept. 1955.

Rather close to *R. emetica* SCHAEFF. ex FR., but smaller, less acrid, and with almost globose spores sculptured by a rather perfect, but low and fine net.

Distribution: One of the few species known as typical for the arcto-alpine areas, but frequently recorded as *R. emetica*. It was found rather commonly at all stations visited by me, including Godthåb and Kangâmiut, confined mostly to low heaths, humid north slopes or snow beds. Known also from Iceland (CHRISTIANSEN), Færöes (MØLLER), Norwegian and Lappland mountains (BLYTT, LANGE), and from the Alps (FAVRE), everywhere reaching higher altitudes than almost all other species of the genus. It seems widely distributed. SINGER records it from Altai and Caucasus.

Russula gracilis var. altaica SING.

syn.: *R. gracillima* J. SCHAEFF.

ML91, Godthåb, 18. July; ML305, Sdr. Strfj., Ravneklippen, 18. Aug., boggy area on north slope; ML404, ibid., Hassells Fjeld, 28. Aug., on lake shore in *Sphagnum-Philonotis* carpet with *Betula nana* and *Salix arctophila*; ML502, ML515, Godthåb, 6. Sept. — FT34, Egedesminde, 16. Aug., 1955, in boggy heath; FT96, Godhavn, 27. Aug. 1955, under *Betula nana*.

The species recalls a slender *R. queletii* FR., but is generally almost mild.

Distribution: Quite common in boggy areas at Godthåb and Sdr. Strfj. and probably also among the species from Kangâmiut. Re-

corded from Lappland (SCHAEFFER) and from ALTAI (SINGER), presumeably also included in other lists under various names.

Russula claroflava GROVE

ML301, Sdr. Strfj., Ravneklippen, 18. Aug., on lake shore in *Betula nana-Salix glauca* vegetation.

Distribution: The species was met in quite typical forms both at Sdr. Strfj. and Ivigtut, but not very common in any of the places. It is known also from Lappland (ROMELL, LANGE). Probably exclusively occurring with *Betula* spp.

Russula decolorans (FR.) FR.

ML191a, b, Sdr. Strfj., Hassells Fjeld, 2. Aug., in dwarf shrub heath with *Betula nana*; ML308, ibid., Ravneklippen, 18. Aug.; ML367, 368, ibid., Hassells Fjeld, 22. Aug., on north slope with *Betula nana*, 400 m alt.

The material is referred to *R. decolorans* with some reserve. The spore characters check better with *R. paludosa* BRITZ., but the blackening of the flesh was quite distinct in nearly all specimens. A great variability in colour was noticed, from bright red to pallid yellowish.

Distribution: The species was very frequent in the Sdr. Strfj. area, growing abundantly in the mossy *Betula nana* heaths on the north slopes. It was found in the Ivigtut region also. I have collected quite similar material in Lappland. ROMELL found both *R. decolorans* and *R. paludosa* in Lappland (SCHAEFFER 1939) and BLYTT records *R. decolorans* from the lower alpine belts in Norway.

Russula aeruginea LINDBL.

ML370, Sdr. Strfj., Hassells Fjeld, 22. Aug., in *Betula nana* heath, 250 m alt.; ML508, Godthåb, 6. Sept., ML535, Ivigtut, 11. Sept. — FT2, Godthåb, 12. Aug., 1955; FT24, Holsteinsborg, 15. Aug., 1955.

All specimens were rather pallid or even almost whitish, but typical in all other respects, also in microscopic characters, and corresponding well to the open air form frequently encountered in Denmark. ML370, the purest white form, may, however, better be placed with *R. basifurcata* PECK sensu J. E. LANGE.

Distribution: Met at all main stations visited, but not a common species in any of these. On record from Lappland (ROMELL) and Iceland (LARSEN, CHRISTIANSEN). It is highly probable that *R. exalbicans* f. *decolorata* SING., from Altai, is identical.

Russula xerampelina SCHAEFF. ex FR.

ML516, Godthåb, 6. Sept.

The present specimen was large, and of the dark red type, with prominently coloured stipe. The spores were finely warty with a thin net, similar to those found in var. *pascua* MØLLER described from the Færöes, and also similar in sporetype to *R. melliolens* sensu J. E. LANGE.

Distribution: Only record from Greenland. Various forms of the group are on record from other arcto-alpine areas (Lappland, SCHAEFFER 1939, the Færöes (var. *pascua*) MØLLER, Altai (*R. oreina*) SINGER 1938), but the Greenland specimen is not very similar to these forms, corresponding better in stature to the form common in the lowland.

Russula lutea (HUDS. ex FR.) FR.

ML143, Sdr. Strfj., Hassells Fjeld, 30. July, in *Dryas-Carex nardina* community, 450 m alt.

The colour of the pileus was more dull than in the typical form, and the specimen may best be referred to f. *montana* SINGER, described from 2500 m alt. in the Alps (cp. SINGER, 1925). The microscopic characters are as in the typical form, with free spines on the spores.

Distribution: Only found once in Greenland, and to my knowledge not on record from other northern localities, except for a very dubious record from Ellesmere Land (ROSTRUP 1906).

Russula sphagnophila var. **heterosperma** SING.

ML74, Ivigtut, 15. July, on heath; ML365—366, Sdr. Strfj., Hassells Fjeld, 22. Aug., near small lake, 400 m alt. — FT6, Godthåb, 12. Aug., 1955.

The species varies very much in colour, from very deep dark red to pallid, but the venose, soft stem, pinkish from base upwards, facilitates the identification somewhat. The spores differ markedly from those of the usual European form (*Russula venosa* VEL. sensu J. E. LANGE, *Russula nitida* (PERS. ex FR.) FR. sensu SCHAEFFER), as they have a fairly distinct net, but they agree well with the var. *heterosperma*, which SINGER (1938) describes from Siberia.

Distribution: Probably quite common in the *Betula* heaths. Noted also from Kangâmiut, and specimens probably belonging here are included in TERKELSEN's material from Holsteinsborg and Godhavn.

Russula versicolor J. SCHAEFF.

ML142, Sdr. Strfj., 30. July, in heath in main valley; ML189, ibid., Hassells Fjeld, 2. Aug., moist heath with *Betula nana-Salix glauca*, in moss; ML306, ibid., Ravneklippen, 16. Aug., on north slope in *Betula nana*; ML369, ibid., Hassells

Fjeld, 22. Aug., in *Betula nana* and deep moss, 250 m alt. — FT18, ibid., 13. Aug., 1955, in *Betula nana* and *Salix*.

The above cited material seems quite typical. It agrees in microscopical characters with the specimen distributed by LUNDELL & NANNFELDT (No. 418), a specimen confirmed by J. SCHAEFFER.

Distribution: Evidently quite common in Greenland, though not noted with certainty from Ivigtut and Godthåb. Known also from Lappland (SCHAEFFER) and from Iceland (CHRISTIANSEN).

Lactarius S. F. GRAY

Lactarius torminosus var. **gracillimus** J. E. LANGE

ML116, Sdr. Strfj., 27. July, heath bog in main valley; ML224, ibid., Hassells Fjeld, 6. Aug., under *Betula nana* in peat bog; ML641, Ivigtut, 26. Sept., in *Sphagnum* under *Betula*. — FT64, Godhavn, 19. & 25. Aug., 1955; FT108, ibid., 30. Aug., 1955.

The Greenland specimens are all small, pale, typical var. *gracillimus*. Several authors prefer the name *L. pubescens* FR. for this form, but the Friesian description of *L. pubescens* is rather ambiguous, while the small pale forms are covered by the original diagnosis of *L. torminosus*.

Distribution: The species seems common in arctic areas. I have met it in 620 m alt. in the Sdr. Strfj. area, and it is known from high altitudes in the mountains of Norway and Lappland (BLYTT, LANGE). Both LARSEN and CHRISTIANSEN record it from Iceland, while it seems absent on the Færöes (MØLLER). LEBEDEVA (1928) notes it from Arctic Siberia.

Lactarius groenlandicus TERKELSEN

A large and conspicuous white, mild *Lactarius*, recently described from Greenland by TERKELSEN (1956). It is probably most closely related to *L. controversus* PERS. ex FR.

Distribution: TERKELSEN records the species from Sdr. Strömfjord and Godthåb. I have seen some collections from East Greenland (71—74° N., leg. SCHOLANDER) which in all probability should be referred here, as should also ROSTRUPS record (1894) of *L. pargamenus* from Danmarks Ö (E. Gr., 70° N.).

Lactarius uvidus (FR. ex FR.) FR.

ML14, Grönnedal by Ivigtut, 9. July, in moss in *Salix* scrub; ML252, Ravneklippen, Sdr. Strfj., 8. Aug., in *Salix* thicket. — FT65, Godhavn, 19. Aug., 1955.

Lactarius uvidus is in my oppinion not clearly separated from *L. violascens* (OTTO ex FR.). The Greenland specimens are small, sometimes even dwarfish, and more or less viscid.

Distribution: Noted from Ivigtut, Godthåb, Kangâmiut, and the Sdr. Strfj. area, but not very common in any of these station. *L. uvidus* seems widely distributed in arcto-alpine areas. It is abundant and reaches high altitudes (1100 m) in Lappland (LANGE), both LARSEN and CHRISTIANSEN record it from Iceland, BLYTT from Norway, and it is very likely, that *L. violascens*, which FAVRE notes from the high Alps, should also be referred here.

Lactarius flavidus BOUD.

ML266, Sdr. Strfj., Ravneklippen, 8. Aug., in deep moss in *Salix* copse; ML557, Ivigtut, 13. Sept., under *Salix* and *Betula*. — FT68, Godhavn, 20. Aug.; FT88, ibid., 26. Aug.; FT110, ibid., 30. Aug., 1955, all under *Salix*.

Lactarius aspideus (FR. ex FR.) FR. is generally considered synonymous but in its original sense it is more likely to be a synonym of *L. repraesentaneus* BRITZ.

Distribution: A rare species in the area visited by me, while it may be more frequent in the Godhavn area. Also rare in Iceland (CHRISTIANSEN) and in Lappland (ROMELL 1912?, LANGE, unpubl.).

Lactarius glyciosmus (FR. ex FR.) FR.

ML90, Godthåb, 18. July; ML268, Sdr. Strfj., 10. Aug., on north slope of Nákajanga; ML316, ibid., Ravneklippen, 18. Aug., on north slope with *Betula nana* and *Salix glauca*. — FT120, Diskofjord, 31. Aug., 1955, moist place with *Betula*.

Some of the Greenland specimens were almost odorless, thus corresponding to the form noted in Lappland by ROMELL and LANGE (1912, 1946). In other respects the material was quite typical.

Distribution: The species was noted also in the Ivigtut area and at Kangâmiut, and it seems rather common in all these places. In the Sdr. Strfj. area it was most abundant on mossy north slopes, up to about 500 m alt., but it was also quite frequent in low heaths and *Salix* thickets. It is quite common in the Norwegian and Lappland mountains (BLYTT, ROMELL, LANGE) and probably recorded from Iceland by LARSEN and CHRISTIANSEN (as *L. lilacinus* and *L. spinosulus* respectively).

Lactarius rufus (SCOP. ex FR.) FR.

ML524, Ivigtut, 11. Sept.

Distribution: Quite common in the Ivigtut area, growing in heath bogs under *Betula glandulosa*, but not found by me in any of the stations further to the north. An earlier record from about 77° N. on East Greenland (FERDINANDSEN, 1910) needs confirmation. It is noted from the lower alpine zones in the Norwegian and Lappland mountains

(Blytt, Romell, Lange), but has not yet been found in Iceland and in the Færöes.

Lactarius mitissimus (Fr.) Fr.

ML510, Godthåb, 6. Sept.

Distribution: Common at all main stations visited, and at Sdr. Strfj. found up to 600 m alt. Probably also represented in Terkelsen's material from Holsteinsborg and Godthåb. Known from the Norwegian and Lappland mountains (Blytt, Romell, Lange).

Lactarius tabidus Fr. sensu J. E. Lange

syn.: *L. theiogalus* Fr. sensu Neuhoff

ML555, Ivigtut, 12. Sept., under *Betula* in moss in open vegetation of *Salix* and *Betula*.

Distribution: Only recorded with fair certainty from Ivigtut, but a specimen from Godhavn (Terkelsen) may also belong here. Iceland (Larsen) and Lappland (Romell, Lange), probably only in the birch woods. Blytt found it to reach higher altitudes in the Norwegian mountains, but it is not easy to ascertain whether his *L. theiogalus* really is this species.

My collections include three further species of *Lactarius*, each found but a single time. ML273, found at 700 m alt. on Nákajanga, recalls a dwarfish specimen of *L. scrobiculatus* Scop. ex Fr. It is not *L. repraesentaneus* Britz., which is common in similar stations in Lappland (Lange), but has not been found in Greenland as yet. ML599, from an *Alnus crispa* thicket at Ivigtut may be *L. obnubilis* sensu J. E. Lange (*L. obscuratus* Lasch), while ML556 from at *Betula* heath bog at Ivigtut seems close to *L. pallidus* and probably is identical with "*L. argillaceus* Pearson", an unpublished species mentioned by Neuhoff (1956, p. 132). I have a dubious field record of *L. vietus* (Fr.) Fr. from Ivigtut, and a specimen from Godhavn (FT56) may represent this species too, as may also the *L. blennius* (Fr.) Fr. recorded by Rostrup (1894) from East Greeenland, but the occurrence of *L. vietus* in Greenland needs final confirmation.

APHYLLOPHORALES

Thelephoraceae

Thelephora Fr.

Thelephora radiata Holmsk. ex Fr.

ML177, Sdr. Strfj., Hassells Fjeld, 2. Aug., on south slope with *Carex* and moss on sand; ML204, ibid., 4. Aug., on small slope with lichens and moss.

The Greenland specimens are small, rarely more than 1 cm across, and regularly cyathiform.

Distribution: Found a few times at Sdr. Strfj. but not noted from other stations visited. *T. caryophyllea* Schaeff. ex Fr. mentioned by Rostrup (1891) from Qutdligssat (W. Gr., 70°0′ N.) may well have been *T. radiata*, as also the very old record from Iceland (cp. Flora Danica, Tab. 409.2). I have found the species quite a few times in Lappland in the lower alpine zones, always small specimens like those from Greenland.

Clavariaceae

Clavulina Schroet.

Clavulina cristata (Fr.) Schroet.

ML581, Ivigtut, 16. Sept., in deep moss and leaves in *Salix* copse; ML655, ibid., Nordlandet, 29. Sept., under *Juniperus*.

ML581 seems identical with var. *mutans* (Burt) Møller. ML655 is referred to *C. cristata* with some doubt; it is a slender, grayish form with few branches, approching slender types of *C. cinerea* (Fr.) Schroet.

Distribution: Only Greenland records. Known also from Iceland (Larsen) and from the Færöes (Møller).

Ramaria S. F. Gray

Ramaria ochraceo-virens (Jungh.) Donk

ML320, Sdr. Strfj., Hassells Fjeld, 20. Aug., south slope under *Salix* on light cover of leaves over loess.

The species is supposed to be confined to needle beds in coniferous wood; however, the present specimens were typical in all respects, except for the somewhat more gracile stature.

Distribution: Only record, and not known from other arcto-alpine areas.

A single specimen of a large *Ramaria* species was met at Ivigtut, in moss over a *Salix* stump (ML638). It seems close to *R. suecica* (Fr.) Donk, but differs in darker brown colour and larger spores (10—12 × 4—4.5 μ).

Clavaria Fr., emend.

Clavaria argillacea Fr.

ML17, Sdr. Strfj., Hassells Fjeld, 4. Aug., in *Sphagnum* carpet; ML225, ibid., Kløftsøerne, 6. Aug., in *Sphagnum* in peat bog; ML314, ibid., Ravneklippen, 18. Aug., in springy area; ML345, ibid., Hassells Fjeld, 22. Aug., in *Sphagnum* carpet, 400 m alt.; ML417, ibid., 28. Aug., on north slope in *Sphagnum* and other mosses, 500 m alt.; ML518, Godthåb, 7. Sept.; ML560, Ivigtut, 14. Sept., in deep moss under *Betula*; ML589, 628, ibid., 18. Sept., snow bed with *Lycopodium complanatum*, *Sieglingia*, and *Empetrum*.

ML197, 235, 345, and 417 represent var. *sphagnicola* (Boud.) Corner; the remaining collections seem to belong in the species in broad sense but cannot be classified easily with the described varieties.

Distribution: The only fairly common clavariaceous species in Greenland. *Clavaria tenuipes* Berk. from Ujaragssuit (W. Gr., 70°30′ N., Rostrup 1888) and from Danmarks Ö (E. Gr., 70° N., Rostrup 1894) should most likely be referred here too. The same holds true for *Clavaria fragilis* from Iceland (Larsen), and further studies will probably show that the species is widely distributed towards the north.

Clavulinopsis Overeem

Clavulinopsis septentrionalis Corner

ML393, Sdr. Strfj., Sandflugtdalen, in large flocks among *Polytrichum*, 25 m from Ice Cap.

Distribution: Recently described from Swedish Lappland by Corner (1956), and also noted in the Lappland mountains, in low *Polytrichum* vegetation, by the present author. Only the above mentioned specimen known from Greenland, but the plant is very small and easily overlooked.

Pistillaria Fr.

Pistillaria uncialis (Grev.) Cost. & Dufour

ML342, Sdr. Strfj., Hassells Fjeld, 20. Aug., on south slope under *Salix*, on leaves.

Fruit body 1.5—2 cm high, fertil part about 1—1.5 cm high, clavate, attenuated, pallid, fertil part almost white when fresh, stem glabrous

or almost so. Spores 6—8 × 3.5—4 μ; hyphae clamped, 3—5 μ broad, a few agglutinated superficial hyphae on stem.

The description of *P. uncialis* seems to fit well with the present material, except that the spores are slightly smaller (4—7 × 2—3 μ). It is close to *P. setipes* (GREV.) and its allies, but larger in all macroscopic parts. *Pistillaria epiphylla* (QUÉL.) CORNER, may be an even better identification of the Greenland plant.—It is, however, a very badly known species.

Distribution: Found in a few places in Sdr. Strfj., on south slopes growing on *Salix* leaves. It is highly possible that *Typhula candida* FR. recorded from similar habitat at Vaigat (W. Gr., 70°30′ N., ROSTRUP 1891) is identical with the present material. *T. candida* is generally considered a synonym of *P. setipes*.

Corticiaceae

The few corticiaceous fungi brought home by me were not identifiable. Several species of the group have been recorded from Greenland by ROSTRUP, but no material seem to be preserved. The group is, however, not very common in Greenland, where suitable substrata are comparatively few.

Polyporaceae

Polyporus FR.

Polyporus picipes FR.

ML580, Ivigtut, 16. Sept.; ML617, ibid., 21. Sept.; ML647, ibid., 26. Sept., all on *Salix* branches and trunks.

The species is close to *P. varius* FR. but differs in darker and richer colours and certain minor, mainly microscopic features. The identification of the present material has been confirmed by Dr. A. PILÁT.

Distribution: The species was not uncommon in the Ivigtut area, always on *Salix*, and in large well developed specimens. I know of no other definite records from arcto-alpine areas, comp., however, sub *P. melanopus*.

Polyporus melanopus SCHWARTZ ex FR.

ML54, Narssarssuaq, 13. July, on *Betula* branch.

Distribution: Only Greenland record, if not *P. elegans* (BULL.) FR., found in southernmost Greenland by ROSENVINGE (ROSTRUP 1891) should be referred here. ROMELL records the species from Lappland, his material may include *P. picipes* too. The closely related *P. varius* is on record from Iceland (CHRISTIANSEN).

Polyporus groenlandicus M. LANGE & L. HANSEN sp. nov.

(Fig. 20)

ML191 Sdr. Strfj., 2. Aug., on loess near *Salix*, but connection not noted; ML206, ibid., 4. Aug., on loess, springing from buried *Salix* branch; ML359, ibid., 22. Aug., similar habitat. All from south slope of Hassells Fjeld, in low altitude.

Stipitatus. Pileus 3—6 cm latus, subreniformis, laevis, adpresso-fibrillosus, siccus, carne succulenta, 5 mm crassus, pallidus, siccus coriaceus; pori 0.5 mm alti, angusti, non decurrentes; stipes excentricus vel lateralis, 2—4 cm altus, 0.8 cm latus, nigro-tomentosus; hyphae fibulatae; sporae magn. 6—10 × 2.5—4.5 μ. Typus die 22. Aug. ad sinum Sdr. Strömfjord Groenlandiae occidentalis sub numero ML359 lectus, in Museo Botanico Hauniensi depositus.

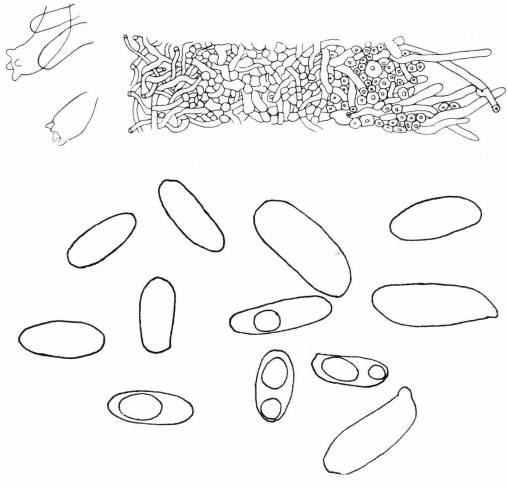

Fig. 20. *Polyporus groenlandicus*. ML206. Stem tissue (× 450), basidia (× 500) and spores (× 1600).

Fruit body stipitate, solitary; pileus 3—6 cm broad, 4—7 mm thick, fleshy tough, succulent when fresh, corky-leathery when dry, semicircular-reniform, depressed over stipe insertion, light Buckthorn Brown (h3) when dry, or more grayish, in one specimen tinged with Tawny Olive (h2) in places, pallid when fresh (Tilleu Buff to Olive Buff, h5—h6); surface of pileus smooth with adpressed fine fibrils, context — 5 mm thick, white to ivory; pore surface concolorous with cap or paler, pore layer very thin, — 0.5 mm, not decurrent, pore mouths angular, 2—4 pores per mm; stipe excentric or lateral, 2—4 cm long, 0.8 cm thick, somewhat swollen at base, dark brown to black velvety all over, terete or slightly longitudinal rugulose. Spores hyaline, cylindric elliptic (5.6) 6—10 (11.2) × 2.5—4.5 μ; cystidia none; hyphae of flesh thinwalled, 1.5—4.5 μ thick, with clamp connections; surface of pileus with thin but distinct cuticula of longitudinal arranged, agglutinated yellowish brown hyphae; velvety surface of stem of obtuse brown thick-

walled hyphal ends, free portion —30 μ long., on a 60 μ thick parenchymatic layer, central portion of thinwalled branched hyaline slightly yellowish hyphae.

On loess, growing from buried stumps, branches or roots of *Salix*. *P. groenlandicus* belongs in *Polyporellus* KARST. subgen. *Melanopus* PAT. sensu PILÁT, and thus in *Polyporus* s. str. as now defined. It is probably closely related to *P. radicatus* SCHWEIN. which also has succulent flesh, similar habitat and a still longer, root-like protracted stem; however, the spores of *P. radicatus* is 12—16 × 6—8 μ and the cap probably more brownish and subtomentose.

Distribution: Only known from the type locality, where the above three collections were the only specimens seen.

Inonotus KARST.

Inonotus radiatus (SOW. ex FR.) KARST.

ML593, Grönnedal by Ivigtut, 18. Sept.; ML630, ibid., 24. Sept., both on *Alnus*.

Distribution: Only found these two times in Greenland by me. ROSTRUP (1891) has a single record of the species also from *Alnus* at Ivigtut, and it is not unlikely that two rather poor specimens which ROSTRUP has identified as *Polyporus vulpinus* FR. (Tungnudliarfik, W. Gr., 61°11′, on *Betula*) and *P. contiguus* (Tassermiut, W. Gr., 60°05′ N. on *Betula*) belong here too. I know no other arcto-alpine records.

Coltricia S. F. GRAY

Coltricia cinnamomea (JACQ. ex PERS.) MURR.

Tassermiut (W. Gr. 60°05′ N.) in tufts of *Polytrichum*, leg. N. HARTZ.

The specimen, which is preserved but now in an almost snuff-like condition, was published by ROSTRUP (1891) as *Polyporus parvulus* KLOTZSCH. It may well be reduced to a mere form of *Coltricia perennis* as proposed by PILÁT.

Distribution: Only Greenland record. A small form of *C. perennis* is recorded from Lappland by ROMELL.

ROSTRUP (1891) further mentiones *Polyporus nigricans* FR., *P. vulpinus* FR. and *Daedalea unicolor* (BULL.) FR. all from *Betula* in southernmost Greenland. The material is not preserved, but the records indicate that the birch woods in South Greenland should be carefully searched before we have a full picture of the occurrence of polyporaceous fungi in Greenland.

TREMELLALES

Tremellaceae

Tremella Fr.

Tremella mesenterica Retz. ex Fr.

ML595, Grönnedal by Ivigtut, 18. Sept., on *Alnus* branch.

A very small specimen which belongs in *T. mesenterica*, at least in broader sense.

Distribution: Only found once by me in Greenland, but Rostrup (1891) has several records of species of *Tremella* from Greenland (*T. albida*, *T. intumescens*, and *T. lutescens*) all from *Salix* in the southernmost parts. *T. mesenterica* itself is on record from Iceland (Christiansen), the Færöes (Møller) and Lappland (Neuhoff 1936) and probably not uncommon in the upper birch wood zones and the lowest alpine regions.

Exidia Fr.

Exidia repanda Fr.

ML55, Narssarssuaq, 13. July, on branches of *Betula*, more rarely on *Sorbus*; ML304a, Sdr. Strfj., Örkendalen, 15. Aug., on *Betula nana*; ML333, ibid., Nákajanga, 20. Aug., on *Betula nana*.

Distribution: Very common and well developed in the Narssarssuaq area, small and rare at Sdr. Strfj. Neuhoff finds the species to be North European, mostly growing on *Betula*. It is recorded from Kola Peninsula, Torne Lappmark and Iceland (Neuhoff, l. c.). Rostrup (1891) further records *E. saccharina* Fr. from *Betula* at Igaliko (W. Gr., 60°59′ N.) and *E. recisa* (Ditm. ex Fr.) from *Salix* at Tassermiut (W. Gr., 60°05′ N.).

ASCOMYCETES

The Ascomycetes form a very considerable part of the species listed in previous publications on Greenland fungi. ROSTRUP (ll. c.) and LIND (1934) have contributed the major part of this information. Their hunting field was to a large extent the herbarium sheets with Greenland phanerogams, and their lists include mainly Micromycetes, a group of fungi outside the scope of this work. However, ROSTRUP has also listed several larger Ascomycetes. My own collections of larger Ascomycetes from Greenland are not very many. The account given here includes those of them which have been identified with fair certainty, and further a few of the more remarkable forms not found by me. Quite a few *Pezizales* remain unidentified, mostly because they were unripe.

GEOGLOSSALES

Geoglossaceae

Mitrula PERS. ex FR.

Mitrula gracilis KARST.

ML237, Sdr. Strfj., 6. Aug., on wet mosses in small lake.

The nomenclature and distribution of this species have been dealt with by NANNFELDT (1941) and FAVRE (1949). It is, however, not impossible that some authors may have confused it with *M. multiformis*.

Distribution: Only found a few times by me, in the Sdr. Strfj. area, but ROSTRUP has three older records (Ivigtut (ROSTRUP 1891)), Kap Stewart (E. Gr., 70°27′ N.) and Danmarks Ö (E. Gr., 70° N.) (ROSTRUP 1894)). It is also known from Jan Mayen and Iceland (LARSEN) from Lappland (NANNFELDT 1941) from Norway (HENNING 1885) from the Alps (FAVRE 1949) and from Labrador (DURAND 1908).

Mitrula multiformis (E. HENN.) MASS.

ML19, Grönnedal by Ivigtut, 10. July, in small group in a stream; ML30, ibid., 11. July, in wet mosses; ML46, ibid., in seeping water, subfasciculate; ML238, Sdr. Strfj., Hassells Fjeld, 6. Aug., in wet *Salix* thicket on sticks and leaves.

Distribution: Not infrequent at Ivigtut while only found a single time at Sdr. Strfj., where suitable localities are rare. Known from Norway (HENNING 1885) and from Lappland (NANNFELDT 1941).

Mitrula paludosa FR.

ML561, Ivigtut, 14. Sept.

Distribution: Only record from Greenland. Recorded from Lappland (NANNFELDT 1941).

Corynetes HAZSL.

Corynetes arenarius (ROSTR.) DURAND

Distribution: Found at Nuak by HARTZ (ROSTRUP 1891). Also known from Labrador (DURAND 1908).

HELOTIALES

Helotiaceae

Helotium FR.

Helotium aeruginosum (OEDER ex FR.) FR.

ML650, Ivigtut, 28. Sept., on *Sorbus decora.*

Distribution: Only recorded this one time from Greenland, and not to my knowledge on record from other far northern stations.

Sclerotinia FUCK.

Sclerotinia vahliana ROSTR.

ML95a, Godthåb, 22. July, on leaves of *Eriophorum* sp.

Distribution: Only found this one time by me, but recorded from several Greenland localities by ROSTRUP (1891) as far north as Umanak. Also known from Iceland (LARSEN), from Lappland (NANNFELDT 1928) and from Ellesmere Land (ROSTRUP 1906), and probably a common species in the arcto-alpine areas.

PEZIZALES

Pezizaceae

Peziza (DILL. ex FR.) FR.

Peziza badia PERS. ex FR.

ML172, ML173, Sdr. Strfj., 1. Aug., in *Salix* thicket.

Distribution: The species is known to be constituted of several taxonomic units, but it has not been possible for me te place the Green-

land material in one of these, as the plants are hardly ripe. It has little value to comment on the distribution on this basis.

Peziza vesiculosa BULL. ex FR.

ML24, Ivigtut, 9. July, on soil mixed with dung.

Distribution: The species is probably not indigeneous to Greenland. I have found it in a similar habitat in Lappland.

Lamprospora DE NOT.

Lamprospora crec'hqueraultii CROUAN

ML325, Sdr. Strfj., Hassells Fjeld, 20. Aug., in moist *Kobresia-Salix* vegetation. — Ikorfat, Nûgssuaq, 70°46′ N. 10. Aug. 1947, leg. C. A. JØRGENSEN.

Distribution: Also known from Lappland (NANNFELDT 1928).

Humaria FUCK.

Humaria humosa (FR.) QUÉL.

ML48, Grönnedal by Ivigtut, 11. July, in low mosses in *Salix* thicket.

Distribution: Only Greenland record. Known also from Baffin Land (LINDER 1947).

Lachnea (FR.) GILL.

Lachnea scutellata (L. ex FR.) GILL.

ML156a, Sdr. Strfj., 31. July.

Distribution: Reported from several Greenland localities by ROSTRUP, as far north as Disko, 69°30′ N., on the west coast, and Danmarks Ö, 70° N. and Hurry Inlet, 70°51′ N., on the east coast (ROSTRUP 1891, 1894, 1904). Also known from Iceland (LARSEN) and from Lappland (LUNDELL & NANNFELDT No. 1370).

Lachnea stercorea (FR.) GILL.

ML49, Ivigtut, 11. July, on dung heap.

Distribution: The species seems to occur mainly in arcto-alpine regions. It was only found once by me in Greenland, but is on record from Svalbard (KARSTEN), Iceland (LARSEN) and Lappland (NANNFELDT 1928), Alps (HEIM 1947), and also known from other Central European mountain regions.

Sepultaria (Cooke) Boud.

Sepultaria arenicola (Lev.) Mass.

(cp. Fig. 32, p. 109)

ML131, Sdr. Strfj., Ravneklippen, 26. July, flat sandy area with *Salix*; ML290, ibid., Örkendalen, 14. Aug., foot of dune with *Salix*; ML323, ibid., Hassells Fjeld, 20. Aug., *Salix-Kobresia* vegetation on loess; ML327, ibid., 20. Aug., lake shore with *Plantago maritima*; ML383, ibid., Sandflugtdalen, 24. Aug., in sand; ML432, ibid., no date or precise loc.

Distribution: The species was occurring abundantly in the sandy localities at Sdr. Strömfjord, but is not known from other places in Greenland. Favre records two species from the Alps which are very closely related to *S. arenicola*.

Helvellaceae

Helvella L. ex. Fr.

Helvella arctica Nannf.

(cp. Fig. 31, p. 107)

ML298, Sdr. Strfj., Örkendalen, 13. Aug., in sand with *Lesquerella arctica*, *Salix*, and *Betula*; ML380, ibid., Sandflugtdalen, 24. Aug., in sand. — Kutsiaq (W. Gr., 70°30′ N.) 19. Aug. 1947, leg. C. A. Jørgensen.

Distribution: A frequent species on the sandy plaines in the Sdr. Strömfjord valleys, and very likely common in other sandy and gravely localities in Greenland. Rostrup's records of *H. corium* should probably be referred here (Qutdligssat, W. Gr., 70°0′ N., 1891, Danmarks Ö, E. Gr. 70° N., Kap Stewart, E. Gr., 70°27′ N., 1894). Nannfeldt (1937) described it on material from Svalbard and Lappland, and it is also known from Iceland (Larsen, as *H. corium*). Favre records a slightly aberrant form from the Alps.

Helvella acetabulum (L. ex Fr.) Quél.

ML171, Sdr. Strfj., Hassells Fjeld, 28. July, in loess in *Salix* scrub; ML292, ibid., St. Saltsö, in *Kobresia* vegetation, 15. Aug. — Ikorfat (W. Gr., 70°46′ N.) 19. Sept., 1947, leg. C. A. Jørgensen.

Distribution: Found a few times in the Sdr. Strömfjord region. The delimitation of the species towards *H. leucomelas* and *H. sulcata* is not clear to me, and the species recorded under these names from Iceland (Larsen) may be identical with the Greenland forms.

Helvella lacunosa Afz. ex Fr.

ML56, Narssarssuaq, 13. July, sandy soil over rocks; ML176, Sdr. Strfj., Hassells Fjeld, 2. Aug., in wet moss and grass, 250 m alt.; ML206a, ibid., 4. Aug.;

ML291, ibid., St. Saltsö, 15. Aug., in *Kobresia* veg.; ML343, ibid., Hassells Fjeld, in moist *Kobresia* vegetation with *Salix*.

Distribution: Also known from Claushavn (W. Gr., 69°5′ N.) ROSTRUP 1891. Found in Lappland (LANGE unpubl.) and in the Alps (FAVRE).

Morchellaceae

Morchella DILL. ex FR.

Morchella esculenta L. ex FR. coll.

Recorded from S. Isortoq (ROSTRUP 1888) and from Ikertôq (W. Gr., 66°56′ N.) (ROSTRUP 1891).

ADDITIONS AND CORRECTIONS TO PART II

Hygrophorus lilacinus (LAEST.) M. LANGE n. comb.

Agaricus (*Omphalia*) *lilacinus* LAESTADIUS 1860: 45.
Hygrophorus violeïpes M. LANGE 1955.
Omphalia luteolilacina FAVRE 1955.

LAESTADIUS' description is published as a footnote but covers the plant excelently. The work in question was unknown to me when I described the fungus, and evidently also unknown to FAVRE. The species must be classed in *Hygrophorus*, close to *H. vitellinus*, which species it recalls very much, especially when old faded specimens are compared. It could not very well find a place in the genus *Omphalina*, because of the gelatinous cap surface.

Arrhenia auriscalpium (FR.) FR.

ML133, Sdr. Strfj., main valley, 28. July, humid place in heath; ML363, ibid., Hassells Fjeld, 22. Aug., on open spot with lichens in *Vaccinium uliginosum* heath, 400 m alt.

Distribution: Found a few times in the Sdr. Strfj. area, on naked peaty soil; excelently described from Lappland by PILÁT and NANNFELDT (1955) and from the Alps by FAVRE.

Omphalina luteovitellina (PILÁT & NANNF.) M. LANGE comb. nov.

Omphalia luteovitellina PILÁT & NANNFELDT 1955:22.
Omphalina flava (COOKE) M. LANGE 1955.

The basinym for *Omphalina flava*, *Agaricus umbelliferus* "*flavus*" COOKE is, as pointed out by PILÁT and NANNFELDT, rather much like a nomen nudum.

In the Handbook which constitutes the text to COOKE's plate the name is substituted with var. *abiegnus* B. & BR. There is some evidence that this is a mistake, as REA when taking up COOKE's original name

(1922) rightly records the variety from mountains, but this will hardly make the name tenable. It has been suggested that *Agaricus nivalis* published in Flora Danica Tab. 1072, is this species, but FRIES (1821) regarded it (correctly) as a variety of *Omphalia fibula*, and I have seen the name used nowhere with specific rank in later publications. At the present moment it seems preferable to accept the name given by PILÁT & NANNFELDT.

Omphalina obscurata KÜHNER

Several finds have been referred to this species in the present work (cp. II, p. 21). The individual finds differ considerably in habitat and also in spore size and shape, varying from 9—10 × 7—8 μ (ML6, partly two-spored) to 7.5—9.0 × 4.8—6.2 μ (ML59). I have also several collections from Lappland, which I believe should be referred here, with spores 7.2—9.8 × 4.9—6.1 μ.

Two recently published species are identical with or very close to *O. obscurata*, viz. *Omphalia lundellii* PILÁT (PILÁT and NANNFELDT 1955) and *O. obatra* FAVRE 1955. Both have the same characteristic pigment on the trama hyphae and agree also in other microscopic details (spores 7.5—9 × 4.5—5.3 μ and 7—9 × 5—6 μ respectively) I have little doubt that the two species are synonymous and PILÁT's name has a few months priority. There is, however, some doubt as to whether these species are really different from *O. obscurata*, and also whether part of my Greenland and Lappland material may better be placed with *Omphalia umbratilis* v. *minor* (FR.) sensu MØLLER and FAVRE. FAVRE indicates hyphae with pigment bands for this last species also, and gives the stem as white pruinose, while it is glabrous or almost so in *O. lundellii*, and in at least some of my specimens of *O. obscurata* sparingly clad with dark pruinosity. The whole group is badly in need for a revision, but until further I prefer to retain the name *O. obscurata* for the Greenland plants. — The species group is one of the most widely distributed series of species. — Closely related or identical forms are reported from Arctic Siberia (LEBEDEVA), and from Antarctis (SINGER 1954), where it as yet is the only Agaric noted.

Clitocybe rivulosa var. **dryadicola** FAVRE

Material of this variety, recently described by FAVRE, was not among the exsiccata brought home from Greenland, but certain finds from the Sdr. Strömfjord area can be referred here with certainty on the basis of field notes. I have collected it in *Dryas* tufts in Lappland also.

Psilocybe stagnina (Fr.) M. Lange n. comb.

Agaricus (*Galera*) *stagninus* Fries (1821)
Galerina stagnina (Fr.) Kühner
Tubaria stagnina (Fr.)

ML200, ML355, Sdr. Strfj., Hassells Fjeld, 4. Aug., 22. Aug., on floating mat of mosses; ML281, ibid., north side of Nákajanga, 10. Aug., in *Sphagnum*.

Cap 1.0—2.5 cm broad, at first subglobose with incurved margin, soon expanding to almost flat; Cinnamon Rufous (e4) when young, darker when older (Maroon to Bistre, c1), hygrophaneous, fine white veil covering bud, but soon disappearing from central part, remaining as white flocci on obscurely striate cap; flesh concolorous, thick; gills moderately broad, 16—24 L, 1—2 tiers of l, slightly but distinctly decurrent, paler than cap, Ochraceous Tawny (g2) at first, darkening to Cinnamon Brown (g8); stem 3—6 × 0.1—0.3 cm, distinctly hollow, paler than cap at first, but soon concolorous, fibrillose-floccose from appressed whitish flocci, often forming a ringlike zone, base with grayish white felt, apex pruinose.

Spore print dark Tawny Olive (h2 or darker).

Epicutis of subgelatinous, hyaline, loosely woven hyphae with clamp connections, 2—4 μ broad, trama of loosely woven, branched hyphae, 4—14 μ broad, with clamps, walls finely incrusted by brown pigment; gill trama similar, almost regular, paler and more narrow hyphae in subhymenium; basidia about 40 × 11 μ, mostly 4-spored, a few 2-spored seen, pleurocystidia absent, cheilocystidia 35—60 × 8—10 × 5—7 μ, inflated a little below, subcapitate or not; spores rather pale, broadly rounded elliptical, with a small germ pore, wall smooth without plage, 12—15 (20) × 8—9 μ.

The dark spore print and the broadly rounded smooth spores with germ pore but without plage make it evident that the species cannot be referred to *Galerina*, but should be placed in *Psilocybe*, subgenus *Deconica*, in the vicinity of *P. atrobrunnea* (Lasch). Already the eminent picture in Fries Icones (Pl 129,2), shows that the plant looks very much like a gigantic specimen of the *P. atrorufa* type, and Fries (1821) mentioned *Agaricus atrorufus* Bolt. as a variety of *A. stagninus*.

Distribution: Not common in Greenland, confined to wet moss carpets, sometimes growing in *Sphagnum*. Besides above mentioned finds also met at Godthåb (Sept. 6.) and Kangâmiut (Sept. 1.). Fries himself (1838) indicated that this plant was restricted to the mountain bogs, and it is probably one of the relatively few species which are rare or even absent outside the arcto-alpine areas, where it, on the other

hand, seems to be widely distributed. It is known from Jan Mayen (LARSEN) and from Iceland (CHRISTIANSEN); FAVRE reports it from the Alps, just above the timber line, and I have collected it in the Lappland mountains.

A number of species have had their frequency wrongly indicated in Part II. This applies especially to *Hygrophorus turundus*, which was found at several places at Sdr. Strömfjord, as was also *Mycena concolor*, *Clitocybe ditopa* and *C. diatreta*. A few other smaller omissions are corrected in Tab. 20, where also a few nomenclature changes are introduced.

GENERAL PART

The Distribution of the Fungi in Various Plant Communities

The enumeration of the Greenland fungi form a rather long list. It is true that many species have been noticed but a few times or only once, yet several others were found commonly and widespread. The distribution of the species is indicated in the taxonomic account. This information is, however, not sufficient as a description of the Macromycete flora of Greenland. With this in view, I spent some time making analyses of the vegetation with special regard to the fungal component. A detailed account of the plant communities in the area visited by our expedition is published by BÖCHER (1954), which paper also includes species of fungi in some tables; but, naturally, a much more specialized study is required to provide a picture of the occurrence of the fungi.

The more detailed records in the present paper are based on vegetational analyses by means of sample quadrats. 1 sq.m units were most frequently employed, but larger quadrats were found more expedient in some communities. Simple species lists were made in such places where time did not permit a more precise sampeling or where the character of the vegetation made it difficult to place quadrats. Permanent quadrats surveyed several times are, of course, necessary to obtain a full picture of the fungus flora (cp. M. LANGE 1948 a). However, time permitted but a few quadrats to be studied more than once.

The lists of green plants included in the present study should be considered with some indulgence. Some of the higher plants, mosses, and lichens mentioned may well have been misdetermined, and small mosses and lichens occasionally overlooked. I have had valuable assistance in the identification of species in the above groups by my colleagues, Prof. T. W. BÖCHER (Phanerogames), Mr. K. HOLMEN (Mosses), and Mr. M. SKYTTE CHRISTIANSEN (Lichens). The major part of the identifications were, however, made in the field by myself.

The identification of the fungi is in itself no easy matter. It was not possible to preserve material of all specimens—or even species—met in the sampled areas, nor of course to identify all specimens with cer-

tainty, even if material were preserved. The lists build in part on field identifications and include some specimens refered to genus only, or to species which have not with certainty been prooved to occur in Greenland. The latter names are marked with an asterisk. They are only maintained for such species where there is a fair chance that the original identifications have been correct, although the species have not been among the exsiccata brought home. Most of these cases are discussed in the taxonomic account. The collection number is added in such cases where the specimens from an analysis were preserved.

In spite of the deficiencies, I believe it possible to reach safe conclusions, both regarding the general picture of the fungus flora and when comparing with similar analyses from elsewhere.

Analyses were only made at the three main stations, Ivigtut (61° N.), Godthåb (64° N.), and the head of Sdr. Strömfjord (67° N.). The stations in question belong in three distinct plant geographical areas with very different climates. Ivigtut is subarctic and very distinctly oceanic (annual precipitation 1330 mm), Godthåb is low arctic and oceanic (ann. precip. 596 mm), and the inner Sdr. Strömfjord area is subarctic-continental with an annual precipitation as low as 103 mm. The climate of the stations in question is further described by BÖCHER (1949a), from where the above figures are taken.

The fact that a great number of fungi are known as dependent on a certain host tree (or shrub) has been a guide when arranging the different analyses. *Betula* spp. plays a role in the first groups, while *Salix* spp. are dominant in the following sections. *Salix* spp. are, however, very widespread, and only very few communities are quite without *Salix*.

Betula Dwarf Shrub Heaths

Oceanic Betula glandulosa Heaths

The dwarf shrub heaths are the dominant plant communities in most parts of the unglaciated areas in Greenland. They form, however, a very variable pattern. The heaths in the lowland at Ivigtut are of the subarctic-oceanic type with *Betula glandulosa* dominant together with *Empetrum hermaphroditum* and *Vaccinium uliginosum* subsp. *microphyllum*. The field layer is most often a thick cover of mosses and large lichens. The soil is a peaty humus of a rather acid reaction, pH about 4.5 (cp. BÖCHER 1954, p. 47).

The fungus flora of these heaths is comparatively rich. Fleshy Agarics, such as *Lactarius rufus*, *Russula claroflava*, and *Leccinum scabrum* compose the most conspicuous element, smaller forms tolerant

Table 1.

Quadrat No.	1	2	3	4	5	6	7	8	9	10	C
Betula glandulosa	3	+	3	4	1	2	4	4	3	5	100
Vaccinium uliginosum	4	5	4	3	4	4	2	1	3	+	100
Empetrum hermaphroditum	2	1	+	1	+	+	..	..	..	+	70
Juncus trifidus	+	+	+	..	..	+	+	..	..	..	50
Carex bigelowii	..	..	..	..	..	+	+	+	..	+	40
Deschampsia flexuosa	..	..	..	..	..	..	..	..	..	+	10
Lycopodium annotinum	..	..	..	..	..	..	..	..	..	+	10
Cover, per cent	70	60	60	70	50	50	60	50	50	60	..
Dicranum scoparium	4	4	4	4	2	2	4	2	2	3	100
Hylocomium schreberi	2	1	1	2	1	1	2	1	4	3	100
Ptilidium ciliare	2	2	2	3	1	1	1	1	+	1	100
Polytrichum alpinum	2	3	2	2	1	3	1	1	+	..	90
Rhacomitrium canescens	..	..	..	..	..	..	..	..	+	..	10
Cover, per cent	50	60	50	60	20	30	40	20	40	40	..
Stereocaulon alpinum	2	3	3	2	1	4	3	4	3	4	100
Cetraria islandica	+	1	+	1	+	1	1	+	+	2	100
Cladonia rangiferina	+	..	+	+	1	..	..	2	3	1	70
Cetraria cucullata	+	+	..	1	+	+	+	+	..	..	70
Alectoria ochroleuca	+	+	+	+	3	..	..	+	..	..	60
Cetraria nivalis	..	..	+	+	1	..	..	1	+	..	50
Cladonia alpestris	..	..	..	+	1	..	..	+	1	+	50
— *elongata*	..	..	..	+	+	..	+	+	..	..	40
Psoroma hypnorum	..	..	+	..	+	..	+	+	..	..	40
Nephroma arctica	..	1	1	..	..	..	..	..	..	..	20
Sphaerophora coralloides	..	..	..	+	..	..	..	..	..	..	10
Cover, per cent	20	30	30	20	50	50	40	70	50	60	..
Mycena megaspora 583	0	4	5	1	1	2	0	3	13	1	80
*Galerina mycenopsis**	..	1	2	1	1	1	1	1	..	..	70
Lactarius glyciosmus	..	1	..	..	2	1	1	..	1	2	60
Xeromphalina fulvobulbillosa	0	0	1	5	0	70	40	..	..	..	40
*Galerina hypnorum**	..	2	..	2	..	..	..	..	3	..	30
Mycena ad *concolor*	1	3	1	..	..	..	..	..	..	..	30
Collybia obscura 602	..	..	2	..	0	..	..	4	..	..	20
Marasmius androsaceus	..	..	..	..	..	..	..	8	5	..	20
Laccaria laccata	..	..	..	3	..	..	..	..	0	0	10
Russula claroflava	..	..	..	..	..	..	1	..	..	..	10
Inocybe lanuginella	..	..	..	..	1	..	..	..	..	..	10
Cortinarius mucosus	..	..	..	..	..	..	..	..	1	..	10
— *cinnamomeus*	..	..	..	..	0	..	..	..	..	..	..
Russula sphagnophila var.	..	..	..	0	..	..	..	..	..	..	..
Hygrophorus lilacinus	..	..	..	..	..	..	..	..	0	..	..
No. of species per sq. m.	1	5	5	5	4	4	4	4	5	2	3.9

Betula glandulosa — *Vaccinium uliginosum* heath between Ivigtut and Grönnedal. Almost flat, unshaded locality with rich field layer of moss and lichens. 10 quadrats of 1 sq. m along line, 1 m between quadrats, a larger distance between Q. 5 and Q. 6. Sept. 18.

The green plants are recorded by their covering in 6-graded scale (HULT — SERNANDER). The fungi are given by the number of individuals found.—Species found very close to a quadrat are indicated by 0. Collection number is indicated if material from the analysis is preserved. * indicates that the species in question has not been represented among the collections brought home, and that the identification is tentative.

to desiccation are numerous (*Marasmius*, *Collybia*, *Xeromphalina*, *Mycena megaspora*), while the more ephemeral forms of *Mycena* and *Galerina* occur in the sheltered places.

Tab. 1 records an analysis of a flat, moderately humid heath area almost entirely without *Salix* and with mosses as the most important component in the field layer. (Fig. 21, cp. also Fig. 5, LANGE 1955).

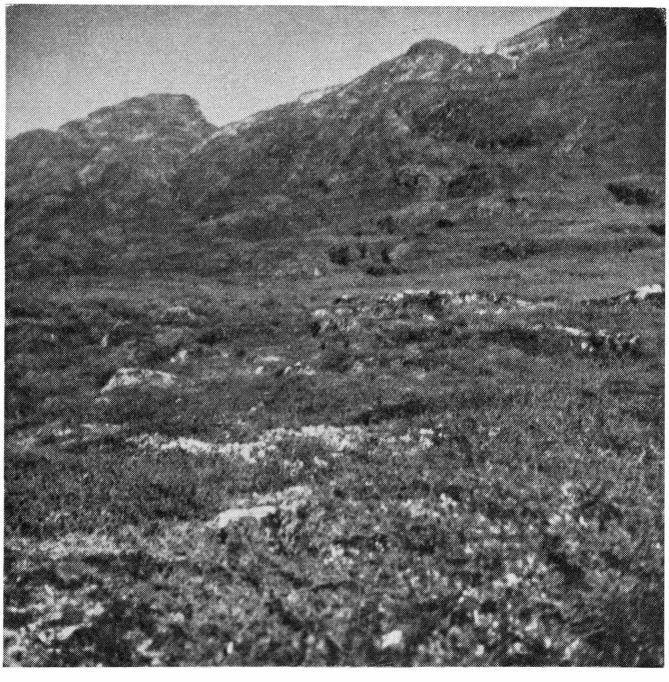

Fig. 21. *Betula glandulosa* heath at Ivigtut.

The species density—3.9 per sq.m—was high, even when compared with figures from Danish stations with dwarf shrub vegetation. Analyses of a similar type from a heath bog in Denmark (LANGE 1948a) showed a species density in three dwarf shrub communities ranging from 8—11.5 for three years' observation, 4.7—7.3 for one year observation, and—comparable with the above figure—2.0—3.8 species per sq.m in series of 10 sq.m as the highest value reached at one observation in any of the three years.

The fleshy forms seem to occur somewhat more frequently in the areas where the field layer is more rich in lichens, and the dessication is a more important factor, but at the same time a higher soil temperature can be reached. *Lactarius rufus* and *Leccinum scabrum* may be even very frequent here together with the much more rarely occurring *Paxillus involutus*. Other species noted as fairly frequent in the *Betula glandulosa*

heath were *Collybia dryophila*, *Cystoderma amianthinum*, *Hygrophorus marchii*, *Omphalina luteovitellina*, *O. ericetorum* and *Psilocybe montana*.

The most humid stretches, where *Sphagnum* becomes of some importance, have some of the usual turficolous flora elements such as *Hypholoma myosotis* and *H. elongata*.

A very special flora is found under the large *Juniperus* shrubs in the heath. Most of these shrubs are almost flatly depressed, and the branches give very good protection to the whole needle layer, where some ephemeral species may thrive, viz. *Mycena citrinovirens*, *M. delicatella* and *Rhodophyllus cancrinellus*. Very well developed species of *Marasmius androsaceus* are also found.

Continental Betula nana Heaths

The heaths in the inner Sdr. Strömfjord region are strongly influenced by the continental climate, and the vegetational cover responds very markedly to small differences in water supply. The most typical community of the flat lowland area is probably a *Betula nana—Salix glauca callicarpaea—Empetrum—Vaccinium uliginosum* alliance on moderately acid soil (pH about 5.5, cp. Böcher 1954, p. 274), but *Ledum*

Table 2

Quadrat No. (25 sq. m)	8	7	9
Betula nana	2	5	4
Salix glauca	4	1	3
Empetrum hermaphroditum	2	1	2
Vaccinium uliginosum	4	+	..
Ledum decumbens	+	..	..
Pirola grandiflora	2	+	..
Stellaria longipes coll.	+	+	..
Equisetum arvense	+	+	..
Campanula rotundifolia	+	..	..
Calamagrostis lapponica	..	+	5
Polygonum viviparum	..	..	+
Juncus arcticus	..	..	+
Carex maritima	..	..	+
Cover, per cent.	95	70	95
Aulacomnium turgidum	4	5	..
Tortula ruralis	2	1	..
Hypnum cupressiforme	1	..	..
Dicranum sp.	1	..	..
Drepanocladus uncinatus	..	1	4
Campylium stellatum	..	..	4
Peltigera canina	2	2	..
Cetraria cucullata	2	..	..
Cladonia spp.	2	..	..
Nephroma expallens	+	1	..
Peltigera leucophlebia	..	3	..
Cover, per cent.	80	95	80

(continued)

Table 2 (cont.)

	Q 8		Q 7		Q 9	
Date of survey	30.vii	30.viii	29.vii	30.viii	30.vii	30.viii
Collybia obscura	1	..	..	..	..	..
Cortinarius mucosus 122	1	..	..	..	..	..
Inocybe auricoma 140	2	..	..	..	..	..
— *fastigiata* 138	0	..	..	..	..	..
— *flocculosa* 139	0	..	..	..	..	..
Clitocybe leucophylla 117	1	..	2	..	..	..
Rhodophyllus nitens 119	1	..	0	..	..	..
Hebeloma mesophaeum	..	1	..	..	..	1
Calvatia tatrensis v. *groenlandica*	..	0	..	..	..	..
Russula alpina	..	..	2	3	..	..
Lactarius glyciosmus	..	..	12	4	..	..
Clitocybe diatreta	..	..	5	..	..	..
Galerina pumila 125	..	..	1	1	..	..
Leccinum scabrum	0	..	1	3	..	..
Russula decolorans	..	..	..	4	..	..
Cortinarius (*Telam.*) sp.	..	..	..	8	..	..
Clitocybe sp.	..	..	..	3	..	..
Collybia cirrhata 127	..	..	0	..	..	..
Cortinarius phaeopygmaeus 141	..	..	..	..	24	6
Russula gracilis var.	..	..	..	..	1	1
Laccaria laccata	..	..	..	..	1	..
Hebeloma longicaudum	..	..	..	..	1	0
Collybia sp.	..	..	..	..	1	..
Lactarius torminosus	..	..	..	..	..	1
Inocybe dulcamara	..	..	..	..	..	2
Leptotus lobatus	..	..	..	..	0	0
No. of species per 25 sq. m	5	1	6	7	5	5

Betula nana — *Salix glauca* dwarf shrub heath in main valley at head of Sdr. Strömfjord. Three quadrats surveyed twice. 25 sq. m each. List of green plants not fully complete. Humidity: Q. 8, dry; Q. 7, moderately humid; Q. 9, humid.

spp. and *Rhododendron lapponicum* may play a considerable role, and large areas have a vegetation of a steppe-like type with *Calamagrostis* spp. and *Kobresia myosuroides* as dominant species (cp. p. 97).

The fungus flora varies much already in the different types of dwarf shrub heaths, both in accordance with differences in soil reaction and with differences in humidity and the corresponding development of the field layer. Analyses from three stations near the camp at the head of Sdr. Strömfjord will show this (Tab. 2). The species density was rather low, as was also the number of individuals encountered, hence a large quadrat unit of 25 sq.m was chosen; but hardly any of the six analyses reached one individual per sq.m, and the species density per sq.m. was probably not much over 0.3. However, the analyses show clearly the marked difference in the development of the fungus flora in areas with varying soil humidity. Especially the driest quadrat (No. 8) was furthermore strongly affected by the summer dessication. The species list for the three quadrats is fairly long, and many more species were met over the area. The more important of these were: *Calvatia cretacea*, *Russula sphagnophila* var., *Clitocybe infundibuliformis* s. lat., *Clitocybe* ad *diatreta*,

Inocybe decissa v. *brunneo-atra*, *Lactarius mitissimus*, and, in the *Dryas* heaths, *Marasmius epidryas* and *Clitocybe rivulosa* var. *dryadicola*.

A special flora is found on small local slopes in the heath. Such slopes, especially when facing south, east, or west, are often very sparingly clad with small mosses and lichens and such species as *Omphalina acerosa* and *Thelephora radiata* find here their usual habitat.

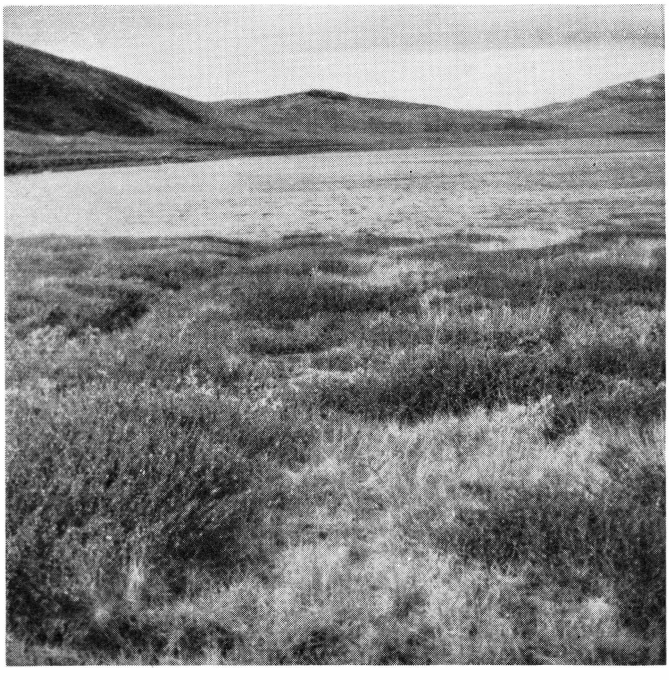

Fig. 22. *Betula nana* heath with *Kobresia*. St. Saltsö, Sdr. Strömfjord.

Another special flora developes in small depressions where water may accumulate after thaw and rain. *Galerina pumila*, *Leptotus lobatus*, and *Mitrula multiformis* are there the most frequently met element.

The larger parts of the dwarf shrub heaths occur on moderately acid soil. However, some smaller regions with a *Betula nana—Kobresia* community inhabit distinctly basic soil, with pH about 8.2 (cp. BÖCHER 1954, p. 214). Analyses from such an area close to the Store Saltsö, (Fig. 22) a lake with distinct saline water, showed of fungus flora well distinct from that of other heath regions (Tab. 3). Very few or no fungi grew under the *Betula* shrubs, while the *Kobresia* areas had a relatively rich flora, where especially the number of larger Ascomycetes is noteworthy, their presence certainly explained by the alcaline character of the soil.

Table 3

Quadrat No.	1	2	3
	6 sq. m	3 sq. m	15 sq. m
Betula nana	2	1	1
Salix glauca	1	1	1
Dryas integrifolia	+	2	+
Rhododendron lapponicum	+	..	..
Kobresia myosuroides	5	5	5
Braya linearis	+	+	+
Campanula rotundifolia	+	+	+
Calamagrostis purpurascens	..	1	+
Carex capillaris	+	+	..
Polygonum viviparum	+	+	..
Primula stricta	..	+	+
Gentiana detonsa	..	+	+
Cerastium alpinum	..	+	+
Draba hirta	+	..	+
Pirola grandiflora	..	1	..
Cover, per cent.	70	60	80
Hypnum revolutum	3	3	2
Distichum capillaceum	1	2	2
Tortula ruralis	..	1	3
Aulacomnium turgidum	2	..	..
Camptothecium nitens	2	..	..
Tortella fragilis	..	..	1
Barbula recurvirostris	..	..	1
Pohlia nutans	..	..	1
Helvella atra 291	4	11	11
Hebeloma longicaudum	3	2	1
Cortinarius glandicolor var.	4	1	2
Peziza 293	9	1	6
Helvella acetabula 292	8	..	8
Lachnea	..	7	40
Peziza	..	1	1
Sepultaria arenicola	..	6	..
Clitocybe rivulosa v. *dryadicola*	..	4	..
Hebeloma mesophaeum	..	..	1
Lactarius torminosus	..	..	1
No. of species per quadrat	5	8	9

Kobresia communities in *Betula nana* heath near Store Saltsö; Sdr. Strömfjord. Three quadrats analyzed on Aug. 15.

Bogs and Lake Shore Heaths

The lakes of the inner Sdr. Strömfjord area are extremely interesting and different. Some of them are distinctly continental with notable salinity, while others are of a more usual type with circumneutral or slightly acid water (cp. BÖCHER, 1949). The shores of the former type harbour no or almost no fleshy fungi, while the flora of fungi of the latter is much dependent on the shore itself, whether it is formed as a floating mat grading into a peaty heath bog or whether it is found on harder soil. On a hard soil beach of Klöftsöerne (The Ravine Lakes) were noted the following fungi in a vegetation of *Betula nana*, *Empetrum*,

Table 4.

Quadrat No. (1 sq. m)	I									II	III	IV
	1	2	3	4	5							
Calamagrostis neglecta	2	2	3	2	2					..	..	..
Eriophorum scheuchzeri	1	1	1	1	1					..	..	..
Menyanthes trifoliata	+	+	+	+	+					..	..	..
Hippuris vulgaris	+	+	+	+	+					..	..	..
Montia lamprosperma	..	..	+	..	+					..	..	..
Ranunculus hyperboreus.....	..	..	+	..	..					..	..	..
Betula nana	..	..	..	..	..					..	..	..
Cover, per cent.	20	20	25	20	20					..	..	..
Calliergon sp.....	5	5	5	5	5					..	..	..
(other mosses not recorded, very few)												
Cover, per cent.	100	100	100	100	100					..	..	..
Leptotus lobatus 348.....	1	..	29	200	5					×	..	×
Galerina clavata.....	..	14	21	0	7					×	..	×
Psilocybe stagnina.....	..	4	31	1	0					×200	..	×281
No. of species per quadrat...	1	2	3	2	2	2.0				..	..	..
Quadrat No. (1 sq. m)	6	7	8	9	10	11	12	13	14			
Betula nana	2	1	+	3	1	1	2	3	3	..	..	..
Salix arctophila	2	3	1	3	1	..	..	..	+	..	..	..
Carex rariflora.....	1	1	2	1	2	+	+	+	+	..	..	..
Vaccinium uliginosum	1	1	+	..	2	+	1	+	+	..	..	..
Ranunculus lapponicus	+	+	..	+	+	+	1	+	+	..	..	..
Poa pratensis coll.	+	+	..	1	+	..	+	..	..	..	..	..
Vaccinium vitis-idaea.....	1	1	..	..	..	2	2	2	2	..	..	..
Empetrum hermaphroditum ..	+	..	..	..	..	3	3	3	4	..	..	..
Ledum decumbens	..	..	..	..	..	3	3	3	2	..	..	..
Pedicularis flammea	..	..	..	..	..	..	+	+	+	..	..	..
Cover, per cent.	40	40	20	50	30	not recorded				..	..	..
Aulacomnium palustre	5	5	5	5	5	5	4	5	5			
Sphagnum.....	..	2	1	1	1	2	3	1	1	..	..	..
Polytrichum	+	..	1	+	+	..	..	..	..	..	..	..
Dicranum bonjeani	1	+	..	+	..	..	..	..	..	..	..	..
Paludella squarrosa.....	..	1	..	..	..	..	..	..	..	..	..	..
Aulacomnium turgidum	..	..	..	..	..	..	+	..	..	..	..	..
Peltigera leucophlebia	1	1	1	1	+	2	2	1	2	..	..	..
— *malacea*	..	1	..	+	..	2	3	1	..	..	..	..
Cover, per cent.	100	100	100	100	100	100	100	100	100	..	..	..
Cortinarius (*Telam.*) sp.	1	9	1	..	..	..	..	..	..	×	..	×
Omphalina ericetorum.....	0	4	2	..	..	2	1	0	0	×	×	..
Galerina vittaeformis 343a ..	0	..	..	2	2	3	1	..	..	×	×	..
Lactarius glyciosmus.....	..	..	0	9	..	0	..	..	..	×	×	..
Omphalina epichysium.....	2	..	..	..	0	..	..	..	0	×199	×223	×
Cortinarius paleaceus	..	..	..	1	..	..	..	..	..	..	..	..
Collybia cirrhata	..	..	..	1	..	..	..	..	..	..	..	..
Lactarius mitissimus	..	..	..	..	1	..	..	..	..	..	..	..
Cortinarius (*Hydroc.*) sp. ...	..	..	..	..	1	..	..	..	..	..	..	..
Hebeloma mesophaeum.....	..	..	0	..	0	..	..	..	..	×	..	..
Mycena leptocephala 346	0	..	..	..	..	..	..	..	..	..	..	..
Hypholoma elongatum 344...	..	..	0	..	..	..	..	..	..	..	×	..
Rhodophyllus anthracinellus..	..	..	0	..	..	..	..	..	..	×	..	..
Leccinum scabrum 356.....	..	..	..	0	..	..	..	0	0	×	×	..
Russula alpina	..	..	..	..	0	..	..	..	..	×	×	..
Cortinarius cinnamomeus....	..	..	..	0	..	..	..	4	..	×201	×	..

(*continued*)

Table 4 (cont.)

Quadrat No. (1 sq. m)	I									II	III	IV
	6	7	8	9	10	11	12	13	14			
Laccaria laccata.....	..	..	..	..	0	..	..	..	1	×	×	×
Clavaria argillacea	..	..	..	..	..	5	4	3	3	×197	×225	..
Mycena epipterygia.....	..	..	..	..	..	8	..	..	1	..	..	..
Russula sphagnophila 365...	..	..	..	..	..	1	..	..	0	×	×	..
— *decolorans* 367	..	..	..	..	..	..	0	..	..	..	..	..
Hygrophorus turundus	..	..	..	..	..	0	..	..	..	×198	×	×
Lactarius torminosus	..	..	..	..	..	..	..	0	..	..	×224	×
Galerina pumila	..	..	..	..	..	..	..	..	..	×	×	×
Russula gracilis.....	..	..	..	..	..	..	..	..	..	×	×	×
Rhodophyllus jubatus	..	..	..	..	..	..	..	..	..	..	×235	..
No. of species per quadrat...	2	2	2	4	3	5	3	2	3	2.9		

Lake shore community at Hassells Fjeld, Sdr. Strömfjord, 400 m alt. Three transects of 5, 5, and 4 quadrats (1 sq. m) analyzed Aug. 22. (I), and species list from Aug. 4. (II).—Species list from similar locality, Klöftsöerne, 350 m alt. Aug. 6. (III), and from small lake on Mt. Nákajanga, alt. 620 m, Aug. 10. (IV). × indicates presence.

Salix arctophila, *Comarum*, *Menyanthes*, *Calliergon giganteum*, and *Camptothecium nitens* (6. Aug.): *Collybia cirrhata*, *Hebeloma mesophaeum* (287), *Laccaria laccata*, *Lachnea scutellata*, *Lactarius torminosus*, *Naucoria carpophiloides*, and *Rhodophyllus* sp.

A much richer fungus flora was encountered where the shore is a floating mat of mosses and sphagna boardering a peaty heath bog. Three such areas were studied. The most detailed analyses are from a small lake on Hassells Fjeld, 400 m alt. BÖCHER (1954, p. 288) records the vegetational zones from this lake and gives the pH of the lake water as 5—6, while pH in the water from the floating mat is 4.5. The fungus flora was listed on Aug. 4. and studied in greater detail on Aug. 22. when a transect with 14 quadrats was analysed. Q. 1—5 are from the west end of the lake, Q. 6—10 from the north end, while Q. 11—14 are from the south-west side close to a rather steep, north facing slope (Tab. 4, I—II; Fig. 9, LANGE, 1955).

The outer floating mat showed a fungus flora extremely rich in individuals but poor in species. *Laccaria laccata* was noted very sparingly in this zone, but aside from this were found only the three species listed (Tab. 4, Q. 1—5). Probably no other Greenland locality studied showed a similar number of individuals per sq.m (about 60 for 5 quadrats), when the occurrence of very small, ephemeral forms is excluded. The inner zones were poorer as to the number of individuals but the number of species found was rather high and the species density (2.9) the highest met in the Sdr. Strömfjord area, and also the number of individuals per sq.m (8.0) is rather high. The general composition of the flora in these inner zones corresponds largely to that which is found in similar places elsewhere. There is a distinct turficolous element present (*Omphalina*

epichysium, *Hypholoma elongatum*, *Hygrophorus turundus*, *Clavaria argillacea*), but only the two last mentioned of these species seem attached to *Sphagnum*, and the true sphagnicolous element is thus almost lacking, as is the case in all Greenland localities studied by me.

Very similar floras were met at the two other lakes where communities of the same type were studied (Tab. 4, III—IV): An *Empetrum*—

Fig. 23. Dwarf shrub heath with tussocks and numerous fungi (*Leccinum scabrum*). Hassells Fjeld, 300 m alt.

Betula nana—Ledum decumbens vegetation with a few *Salix arctophila*, and *Aulacomnium palustre* with *Sphagnum* spp. as the field layer, at Klöftsöen (Aug. 6.), and a small lake at Nákajanga (620 m alt.) with a similar moss carpet with *Betula nana* and *Salix arctophila* (Aug. 10.).— A floating mat was found in the latter of these two localities only. It was again inhabited by *Galerina clavata*, *Leptotus lobatus*, and *Psilocybe stagnina*.

North Slopes

The rich development of the dwarf shrub heath vegetation on the north facing slopes of the low broad mountains of the inner Sdr. Strömfjord area is a very conspicuous feature. *Betula nana* and *Ledum decumbens* are the dominant shrubs, *Salix glauca*, *Empetrum*, and *Vaccinium uliginosum* occuring scattered. The field layer is a thick carpet of mosses and large lichens covering raw humus. The soil is acid (pH 4.8—5.5)

Table

Quadrat No. (1 sq. m)	1	2	3	4	5	6	7	8
Elevation, m alt.	80	83	86	88	90	92	95	98
Slope ° N.	10	20	10	20	0	15	25	35
Betula nana	4	4	5	5	4	4	4	4
Ledum decumbens	3	..	..	3	1	2	2	..
Vaccinium uliginosum	..	..	+	2	2	+	..	..
Salix glauca	1	..	..	1	2	..	..	also
Empetrum hermaphroditum	..	..	..	+	+	..	..	..
Calamagrostis lapponica	1	1	2	2	1	1	1	1
Stellaria longipes coll.	+	1	+	+	1	+	1	1
Equisetum arvense	+	+	+	..	+	+	+	+
Poa pratensis coll.	..	+	..	..	..	..	..	+
Pirola grandiflora	..	..	..	..	..	..	..	1
Saxifraga tricuspidata	..	..	..	..	..	..	..	+
Festuca rubra	+	..	..	..	..	..	+	..
Luzula confusa	..	..	..	..	+	..	..	..
Pedicularis labradorica	..	..	..	..	+	..	..	..
Cover, per cent.	60	60	70	80	80	50	60	60
Hylocomium splendens	3	5	3	3	1	2	3	3
Aulacomnium turgidum	3	3	3	3	3	5	5	5
Tortula ruralis	4	2	2	3	3	..	..	..
Polytrichum juniperinum	..	1	..	..	..	..	..	..
Drepanocladus uncinatus	..	..	..	1	+	..	..	..
Dicranum sp.	..	..	..	..	+	..	+	..
Pohlia nutans	..	..	..	..	1	..	+	..
Peltigera leucophlebia	2	2	2	3	2	2	4	3
Nephroma expallidum	1	1	2	2	1	+	..	+
Peltigera canina	..	..	2	..	..	2	..	..
Cladonia pyxidata	..	+	..	..	..	..	..	..
Cover, per cent.								
Russula decolorans 308	1 +	.. +	..	.. +	1 +	1	1 +	0
Collybia cirrhata	1 +	0 +	0 +	9 +	0	0	22 +	4
Leccinum scabrum	.. +	1 +	.. +	1	..	1 +	0	1
Clitocybe ad *obsoleta*	..	..	..	..	..	.. +	..	0
Cystoderma granulosum	..	..	..	..	..	..	0	..
Russula alpina 307	..	..	..	..	..	..	..	0
Cortinarius hemitrichus	..	..	1	..	..	..	..	..
Cortinarius cinnamomeus	..	..	..	..	..	..	..	..
Mycena concolor 310	..	..	..	..	..	..	1	..
No. of species per quadrat	2	1	1	2	1	2	3	2

Betula nana heath rich in mosses on steep north slope of Ravneklippen. Two transects of 10 quadrats of 1 sq. m; 10 m between each quadrat. Aug. 18. + indicates that the species was found on the line between the quadrats.

The following additional species were noted on the lines but not in a quadrat: *Clitocybe ditopa*, *C. leucophylla*, *Cystoderma amianthinum*, *Galerina mniophila*, *Laccaria laccata*, *Lactarius glyciosmus*, *L. mitissimus*, *Mycena metata*, *Russula versicolor*, and *Stropharia aeruginosa* var. *alpina*.

and a permafrost zone is met 20—30 cm down in the humus (cp. BÖCHER 1954, p. 271). Tussocks are found where the slopes are less steep, and develop to a considerable height at the foot of the slopes where *Salix glauca* often is more dominant (Fig. 23). The highest parts of the slopes

9	10	11	12	13	14	15	16	17	18	19	20	C
102	105	105	108	111	116	120	125	130	133	136	138	
25	20	15	20	40	40	40	50	25	20	20	25	
3	5	2	4	3	1	2	3	3	3	3	2	100
4	3	4	2	3	1	1	..	2	4	3	..	75
2	1	2	..	+	1	4	..	2	2	3	2	70
near Q. 3, 6, 8, 9, and 10.				..	..	..	..	..	..	..	..	15
..	..	..	..	..	..	..	..	..	..	..	..	10
2	+	1	1	+	+	+	+	+	+	1	+	100
+	+	+	+	1	+	+	2	1	1	+	+	100
+	+	+	+	+	+	+	+	+	+	1	1	95
..	+	..	..	+	..	..	..	+	+	+	+	40
..	..	..	..	..	4	4	2	..	..	..	..	20
..	..	..	..	..	..	..	+	..	..	+	..	15
..	..	..	..	..	..	..	..	..	..	..	..	10
..	..	..	..	..	..	..	..	+	..	..	..	10
..	..	..	+	..	..	..	..	..	..	..	..	10
50	70	40	50	40	40	60	30	50	60	60	50	..
4	2	5	4	5	5	5	5	4	4	5	4	100
3	5	4	4	1	2	2	4	3	4	3	3	100
1	1	1	..	..	..	..	..	3	1	2	..	55
..	1	..	3	..	..	..	..	..	..	..	..	15
..	1	..	..	..	..	..	..	..	..	..	..	15
..	..	..	..	..	..	..	..	..	..	..	2	15
..	..	..	..	..	..	..	..	..	..	..	..	10
3	3	2	4	2	3	3	2	3	3	3	3	100
1	1	..	..	1	1	..	1	1	..	..	..	65
..	..	..	..	..	..	..	..	..	..	..	..	10
..	..	..	..	..	..	..	..	+	..	..	..	10
00 per cent. throughout												
..	1 + 0		3 +	.. +	.. +	..		0	..	..	..	30
0 + 12	..	+ ..	+	..	..	..	..	..	..	..	..	25
..	..	..	+ 0	..	..	..	..	..	..	+ 0	..	20
.. +	..	0	..	+ 0	+ ..	..	..	+ ..	+ 2	+ ..	2	10
..	..	..	1	+ ..	..	0	..	..	+ 0	..	+ 0	5
.. +	..	..	..	..	..	..	0	0	+ 2	..	..	5
..	..	..	..	..	..	..	..	..	..	..	..	5
..	..	..	..	..	..	..	..	..	..	1	..	5
..	..	..	..	..	..	..	..	..	..	..	..	5
0	2	0	2	0	0	0	0	0	2	1	1	1.1

are in places covered with a *Cassiope tetragona* community where the other dwarf shrubs may be lacking (Fig. 24).

The analyses (Tab. 6) show the composition of the flora at the foot of the north slope of Ravneklippen, and Tab. 5 similar records from a somewhat higher altitude on the same slope. The high frequency of *Collybia cirrhata* (on dead *Leccinum scabrum*) and other indications made it likely that the fungus flora had passed its optimum of development, and the species density recorded may not fully reflect the richness of the fungus flora in the community. The fungus flora was most abundant

Fig. 24. *Cassiope tetragona* heath. North slope of Hassells Fjeld, 500 m alt.

where the slope was moderately steep, and very few fungi occured on the steepest part (cp. Tab. 6, Q. 13—16). The first transect (Q. 1—10) shows a species density of 1.6 per sq.m, total sloping 25 m per 100 m. It is, however, unlikely, that the species density should compare with that recorded in oceanic *Betula glandulosa* heath of Ivigtut (cp. p. 68), mostly because of the much poorer development of the ephemeral element and the species of the *Marasmius*-type. Similar communities were studied at other localities, and the series of species lists is included in Tab. 7.

The relatively good humidity conditions and the rich possibilities for mycorrhiza formation favour the development of a fungus flora where fleshy forms play a dominant role. *Leccinum scabrum* and *Russula decolorans* reach their best development here, associated with *Cystoderma granulosum*, *Clitocybe leucophylla*, *C. obsoleta**, *Cortinarius cinnamomeus*, *C. mucosus*, *Lactarius glyciosmus*, and *Russula alpina*. The thinfleshed forms are comparatively few and of scattered occurrence.

The flora on the north slopes has numerous species in common with the inner lake shore communities (Tab. 4, p. 75) but the sphagnicolous-turficolous element is of course strongly reduced. Comparison with the lowland heath analyses (p. 71) shows again a rather high degree of similarity. The flora on the north slopes is, however, considerable richer

Table 6.

	C	I
Betula nana	100	..
Vaccinium vitis-idaea	100	..
Ledum decumbens	80	..
Salix glauca	70	..
Empetrum hermaphroditum	50	..
Vaccinium uliginosum	40	..
Calamagrostis lapponica	100	..
Stellaria longipes coll.	90	..
Pedicularis labradorica	30	..
Ranunculus lapponicus	10	..
Poa pratensis coll.	10	..
Cover, per cent	60–90	..
Aulacomnium palustre	100	..
— *turgidum*	90	..
Polytrichum sp.	30	..
Tortula ruralis	20	..
Peltigera leucophlebia	100	..
— *canina*	60	..
Cover, per cent	100	..
Galerina pumila	10	2
Lactarius glyciosmus	10	2
Clitocybe leucophylla	10	1
Laccaria laccata	10	1
Leccinum scabrum	10	1
Mycena concolor	10	1
— sp.	10	1
No. of species per quadrat	0.7	..

Betula nana heath at the foot of very steep north slope of Ravneklippen, almost flat area in 50 m alt. with tussocks and humid deep moss carpet. Transect of 10 quadrats of 1 sq. m with 5 m between the quadrats. 18. Aug. I: number of individuals.—Other species noted along the transect are listed in Tab. 7 No. 4.

in specimens but not so rich in species, as certain groups, such as the genera *Inocybe* and *Hebeloma* and the *Gasteromycetes*, are almost or totally lacking. Some of these species are, however, found on local, flat terraces on the north slope, where the moss carpet is less deep. Both *Calvatia tatrensis* v. *groenlandica* and *Lycoperdon molle* were noted from such places.

The general structure of the flora is reminiscent of that recorded in the oceanic heath regions at Ivigtut, though of course a notable difference is found in the list of species. Most of the fleshy species are attached to *Betula nana* or *Salix glauca*, especially to the former, as it appears from the species lists Tab. 7, Nos. 2, 6, 7, and 8, where respectively *Salix* and both *Betula* and *Salix* were absent.

Table 7

Species lists from north slopes with thick moss carpet.

	1	2	3	4	5	6	7	8	F
Clavaria argillacea	..	..	..	+	..	..	..	+	2
Clitocybe ditopa	..	..	+317	+	..	..	+	(+)417	4
— *leucophylla*	+	..	+	+	+386	+	+	..	6
— *pseudoectypa*	..	..	..	..	..	..	..	+405	1
— *diatreta*	..	..	..	..	+388	..	..	..	1
— spp.	+	+	+	+	..	+	+	+	..
Collybia cirrhata	..	..	+	..	..	+	+	..	3
— *obscura*	+	..	..	..	..	+411	+	..	3
Cortinarius cinnamomeus	+	..	..	+	..	+	+	..	4
— *hemitricus*	..	..	+	..	..	..	..	..	1
— *mucosus*	+	..	..	+	+397	+	..	..	4
— spp.	+	+	..	+	..	+	..	..	..
Cystoderma amianthinum	..	..	+313	..	+	..	..	..	2
— *granulosum*	+	+295	+	..	+385	+	..	(+)	6
*Galerina hypnorum**	..	..	..	..	..	+	..	..	1
— *mniophila**	+	..	+	..	..	..	+	+	4
— *pumila*	..	+	..	+	..	..	..	..	2
— *vittaeformis*	..	..	..	..	+	..	..	..	1
Inocybe borealis	..	..	..	..	+387	..	..	..	1
Laccaria laccata	..	+	+	+	+	..	(+)	..	5
Lactarius glyciosmus	+	+	+	+	+	..	+	(+)	7
— *mitissimus*	..	..	+	..	..	..	(+)	..	2
Leccinum scabrum	+	+	+	+	+	+	+	(+)	8
Melanoleuca oreina	+	..	..	..	+	..	..	..	2
Mycena concolor	..	..	+	+	+	..	..	..	3
— *epipterygia* var.	..	..	..	+302	+396	..	..	+	3
— *filopes*	..	..	..	..	+	..	..	+	2
— *metata*	..	..	+318	..	..	..	..	..	1
— *urania*	..	..	..	..	..	..	..	+	1
— sp.	..	+	..	..	..	..	..	..	..
Omphalina ericetorum	..	+	..	+	+	+	+	+	6
— *luteovitellina*	..	..	..	..	..	..	+398a	+	2
Psilocybe montana	..	+	..	..	..	..	..	..	1
Rhodophyllus nitens	..	+	..	..	+	..	..	..	2
Russula alpina	+	+	+	..	+	+	..	(+)	6
— *decolorans*	+	+	+	+	+	+	+	..	7
— *versicolor*	..	..	..	..	..	..	+403	..	1
Stropharia aeruginosa var.	..	..	+	..	+395	..	..	..	2

Species lists from north slopes at Sdr. Strömfjord with dwarf shrubs and thick moss carpet. 1. Hassells Fjeld, 4. Aug. — *Betula nana*, *Salix glauca*, *Ledum decumbens*. *Aulacomnium turgidum*, *Peltigera leucophlebia*. Low, flat slope, 400 m alt. — 2. Bredestrand, 14. Aug. — *Ledum decumbens* 4, *Betula nana* 3, *Equisetum arvense* 3, *Aulacomnium turgidum* 5, *Hylocomium splendens* 3, *Peltigera leucophlebia* 3. No *Salix*. Slope 30° N. 20 m alt. — 3. Ravneklippen (cp. Tab. 5) 18. Aug. — 4. ibid. (cp. Tab. 6) 18. Aug. — 5. Sandflugtdalen, 100 m from Ice Cap, 26. Aug. *Betula nana*, *Ledum decumbens*, *Salix glauca*, *Aulacomnium turgidum*. Small, rather steep north slope, 80 m alt. — 6—8. Hassells Fjeld, towards Ringsödalen, 28. Aug. — 6. *Betula nana*, *Ledum decumbens*, *Cassiope tetragona* (scattered). No *Salix*. 300 m alt. Steep slope. — 7. *Betula nana*, *Ledum decumbens*, *Empetrum*, *Cassiope tetragona*. 400 m alt. 25—40° sloping north. Species in ( ) from neighbouring area with *Salix*. — 8. *Cassiope tetragona*, *Pirola grandiflora*. *Salix* and *Betula* absent. Small steep slope 40—50° North, 500 m alt. Species in ( ) from neighbouring area with *Betula*. The number of localities for each species is summarized in the last column.

The lists are not fully complete, and the areas surveyed were of very different size, thus the comparison should be made with reserve.

Fell Field and Snow Bed Communities

Fell field and snow bed vegetation cover large areas in higher altitudes in the Ivigtut mountains. My analyses from these regions are very incomplete as the first visit here was too early in the season and the last visit so late that frost and snow had seriously hampered the fungus flora (Tab. 9, I). A much more complete picture was obtained

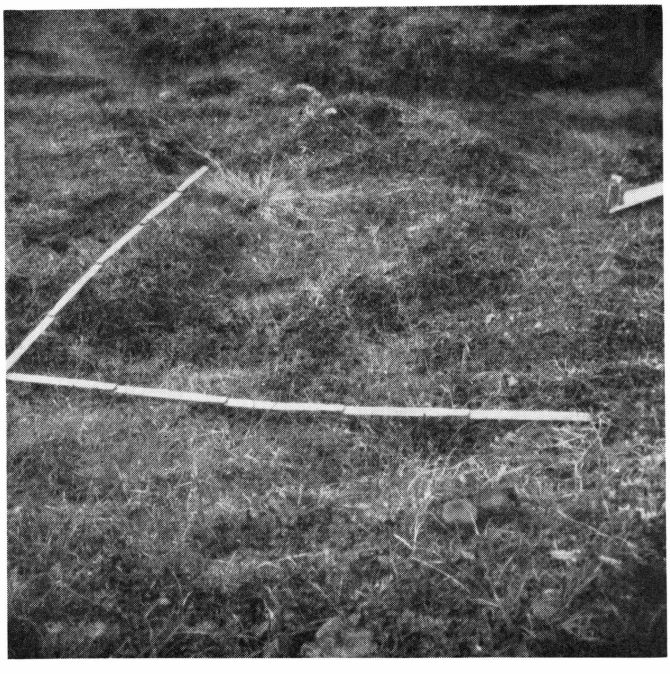

Fig. 25. *Salix herbacea* vegetation at Godthåb.

from the *Salix herbacea* dominated community which was widely distributed at Godthåb, and which could probably best be described as a snow bed vegetation (Fig. 25). *Salix glauca* occurs but sparingly, in small low shrubs, and *Betula nana* is almost absent, while *Salix herbacea* is quite dominant in the field layer together with low mosses (esp. *Dicranum* spp. and *Polytrichum alpinum*). The soil is here distinctly acid, pH about 4.5—5.0 (cp. Böcher 1954, p. 120). Tab. 8 shows analyses from such a locality. The fungus flora is profusely developed, with high species density (3.5 per sq.m), a very large number of species in the total list, and also a high number of individuals per sq.m. Fleshy species are of high frequency, while the ephemeral species play an inferior role and those of the *Marasmius*-type seem totally absent.

Among the few other species noted (and identified) from this community should be mentioned *Hebeloma pusillum*, *Hygrophorus vitellinus*,

Omphalina luteovitellina, *O. obscurata*, *Inocybe lacera*, and *Mycena fibula* (cp. Tab. 9, G). Still more humid places have a vegetation more dominated by species such as *Eriophorum scheuchzeri* and *Drepanocladus*. These areas have a fungus flora with *Galerina pumila*, *G. clavata*, and *Cantharellus lobatus* as dominant species. The community was not more precisely analyzed.

Vegetation of the snow bed type was also dominant on the skerry-locality Kangâmiut (65°48′ N.). A more detailed analysis of the fungus flora was not obtained, but the flora seemed still richer than at Godthåb (Tab. 9, K). It reached its maximum development in a *Salix herbacea* community with *Empetrum hermaphroditum*, *Carex rigida*, *Stereocaulon*,

Table 8

Quadrat No. (1 sq. m)	1	2	3	4	5	6	7	8	9	10	
Salix herbacea	5	5	5	5	5	4	5	5	5	5	100
Empetrum hermaphroditum	+	+	..	+	+	+	+	+	+	1	90
Salix glauca	+	1	also found near quadrats 3, 4, and 6								20
Rubus chamaemorus	..	+	..	..	..	..	..	..	..	..	10
Vaccinium uliginosum	..	..	..	..	..	+	..	..	..	..	10
Carex bigelowii	..	1	1	..	1	..	+	1	+	0	80
Poa pratensis coll.	+	+	+	+	+	+	..	+	..	..	70
Luzula spicata	+	+	+	+	..	+	..	+	..	..	60
Festuca ovina	+	1	..	..	..	..	..	..	..	..	20
Carex lachenalli	+	+	..	..	..	..	..	..	..	..	20
Festuca vivipara	..	..	+	..	..	..	..	..	..	..	20
Carex deflexa	..	..	..	..	..	..	1	..	..	+	10
Deschampsia flexuosa	..	..	..	..	..	..	..	..	1	..	10
Juncus trifidus	..	..	..	+	..	..	..	..	..	..	10
Trisetum spicatum	..	..	..	+	..	..	..	..	..	..	10
Cover, per cent	60	80	60	60	70	50	70	70	60	70	..
Dicranum fuscescens	4	3	5	3	5	5	5	4	3	5	100
Polytrichum alpinum	2	4	+	1	1	1	+	3	1	3	100
Drepanocladus uncinatus	..	..	+	..	..	..	..	1	..	1	30
Ptilidium ciliare	..	+	3	+	..	..	..	1	..	1	50
Conostomum tetragonum	..	..	..	+	..	+	..	..	..	..	20
Small Hepatics	+	2	+	1	1	1	+	1	1	1	..
Psoroma hypnorum	1	1	2	1	+	1	2	1	2	1	100
Cladonia elongata	+	+	+	+	+	+	+	+	+	+	100
— *mitis*	2	+	..	2	1	1	1	1	2	1	90
— *coccifera*	+	1	..	+	+	+	..	+	+	+	80
— *pyxidata*	+	+	..	+	+	+	..	+	+	+	80
Ochrolechia frigida	1	+	+	2	..	+	..	+	..	..	60
Stereocaulon alpinum	2	+	+	..	..	..	..	+	+	..	50
Cetraria delisei	+	+	..	+	..	..	+	..	..	..	40
Cladonia bellidiflora	..	..	..	..	..	..	+	..	+	+	30
— *uncialis*	..	..	..	+	..	+	..	..	..	..	20
Cetraria islandica	..	..	..	..	..	..	+	..	..	+	20
Peltigera sp.	..	+	..	..	..	..	+	..	..	..	20
Solorina crocea	..	..	..	+	..	+	..	..	..	..	20
Sphaerophora coralloides	..	..	..	+	..	..	..	..	..	..	10
Cladonia gracilis	..	..	..	..	..	..	..	..	..	+	10
Cover, per cent	70	80	80	70	70	80	80	80	70	80	..

(*continued*)

Table 8 (cont.)

Quadrat No. (1 sq. m)	1	2	3	4	5	6	7	8	9	10	
Cortinarius glandicolor	..	12	..	..	0	..	2	4	..	2	40
Lactarius mitissimus	..	3	3	..	..	..	1	0	3	..	40
Laccaria laccata	6	0	..	14	0	0	0	..	0	4	30
Omphalina ericetorum	1	0	..	2	2	..	..	..	..	0	30
Rhodophyllus (*Ent.*) sp.	3	..	0	..	..	..	0	1	..	2	30
Inocybe lanuginella 501	..	0	..	0	1	1	..	..	2	..	30
Russula gracilis var. 502	0	2	..	0	0	..	1	..	0	0	20
— sp. 515	..	..	..	5	..	0	..	..	..	4	20
Naucoria scolecina	..	..	..	..	1	..	1	..	..	..	20
Cortinarius acutus 511	..	..	..	..	0	..	50	..	0	..	10
Mycena filopes	0	0	..	..	1	..	..	..	..	..	10
Galerina vittaeformis	..	0	..	1	..	0	..	..	..	..	10
Russula sp. 507	..	..	..	..	2	..	..	..	..	0	10
Mycena citrinomarginata	..	1	..	..	..	..	..	..	..	0	10
Cortinarius phaeopygmaeus ...	..	..	..	..	30	..	..	..	..	..	10
Russula versicolor?	4	..	..	..	..	..	..	..	..	..	10
Lactarius uvidus.....	..	..	..	2	..	..	..	..	..	..	10
*Galerina hypnorum**	..	..	..	..	..	..	..	..	..	1	10
*Mycena alcalina**?.....	..	..	0	..	..	..	..	0	..	..	..
Hebeloma mesophaeum	..	0	..	..	..	..	..	..	..	..	..
Lyophyllum erosum	..	0	..	..	..	..	..	..	..	..	..
Galerina pumila	..	..	0	..	..	..	..	..	..	..	..
Amanita vaginata 509.....	..	..	..	..	..	..	..	0	..	..	..
No. of species per sq. m	4	4	1	5	6	1	5	2	2	5	3.5

Salix herbacea snow bed-heath with scattered *Salix glauca* over low rocks. Godthåb, 6. Sept. Quadrats of 1 sq. m placed in those patches where *Salix herbacea* and lichens were most clearly dominant. Slope 0—15° East. Thin or very thin cover of soil. Rather humid area. Three further species of *Russula*, all unidentified, were noted near some of the quadrats.

Cladonia elongata, and various Musci. At least ten species of *Russula* (*R. alpina*, *R. gracilis*, and other, unidentified species), several species of *Cortinarius* with *C. acutus*, *C. alpinus*, and *C. cinnamomeus* as the most frequent, some species of *Inocybe* (*I. calamistrata*, *I. lacera*, *I. praetervisa*), *Lactarius uvidus*, *L. glyciosmus*, *Omphalina ericetorum*, *O. luteovitellina*, *Amanita vaginata*, and some species of *Hygrophorus* were noted from this community.

An extreme snow bed in deep shadow on the north side of the rocks where *Salix herbacea* was associated with *Anthelia juratzkana* and *Dicranum glaciale* still harboured a fungus flora quite rich in individuals, though poor in species. An analysis of such a vegetation is recorded by Böcher (1954, p. 120). It includes *Cortinarius alpinus*, *Hebeloma mesophaeum*, *Laccaria laccata* and *Omphalina ericetorum* in one sq.m. *Omphalina luteovitellina* and *Hygrophorus vitellinus* were found in this vegetation also.

Along a small creek in the moss carpet of *Calliergon stramineum* with *Eriophorum scheuchzeri* were found *Galerina clavata*, *Leptotus lobatus* and *Psilocybe stagnina*, exactly the same group of species

Table 9

	S	K	G	I
Amanita vaginata	..	+	+ 509	..
Arrhenia auriscalpium	+	..	..	..
Cortinarius acutus	..	+	+ 511	..
— *alpinus*	..	+	+	+ 565
— *cinnamomeus*	+	+	+	+
— *glandicolor* var.	+	..	+	..
— *hemitricus*	+ 278	..	..	..
— *phaeopygmaeus*	..	..	+	..
*Galerina hypnorum**	..	..	+	..
— *pumila*	..	..	+	..
— *vittaeformis*	..	..	+ 514	..
Hebeloma mesophaeum	+	+	+	..
— *pusillum*	..	..	+	..
Hygrophorus lilacinus	+	..	+	+ 586
— *vitellinus*	+ 269	..	+	+ 584
— spp.	..	+	+	..
Inocybe calamistrata	..	+	..	..
— *lacera*	..	+	+	..
— *lanuginella*	..	..	+	+
— *praetervisa*	..	+	+	..
Laccaria laccata	+	+	+	+
Lactarius glyciosmus	..	+	+	..
— *mitissimus*	+	..	+	+
— *uvidus*	..	+	..	..
Leptotus lobatus	..	..	+	+
Lyophyllum erosum	..	..	+	..
Mycena alcalina	..	..	+	..
— *citrinomarginata*	..	..	+	..
— *fibula*	..	..	+	..
— *filopes*	..	..	+	..
Naucoria scolecina	..	..	+	..
Omphalina ericetorum	+	+	+	+
— *luteovitellina*	+	+	+	+
— *obscurata*	+	..	+	..
— *pyxidata*	+	..	..	..
Rhodophyllus spp.	+	..	+	+
Russula alpina	+	+	+	+
— *gracilis*	..	+	+	+
— spp.	..	+	+	..

Species lists from snow beds and similar vegetations with *Salix herbacea* dominant. S: Sdr. Strömfjord, Nákajanga, small patches in high altitude, 10. Aug. — K: Kangâmiut, incomplete list from extreme snow beds and less extreme vegetations with *Salix herbacea* and *S. glauca*. 1. Sept. — G: Godthåb, various *Salix glauca* — *Salix herbacea* communities over low cliffs, rather large area surveyed on Sept. 6—9. (cp. Tab. 8). — I: Ivigtut, scattered notes from snow beds in rather high altitude. Flora in this locality much reduced from frost and list very incomplete.

which was met at the floating moss mat at Sdr. Strömfjord lakes (cp. p. 76).

Snow bed vegetation with *Salix herbacea* was a very rare type of vegetation in the continental Sdr. Strömfjord area, found only in small patches high up on the north slopes, where some natural obstacle provided deep shade. Two small snow beds were studied near the top of Mt. Nákajanga, Aug. 10. (Tab. 9, S).

Table 10

I	II	III
Bovista tomentosa 275	Quadrat of 4 sq. m	*Cortinarius saturninus*
Clitocybe sp.		— (*Hydroc.*) sp.
Cortinarius anomalus 272	*Cortinarius* ad *uraceus*.. 14	*Hebeloma longicaudum*
— *argutus* 283	*Hebeloma mesophaeum* . 8	*Inocybe* (2 spp.)
— *glandicolor* var.	*Inocybe calospora* 267.. 1	*Lactarius torminosus*
— *torvus**	— *hirtella* 1	*Leccinum scabrum*
Hebeloma mesophaeum	*Russula alpina* 1	*Omphalina obscurata*
Inocybe calamistrata 277		*Psilocybe montana*
— *dulcamara*		*Russula* sp.
— *lanuginella*		
— *obscura*		
Lactarius ad *scrobiculatus** 273		
Lycoperdon spadiceum 285		
Omphalina obscurata		
Russula sp.		
Stropharia aeruginosa var. 274		

Species lists and analysis from fell field vegetations (cp. text, p. 83). I: Nákajanga, 700 m alt. 10. Aug. — II: Ibid. Quadrat of 4 sq. m around small, creeping *Salix glauca*. 10. Aug. — III: Hassells Fjeld towards Ringsödal, 520 m alt. 28. Aug.

The differences between the species lists from the north slopes (Tab. 7) and those from the snow bed vegetations (Tab. 9) are very significant. There can be no doubt that both communities are truely arcto-alpine in their composition, and the species occurring here are true members of the arcto-alpine flora. The structure of the two floras is the same, with fleshy species dominant, but the species lists differ much. The factor primarily responsible for this seems to be the absence of *Betula* in the snow bed communities. The other important factor is the character of the field layer, a thick cover of mosses on the north slopes, and a less continuous layer of low mosses and lichens in the snow beds.

A fell field vegetation was only studied in the inner Sdr. Strömfjord region. Typical fell fields occur here and there on flat areas in high altitudes, especially in windswept places and at the very top of the mountains. The vegetation was a very scattered dwarf shrub cover among *Rhacomitrium* or *Stereocaulon* patches and small tufts of *Carex supina* and *C. nardina*. (pH. ca. 6—7, cp. Böcher 1954, p. 142). The fungus flora of this region was comparatively rich. A list from the top of Mt. Nákajanga, 700 m alt. is recorded in Tab. 10, I. The dwarf shrubs noted here were *Salix glauca* (very sparse), *Rhododendron lapponicum*, *Dryas integrifolia*, and *Vaccinium uliginosum*. It appeared that the fungi were mostly attached to *Salix glauca*. A quadrat of 4 sq.m around a creeping *Salix* showed the following flora of fungi. (Tab. 10, II).

A similar locality was studied at the top of Hassells Fjeld, 520 m alt. The vegetation was the same as on Nákajanga except that *Betula nana* occurred. This probably accounts in part for the difference between the species lists (Tab. 10, III).

Salix glauca Thickets

Oceanic Vegetational Types

Salix glauca (subsp. *callicarpaea*) occur at all stations visited by me. It forms thickets or copses at Narssarssuaq, Ivigtut and as far north as the inner Sdr. Strömfjord area, while only scattered low shrubs are met at Godthåb, Kangâmiut and Pâ. There is a notable difference be-

Table 11.

Quadrat No. (1 sq. m)	1	2	3	4	5	6	7	8	9	10	C
Salix glauca (shade, per cent.)	50	50	50	60	60	40	40	50	50	50	..
Deschampsia flexuosa	3	2	2	4	2	3	3	2	2	2	100
Angelica archangelica	+	+	2	1	1	..	..	1	3	1	80
Taraxacum sp.	..	+	+	1	+	..	+	+	+	+	80
Campanula rotundifolia	+	+	+	+	+	..	+	..	+	+	80
Coptis trifolia	+	+	+	+	+	+	+	+	..	..	80
Lycopodium annotium	..	+	2	3	1	..	..	1	3	3	70
Thalictrum alpinum	+	1	+	..	1	..	..	+	1	2	70
Poa pratensis coll.	..	+	..	+	+	+	+	+	..	+	70
— *nemoralis*	+	1	+	..	..	..	..	+	1	+	60
Carex bigelowii	+	2	1	+	..	+	+	..	..	..	60
Rhinanthus groenlandicus	+	+	..	+	+	..	+	+	..	..	60
Dryopteris linnaeana	1	+	2	..	..	..	..	..	+	1	50
Agrostis sp.	1	..	+	+	1	1	..	..	..	..	50
Chamaenerium angustifolium	..	+	..	+	+	+	..	..	..	+	50
Equisetum arvense	1	+	..	..	+	..	+	..	..	..	40
Galium triflorum	..	..	..	..	+	..	+	..	+	+	40
Veronica wormskjoldi	+	..	..	..	..	..	+	..	+	..	30
Linnaea borealis	..	..	..	3	..	..	..	2	..	..	20
Hieracium sp.	..	..	..	..	1	..	..	..	+	..	20
Phleum commutatum	..	..	..	..	..	..	+	..	+	..	20
Calamagrostis langsdorfii	..	..	..	..	..	+	..	..	..	..	10
Empetrum hermaphroditum	..	..	..	1	..	..	..	..	..	..	10
Cover, per cent.	40	60	50	60	40	50	60	40	50	60	..
Hylocomium schreberi	5	4	+	5	5	5	5	1	2	1	100
— *squarrosum*	4	4	5	3	2	2	2	3	1	3	100
Brachythecium salebrosum	1	2	2	2	1	1	+	3	4	3	100
Drepanocladus uncinatus	+	1	+	1	2	+	+	3	2	2	100
Polytrichum alpinum	1	..	+	+	..	+	+	..	+	..	60
Brachythecium sp.	..	..	3	1	1	..	..	2	2	4	60
Hylocomium splendens	..	..	..	..	3	1	..	3	1	..	40
Climacium dendroides	..	..	..	..	..	..	..	..	1	..	10
Peltigera leucophlebia	..	..	..	1	..	1	..	..	..	..	20
— *canina*	..	..	..	1	..	..	..	..	1	..	20
Cetraria islandica	..	..	..	..	+	..	..	..	+	..	20
Psoroma hypnorum	..	..	..	..	+	..	..	..	..	..	10
Cover, per cent.	90	80	90	90	90	80	80	90	80	80	..

(continued)

Table 11 (cont.)

Quadrat No. (1 sq. m)	1	2	3	4	5	6	7	8	9	10	C
Mycena filopes	1	1	2	9	0	1	4	0	1	1	80
Cortinarius hemitricus	2	1	2	1	1	..	..	5	6	2	80
— sp.	4	..	3	4	..	..	..	0	5	9	50
Delicatula delectabilis 609	3	..	1	..	..	1	..	..	..	1	40
Mycena citrinomarginata	..	9	2	..	..	..	..	0	..	4	30
Lactarius mitissimus	..	..	3	1	0	1	..	0	..	..	30
Galerina vittaeformis	0	1	..	..	..	1	2	..	..	..	30
Laccaria laccata	..	2	..	..	..	1	..	..	..	1	30
Clitocybe vibecina	..	..	1	1	..	..	..	..	..	2	30
Lentinellus omphalodes	..	..	0	..	..	..	0	3	1	0	20
Galerina mycenopsis	2	..	3	0	0	..	..	..	..	0	20
Mycena stannea	..	1	..	0	1	..	..	..	..	..	20
Inocybe flocculosa	..	..	..	..	1	..	..	2	..	..	20
Cortinarius obtusus	..	..	..	..	..	..	..	1	..	1	20
Mycena metata	..	..	..	..	..	..	..	1	2	..	20
Hebeloma sp.	..	..	..	..	..	..	..	..	1	1	20
Clitocybe ad *angustissima*	..	..	..	1	..	0	..	..	..	..	10
Mycena hemisphaerica	..	..	..	..	8	..	..	..	..	..	10
— *epipterygia* var.	..	..	..	..	..	..	5	..	..	..	10
— *rubella*	..	2	..	..	..	..	..	..	..	..	10
Cortinarius saturninus	..	1	..	..	..	..	..	..	..	..	10
Psilocybe crobula	..	..	..	..	..	..	1	..	..	..	10
Cortinarius sp.	..	..	..	..	..	..	..	..	1	..	10
Mycena rubromarginata	..	..	..	..	1	..	..	..	..	..	10
Polyporus picipes	..	..	..	0	..	..	..	..	..	..	..
Flammulina velutipes	..	..	..	0	..	..	..	..	..	..	..
Cortinarius decoloratus	..	..	..	..	..	..	..	..	..	0	..
No. of species per sq. m	5	8	8	6	5	5	4	5	7	9	6.2

Salix glauca thicket in Ivigtut valley. Sept. 21. Transect of 10 quadrats, 1 sq. m each, 1 m between quadrats. *Salix* shrubs about 3 m high, grass and herbs in deep moss carpet, generally 10—25 cm thick.

tween the suboceanic—continental thickets at Sdr. Strömfjord, and the oceanic type at Ivigtut. The broad valley at Ivigtut is widely covered with a vegetation of tall shrubs or even some individuals of almost tree-like stature. Pure *Salix* stands are frequent, but *Betula pubescens tortuosa* plays a role in many places, as also *Sorbus decora*, while *Alnus crispa* occasionally forms small scrubs. The field layer in the *Salix* thickets develops as a thick moss carpet rich in herbs (cp. Böcher 1954, p. 72 and Lange 1955, Figs. 3 and 4).

The fungus flora is richer than in any other Greenland station analyzed by me. The ephemeral species play a great rôle, especially *Mycena*, *Delicatula*, and *Galerina* spp. Species growing on decaying *Salix* branches and stems are of importance too, while the large fleshy species, such as *Russula* and *Lactarius* spp. are absent or rare, as also are species of *Inocybe*. The analyses in Tab. 11 show the structure of the fungus flora. The species density reached the very high value of 6.2 per sq.m. I know of no available figures from similar communities, but the species density in *Betula alba*-dwarf shrub communities in Denmark (cp.

M. LANGE 1948a) was found to vary from 10.4—12.6 as a total for three years observations, 5.4—9.3 in one single year, and 2.2—5.5 species per sq.m in the series (of 10 quadrats) as a maximum for a single observation through the three years. So the above recorded Greenland figures demonstrate a very rich flora. Also the total number of species in the analysis is high—24 in 10 quadrats.

Other fungi noted in the community are *Cortinarius anomalus*, *C. delibutus*, *C. trivialis*, *Mycena psammicola*, *Pholiota groenlandica*, and *Ramaria* sp. The flora of fleshy species seemed richer where *Betula pubescens* was found. The following species occured where *Salix* and *Betula* grew together: *Lactarius flavidus*, *L. tabidus*, *L. torminosus*, *Rozites caperata* and *Tricholoma atrosquamosum*.

The *Alnus* thickets were small with few fungi, of which only *Cortinarius pulchellus*, *Lactarius* (599), *Naucoria escharoides*, and *Inonotus radiatus* deserve noticing.

Suboceanic-Subcontinental Salix Thickets

Betula pubescens and *Alnus crispa* are totally absent in the Sdr. Strömfjord region, they both have their northern limit further to the south. But *Salix glauca* occur in most plant communities, although most frequently as low shrubs, scattered among other dwarf shrubs. It forms, however, well developed stands in protected places at the foot of the mountains and in small valleys. The development of the stands seems dependent partly on the humidity, but also on the presence of a sufficiently thick soil cover over the rocks.

On the north slopes, in rather high altitude (200—400 m) the thickets may be of suboceanic or even oceanic type, with a prolific vegetation of large herbs and grasses, especially where they develop along small creeks (cp. BÖCHER 1954, p. 90, and LANGE 1955, Fig. 6). *Angelica* and *Calamagrostis langsdorfii* may form so thick a cover that the fungus flora develops but sparingly. In a copse of this type (Ringsödalen, 28. Aug.) was noted *Cortinarius hemitricus*, *Collybia cirrhata*, *Laccaria laccata*, and *Rhodophyllus* (*Entoloma*) sp. as the only species of fleshy fungi.

A much richer fungus flora was encountered in some nearby thickets with less rich water supply (Fig. 26). The field layer was here a rather thin moss carpet, mostly of *Mnium longirostre* and *Climacium dendroides*, with scattered phanerogams: non-flowering *Angelica*, *Calamagrostis langsdorfii*, *Polygonum viviparum*, *Oxyria digyna*, *Stellaria longipes*, and *Pirola grandiflora*. In some places was the field layer of fallen *Salix* leaves only. The soil is slightly acid.

The fungus flora was rich in species, as it is seen in Tab. 12, II, and also fairly rich in individuals. The composition recalls in many ways

that of the fungus flora in the *Salix* copses at Ivigtut, although the two lists have few species in common. The ephemeral species are predominant, larger fleshy species and species of *Inocybe* being rather few.

Another north slope copse, at the foot of Mt. Ravneklippen, was of a more dry type. *Angelica* and *Calamagrostis* were absent and the moss carpet developed only where water peeped out of the ground. The species

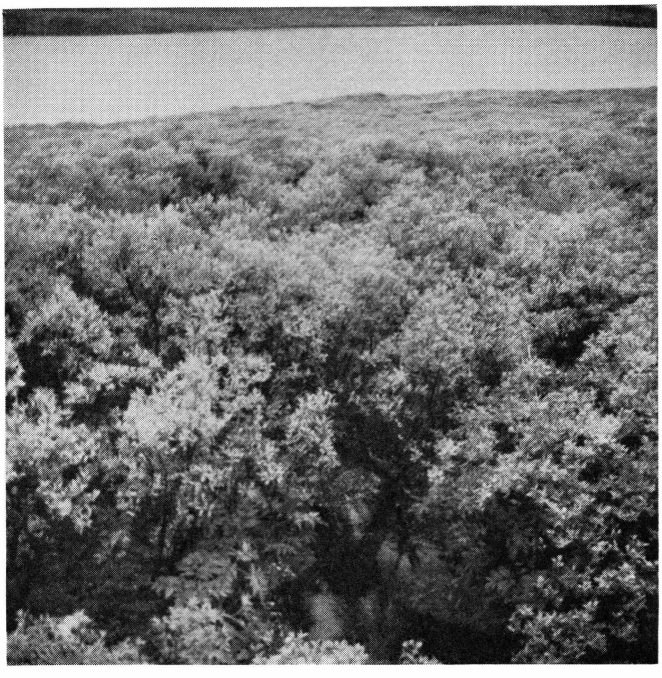

Fig. 26. Rich *Salix* thicket at Hassells Fjeld.

list (Tab. 12, I) has, however, many species in common with that from Ringsödalen, but several ephemeral forms are absent and the number of *Inocybe* species is larger, corresponding to the more continental character of the latter locality.

Continental Salix Scrubs

The south slopes of the mountains in the inner Sdr. Strömfjord area are extremely dry and have a distinct continental type of vegetation. The lower part of the slopes have a comparatively thick cover of loes soil over the rocks, and the vegetation is probably also favoured by humidity from a better snow cover and from a few small wells, making it possible for *Salix glauca* to form small thickets or scrubs. In those places where the largest wells come out are low and very dense *Salix*

shrubs surrounding openings with profuse *Kobresia* tufts. The soil here is sandy loess with pH 6.5 (cp. BÖCHER 1954, p. 200).

Table 12

	I	II
Clitocybe odora var.	+ 261	..
Collybia cookei	+ 249	+
Coprinus domesticus	..	+
— *lagopus* var.	..	+ 401
— *miser*	+ 243	+ 402
Corticium sp.	+	..
Cortinarius hemitricus	..	+ 424
— *inconspicuus*	+ 246	+
— *phaeopygmaeus*	+ 247	+
— *saniosus*	+ 248	..
— *saturninus*	+ 260	..
— sp.	..	+ 421
Hebeloma longicaudum	+	+
— *mesophaeum*	+	+
Hypholoma elongatum	..	+ 413
Galerina pumila	+	+
— *vittaeformis*	+ 254	+
Inocybe dulcamara	+	+
— *fastigiata*	+	..
— *hirtella*	+ 258	..
Laccaria laccata	+	+
Lactarius flavidus	+	..
— *glyciosmus*	..	+
— *mitissimus*	..	+
— *uvidus*	+ 252	..
Lentinellus omphalodes	+	..
Leptotus lobatus	+	+
Marasmius epiphyllus	..	+
Mycena citrinomarginata	..	+
— *leptocephala*	..	+
Mycenella salicina	..	+ 410
Naucoria carpophiloides	+ 253	+
Omphalina pyxidata	..	+ 416
Pistillaria uncialis	..	+
Psathyrella squamifera	+ 251	+
— *subnuda*	+ 250	+
Rhodophyllus nitens	+ 263	+
— *radiatus*	+ 245	+
— *sericeus*	+	+
Thelephora radiata	+	..
Tubaria pellucida	+ 244	+ 426

Species lists from Suboceanic-Subcontinental *Salix glauca* thickets at Sdr. Strömfjord. I: Ravneklippen, 8. Aug. — II: Hassells Fjeld, 28. Aug. Cp. text p. 90.

The individual shrubs are generally too dense to harbour any growth of fleshy fungi, while a flora of real significance is met in the openings among the *Kobresia* tussocks, especially just close to the *Salix* shrubs. (Fig. 27). Tab. 13 shows an analysis from such an area. Ephemeral forms are now absent, except in the very wettests parts—*Inocybe* plays a great role, and *Sepultaria arenicola* represents the steppe element in the fungus

flora. The fungus flora in Q. 1—3 seemed to have passed its maximum and many specimens were old and dried up. The large tussocks made it difficult to place 1 m quadrats, and 4 m quadrats were chosen, making it difficult to compare the analyses with other results, but the species density, 5.4 per 4 sq.m, is certainly rather high.

Just where the wells come out the fungus flora is often very poor, as the cover of phanerogams becomes too thick with *Carex* species

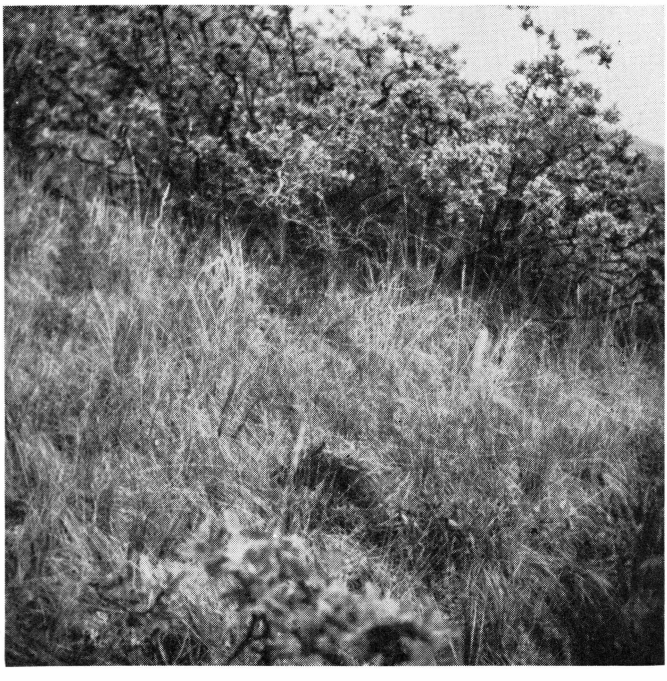

Fig. 27. *Kobresia-Salix glauca* community, south slope of Hassells Fjeld.

dominating and almost no moss cover. Ephemeral forms can develop in this community.

The *Salix* shrubs on the less humid south slope localities are not so dense but may grow taller. *Kobresia* is found here too, but growing more scattered and in lower tussocks, mostly at the upper brim of the scrubs. The lower brim has frequently a vegetation of dwarf shrubs with *Betula nana*, *Empetrum*, and *Vaccinium uliginosum*, while the central part has a scant vegetation of *Pirola grandiflora—Saxifraga tricuspidata*, or no cover of green plants at all but a dusty layer of *Salix* leaves.

The fungus flora in these different zones were studied at two places on Hassells Fjeld, at the foot of the mountain, near the camp, and in a ravine in about 250 m alt. (cp. LANGE 1955, Fig. 8). Lists were

Table 13

Quadrat No. (4 sq. m)	1	2	3	4	5	C
Salix glauca	1	2	2	3	3	100
Vaccinium uliginosum	..	..	..	..	+	20
Kobresia myosuroides	5	5	5	4	4	100
Calamagrostis purpurascens	1	1	1	+	+	100
Potentilla nivea coll.	+	+	+	+	+	100
Cerastium alpinum coll.	+	+	+	+	..	80
Artemisia borealis	+	+	+	+	..	80
Carex supina subsp. *spaniocarpa*	+	+	+	..	..	60
Euphrasia arctica	..	+	+	..	+	60
Pirola grandiflora	..	..	..	2	1	40
Gentiana aurea	..	..	..	1	1	40
Campanula rotundifolia	..	..	..	+	+	40
Polygonum viviparum	..	..	..	..	2	20
Melandrium triflorum	+	..	..	..	..	20
Carex scirpoidea	..	..	..	..	+	20
Cover, per cent.	80	70	70	60	80	..
Campylium stellatum	..	1	..	2	3	60
Distichum capillaceum	1	..	+	2	..	60
Bryum sp.	..	+	..	..	1	40
Tortula ruralis	..	..	+	..	1	40
Barbula recurvirostre	..	..	..	3	..	20
Drepanocladus uncinatus	..	..	..	..	3	20
Thuidium abietinum	..	..	..	..	1	20
Cladonia pyxidata	1	2	+	+	+	100
Cornicularia aculeata	2	1	+	..	..	60
Physcia muscigena	1	..	1	..	+	60
Cetraria nivalis	+	..	2	..	..	40
Cover, per cent.	20	25	25	40	50	..
Inocybe dulcamara	1	1	0	2	0	60
*Hebeloma crustuliniforme**	3	1	0	2	..	60
Sepultaria arenicola 323	1	14	18	..	..	60
Hebeloma mesophaeum	..	3	1	..	1	60
Cortinarius hinnuleus var. 326	..	..	..	2	2	40
— *saturninus*	..	..	..	1	3	40
Inocybe flocculosa	..	..	..	1	3	40
Lamprospora crec'hqueraultii 325	..	..	..	200	..	20
Peziza sp. 324	..	..	..	6	..	20
Pistillaria uncialis	..	..	..	..	6	20
Laccaria laccata	..	..	..	..	2	20
Inocybe fastigiata	3	..	..	..	..	20
Cortinarius sp.	..	..	1	..	..	20
Coprinus sp.	..	..	..	..	1	20
Naucoria carpophiloides	..	..	..	..	1	20
Cortinarius phaeopygmaeus	..	..	..	..	1	20
Bovista echinella	..	..	..	..	0	..
No. of species per 4 sq. m	4	4	3	7	9	5.4

Salix glauca-Kobresia myosuroides community. Sdr. Strömfjord, Hassells Fjeld, on south slope at foot of mountain. 20. Aug.—Small openings in low *Salix* scrub.

5 quadrats of 4 sq. m each, slope 20—35° South, 1—3 with shadow from 0.5—0.8 m high *Salix*, in 4 from 1.4 m high *Salix*, and in 5 from 2 m high *Salix*. 1—3 rather dry, 4—5 more humid.

made on Aug. 2. and Aug. 4. resp. (The lists are not reproduced). Two permanent quadrats were studied on July 28—29 and again on Aug. 30. The *Kobresia*-zone seemed to harbour the richests flora (Quadrat 5, Tab. 14), very similar to that listed from the rich *Kobresia* vegetation (cp. Tab. 13). The flora of very ephemeral species noted on Aug. 30. had developed after rain. The *Betula nana—Vaccinium uliginosum* zone was not rich in fungi, *Hebeloma longicaudum*, *H. mesophaeum*,

Fig. 28. *Salix glauca* shrubs on south slope of Hassells Fjeld.

Lactarius torminosus, and *Leccinum scabrum* were noted from this community in the two localities studied.

The areas with scattered vegetation were often quite without fungi or at least with a very poor flora. Quadrat 3, Tab. 14, can serve as an example of this. Only *Pistillaria* developing in quantity after rain was of numerical significance. Where the ground vegetation was absent was found the same species as in Q. 3 together with *Coprinus domesticus*, *Hebeloma longicaudum*, and *Melanoleuca cognata*, all occurring in small number.

Higher up on the south slopes, in less protected places, *Salix* shrubs were growing singly as small "islands" in the dry steppe vegetation (Fig. 28). The field layer under the shrubs was very sparse, covering 0—20 per cent., and made up of *Calamagrostis purpurascens*, *Campanula*

Table 14

Quadrat No. (16 sq. m)	5	3
Salix glauca (shade)	5	5
Kobresia myosuroides	3	1
Calamagrostis purpurascens	+	1
Potentilla nivea coll.	+	+
Carex supina subsp. *spaniocarpa*	..	+
Cerastium alpinum coll.	..	+
Artemisia borealis	..	+
Poa glauca	..	+
Cover, per cent.	20	10
Tortula ruralis	1	+
Cetraria nivalis	1	..
Cornicularia aculeata	+	..
Physcia muscigena	+	..
Cetraria islandica	..	+
Peltigera canina	..	+
Cover, per cent.	10	2

Date of survey	29. vii	30. viii	28. vii	30. viii
Cortinarius pauperculus 128	16	..	..	..
Hebeloma longicaudum 126	3	..	0	..
Psilocybe physaloides 129	1	..	..	..
Inocybe dulcamara 130	4	..	..	..
— *flocculosa*	1	..	..	..
— *lacera*	1	..	..	..
Helvella acetabulum 171	0	..	..	..
Marasmius epiphyllus	..	8	..	..
Hebeloma mesophaeum	..	1	..	..
Pistillaria uncialis	..	20	..	1000
Clitocybe diatreta	..	..	1	..
Collybia obscura	..	..	1	..
Agaricus arvensis 170	..	..	1	..
— *salicophilus* 167	..	..	0	..
Collybia cirrhata	..	..	..	2
Clitocybe sp.	..	..	..	1
No. of species per 16 sq. m	6	3	3	3

Salix glauca thicket on south slope of Hassells Fjeld, Sdr. Strömfjord. Two quadrats of 16 sq. m each. *Salix* shrubs about 1 m high, slope 5—10° South, soil dry loess layer under thick cover of leaves, elevation 40 m. Each quadrat surveyed twice, the second time after rain.

rotundifolia, *Carex supina* and occasionally *Draba aurea*, *Poa glauca*, and *Cerastium alpinum*. Lichens and mosses were absent, or a few plants of *Tortula ruralis* were seen.

Four individual shrubs, covering an area of 12—40 m each were studied on Aug. 20., a few days after a rainfall. (Tab. 15). The fungus flora was almost devoid of fleshy species of agarics, but some xerophytic Macromycetes tolerant to dessication were growing in the loess soil among the leaves, probably representing a steppe element in the fungus flora. (*Bovista tomentosa*, *Ramaria ocraceovirens*, *Geastrum minimum*,

Table 15

Salix shrub No.	1	2	3	4
Xerophytic element:				
Bovista tomentosa 328	..	1	..	..
Coprinus domesticus 341	1	5	1	3
Geastrum minimum 319	..	26	..	..
Polyporus groenlandicus 359	..	..	..	1
Ramaria ochraceovirens 320	8	..	22	..
Thelephora radiata	..	2	..	..
Ephemeral element:				
Clitopilus septicoides 322	40	..	..	..
Delicatula sp.	..	2	..	..
Marasmius epiphyllus 321	..	..	..	11
Mycena filopes	..	..	..	2
Mycena sp.	6	..	3	..
Naucoria carpophiloides	..	5	3	..
Pistillaria uncialis 342	c. 2000	..	..	c. 2000
Cortinarius sp.	1	1	1	..
Mycena pura 331	..	..	..	26

Isolated *Salix* shrubs in steppe vegetation on south slope of Hassells Fjeld, Sdr. Strömfjord, 100—150 m alt., 20. Aug. Vegetation see text p. 95. Surveyed area about 6 sq. m in 1—3, 40 sq. m in 4. Slope 15—20° South. Ephemeral flora element developed after rain.

Polyporus groenlandicus, and *Thelephora radiata*). It is not unlikely, that *Coprinus domesticus*, springing from a large yellow ozonium, belongs biologically in this group. The remaining species were almost all very ephemeral forms developed after the rain—or a few of them thriving in mouse holes and other depressions under the leaves.

The Grass Steppes

The dominant vegetation of the south slopes of the mountains in the inner Sdr. Strömfjord area is a typical subarctic continental steppe with *Puccinellia*, *Carex supina*, and *Calamagrostis purpurascens*, developing as a dense cover or as more scattered tufts. A few xerophytic mosses and some small low lichens form a more or less scattered field layer on the dry cracked loess soil. (pH ca. 7.0, cp. Böcher 1954, p. 193).

Salix glauca occurs as very scattered shrubs, and harbour a fungus flora of some significance, (cp. p. 91 ff.), but the grassclad areas over the outer *Salix*-rhizosphere, and the truly *Salix*-free regions are almost totally without fungi. My analyses comprise two larger areas surveyed on Aug. 20., and two quadrats (Q. 1 and Q. 2) of 25 sq.m each, studied on July 28. and Aug. 30. No fungi whatsoever were encountered at the August observations while one dried-up specimen, *Bovista tomentosa* and

Laccaria laccata, respectively, was found in each of the two quadrats on July 28. Hardly any other species were recorded from this vegetation, which with regard to the fungal component is by far the poorest community in the area. It is, however, not improbable that a richer fungus flora may develop here early after the thaw, when the soil humidity is higher and the insolation may bring the soil temperature to a relatively high level.

The lowland areas are in places dominated by a steppe-vegetation of *Kobresia myosuroides*. This community was not studied in detail with regard to its fungal component, but a few species were met, especially where the field layer was a fairly well developed moss carpet.

Sand Dunes and Drift Sand Plaines

The two broad valleys, Örkendalen and Sandflugtdalen, have large areas with drift sand which form low dunes. Small, isolated shrubs of *Salix glauca* are met, and on the dunes grows *Elymus* scattered, while the depressions have a very sparse vegetation of *Festuca rubra*, *Carex*

Table 16

	Line 1 10×1 m		Line 2 10×1 m		Q. 1 1 sq. m	Q. 2 4 sq. m
Salix glauca (not more than 4 m from any quadrat)	..		..		1	+
Festuca rubra	100		100		+	1
Carex maritima	40		90		+	+
Calamagrostis purpurascens	50		50		..	..
Artemisia borealis	30		10		..	..
Armeria scabra	40		..		..	..
Elymus mollis	..		30		..	+
Juncus arcticus	..		30		..	+
Honckenia peploides	10		..		+	..
Cover, per cent.	2—20		5—15		15	10
	C	I	C	I	I	I
Cortinarius psammouraceus 377	..	..	..	..	11	2
— sp. 376	0	..	30	4	..	2
Hebeloma strophosum 375 + *mesophaeum*	30	13	60	7	3	3
Helvella arctica 380	10	9	..	..	..	71
Inocybe serotina 372	20	2	..	..	0	5
— *lacera* + *dulcamara* 373—74	..	..	30	8	..	..
Laccaria trullisata 384	..	..	..	..	5	..
Lachnea sp.	..	..	10	9	..	..
Sepultaria arenicola 383	..	..	20	8	..	..
No. of species per sq. m	0.6	..	1.5	..	4	—

Drift sand and dune vegetation in Sandflugtdalen, Sdr. Strömfjord. 24. Aug. Two transects of 10×1 sq. m each and two single quadrats. For the transects are indicated only the constancy per cent. (C) and the No. of fruit bodies in total (I).

maritima, *Juncus arcticus*, *Artemisia borealis*, and a few other herbs, developing where the drift sand is blown away and the sand is relatively humid. Mosses and lichens are almost absent. (Fig. 29). The fungus flora was found comparatively rich in these depressions. The analyses (Tab. 16) comprise two single quadrats of 1 sq.m and 4 sq.m respectively, from areas especially rich in fungi, and two transects of 10 Q. (1 sq.m

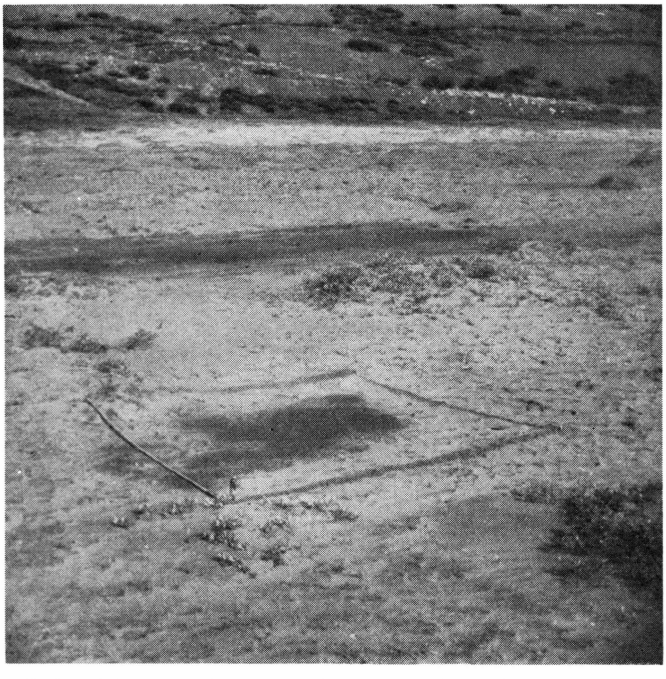

Fig. 29. Small humid depression in drift sand region. Sandflugtdalen. (Quadr. 2).

each). Transect 1 is from an area with very small dunes on a flat depression, transect 2 is from between two rows of low dunes where the depression was rather humid. *Salix glauca* was found in both places, and never more than 4 m from a quadrat, so all quadrats are probably within the *Salix*-rhizosphere. The analyses of the fungus flora were difficult as the specimens were incrusted very strongly with sand.

The dominant species were small Hebelomae, Inocybes, and Cortinarii, together with *Helvella arctica*, *Sepultaria* and *Laccaria trullisata*. All of the species were locally abundant, and especially *Helvella arctica* occurred in large flocks. The most humid depressions had a fungus flora of *Conocybe ammophila*, *Sepultaria*, *Hebeloma mesophaeum*, and *H. strophosum* among *Juncus arcticus* and *Salix glauca*. None of all the species mentioned were met more than 5 m from a *Salix* shrub. A single specimen of *Leccinum scabrum* and *Lentinellus omphalodes* respectively was met

Fig. 30. *Inocybe maritima* and *Hebeloma* sp. in dune vegetation. Örkendalen.

in two large *Salix* shrubs, while a few *Psilocybe montana* were met on a *Salix*-free dune, probably growing on *Elymus* leaves. No other species were noted from the area, while the same group of fungi was found at Bredesand, Örkendalen, Aug. 14. in a similar sandy area. (Fig. 30).

There is, I believe no other detailed record of arenicolous fungi in arcto-alpine areas. ROSTRUP records *Geoglossum arenarium* and *Inocybe maritima* from Greenland, but with no specific information on ecology. It is highly possible that further studies in the Sdr. Strömfjord area and similar localities elsewhere will proove the presence of still more arenicolous fungi in the subarctic and arctic zone.

Periodicity of the Fungus Flora

The seasonal variation of the fungus flora may, with some reservations, be indicated for the Greenland stations visited. The general impression was that the season in question was a "good" season, and that the frost came rather late. Ivigtut was visited in two periods—July 9.—15. and September 11.—October 1. The first period was evidently very early in the fungus season. Except for the local coprophilous element, but few species were found (about 35), and only about half a dozen of them in larger numbers of individuals: the more frequent being *Collybia dryophila*, *C. obscura*, *Omphalina ericetorum*, *O. obscurata*, *Laccaria laccata*, and *Mitrula multiformis*. Almost all remaining species were found but once or twice. The composition of this flora recalls quite well the early season aspect in temperate regions. The September flora was much more abounding and characterized by copious occurrence of fleshy species: *Lactarius*, *Russula*, *Leccinum*, *Cortinarius*, and also of such more ephemeral species as *Mycena* and *Galerina*. The total number of species listed was about 100, and the number of individuals was much larger than in the early season. The composition of the flora and also the general impression indicated that the maximum development was reached at this time or probably a little earlier in September. The flora was radically reduced towards the end of September when the frost started.

Godthåb was visited on July 17.—19. and Sept. 5.—8. The early visit disclosed a flora rather similar to that met at Ivigtut, mainly made up of *Omphalina*, *Galerina*, and *Collybia* spp., the fleshy forms were rare and scattered, and large areas were quite devoid of fungi. The total list includes about 25 species, while the flora on Sept. 6. had developed in almost all plant communities, in places even profusely, and included many fleshy species. A total list of species was not made up, a provisional list includes about 40 names. The general impression was of flora which had just passed its optimum. Similarily seemed the flora at Kangâmiut, Sept. 1. to be at its very peak.

The stay in Sdr. Strömfjord lasted from July 24. to Aug. 31. The most exact guidance to the evaluation of periodicity in this area may be the quadrats Nos. 1—9 which all were surveid at the beginning and

the end of the period. They indicate largely a summer optimum of development at the beginning of the period and a decline of the flora through August, due to dessication. A flora of very ephemeral forms appears after the light rain showers. All these quadrats are on south slopes or on the plaine, but local observations seem to indicate a similar development on the north slopes, where, however, no rain-dependant ephemeral elements were encountered. There is probably some variation in the picture, and it is likely that a spring flora of fungi appears on the south slopes, especially where the snow disappears very early, where it may even be the most significant aspect. At least were these regions in places almost without fungi in August. It seemed, however, that the optimum development of the flora taken as a whole is around August 1., at which time it includes a large number of fleshy forms. There was no sign of a specific autumn flora developing at the end of August; at least not one significantly different from the earlier aspects. Fleshy forms as *Agaricus*, *Russula*, *Leccinum* were definitely more abundant in the early season, as was also *Inocybe*, but it may be that such genera as *Clitocybe* and *Mycena* had a later optimum.

Geographical Distribution of the Fungi

Our knowledge of the distribution of the fungi is not good enough as yet to permit a division of the fungus flora of a given region into distinct series such as continental or oceanic, arctic or subarctic. It is clear that a classification on the lines employed for vascular plants ultimately is likely to be applicable to the fungi, but scant information on the fungus flora of vast areas, and difficulties regarding nomenclature and species concept make this a far goal, even for such regions where good information is on hand. It should, however, be permissible to take certain steps towards such a classification, and others may be suggested.

The constant connection of many fungi with one or a few host plants gives this study a special aspect, in which it differs from similar work on almost all green plants. Fungi may thus have an area of distribution as wide as that of the host plant, or at least follow the host to one of its geographical limits. PILÁT & NANNFELDT (1955) found *Collybia esculenta* at the furthermost stand of *Pinus* in the Lappland mountains in Sweden, and I have made similar observations for *Boletus granulatus* in the same area. Several other Agarics connected with *Pinus* have, on the other hand, their border line further to the south and have not been observed in North Lappland, (e. g. *Tricholoma equestre*, *Gomphidius* spp.), although soil conditions seem favourable, thus making it probable that the fungi in question have a climatic border line more narrow than that of the host.

The several fungi which are not confined to one host or a definite group of hosts have, of course, less easely defined potential limits of distribution, but most species seem in some way or other dependant on a substratum supplied by other plants. They are absent where the substratum is not found but, again, only present when other conditions are also favourable. This last reservation is in fact what makes a plant geographical arrangement of the fleshy fungi worthwhile. But these conditions ask for great precaution when comparing the flora of two areas. This is very evident when one compares the results of the present study with other more detailed accounts of alpine and arctic fungi, as those of LARSEN and CHRISTIANSEN from Iceland, of MØLLER from the Færöes,

and especially the most recent and comprehensive one, FAVRE's publication on the fungi of the Swiss Alps. This last work deals exclusively with the flora above the timber line, but this border seems in the area in question to delimit the upper zone of the coniferous forest from a vegetation where the shrubs are pygmaean species of *Salix*, *Dryas*, and some *Ericaceae*. There seems to be no zone dominated by larger shrubs of *Salix* spp. and *Betula* spp. as it is found in Scandinavian mountains (at Abisko f. inst. from about 500 to 800 m alt.), and which vegetation is very widespread in the southern part of Greenland. The presence of meadow-like grass communities in the Alps indicates a difference of importance when comparing the fungus flora of the two regions. It is well in accordance with these differences, that FAVRE found but very few species of *Lactarius* and *Russula* in the Alps, just as MØLLER reports the two genera as almost absent on the Færöes where dwarf shrubs are rare. Similarily is the element confined to grassy meadows more dominant in the Alps and even much more so on the Færöes. It includes i. a. *Hygrophorus conicus* and *Anellaria semiovata*. There is, however, still a large number of fungi which the arcto-alpine areas seem to have in common. Comparatively few of these species are known to be restricted to these regions. The list below (Tab. 17) includes such Greenland species which, with fair certainty, can be regarded as absent or very rare outside

Table 17.

Calvatia cretacea	*Mycena epipterygia* var. *badiceps*	*Cortinarius phaeopygmaeus*
— *arctica*	*Stropharia aeruginosa* var. *alpina*	*Russula alpina*
— *tatrensis*	*Psilocybe stagnina*	*Clavulinopsis septentrionalis*
Hygrophorus vitellinus	*Cortinarius alpinus*	*Helvella arctica*
— *lilacinus*	*Cortinarius glandicolor* var. *exilis*	*Mitrula gracilis*
Arrhenia auriscalpium		— *multiformis*
Omphalina luteovitellina		*Sclerotinia vahliana*
Marasmius epidryas		
Clitocybe rivulosa var. *dryadicola*		

Greenland Macromycetes restricted to arcto-alpine areas, or rarely occurring outside these areas.

the arcto-alpine region and other mountaneous zones. There is a high degree of correspondence with the similar list published by FAVRE (l. c. p. 196), as only a smaller number of species seem restricted to the northern regions. However, quite a few species may well be added to the list, including, in all likelyhood, some of the new taxa described in FAVRE's account and in the present study. This applies especially to the genera *Inocybe* and *Cortinarius*, where the problem in fact is to ascertain whether species known from Greenland and from the Alps may also occur in lowland regions.

A few members of the group seemed to be attached to host plants occurring exclusively or mainly in the zone. *Marasmius epidryas* and *Clitocybe rivulosa* var. *dryadicola* thus to *Dryas* spp., to which species also quite a number of *Inocybe* and *Cortinarius* are bound, while *Cortinarius alpinus* apparently is confined to *Salix herbacea*. The remaining species have less evident connections, at least as far as our present knowledge goes. But it is highly probable that a very large number of them are connected with the dwarf shrubs through mycorrhiza. I believe that SINGER (1954) underrates this factor when presuming that several genera of fungi in the arctic have moss as their substratum. This is not the whole truth for genera as *Cortinarius* and *Inocybe*, both undoubtedly dependent on the presence of dwarf shrubs. It is, however, noteworthy that *Psilocybe stagnina* grows on moss species, which are also frequent in the European lowland, where the fungus does not occur. The group includes some of the species which reach the highest altitude in the Alps and in the Lappland mountains, viz. *Omphalina luteovitellina*, *Russula alpina*, and *Cortinarius alpinus*.

Table 18

Leptotus lobatus	*Inocybe flocculosa*	*Russula aeruginea*
Omphalina obscurata	— *lanuginella*	(— *sphagnophila* var.
— *ericetorum*	*Hebeloma mesophaeum*	*heterosperma*)
Laccaria laccata	*Cortinarius mucosus*	— *versicolor*
Collybia dryophila	— *cinnamomeus*	*Lactarius torminosus*
— *obscura*	— *hemitricus*	— *glyciosmus*
— *cirrhata*	*Galerina clavata*	— *mitissimus*
Mycena megaspora	— *vittaeformis*	— *uvidus*
Cystoderma amianthinum	— *pumila*	*Leccinum scabrum*
— *granulosum*	(*Russula gracilis* var.	*Clavaria argillacea*
Psilocybe montana	*altaica*)	*Helvella lacunosa*
Inocybe lacera	— *claroflava*	— *acetabula*
— *fastigiata*	— *decolorans*	*Lachnea scutellata*
— *dulcamara*		*Sepultaria arenicola*

Greenland Macromycetes frequent in arcto alpine-areas but also occurring frequently in temperate regions.

The major part of the Greenland species is also distributed in European lowland regions. The more common ones are listed in Tab. 18. Some few of these seem, however, to have their main occurrence in arcto-alpine areas, viz. *Leptotus lobatus*, *Omphalina obscurata*, *Mycena megaspora*, and *Galerina pumila*, while the remaining species are more ubiquitous. Many of these fungi are connected with *Betula* and/or *Salix* spp., probably through mycorrhiza. This holds true for the species of *Amanita*, *Cortinarius*, *Hebeloma*, *Russula*, *Lactarius*, and *Leccinum*; most likely also for *Inocybe* and *Laccaria*. Only a few species seem confined to other dwarf shrub hosts, (*Mycena megaspora* to *Empetrum*?) while others may occasionally be connected with such hosts (*Collybia dryophila*

may grow on leaves of *Vaccinium uliginosum*). Most species of the remaining genera are confined to the moss and lichen vegetation, some of them directly attached to the moss plants (*Leptotus*, *Galerina*). A few species thrive on decaying fungi (*Collybia cirrhata*, and also the rarer *C. cookei* and *Lyophyllum erosum*).

The southern element in the Greenland fungus flora can hardly be fully described before the *Betula pubescens tortuosa* copses in the fjords south of Ivigtut have been carefully studied. I spent but a few hours in Narssarssuaq, very early in the season, and the *Betula* trees at Ivigtut are rather few and isolated. A large number of fungi seem, however, not to follow *Betula pubescens* to its Greenland stands; the most remarkable of these are *Tricholoma flavobrunneum*, *T. album*, *Cortinarius pholideus*, *Lactarius necator*, and *Polyporus betulinus*. Quite a few species attached to *Salix* seem missing, e. g. *Tricholoma cingulatum*, *Cortinarius uliginosus*, and *Naucoria conspersa*, and further many fungi which are met under or on both *Betula* and *Salix*, such as *Armillaria mellea*, *Pluteus cervinus*, *Coprinus micaceus*, *Cortinarius semisanguineus*, and others. However, the species listed below (Tab. 19) seem to be confined to southernmost Greenland, and the majority of these are even of rare occurrence or absent at Ivigtut. At least one of them, *Naucoria escharoides*, is attached to *Alnus crispa*, which has its north limit at 66° N., while some others (probably) form mycorrhiza with *Betula pubescens* (*Amanita*

Table 19

Bovista nigrescens	*Marasmius androsaceus*	*Cortinarius trivialis*
Crucibulum vulgare	*Mycena rubella*	— *decoloratus*
Sphaerobolus stellatus	— *rubromarginata*	*Naucoria escharoides*
Panellus ringens	— *stannea*	*Rozites caperata*
Hygrophorus pratensis	— *hemisphaerica*	*Galerina marginata*
Flammulina velutipes	— *delicatella*	*Paxillus involutus*
Omphalina philonotis	*Amanita muscaria*	*Lactarius rufus*
Tricholoma atrosquamosum	*Kuehneromyces mutabilis*	*Polyporus* spp.
	Agrocybe praecox	*Helotium aeruginosum*

Greenland Macromycetes confined to southernly, subarctic stations.

muscaria, *Tricholoma atrosquamosum*). *Helotium aeruginosum*, *Flammulina velutipes*, *Kuehneromyces mutabilis*, and *Polyporus* spp. are dependent on the rather thick branches or trunks which are absent further to the north. *Paxillus involutus* and *Lactarius rufus* were both found with *Betula glandulosa* also. They may be at their climatic border line or may be unable to form mycorrhiza with *Betula nana*, which dominates north of 64° N.

Some groups of species confined to very special substrata deserve mentioning. The coprophilous fungi were by me met almost exclusively in the Ivigtut region on dung from horses and cows. Their spores may

well be brought to Greenland with fodder, and it is not possible on the present material to pass judgment on their indigenity. Reindeer-dung (and dung from the mosque ox) may provide suitable substrat even at very far northern stations but I had no luck in finding such treasures. The carbonicolous fungi most commonly met: *Lyophyllum atratum*, *Pholiota carbonaria*, and *Coprinus angulatus* were met at Ivigtut, *Coprinus*

Fig. 31. *Helvella arctica* in dune vegetation at Sandflugtdalen.

angulatus also at Sdr. Strömfjord, but the latter station was a very small spot and better habitats must be inspected before the north limit of these species can be determined.

Arenicolous habitats were found quite rich in fungi in the Sdr. Strömfjord area (cp. p. 98). A remarkable number of species inhabiting similar places in boreal regions were abundant here, making it likely that the arenicolous flora remains fairly unchanged towards the north.

Sphagnicolous species should find suitable habitats in the regions studied by me. It is then a notable fact that many of these have not been found in Greenland, viz. *Galerina paludosa*, *G. sphagnicola*, *G. tibiicystis*, and *Lyophyllum palustre*. The only typical sphagnicolous species in the Greenland flora is *Omphalina philonotis* which was found at the southernmost station, Narssarssuaq; while such species as *Clavaria*

argillacea, *Hygrophorus turundus*, and *Omphalina epichysium* may grow on *Sphagnum*, but may in Greenland as elsewhere also grow on other mosses. This is also true for the Greenland form of *Hypholoma elongatum*. This distribution indicates a climatic border line for many sphagnicolous species. The host plant genus is distributed as far north as 77° N. (B. LANGE 1952) and occurs also in the alpine zones studied by FAVRE, who also found the typical sphagnicolous element almost absent.

The possibility of defining an oceanic element and a continental element in the Greenland fungus flora should certainly be further studied. SINGER (1954) has given a very preliminary note on the "atlantic" character of some few species. Comparison of the flora at the continental station at Sdr. Strömfjord and at the oceanic stations Godthåb, Ivigtut, and Kangâmiut (cp. p. 83) gives some indications, but the species list from Godthåb and Kangâmiut are not detailed enough to make a full evaluation possible. It seems, however, that the following species may constitute an oceanic element: *Collybia dryophila*, *Omphalina luteovitellina*, *Hygrocybe lilacina*, *Marasmius androsaceus*, *Mycena megaspora*, *Amanita vaginata*, *Inocybe lanuginella*, *Cortinarius acutus*, *C. alpinus*. To this list could probably be added several species of *Hygrophorus* and *Russula*, the latter genus found especially abundant at coastal stations, and also species of *Mycena* and *Psathyrella*, which were most common at Ivigtut, and which at Sdr. Strömfjord occurred mainly in the oceanic-suboceanic *Salix* thickets. The fact that the large majority of fungi in the temperate regions are confined to woods is in all probability not only caused by the presence there of suitable substrate (including mycorrhizal hosts) but also by the high and rather constant air-humidity and the shade. The arcto-alpine microforest (as FAVRE designates the alpine dwarf shrub community) can supply the necessary substrata, but shade is much more sparse, and humidity of the air dependant—to a large extent—on the macroclimatic conditions. I have little doubt that this accounts for the oceanic distributional type of many species in Greenland which in other places may inhabit the woods of even rather continental zones.

As probable members of continental element may be considered *Agaricus salicophilous*, *Bovista tomentosa*, *Calvatia tatrensis* v. *groenlandica*, *Coprinus domesticus*, *Sepultaria arenicola*, and probably also the *Lycoperdon* spp. and several species of *Inocybe*. The latter genus was very sparingly represented at the coastal stations. The continental flora seems further characterized by the occurrence of a number of very ephemeral forms developing just after rain and soon disappearing (cp. p. 97).

It should be further studied whether the species in question are truely continental, as at least a part of them may well be dependant

on the alcaline soil, which is predominant in some regions where the precipitation is low, but of course also is found in more oceanic regions with alcaline rocks. This applies also to the several species of Ascomycetes found in the drier communities, but not included in the above enumeration.

Further indications concerning the plant geographical status of a number of species may be extracted from the vegetational studies re-

Fig. 32. *Sepultaria arenicola* in humid place in dune area. Örkendalen.

ported above. The basis is, however, still rather meagre, and even the outline given in this chapter may not stand. It concurs, though, largely with the results one will arrive at when also using the information presented in Tab. 20 on the distribution of fungi in the arcto-alpine areas. The table is in the main a summary of the information given in the taxonomic account, with such data added which have been made available since the publication of Parts I and II. The table includes only the fungi which are known from Greenland. There is a very long additional list to be excerpted from FAVRE's study, including quite a few species common in the Alps. However, most of these fungi are new taxa of *Inocybe* and *Cortinarius*, and their occurrence in Greenland is highly probable. Species really common in the Alps and definetely rare or absent in Greenland are *Bovista nigrescens*, *Hygrophorus conicus*, and *Anellaria semiovata*.

Table 20

	Ivigtut	Godthåb	Sdr. Strömfjord	Other Greenland loc.	Iceland	Færöes	Jan Mayen-Svalbard	Lappland	Norwegian Mts.	Alps	Other Arcto-Alpine loc.
Geastrum minimum	..	..	+	..	..	..	..	+	+	+	..
Calvatia cretacea	+	..	+	+	..	..	+	+	+	..	+
— *arctica*	..	..	..	+	..	..	..	..	+	..	..
— *tatrensis*	+	..	(+)	+	..	..	..	+	+	..	+
— — var. *groenl.*	+	..	+	+	..	..	..	..	..	..	..
Lycoperdon molle PERS. (syn.: *L. umbrinum* s. HOLLÓS)	..	..	+	+	..	..	+	+	+	+	..
Lycoperdon nigrescens	..	..	..	+	..	..	..	+	+	+	..
— *spadiceum*	..	..	+	..	..	..	..	..	..	+	..
— *pusillum*	..	..	+	+	+	..	..	..	..	..	..
Bovista echinella	..	..	+	+	..	..	..	+	..	..	..
— *tomentosa*	..	..	+	+	..	..	..	..	+	+	..
— *nigrescens*	..	..	..	+	+	..	..	..	+	+	..
Crucibulum vulgare	+	..	..	..	+	..	..	+	+	..	..
Sphaerobolus stellatus	+	..	..	..	..	..	..	..	..	..	..
Panellus ringens	..	..	..	+	..	..	..	..	..	..	..
Resupinatus algidus var.	+	..	..	..	..	..	..	+	..	..	..
Lentinellus omphalodes	+	..	+	+	..	..	..	+	..	(+)	..
Flammulina velutipes	+	..	..	..	..	+	..	+	..	..	..
Hygrophorus pratensis	+	..	..	..	+	+	..	..	..	..	..
— *turundus*	(+)	..	+	..	+	+	..	..	..	+	(+)
— *coccineus*	..	+	..	..	+	..	..	..	..	+	..
— *marchii*	+	+	..	..	..	+	..	..	..	+	..
— *vitellinus*	+	+	+	+	+	+	..	..	..	+	+
— *lilacinus* (syn.: *H. violeïpes*)	+	+	..	+	..	..	..	+	..	+	..
Arrhenia auriscalpium	..	..	+	..	..	..	..	+	..	+	..
Leptotus lobatus	+	+	+	+	+	+	+	+	..	+	+
Omphalina acerosa	..	..	+	..	..	..	..	+	..	+	..
— *obscurata*	+	+	+	+	+	..	..	+	..	+	..
— *philonotis*	..	..	..	+	..	..	..	+	..	..	..
— *epichysium* var.	..	..	+	..	..	..	..	+	..	..	..
— *demisella*	+	..	..	+	..	..	..	+	..	..	..
— *pyxidata*	..	..	+	..	..	..	+	+	..	+	..
— *ericetorum*	+	+	+	+	+	+	+	+	+	+	+
— *luteovitellina* (syn.: *O. flava*)	+	+	+	+	..	+	..	+	+	+	..
Lyophyllum erosum	..	+	..	..	..	+	..	..	..	..	..
— *atratum*	+	..	..	..	..	..	..	+	..	..	..
Calocybe pseudoflammula	..	..	+	..	..	..	..	..	..	..	..
Laccaria laccata	+	+	+	+	+	+	(+)	+	+	+	..
— *tetraspora*	+	..	..	..	..	..	..	..	..	..	+
— *tortilis*	+	..	..	..	..	+	..	+	..	+	..
— *trullisata*	..	..	+	..	..	..	..	..	..	..	..
Clitocybe leucophylla	..	..	+	..	..	..	..	..	..	..	..
— *ditopa*	..	..	+	..	..	..	..	..	..	..	..
— *vibecina*	+	..	..	..	..	..	..	..	..	..	..
— *diatreta*	..	..	+	..	..	..	..	..	..	..	..
— *dealbata*	..	..	+	..	+	..	..	..	..	..	..

(*continued*)

Table 20 (cont.)

	Ivigtut	Godthåb	Sdr. Strömfjord	Other Greenland loc.	Iceland	Færöes	Jan Mayen-Svalbard	Lappland	Norwegian Mts.	Alps	Other Arcto-Alpine loc.
Clitocybe rivulosa var.	..	..	+	..	..	..	..	+	..	+	..
— *odora* f. *subsphaer.*	..	..	+	..	..	..	..	..	..	..	..
— *infundibuliformis*	..	..	+	+	+	+	..	+	+	+	..
— *pseudoectypa*	..	..	+	..	..	..	..	..	..	..	..
Tricholoma atrosquamosum	+	..	..	..	..	..	..	..	..	..	..
Melanoleuca cognata	..	..	+	..	+	..	..	..	..	+	+
— *oreina*	..	..	+	..	..	..	..	..	..	(+)	..
Collybia dryophila	+	+	+	+	+	..	..	+	+	+	+
— *cookei*	..	..	+	..	..	..	..	..	..	..	..
— *cirrhata*	+	+	+	+	..	..	..	+	..	..	..
— *obscura*	+	..	+	..	..	..	..	+	..	+	..
Marasmius epidryas	+	..	+	+	..	..	..	..	..	+	..
— *androsaceus*	+	..	..	..	..	+	..	+	..	..	..
— *epiphyllus*	..	..	+	..	..	..	..	..	..	..	..
Delicatula delectabilis	+	..	..	..	..	..	..	..	..	..	..
Mycena fibula	+	+	+	..	..	+	..	+	..	+	+
— *delicatella*	+	..	..	..	..	..	..	..	..	..	..
— *citrinovirens*	+	..	..	..	..	..	..	..	..	..	..
— *rubella*	+	..	..	..	..	..	..	..	..	..	..
— *pura*	+	+	+	..	..	..	..	+	+	+	+
— *rubromarginata*	+	..	..	..	..	..	..	+	+	+	+
— *citrinomarginata*	+	+	+	+	..	+	..	+	..	..	..
— *leptocephala*	+	+	+	..	+	..	..	+	..	..	..
— *stannea*	+	..	..	..	..	..	..	..	..	..	..
— *aetites*	..	..	+	..	+	..	..	..	..	..	..
— *urania*	..	..	+	..	..	..	..	..	..	..	..
— *psammicola*	+	..	..	..	..	..	..	..	..	..	..
— *metata*	+	..	+	..	..	..	..	..	..	..	..
— *filopes*	+	..	+	..	..	..	..	+	..	..	..
— *megaspora*	+	+	..	..	..	..	..	+	..	..	..
— *hemisphaerica*	+	..	..	..	..	..	..	..	..	..	..
— *subconcolor*	+	..	..	..	..	..	..	..	..	..	+
— *concolor*	+	+	+	..	..	..	..	..	..	..	..
— *pseudopicta*	(+)	..	+	..	+	..	..	..	..	..	..
— *epipterygia* var.	+	+	+	+	..	..	..	..	..	..	..
Mycenella salicina	..	..	+	..	..	..	..	..	..	..	..
Xeromphalina fulvobulbillosa	+	..	..	..	..	..	..	..	..	..	..
Amanita vaginata	+	+	..	+	+	..	..	+	+	+	..
— *muscaria*	..	..	..	+	..	..	..	..	..	..	+
Agaricus arvensis	..	..	+	..	+	+	..	..	..	..	..
— *fissuratus*	..	..	..	+	..	..	..	..	..	..	..
— *campestris*	..	..	+	..	+	+	..	..	..	+	..
— *salicophilus*	..	..	+	..	..	..	..	..	..	..	..
Cystoderma granulosum	+	..	+	+	..	+	..	+	..	..	..
— *amianthinum*	+	..	+	..	+	..	..	+	..	+	+
Coprinus macrocephalus	+	..	..	..	+	+	..	..	..	..	..
— *lagopus* var.	..	..	+	..	..	..	..	..	..	..	..
— *filamentifer*	+	..	..	..	..	..	..	..	..	..	..
— *stercorarius*	+	..	..	..	..	+	..	..	..	..	..
— *martinii*	..	..	+	..	..	..	..	..	..	+	..

(*continued*)

Table 20 (cont.)

	Ivigtut	Godthåb	Sdr. Strömfjord	Other Greenland loc.	Iceland	Faeröes	Jan Mayen-Svalbard	Lappland	Norwegian Mts.	Alps	Other Arcto-Alpine loc.
Coprinus domesticus	..	..	+	..	+	..	..	+	..	..	..
— *pyrrhantes*	+	..	..	..	..	..	..	..	..	..	..
— *angulatus*	+	..	+	..	..	..	..	+	..	..	..
— *bisporus*	+	..	..	..	..	+	..	+	..	..	..
— *miser*	..	..	+	..	+	..	..	+	..	+	..
Psathyrella velutina	+	..	..	..	..	..	..	..	..	..	..
Panaeolus campanulatus	+	..	..	..	+	+	..	..	..	..	..
— *ater*	..	..	+	..	..	..	..	..	..	..	..
Anellaria semiovata	..	+	..	..	+	+	..	+	+	+	+
Stropharia aeruginosa var.	..	..	+	..	+	..	..	..	(+)	..	..
Hypholoma myosotis	+	..	+	..	+	+	..	+	..	..	..
— *elongatum*	+	..	+	..	+	+	..	+	..	+	..
Psilocybe coprophila	..	+	..	..	+	+	..	+	..	..	..
— *merdaria*	+	+	..	..	+	+	..	..	..	..	..
— *montana*	+	+	+	..	+	+	..	+	..	+	..
— *stagnina*	..	+	+	+	..	..	+	+	..	+	..
— *crobula*	+	..	..	..	..	..	..	..	..	..	..
— *physaloides*	..	..	+	..	+	+	..	..	..	..	..
Kuehneromyces mutabilis	+	..	..	..	+	+	..	+	+	..	..
Pholiota groenlandica	+	..	..	..	..	..	..	..	..	..	..
— *carbonaria*	+	..	..	..	..	..	..	+	..	..	..
Conocybe ammophila	..	..	+	..	..	..	..	..	..	..	..
— *rickenii*	+	..	..	..	..	..	..	+	..	..	..
Agrocybe praecox	+	..	..	+	+	+	..	+	+	..	+
Inocybe obscura	..	..	+	..	..	..	..	+	..	(+)	..
— *flocculosa*	+	..	+	+	(+)	..	..	..	..	+	+
— *auricoma*	..	..	+	..	..	..	..	+	..	..	..
— *decissa* var.	..	..	+	..	+	..	..	..	..	..	..
— *geophylla*	..	..	+	..	+	..	+	+	+	+	..
— *posterula*	+	..	..	..	..	..	..	..	..	..	..
— *eutheles*	..	..	+	..	..	..	..	..	..	+	+
— *langei*	..	..	+	..	+	..	..	..	..	..	..
— *hirtella*	..	..	+	..	+	+	..	..	..	+	..
— *lacera*	..	+	+	+	+	+	..	+	+	+	..
— *longispora*	..	..	+	..	..	..	..	..	..	..	..
— *ursinella*	..	..	+	..	..	..	..	..	..	..	..
— *serotina*	..	..	+	..	..	..	..	..	..	..	..
— *calamistrata*	..	..	+	+	+	..	..	+	..	+	..
— *fastigiata*	..	..	+	+	+	(+)	+	+	+	+	..
— *dulcamara*	+	+	+	+	+	+	+	+	..	+	..
— *asterospora*	..	..	+	..	..	..	..	..	..	..	..
— *maritima*	..	..	+	+	..	..	..	..	..	..	..
— *borealis*	..	..	+	..	..	..	..	..	..	..	..
— *praetervisa*	..	+	+	+	+	..	..	..	..	+	..
— *lanuginella*	+	+	..	..	..	..	..	+	..	+	..
— *rennyi*	..	..	+	..	..	..	..	+	..	+	..
— *calospora*	..	..	+	..	..	..	..	..	..	..	..
Hebeloma longicaudum	..	..	+	(+)	..	..	..	..	..	..	..
— *pusillum*	..	+	..	+	..	..	..	+	..	..	..
— *mesophaeum*	+	+	+	+	+	+	+	+	+	+	+

(continued)

Table 20 (cont.)

	Ivigtut	Godthåb	Sdr. Strömfjord	Other Greenland loc.	Iceland	Færöes	Jan Mayen-Svalbard	Lappland	Norwegian Mts.	Alps	Other Arcto-Alpine loc.
Hebeloma strophosum	..	+	+	+	+	(+)	..	..	..	..	..
Naucoria escharoides	+	..	..	..	..	..	..	..	..	..	..
— *scorpioides*	..	+	..	..	..	+	..	..	..	..	..
— *arida*	+	..	..	..	..	..	..	+	+	..	..
— *carpophiloides*	+	..	+	..	..	..	..	..	..	..	..
Rozites caperata	+	..	..	..	+	..	..	+	+	..	..
Cortinarius multiformis	..	..	+	..	..	..	..	..	..	..	..
— *mucosus*	+	+	+	+	+	..	+	+	+	..	..
— *alpinus*	+	+	..	+	..	..	+	+	..	+	..
— *trivialis*	+	..	..	..	..	..	..	..	..	..	..
— *delibutus*	+	..	+	..	+	..	..	+	+	..	..
— *argutus*	..	..	+	..	..	..	..	..	..	..	..
— *decoloratus*	+	..	..	..	..	..	..	..	..	..	..
— *anomalus*	+	..	+	..	+	..	..	+	+	+	..
— *cinnamomeus*	+	+	+	+	+	..	+	+	+	+	..
— *hinnuleus* var. *gracilis*	..	..	+	..	..	..	..	..	..	+	..
— *punctatus*	+	..	+	..	..	..	..	..	..	..	..
— *hemitricus*	+	..	+	..	+	..	..	+	..	+	..
— *paleaceus*	+	..	+	..	..	..	..	+	..	..	..
— *saturninus*	+	..	+	..	+	..	..	..	..	..	..
— *phaeopygmaeus*	..	+	+	..	..	..	..	..	..	+	..
— *glandicolor* var.	(+)	+	+	..	..	..	..	(+)	..	+	..
— *psammouraceus*	..	..	+	..	..	..	..	..	..	..	..
— *saniosus*	..	..	+	..	..	..	..	..	..	..	..
— *obtusus*	+	..	..	..	..	..	..	..	..	..	..
— *acutus*	..	+	..	+	..	..	..	..	..	..	..
— *pulchellus*	+	..	..	(+)	..	..	..	..	..	..	..
Galerina clavata	+	+	+	+	(+)	+	(+)	+	..	+	..
— *vittaeformis*	+	+	+	..	+	..	..	+	..	+	+
— *badipes*	+	..	..	..	..	..	..	..	..	..	..
— *pumila*	+	+	+	+	+	+	..	+	+	+	..
— *marginata*	+	..	..	+	..	..	..	..	..	..	..
Tubaria furfuracea	+	..	+	..	..	..	..	..	..	..	..
— *pellucida*	..	..	+	(+)	+	..	(+)	..	..	..	..
Ripartites tricholoma	..	..	+	..	..	..	..	+	..	+	..
Crepidotus longisporus	+	..	..	..	..	..	..	..	..	..	..
Clitopilus septicoides	..	..	+	..	..	..	..	..	..	..	..
Rhodophyllus jubatus	..	..	+	..	..	(+)	..	+	..	..	..
— *clypeatus*	..	..	+	..	..	..	..	..	..	(+)	..
— *speculus*	..	..	+	..	..	..	..	..	..	..	..
— *radiatus*	..	..	+	..	..	..	..	+	..	..	..
— *sericeus*	(+)	(+)	+	..	+	+	..	+	..	+	..
— *cetratus*	..	..	+	..	..	..	..	..	..	+	..
— *anthracinellus*	..	..	+	..	..	..	..	..	..	..	..
— *junceus*	..	..	+	..	+	..	..	+	..	..	..
— *nitens*	..	+	+	..	..	..	..	..	..	..	..
— *cancrinellus*	+	..	..	..	..	..	..	..	..	..	..
Paxillus involutus	+	..	..	..	..	..	..	+	+	..	+
Leccinum scabrum	+	+	+	+	+	..	+	+	+	..	+

(*continued*)

Table 20 (cont.)

	Ivigtut	Godthåb	Sdr. Strömfjord	Other Greenland loc.	Iceland	Færöes	Jan Mayen-Svalbard	Lappland	Norwegian Mts.	Alps	Other Arcto-Alpine loc.
Leccinum testaceo-scabrum	+	..	..	..	..	..	..	+	..	..	+
Russula delica	..	+	+	+	+	..	..	+	..	(+)	(+)
— *alpina*	+	+	+	+	+	+	..	+	+	+	+
— *gracilis* var.	..	+	+	+	..	..	..	+	..	..	+
— *claroflava*	+	..	+	..	..	..	..	+	..	..	..
— *decolorans*	+	..	+	..	+	..	..	+	+	..	..
— *aeruginea*	+	+	+	+	+	..	..	+	..	..	+
— *xerampelina*	+	..	..	..	..	(+)	..	(+)	..	(+)	(+)
— *lutea*	..	..	+	..	..	..	..	..	..	+	..
— *sphagnophila* var.	+	+	+	+	..	..	..	..	..	..	+
— *versicolor*	..	..	+	..	+	..	..	+	..	..	..
Lactarius torminosus var.	+	..	+	+	+	..	..	+	+	..	+
— *uvidus*	+	+	+	+	+	..	..	+	+	(+)	..
— *flavidus*	+	..	+	+	+	..	..	+	..	..	..
— *glyciosmus*	+	+	+	+	+	..	..	+	+	..	..
— *rufus*	+	..	..	..	..	..	..	+	+	..	..
— *mitissimus*	+	+	+	+	..	..	..	+	+	..	..
— *tabidus*	+	..	..	..	+	..	..	+	+	..	..
Tremella mesenterica	+	..	..	(+)	+	+	..	+	..	..	..
Exidia repanda	..	..	..	+	+	..	..	+	..	..	..
Thelephora radiata	..	..	+	+	(+)	..	..	+	..	..	..
Clavulina cristata	+	..	..	..	+	+	..	..	..	..	..
Ramaria ochraceo-virens	..	..	+	..	..	..	..	..	..	..	..
Clavaria argillacea	+	+	+	+	+	..	..	..	..	..	..
Clavulinopsis septentrionalis ...	..	..	+	..	..	..	..	+	..	..	..
Pistillaria uncialis	..	..	+	(+)	..	..	..	..	..	..	..
Polyporus picipes	+	..	..	..	..	..	..	(+)	..	..	..
— *melanopus*	..	..	..	+	..	..	..	..	..	..	..
— *groenlandicus*	..	..	+	..	..	..	..	..	..	..	..
Inonotus radiatus	+	..	..	(+)	..	..	..	..	..	..	..
Coltricia cinnamomea	..	..	..	+	..	..	..	(+)	..	..	..
Corynetes arenarius	..	..	..	+	..	..	..	..	..	..	+
Mitrula gracilis	+	..	..	+	+	..	+	+	+	+	+
— *multiformis*	+	..	..	..	..	..	..	+	+	..	..
— *paludosa*	+	..	..	..	..	..	..	+	..	..	..
Helotium aeruginosum	+	..	..	..	..	..	..	..	..	..	..
Sclerotinia vahliana	..	+	..	+	+	..	..	+	..	..	+
Peziza badia	..	..	+	..	..	..	..	+	..	..	..
— *vesiculosa*	+	..	..	..	..	..	..	..	..	..	..
Humaria humosa	+	..	..	..	..	..	..	..	..	..	+
Lamprospora crec'hqueraultii ..	..	..	..	+	..	..	..	+	..	..	..
Lachnea scutellata	..	..	+	+	+	..	..	+	..	..	..
— *stercorea*	+	..	..	..	+	..	+	+	..	+	..
Sepultaria arenicola	..	..	+	..	..	..	..	..	..	+	..
Helvella arctica	..	..	+	+	+	..	+	+	..	(+)	+
— *acetabulum*	..	..	+	+	+	..	..	(+)	..	(+)	..
— *lacunosa*	..	..	+	+	..	..	..	+	..	+	..
Morchella esculenta	..	..	..	+	..	..	..	..	..	..	..

(continued)

Table 20 (cont.)

Distribution of Macromycetes in the arcto-alpine areas. The table summarizes the information included in the taxonomic accounts in Parts I—III. Additional records are taken from some of the papers cited below. The main sources are:

Material studied: Own collections from Greenland, Lappland and a few from Iceland and the Swiss Alps. Collections from Greenland, Iceland, and the Færöes in the Botanical Museum, Univ. of Copenhagen; TERKELSEN's collections from West Greenland; collections from Oslo Botanical Museum, from East Greenland.

Literature: Greenland: ROSTRUP (1888, summarizing older litt., 1891, 1894, 1904), FERDINANDSEN (1910).—Iceland: LARSEN (1932, summarizing older litt.), CHRISTIANSEN (1941), LANGE (1949).—Færöes: MØLLER (1945, summarizing older litt.).—Svalbard: DOBBS (1942, summarizing older litt.), HAGEN (1950).—Jan Mayen: HAGEN (1950, summarizing older litt.). Lappland: ROMELL (1912), FRIES (1921, Gasteromycetes), LANGE (1946), PILÁT & NANNFELDT (1955, listing older litt.).—Norwegian Mts.: HENNING (1885), BLYTT (1905), ECKBLAD (1955, Gasteromycetes).—Alps: FAVRE (1955, summarizing older litt., including HEIM (1928)).—Arctic North America: ROSTRUP (1906), DEARNESS (1923), LINDER (1947), and CASH (1953).—The records from "other arcto-alpine areas" are all relevant to extra-European areas, and mostly extracted from various publications by SINGER, and from the above mentioned American sources. Still less than other enumerations in the table have they claim of being complete.

There seems at present to be little basis for more general statements about the character of the fungus flora in arcto-alpine areas. SINGER (1925) once tried to indicate that the genera with markedly rough spores were dominant, especially *Russula* and *Lactarius*. But this is certainly wrong. The dominant genera are rather such as *Inocybe* and *Cortinarius*, and inside the former genus the smooth spored forms seem to be by far the commonest. The genera of the more fleshy fungi are relatively dominant, may be as a result of the variations in humidity which is a result of the lack of tree protection, but the total number of genera represented in the species list is large and very few important ones are totally missing. Among the most notable of those missing are the majority of the genera of *Boletales*, and the all but one genera of the *Lepiota* group. The wood-inhabiting saprophytes and parasites are, of course, very poorly represented (a few *Polyporus*, *Flammulina*, *Lentinellus*, *Galerina marginata*). And the true saprophytes seem, as a whole, to be less abundant than the mycorrhizal fungi, which probably are better fitted to exploit the possibilities of the micro-forest.

A very conspicuous feature stands out from the comparison of the flora in the arcto-alpine areas, namely the wide distribution of the species. SINGER (1954) has pointed out that the arctic fungi often have even a circumpolar distribution, and it is true that almost all the Greenland species recorded by me are found both in North America and in Europe. I presume that this will remain a fact, although the picture may be obscured by the new taxa described, some of which may represent more "local" species of more recent age, as a contrast to the old flora element, which in its main traits finds an identical or similar development in the antarctic region, as it has been demonstrated by SINGER (l. c.).

Conclusions

The fungus flora forms quite a conspicuous element in the Greenland plant communities. The number of Macromycetes dealt with in the present enumeration is about 250, and the species frequency and the number of individuals encountered compare favourable with records from the temperate zones, although hardly in any place reaching the level which is known from the very richest temperate community: the coniferous forest with needle bed and moss cover. The most southernly stations with rich subarctic thickets of *Salix glauca* harbour the richest flora with a considerable element of ephemeral species. However, the typical subarctic-lowarctic flora is characterized by the dominance of fleshy species, mostly representing genera known to have mycorrhizal connections. Other exceptions from the rule are met in the most humid zones in the bogs, dominated by hygrophilous thinfleshed species, and probably also met in the highest arcto-alpine zones where the mycorrhizal hosts disappear.

Our present knowledge of the composition of the flora, as outlined in the special part, tends to show that the number of fungi specific for the arcto-alpine areas is rather low. It will probably be found to be a general rule that the area of distribution of the individual species of fungi is normally larger than that of each of the host species but smaller than that of the entire group of hosts for the species in question.

The periodicity of the fungus flora is dependant on local climate conditions. The flora seems to reach its optimal development in the S.—W. Greenland coast stations in late August or early September following a spring-summer flora of, mostly, ephemeral species, developing from early July. The frost stops the flora approximately at its optimum. The season (and also the spring flora) tends to be earlier in the areas with continental climate, and has here, at least in places, a notable set back, due to the drying out in August.

Distribution on continental and oceanic vegetational types is not too easy to ascertain for the individual species. Short lists are given, including the most clear examples. There seems to be a pronounced difference in the structure of the fungus flora in the continental regions and in the oceanic regions. The most extreme continental zones have a xerophytic element as dominant part and a group of very ephemeral species developing after rain. The ephemeral element is more stable (though not dominant) in the oceanic regions, where also the fungus flora taken as a whole seems to be richer.

POSTSCRIPT

The report on the Macromycete flora of Greenland is hereby concluded. It is the first general survey since ROSTRUP published his lists in 1888 and 1891. Our knowledge of the Greenland fungus flora is, however, still very incomplete. We have but very few confirmed records from East Greenland, where the Agarics are known to be quite abundant in places even far to the north, and we are without detailed information from west coast stations furthest to the south, and north of 70° N., leaving in fact only a part of the south western regions as reasonably well known. Further studies are highly necessary to complete our picture of the Macromycete flora and to make it possible to draw the north limit of the majority of the species.

There can be no doubt that new information will cause several changes in the records given in these papers. The material was collected at a time when the present author had but very little knowledge of the arcto-alpine fungus flora, and accordingly was not able to do the right "selective" collecting. There is also a good chance that the original field identifications (even if later confirmed through study of exsiccata) apply to such a broad species concept that several taxa will be segregated later on as arcto-alpine species, distinct from the neighbouring forms from the temperate regions. However, the preserved material may in many cases make it possible to revise the records.

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INDEX

The index includes the species treated in Parts I, II, and III, special part. New taxa are indicated by bold face type, synonyms and some dubious species have their page references printed in italics. Illustrations are indicated by *. A few species have been included in the index also under generic synonyms not specifically listed in the text. Species discussed for comparison but not recorded from Greenland are not included, except in such cases where they more or less definitely are considered synonyms of Greenland plants.

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