

NORSK POLARINSTITUTT
MEDDELELSER NR. 101

D. C. LINDSAY

Lichens from Vestfjella,
Dronning Maud Land



NORSK POLARINSTITUTT
OSLO 1972

DET KONGELIGE DEPARTEMENT FOR INDUSTRI OG HÅNDVERK

NORSK POLARINSTITUTT

Rolfstangveien 12, Snarøya, 1330 Oslo Lufthavn, *Norway*

SALG AV BØKER

SALE OF BOOKS

Bøkene selges gjennom bokhandlere, eller
bestilles direkte fra:

*The books are sold through bookshops, or
may be ordered directly from:*

UNIVERSITETSFORLAGET

Postboks 307

Blindern, Oslo 3

Norway

16 Pall Mall

London SW 1

England

P.O. Box 142

Boston, Mass. 02113

USA

Publikasjonsliste, som også omfatter land-
og sjøkart, kan sendes på anmodning.

*List of publications, including maps and charts,
will be sent on request.*

NORSK POLARINSTITUTT
MEDDELELSER NR. 101

D. C. LINDSAY

Lichens from Vestfjella,
Dronning Maud Land



NORSK POLARINSTITUTT
OSLO 1972

Manuscript received June 1971

Printed November 1972

Contents

	Page
Abstract	5
Acknowledgements	5
Introduction	5
Topography	6
Geology	7
Climate	8
Plant habitats	9
Enumeration of species	10
Relationships with other Antarctic floras	18
Literature	20

Abstract

Thirteen lichens are reported from Vestfjella in the first known collection of plants from this area. *Umbilicaria aprina* NYL., a rare northern hemisphere species, is reported from Antarctica for the first time. New combinations involve the transference of *Pyrenodesmia mawsonii* C. W. DODGE to *Caloplaca* as *C. mawsonii* (C. W. DODGE) D. C. LINDSAY and *Umbilicaria spongiosa* var. *subvirginis* FREY et LAMB to *Umbilicaria aprina* as *U. aprina* var. *subvirginis* (FREY et LAMB) D. C. LINDSAY.

Acknowledgements

I wish to thank Dr. G. GULDEN, Curator of Universitetet i Oslo, Botanisk Museum, for the loan of the material collected by the Norsk Polarinstittutt expedition 1968–69, reported on in this paper, the Curator of the Jardin Botanique National de Belgique, for the loan of material collected by the Expédition Antarctique Belge and Dr. L. RYVARDEN, also of Universitetet i Oslo, for the opportunity of studying this material. I am grateful to Dr. S. W. GREENE for assistance with the manuscript and to Professor J. G. HAWKES, Mason Professor of Botany, University of Birmingham, for facilities provided in his department.

The description of the material was carried out under the aegis of the British Antarctic Survey, and I gratefully acknowledge the facilities provided by the Director, Sir VIVIAN FUCHS, and his permission to publish the results.

Introduction

Vestfjella (*c.* 73°–74°S and 13°–16°W) is a small range of isolated peaks lying 150 km to the north-west of Tottanfjella and Heimefrontfjella, which are westward extensions of the Dronning Maud Land mountain ranges. Dronning Maud Land has been little explored botanically and the few results of biological studies have been summarized by BOWRA, HOLDGATE and TILBROOK (1966). The plant life consists of a restricted number of lichens, a few algae and one or two mosses, of which few collections have been made. DODGE (1962) has reported on lichens from Sør-Rondane, in the east of Dronning Maud Land. DALENIUS and

WILSON (1958) mention the occurrence of lichens and mosses on nunataks near Jutulstraumen, western Dronning Maud Land while BOWRA, HOLDGATE and TILBROOK (1966) and LINDSAY (1971) have given a brief account of the lichens of Tottanfjella in the west of Dronning Maud Land.

During the period November 1968 to February 1969 the Norwegian geologists A. HJELLE and T. S. WINSNES of the Norsk Polarinstitut expedition made a small collection of botanical specimens, comprising 52 lichens, some epiphytic on moss, and one alga, from Vestfjella, whilst surveying this area geologically. The thirteen lichen species identified in the Norsk Polarinstitut collection, which bears the reference letters NP, are housed in the Universitetet i Oslo, Botanisk Museum (O), and form the basis of this paper.

Topography

Vestfjella (Fig. 1) is a north-east to south-west trending range of isolated peaks and nunataks, *c.* 130 km long, rising from *c.* 300 m above sea-level at Utpostane in the south-west and Basen in the north-east, to 1132 m above sea-level at Dagvola in the north central part of the range. Many of the peaks rise over 200 m above the general surface of the ice field. (Fig. 2.) The physiography of the region is typical of the other mountain ranges of Dronning Maud Land, and consists of a series of peaks and ridges rising abruptly from more or less smooth ice fields and glaciers, as illustrated by ARDUS (1964), VAN AUTENBOER (1964), WORSFOLD (1967) and JUCKES (in press), who show many rocky cliffs, often surrounded by deep wind-scoops. The scenery is thus typical of many continental Antarctic mountain ranges where they reach the coast, for example at Mac. Robertson Land (FILSON 1966, Figs. 9, 13). Because of the steep-sided nature of many peaks and ridges, steep, unstable scree slopes are found near the bases of such cliffs. Moraines occur along the sides of many of the drainage glaciers (WORSFOLD 1967, Fig. 6).

Wind and freeze-thaw action appear to be the main erosion agencies. VAN AUTENBOER (1964) and WORSFOLD (1967) have noted and discussed the effects of erosion by windborne snow grains on the exposed surfaces of boulders and cliffs, resulting in a "honeycombing" effect. The second, and possibly subordinate factor, is the freeze-thaw action of snow in pockets in rock, which may have been produced by the action of wind-erosion (JUCKES 1969).

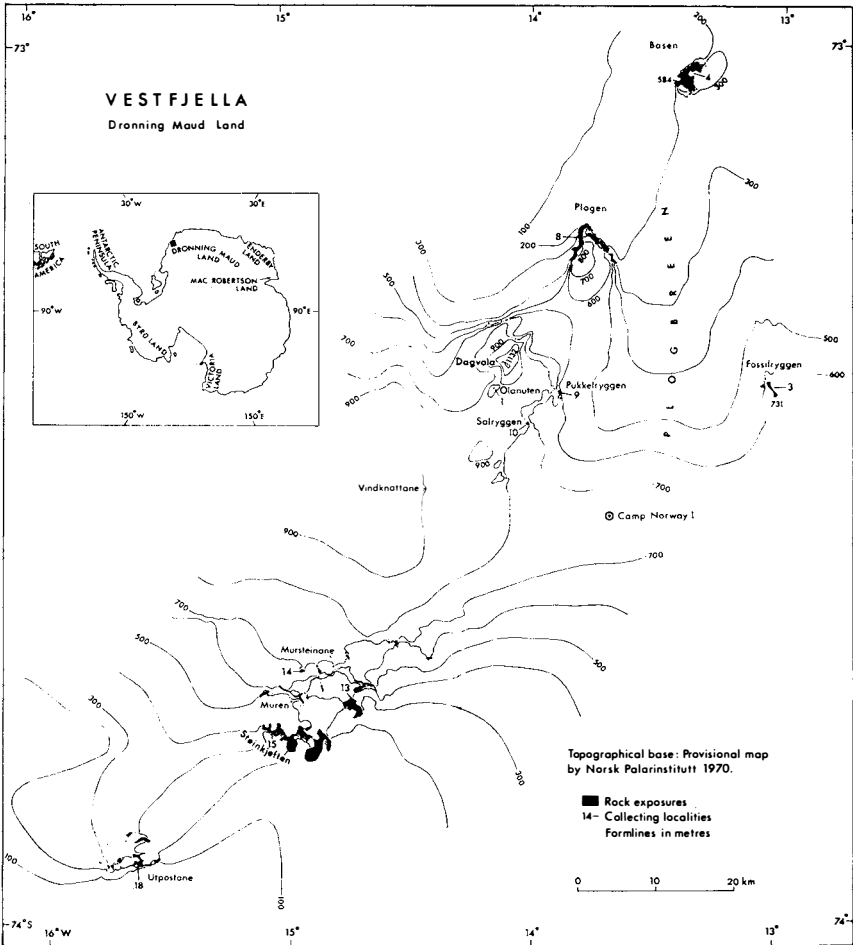


Fig. 1. Map of Vestfjella showing collecting localities.

Geology

Accounts of the geology of various parts of the mountain ranges of Dronning Maud Land have been given by ROOTS (1953) for localities in the western part of the region, JUCKES (in press) for Tottanfjella, and HJELLE and WINSNES (HJELLE and WINSNES 1971) for Vestfjella. VAN AUTENBOER, MICHOT and PICCIOTTO (1964) have described the geology of the Sør-Rondane and GJELSVIK (1964) has summarized the results of Norwegian studies in this region.

In general, western Dronning Maud Land exposures consist of meta-

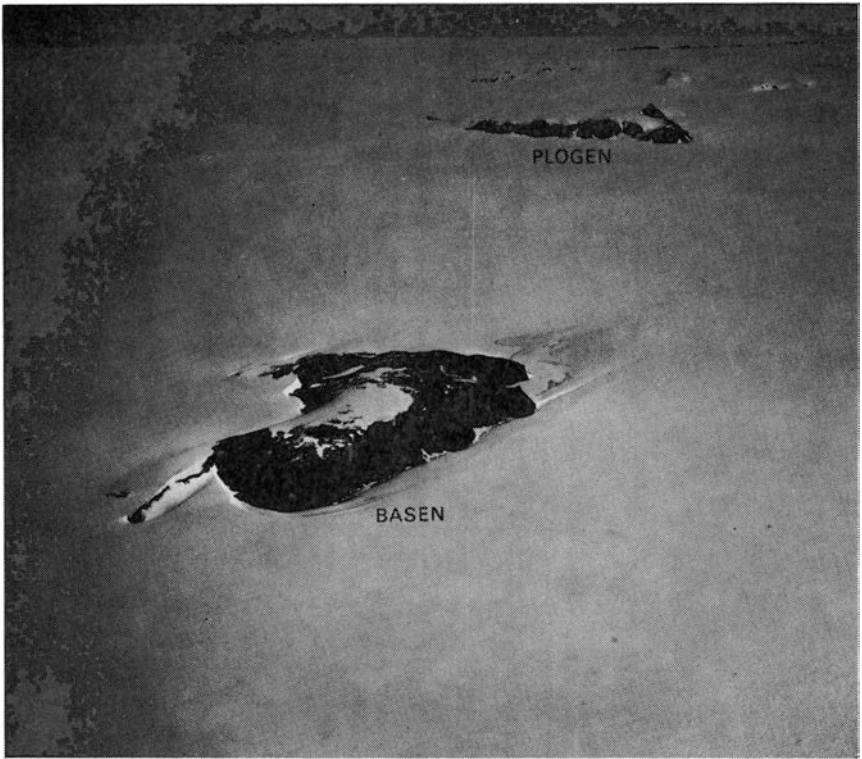


Fig. 2. Vestfjella, looking SSW. Mannefallknausane in the left background. Oblique air photograph by Norwegian-British-Swedish Antarctic Expedition 1949-52.

morphic, sedimentary and volcanic rocks, the former comprising garnetiferous and amphibolite-rich gneisses with some occurrences of shale and schist. The sedimentary rocks are represented by greywackes and sandstones, with a few exposures of mudstone and conglomerate. The sediments are often intersected by dioritic and gabbroic sills and dykes.

The Vestfjella exposures from Steinkjeften along the north-northeast trending main range to Basen are mainly basalts. The outcrops at Utpostane consist almost entirely of olivine-gabbro, whereas those at Fossilryggen are sedimentary, being represented by sandstones and shales.

Climate

The climate of Vestfjella appears to be very similar to that reported from other areas of Dronning Maud Land. ARDUS (1964) has described Tottanfjella as a cold desert, with the temperature remaining below 0°C

throughout the year, with the prevailing winds blowing from the north-east and snow accumulation, where not affected by drifting or scouring, as about 75 cm/year. VAN AUTENBOER (1964) has noted maximum and minimum temperatures in the Sør-Rondane as 0°C and -49°C respectively, the mean annual temperature being about -20°C. The prevailing winds are from the south-east.

Plant habitats

In view of the strong erosional forces at work on exposed rock surfaces, it is not surprising that most plants are restricted to sheltered hollows and pockets (ARDUS 1964; VAN AUTENBOER 1964; LINDSAY and BROOK 1971). ARDUS (1964) has stated that running water is never seen in Tottanfjella. However this is unlikely to be so at all places as indicated by the presence of the hydrophilous alga, *Prasiola crispa* (BOWRA, HOLDGATE and TILBROOK 1966), which was also present in the Norsk Polarinstitut collection from Vestfjella (NP 40). In the Theron Mountains (c. 79°S, 29°W) LINDSAY and BROOK (1971) have noted the existence of large summer melt pools but DALENIUS and WILSON (1958) noticed that water was found for only two hours around midday at Jutulrøra («Ekberget») and Passat (72°16'S, 0°25'W, and 71°18'S, 3°55'W respectively).

A little soil, of mainly mineral composition, may collect in crevices or on ledges and the latter, particularly when damp, often support the richest plant life (BOWRA, HOLDGATE and TILBROOK 1966). A small amount of mineral soil was noticed on some of the specimens in the Norsk Polarinstitut collection.

Snow petrels (*Pagodroma nivea*) were noticed in Vestfjella, but it is not possible in the absence of detailed field notes, to assess their influence on the growth and distribution of such ornithocoprophilous species as *Xanthoria candelaria* and *X. elegans*. LINDSAY and BROOK (1971) have noted that lichens in the Theron Mountains were more or less restricted to dolerites, with only a few occurrences on sediments. At the moment it is not known whether the lichens of Vestfjella exhibit such substrate-specificity.

In view of the sparseness of collecting details and other data, it is impossible at present to give a more adequate account of the habitats of Vestfjella lichens or to say how similar they are to plant habitats in other parts of Dronning Maud Land.

Enumeration of species

For ease of reference, genera and species are arranged alphabetically. References to descriptions and illustrations of each as they occur elsewhere in Antarctica are given and the citation of synonymy is also restricted to Antarctic literature. Notes on the distribution of each species is similarly restricted to localities within Antarctica. Descriptions are only given where a specimen or species differs in some significant respect from published descriptions of Antarctic material.

In view of the results obtained by HENSSEN (1970), from ontogenetic studies on the apothecia of *Umbilicariaceae*, the genera *Agyrophora* SCHOL. and *Omphalodiscus* SCHOL., as reported from Antarctica by LLANO (1950), are now considered synonymous with *Umbilicaria* HOFFM.

The contraction BIRM* is used to denote specimens in the herbarium of the British Antarctic Survey, at present housed in the Department of Botany, University of Birmingham, England.

1. *Alectoria minuscula* (NYL. ex ARNOLD) DEGEL.

Syn: *Alectoria antarctica* C. W. DODGE and BAKER (1938, p. 599), fide LAMB (1964, p. 28).

Descrip: LAMB (1964, p. 28); FILSON (1966, p. 63).

Icon: LAMB (1964, plate 7), FILSON (1966, plate 38), KASHIWADANI (1970, plate 3, Fig. 6).

The three specimens collected by the Norsk Polarinstittut expedition are apparently referable to f. *minuscula*, but as LAMB (1964, p. 28) points out, the four forms of this species so far recorded from the Antarctic intergrade and probably result from environmentally induced modification. No lichen substances were extracted from any of the specimens confirming LAMB's (1964, p. 28) suggestion that this species may not produce any.

Distribution: Widespread on rocks in non-nitrogenous situations throughout the Antarctic (LAMB 1964; LINDSAY 1969a).

Specimens examined: Salryggen (locality 10), NP 29; Steinkjeften (locality 15) NP 43, 47.

2. *Biatorella antarctica* J. MURR.

Descrip: MURRAY (1963, p. 60), FILSON (1966, p. 33).

Icon: FILSON (1966, plate 1, f-g., plate 4).

The solitary specimen in the NP collection agrees well with the type description and FILSON's drawings, but is only moderately fertile. No lichen substances have so far been reported for this species; usnic acid was recrystallized in GE from the dried acetone extract of the thallus.

Distribution: An Antarctic endemic, widespread around the Antarctic continent. Recorded from Dronning Maud Land (LINDSAY 1971), Mac. Robertson Land (FILSON 1966) and Victoria Land (MURRAY 1963), extending northwards along the Antarctic Peninsula to the South Orkney Islands (specimens in BIRM*).

Specimen examined: Plogen (locality 8) NP 19.

3. *Buellia frigida* DARB.

Syn: *Buellia quercina* DARB., fide LAMB (1968, p. 58); *Rinodina frigida* (DARB.) C. W. DODGE (1948, p. 259).

Descrip: LAMB (1968, pp. 56–58); FILSON (1966, pp. 35–36); MURRAY (1963, p. 62).

Icon: FILSON (1966, plates 5, 6); LAMB (1968, plate 12b); KASHIWADANI (1970, plate 1, Fig. 6).

The two specimens of the NP collection, although sterile, are identical with material from Mac. Robertson Land (FILSON 4564, BIRM*).

LAMB (1968, p. 56) noted that this species usually reacts K- and P-, rarely K+ and P+ yellow, which would indicate the presence of norstictic acid. KASHIWADANI (1970) reported his specimens from the Prince Olav Coast as K-, P- and C-. But the two specimens cited below reacted K+ red and P+ yellow, and norstictic acid was recrystallized from GAAn and GAoT from a dried acetone extract of the thallus. Owing to lack of data on the species' chemistry, it is impossible to state at present whether the two chemical strains show any habitat differences or distinct distribution patterns.

Distribution: A circumpolar continental Antarctic endemic, apparently absent from the northern half of the Antarctic Peninsula.

Buellia bastinii C. W. DODGE, described from Princess Ragnhild Coast by DODGE (1962), may be an immature form of this species, but the holotype specimen in BR (Princess Ragnhild Coast, Romnes Summit, 800 m, 70°26'S, 23°19'E Bastin 3, 1959) is ill-developed and no definite judgement can be made on this point.

Specimens examined: Mursteinane (locality 14) NP 32; Steinkjeften (locality 16) NP 50.

4. *Buellia* cf. *illaetabilis* M. LAMB

Descrip.: LAMB (1968, pp. 29–30).

Icon.: LAMB (1968, plate 9, f–g).

Thallus of scattered areolae on rock connected by black ramifying rhizoids. Areolae minute, light grey, glabrous, slightly shining, occasionally blackened at edges, 0.1–0.3 mm diameter. Profusely fertile; apothecia usually solitary, occasionally 2–4 per areola, sessile, minute, lecideine, black, at first plane with an entire proper margin, becoming convex with excluded margin, 0.1–0.3 mm diameter.

Ascospores 8 per ascus, brown, irregularly biseriate, 1-septate, thin-walled, $10\text{--}12 \times 5\text{--}7 \mu\text{m}$. Epithecium $15 \mu\text{m}$ thick, aeruginose, HNO_3 + red. Pycnidia not seen.

Acetone extract of thallus K– and P–.

The single specimen on which the above description is based appears similar to *Buellia illaetabilis*, a species only recently described by LAMB (1968). Of the other species treated by LAMB it approaches *Buellia pycnogonoides* DARB., but differs in the much greater development of areolae and much less dendritic nature of the rhizoids. It is also similar to *B. evanescens* DARB. but differs in the colour of the epithecium and the presence of a cortex 30–40 μm deep, an outer necrotic layer being absent. It resembles *B. illaetabilis* in most respects but the areolae are more dispersed than described by LAMB (1968, p. 29) a difference which is regarded as a result of environmentally induced modification.

Distribution.: *B. illaetabilis* is at present known from three specimens collected from the northern tip of the Antarctic Peninsula (LAMB 1968, p. 98, Table 12). If the specimen cited below is this species, it suggests a wide distribution in both maritime and continental Antarctica.

Specimen examined.: Olanuten (locality 1) NP 1.

5. *Caloplaca mawsonii* (C. W. DODGE) D. C. LINDSAY, *comb. nov.*

Basionym.: *Pyrenodesmia mawsonii* C. W. DODGE (1948, p. 232).

Descrip.: DODGE (1948, p. 232); FILSON (1966, p. 45).

Icon.: FILSON (1966, plate 15,e).

This species is very similar to *Protoblastenia citrina* C. W. DODGE, but differs in the sorediate, subsquamulose thallus, which reacts K + purple. All three specimens examined were sparingly fertile. Parietin was recrystallized in GE from an acetone extract of the thallus.

Distribution.: Now known from two widely separated localities in Antarctica, c. 1,800 km apart, having previously been reported from Mac. Robertson Land (DODGE 1948; FILSON 1966).

Specimens examined: Basen (locality 4) NP 13; Steinkjeften (locality 15) NP 42; Utpostane (locality 18) NP 51.

6. *Lecanora rubina* (VILL.) ACH.

var. *melanophthalma* (RAM.) ZAHLBR.

Syn.: *Squamaria chrysoleuca* (SM.) ACH. var. *melanophthalma* (RAM.) TH. FR. (FRIES 1902, p. 208).

Lecanora chrysoleuca (SM.) ACH. var. *melanophthalma* (RAM.) TH. FR.

Lecanora exulans C. W. DODGE and BAKER (1938, p. 570), fide MURRAY (1963, p. 66).

Descrip.: FILSON (1966, p. 49).

Icon.: FILSON (1966, plate 19, a–f, plate 20); KASHIWADANI (1970, plate 2, Fig. 2, as *Lecanora exulans* DODGE and BAKER).

The three specimens collected match the descriptions and illustrations of FILSON (1966) and KASHIWADANI (1970), except that in a few apothecia in each specimen, the green apothecial pigment is lacking. In such cases, the apothecial discs are dull, waxy yellow, resembling those of *Lecanora aspidophora* VAIN., a nitrophilous species known from the Antarctic Peninsula.

Distribution.: Widespread throughout continental Antarctica but apparently absent or rare in the Antarctic Peninsula, South Shetland and South Orkney Islands.

Specimens examined: Plogen (locality 8) NP 18b; Pukkelryggen (locality 9) NP 22b; Salryggen (locality 10) NP 27b.

7. *Parmelia leucoblephara* C. W. DODGE and BAKER

Descrip.: DODGE and BAKER (1938, pp. 592–593).

Icon.: KASHIWADANI (1970, plate 2, Fig. 8).

Thallus of narrow (0.1–0.5 mm broad), irregularly branched and radiating lobes growing over moss and rock. Lobes light grey or yellowish, imbricate, sorediate, non-isidiate, pruinose, occasionally eroded so that the medulla is exposed. Ventral surface dark brown to black, very densely rhizinose. Rhizinae hyaline, dark brown or black, flattened, branched but not anastomosing.

The specimens agree with the type description (DODGE and BAKER 1938) and KASHIWADANI's illustration. When on rock the plants have the habit of *Pannoparmelia pellucida* C. W. DODGE and BAKER (1938, plate 63, Fig. 418) suggesting that *P. pellucida* may only be an environmentally induced modification of this species.

KASHIWADANI (1970, p. 14) noted that this species contained atranorin and zeorin. Both of these substances were recrystallized in GE from NP 3.

Distribution: An Antarctic endemic, reported from Byrd Land by DODGE and BAKER (1938) and Enderby Land by KASHIWADANI (1970). The present records from Dronning Maud Land suggest a circumpolar continental Antarctic distribution for this species.

Specimens examined: Olanuten (locality 1) NP 3, 6; Basen (locality 4) NP 12, 14; Pukkelryggen (locality 9) NP 22a; Utpostane (locality 18) NP 53.

8. *Protoblastenia citrina* C. W. DODGE

Descrip: DODGE (1948, p. 222); FILSON (1966, p. 44); KASHIWADANI (1970, p. 10).

Icon: FILSON (1966, plate 17); KASHIWADANI (1970, plate 2, Fig. 1).

The material of the NP collection, which was growing over a species of *Grimmia*, is sterile, but is otherwise identical with material from Mac. Robertson Land (LANDON—SMITH 1962, det. R. FILSON, BIRM*). It is distinguished from the superficially similar *Caloplaca mawsonii* (C. W. DODGE) D. C. LINDSAY by the K- reaction of the thallus.

Blastenia autenboeri C. W. DODGE, described by DODGE (1962) from Princess Ragnhild Coast, resembles this species very closely, differing only in possessing polarilocular instead of simple ascospores. The holotype specimen of *B. autenboeri* in BR (Princess Ragnhild Coast, Petrel Egg Nunatak, T. VAN AUTENBOER 1a, 8. i. 1961) is too fragmentary for any detailed examination.

Distribution: An Antarctic endemic, known from Byrd Land and George V Land (DODGE 1948) and Mac. Robertson Land (FILSON 1966) suggesting a circumpolar continental Antarctic distribution.

Specimens examined: Fossilryggen (locality 3) NP 8; Basen (locality 4) NP 10; Plogen (locality 8) NP 18a; Mursteinane (locality 14) NP 34.

9. *Umbilicaria aprina* NYL.

Descrip: LLANO (1950, p. 166), RYVARDEN (1968, pp. 366–367).

Icon: RYVARDEN (1968, Figs. 1–2).

This species, recorded for the first time from Antarctica, appears very similar to *Umbilicaria spongiosa* C. W. DODGE and BAKER (= *Omphalodiscus spongiosus* (C. W. DODGE and BAKER) LLANO), but the type specimen of *U. spongiosa* has not been available for examination. *U. aprina* has been well described and illustrated by RYVARDEN (1968). The holotype from

the Dedschen Mountains, Ethiopia, (NYLANDER 31742, H) was examined by the author.

Umbilicaria aprina is widely distributed throughout continental Antarctica, being recorded, for example, from Tottanfjella as *Omphalodiscus spongiosus* (LINDSAY 1969b) and from Mac. Robertson Land as *O. antarcticus* (FREY and LAMB) LLANO (FILSON 4073, 4227, BIRM*). KASHIWADANI (1970) may have included *U. aprina* under *O. antarcticus*, his plate 3, Figs. 3–4 appearing very similar to it. *U. aprina* is apparently absent from the Antarctic Peninsula, South Shetland and South Orkney Islands, where it is replaced by *U. antarctica* FREY and LAMB (= *Omphalodiscus antarcticus* (FREY and LAMB) LLANO) a species less continental in distribution and centred on the Antarctic Peninsula.

Gyrophoric acid was recrystallized in GE from an acetone extract of the thallus. Gyrophoric acid was also confirmed in the following species of *Umbilicaria* from specimens in the British Antarctic Survey herbarium:

Umbilicaria cristata C. W. DODGE and BAKER; LINDSAY 1382.

Umbilicaria antarctica FREY and LAMB; BRADING 209.

Umbilicaria propagulifera (VAIN.) LLANO; CORNER 497.

The specimens reported by DODGE (1962) from Princess Ragnhild Coast as *U. spongiosa* var. *subvirginis* are referable to *U. aprina*, as *Umbilicaria aprina* var. *subvirginis* (FREY and LAMB) D. C. LINDSAY comb.nov. based on the basionym: *Umbilicaria antarctica* var. *subvirginis* (FREY and LAMB, 1939, p. 273 and the synonym: *Umbilicaria spongiosa* var. *subvirginis* FREY et LAMB) C. W. DODGE, 1948, p. 148. This variety was not present in the NP collection from Vestfjella.

Distribution: RYVARDEN (1968) has summarized the distribution of this species in the northern hemisphere. In Antarctica it is known from the Antarctic Peninsula and Dronning Maud Land (LINDSAY 1969b, all records of *Umbilicaria spongiosa*) and Mac. Robertson Land (FILSON 1966, as *Omphalodiscus antarcticus* pr. p.). This species is another addition to the already strong bipolar element known to occur in the Antarctic flora.

Specimens examined: Olanuten (locality 1) NP 2; Pukkelryggen (locality 9) NP 21, 24, 25; Salryggen (locality 10) NP 27a; Mursteinane (locality 14) NP 39; Steinkjeften (locality 15) NP 46, 49.

10. *Umbilicaria decussata* (VILL.) FREY

Syn: *Omphalodiscus decussatus* (VILL.) SCHOL.

Umbilicaria rugosa C. W. DODGE and BAKER (1938, p. 561) fide LLANO (1950, p. 82).

Umbilicaria pateriformis C. W. DODGE and BAKER (1938, p. 561) fide LLANO (1950, p. 82).

Umbilicaria cerebriformis C. W. DODGE and BAKER (1938, p. 562) fide LLANO (1950, p. 82).

Umbilicaria hunteri C. W. DODGE (1948, p. 146) fide LLANO (1950, p. 82).

Descrip: LLANO (1950, p. 82); FILSON (1966, p. 61); KASHIWADANI (1970, p. 16).

Icon: FILSON (1966, plate 33, a–b); KASHIWADANI (1970, plate 3, Fig. 5).

A very widely distributed, polymorphic species in Antarctica that needs no additional description. The variation in rugosity of the upper surface of the thallus appears to be determined by environmental factors and it is thought that the varieties described from Antarctica by LLANO (1950) have little taxonomic significance. Gyrophoric acid was crystallized in GE from an acetone extract of the thallus.

The record by DODGE (1962) of *Omphalodiscus subcerebriformis* (C. W. DODGE) C. W. DODGE from Princess Ragnhild Coast is based on *Umbilicaria decussata*, the material in BR (VAN AUTENBOER 2) being this latter species with a somewhat thickened, more rugose thallus than typical Antarctic material.

Distribution: Widespread throughout the South Orkney and South Shetland Islands, Antarctic Peninsula, Dronning Maud Land and the Theron Mountains (LINDSAY 1969b), Enderby Land (KASHIWADANI 1970); Mac Robertson Land (FILSON 1966) and Byrd Land (DODGE and BAKER 1938).

Specimens examined: Olanuten (locality 1) NP 5, 7; Basen (locality 4) NP 9; Salryggen (locality 10) NP 26; Mursteinane (locality 14) NP 33, 37, 38; Steinkjeften (locality 15) NP 41.

11. *Usnea sulphurea* (KOENIG) TH. FR.

Syn: *Usnea frigida* C. W. DODGE and BAKER (1938, p. 603), fide LAMB (1964, p. 14).

Descrip: LAMB (1964, p. 14); KASHIWADANI (1970, p. 17).

Icon: LAMB (1964, plate 3b); KASHIWADANI (1970, plate 3, Fig. 7).

The specimens listed below resemble *Usnea acromelana* STIRT. var. *decipiens* (M. LAMB) M. LAMB (LAMB 1964, plate 4a) in possessing prominent, subglobose soredia, but differ in not having black annular cracks on the main branches and a lax, not dense, medulla. Usnic acid was recrystallized in GE from acetone extracts of all the specimens.

Distribution: Widespread in continental Antarctica (LAMB 1964; LINDSAY 1969a), but is so far unknown from the South Orkney and South Shetland Islands.

Specimens examined: Basen (locality 4) NP 16; Plogen (locality 8) NP 20; Salryggen (locality 10) NP 28; Pagodromen (locality 13) NP 31; Mursteinane (locality 14) NP 36; Steinkjeften (locality 15) NP 48.

12. *Xanthoria candelaria* (L.) TH. FR.

f. antarctica (VAIN.) HILLM.

Syn: *Xanthoria lychnea f. antarctica* VAINIO (1903, p. 22).

Physcia parietina var. *lychnea f. antarctica* (VAIN.) HUE (1915, p. 44).

Descrip: VAINIO (1903, p. 22).

Icon: None.

This species in common with so many other ornithocoprophilous lichens in the Antarctic, presents a wide range of morphological variation which probably results from differing response to the slight variations of microenvironments between habitats. The thallus may be erect and bushy to poorly developed, with lobes reduced to 1–2 mm in length and closely adpressed to the substratum, appearing crustose. The relationships between *Xanthoria candelaria* and *X. mawsonii* C. W. DODGE (1948, p. 236) are uncertain, perhaps both being the same taxon.

Distribution: Primarily centred on the Antarctic Peninsula, but also known from the Theron Mountains (LINDSAY and BROOK 1971) and Tottanfjella, Dronning Maud Land (Lindsay 1971).

Specimens examined: Mursteinane (locality 14) NP 35; Utpostane (locality 18) NP 52.

13. *Xanthoria elegans* (LINK) TH. FR.

Syn: *Polycaulionia pulvinata* C. W. DODGE and BAKER (1938, p. 628), fide MURRAY (1963, p. 64).

Polycaulionia sparsa C. W. DODGE and BAKER (1938, p. 629) fide FILSON (1966, p. 42).

Gasparrinia harrissonii C. W. DODGE (1948, p. 234) fide FILSON (1966, p. 42).

Caloplaca elegans (LINK) TH. FR. var *pulvinata* (C. W. DODGE and BAKER) J. MURRAY (1963, p. 64) fide FILSON (1966, p. 42).

Caloplaca sparsa (C. W. DODGE and BAKER) J. MURRAY (1963, p. 65) fide FILSON (1966, p. 42).

Caloplaca sparsa var. *latespora* J. MURRAY (1963, p. 65) fide FILSON (1966, p. 42).

Descrip: FILSON (1966, p. 42); KASHIWADANI (1970, p. 10).

Icon: FILSON (1966, plates 13, 14); KASHIWADANI (1970, plate 1, Fig. 8).

A cosmopolitan species that exhibits a high degree of polymorphism in the Antarctic. Since morphological variation in this species appears to be induced by the slightest change in the environment, infraspecific taxa have minimal significance.

The specimen in BR (VAN AUTENBOER 1g) of *Gasparrinia harrissonii* C. W. DODGE, reported from Princess Ragnhild Coast by DODGE (1962), is typical Antarctic *Xanthoria elegans*.

Distribution: Widespread throughout Antarctica wherever there are bird rookeries. Known from the South Orkney and South Shetland Islands, Antarctic Peninsula, Dronning Maud Land and the Theron Mountains (LINDSAY 1971, LINDSAY and BROOK 1971); Mac. Robertson Land (FILSON 1966); Enderby Land (KASHIWADANI 1970); Byrd Land (DODGE and BAKER 1938), and Victoria Land (MURRAY 1963).

Specimens examined: Olanuten (locality 1) NP 4; Basen (locality 4) NP 11, 15, 17; Pukkelryggen (locality 9) NP 23; Salryggen (locality 10) NP 30; Steinkjeften (locality 15) NP 44, 45.

Relationships with other Antarctic floras

Comparison of the flora of Vestfjella with that so far reported from other Antarctic regions is rendered difficult for two reasons. Firstly, the often unrepresentative nature of many collections introduces a large sampling error, since often only the most conspicuous lichens have been collected. Because of this nothing can be deduced from absences of species from particular areas, as may be done in well-worked regions. Secondly, the different taxonomic philosophies used by different workers appears to have introduced differences in what may be uniform floras. For instance DODGE (1965) considers that many regions of the Antarctic support their own peculiar, endemic flora, with very few circumpolar species, an opinion that results from the application of a narrowly-defined species concept (DODGE 1948, DODGE and BAKER 1938). LAMB (1964, 1968) on the other hand, has adopted a more conservative approach and as a result is recognizing the presence of many Arctic species in Antarctica.

The author considers that the high percentage of endemic species,

especially crustose species, currently recorded from Antarctica results from the use of a "rigid" taxonomy which fails to allow for the influence of microenvironmental factors on the lichen thallus. Such factors may be expected to have considerable influence of lichen morphology in a continent where plants are growing at their extreme limits of survival.

Notwithstanding these difficulties, certain comparisons between the Vestfjella lichen flora and that of other regions is possible. The lichen flora of Vestfjella is very similar to that of Tottanfjella (LINDSAY 1971), 13 species having been recorded from both regions, of which 8 are common to the two. This similarity, especially pronounced, amongst the macrolichens, could have been expected, because of the close proximity of the two ranges. However there is a noticeable difference between the lichens of western and eastern Dronning Maud Land. DODGE (1962) listed 10 species from the Sør-Rondane mountains in the east, of which only 3 have been reported from Tottanfjella and Vestfjella. A revision of this material preserved in Brussels has now raised this number to 6. DALENIUS and WILSON (1958) noted 7 species from Jutulrøra («Ekberget») and Passat, but some of this material is in need of revision as several species seem to have been misidentified. For example, their report of *Neuropogon aurantiaco-ater* (JACO.) M. LAMB is unlikely to be correct as LAMB (1964) has shown that the species is restricted to Fuegia and South Georgia.

Vestfjella possesses 8 species of lichen in common with Mac. Robertson Land and Victoria Land, 25 species having been reported from the latter two regions by FILSON (1966) and MURRAY (1963) respectively. When Vestfjella and Enderby Land (KASHIWADANI 1970) are compared, 6 of the 17 species from the latter area also occur in Vestfjella.

From a collation of the results considered above, it is becoming apparent that a circumpolar continental Antarctic lichen flora exists, composed of the following species: *Alectoria minuscula*, *Usnea sulphurea*, *Biatorrella antarctica*, *Lecanora rubina* var. *melanophthalma*, *Xanthoria elegans*, *Buellia frigida*, *Umbilicaria decussata* and possibly *Usnea antarctica*. Future research, particularly where it is directed to an interpretation of the many crustose endemic species, may be expected to add to this list.

Author's address:

British Antarctic Survey Botanical Section
University of Birmingham, England.

Literature

- ARDUS, D. A., 1964: Some observations at the Tottanfjella, Dronning Maud Land. *British Antarctic Survey Bulletin*, **3**, 17–20.
- AUTENBOER, T. VAN, 1964: The geomorphology and glacial geology of the Sør-Rondane, Dronning Maud Land. (In ADIE, R. J. ed., *Antarctic geology*, 81–103. Amsterdam, North-Holland Publishing Company.)
- AUTENBOER, T. VAN, J. MICHOT and E. PICCIOTTO, 1964: Outline of the geology and petrology of the Sør-Rondane Mountains, Dronning Maud Land. (In ADIE, R. J. ed., *Antarctic geology*, 501–514. Amsterdam, North-Holland Publishing Company.)
- BOWRA, G. T., M. W. HOLDGATE and P. J. TILBROOK, 1966: Biological investigations in Tottanfjella and Central Heimefrontfjella. *British Antarctic Survey Bulletin*, **9**, 63–70.
- DALENIUS, P. and O. WILSON, 1958: On the soil fauna of the Antarctic and of the Sub-Antarctic Islands. The Oribatidae (Acari). *Ark. Zool.*, Ser. 2, **11**, (23), 393–425.
- DODGE, C. W., 1948: Lichens and lichen parasites. *Rep. B.A.N.Z. Antarct. Res. Exped.*, Ser. B, **7**, 1–276.
- 1962. Expédition Antarctique Belge lichens. *Bull. Jard. Bot. Brux.*, **32**, (3), 301–308.
- 1965: Lichens. (In MIEGHAM, J. VAN and F. VAN OYE eds.; *Biogeography and ecology in Antarctica. Monographiae Biologicae*, **15**, 194–200. The Hague, W. Junk.
- and G. E. BAKER, 1938: The Second Byrd Antarctic Expedition – Botany. II. Lichens and lichen parasites. *Ann. Mo. bot. Gdn.* **25**, (2), 515–718.
- FILSON, R. B., 1966: The lichens and mosses of Mac. Robertson Land. *A.N.A.R.E. Rep.*, Ser. B, **82**, 169 pp.
- FREY, E. and I. M. LAMB, 1939: A new species of *Umbilicaria* from the Antarctic. *Trans. Brit. Mycol. Soc.*, **22**, Pts. 3–4, 270–273.
- FRIES, T., 1902: Lichenes Antarctici. (In WILLE, N. Mittheilungen über einige von C. E. Borchgrevink auf dem antarctischen Festlande gesammelte Pflanzen. *Nytt Mag. Naturv.*, **40**, 208–209.)
- GJELSVIK, T., 1964: Geological exploration in the Antarctic and sub-Antarctic regions by Norwegian or Norwegian-led Expeditions. (In ADIE, R. J., ed., *Antarctic geology*, 199–205. Amsterdam, North-Holland Publishing Company.)
- HENSSEN, A., 1970: Die Apothecienentwicklung bei *Umbilicaria* HOFFM. emend. FREY. *Deutschen Botanischen Gesellschaft*, Neue Folge, **4**, 103–126.
- HJELLE, A. and T. WINSNES, 1971: The sedimentary and volcanic sequence of Vestfjella, Dronning Maud Land. (In ADIE, R. J. ed., *Antarctic geology and geophysics*, 539–546, Universitetsforlaget, Oslo.)
- HUE, A. M., 1915: *Lichenes*. Paris, Masson et Cie. (Deuxième Expédition Antarctique Française, (1908–10), Sciences naturelles: documents scientifiques, 1–202.)
- JUCKES, L. M., 1969: Weathering hollows in charnockite at Mannefallknasane, Dronning Maud Land. *British Antarctic Survey Bulletin*, **22**, 97–98.
- in press: The geology of north-eastern Heimefrontfjella, Dronning Maud Land. *British Antarctic Survey Scientific Reports*, 65.
- KASHIWADANI, H., 1970: Lichens from the Prince Olav Coast, Antarctica. *Japanese Antarctic Research Expedition, Scientific Reports*, Ser. E., **30**, 1–21.

- LAMB, I. M., 1964: Antarctic lichens: 1. The genera *Usnea*, *Ramalina*, *Himantormia*, *Alectoria*, *Cornicularia*. *British Antarctic Survey Scientific Reports*, **38**, 34 pp.
- 1968: Antarctic lichens: II. The genera *Buellia* and *Rinodina*. With an ontogenetic section by A. Henssen. *British Antarctic Survey Scientific Reports*, **61**, 129 pp.
- LINDSAY, D. C., 1969a: Further data on Antarctic Usneaceae. *British Antarctic Survey Bulletin*, **20**, 33–40.
- 1969b: New records for Antarctic Umbilicariaceae. *British Antarctic Survey Bulletin*, **21**, 61–69.
- 1971: Notes on Antarctic lichens: IV. Lichens from Tottanfjella, Dronning Maud Land. *British Antarctic Survey Bulletin*, **25**, 99–100.
- and D. BROOK., 1971: Lichens from the Theron Mountains. *British Antarctic Survey Bulletin*, **25**, 95–98.
- LLANO, G. A., 1950: *A monograph of the lichen family Umbilicariaceae in the Western Hemisphere*. Washington, D. C. [Office of Naval Research, Navexos P-831, 281 pp.]
- MURRAY, J., 1963: Lichens from Cape Hallet area, Antarctica. *Trans. Roy. Soc. N.Z., Bot.*, **2**, (5), 59–72.
- ROOTS, E. F., 1953: Preliminary note on the geology of Western Dronning Maud Land. *Norsk geol. Tidsskr.*, **32**, (1), 18–33.
- RYVARDEN, L., 1968: *Umbilicaria aprina* NYL., a rare lichen. *Bryologist*, **71**, (4), 366–368.
- WORSFOLD, R. J., 1967: Physiography and glacial geomorphology of Heimefrontfjella, Dronning Maud Land. *British Antarctic Survey Bulletin*, **11**, 49–57.
- VAINIO, E. A., 1903: Lichens. *Résul. Voyage S.Y. Belgica*, **6**, *Botanique*, 1–46.

A. W. BRØGGERS BOKTRYKKERI A/S - OSLO