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Reassessment of the first lichen and moss collections from Heimefrontfjella, Dronning Maud Land

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Abstract: The lichen and moss collections by G.T. Bowra in Heimefrontfjella in 1963–64 are redetermined. These are the only plant collections made in Heimefrontfjella prior to a Swedish expedition in 1991–92. Taxonomical and nomenclatural improvements have resulted in several changes. A total of 16 lichens and two mosses were found.

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Introduction

During the SWEDARP (Swedish Antarctic Research Programme) expedition in the austral summer of 1991–92, the author made biological investigations in Heimefrontfjella and Vestfjella in western Dronning Maud Land, with special emphasis on the lichens (Thor 1992). The only previous lichen and moss collections from Heimefrontfjella, made by G.T. Bowra in 1963–64, were discussed by Bowra *et al.* (1966) and Lindsay (1971). Bowra *et al.* (1966) also reported the presence of green algae, Collembola, mites and birds. To compare the findings of lichens and mosses during the 1991–92 expedition from Heimefrontfjella with earlier information, the Bowra lichen and moss collections were redetermined, and the result is reported here. A short description of Heimefrontfjella is also provided.

Material and methods

Twenty six lichen, eight mosses, and one alga collected by G.T. Bowra in 1963–64 in Heimefrontfjella and deposited in AAS, were studied by the author in April 1994. Thin layer chromatography (TLC) was carried out in accordance with the method described by White & James (1985). Only the B system (HEF) was used. Geographical names and altitudes are, if not otherwise stated, in accordance with the map from Norsk Polarinstitutt 1988 (sheet D8, Heimefrontfjella Nord and sheet D9, Heimefrontfjella Sør).

Study area

Heimefrontfjella is a *c.* 135 km long mountain ridge of nunataks *c.* 300 km from the coast, and about 180 km south-east of the mountain ridge Vestfjella. Both Heimefrontfjella and Vestfjella are parallel with the coast. Heimefrontfjella is the last mountain ridge above the ice between the coast and the South Pole in this area of the Antarctic, and the distance from Heimefrontfjella to the South Pole is *c.* 1700 km.

The four massifs of the Heimefrontfjella Escarpment, Milorgfjella (Kottasberge), XU-fjella, Sivorgfjella and Tottanfjella (from N–S) are each separated by outlet glaciers from the Amundsenisen plateau (2500–3000 m) down to the Ritscherflya (*c.* 1200 m near Heimefrontfjella). Sivorgfjella and Tottanfjella are together *c.* 80 km long and extend from *c.* 74°31'S, 11°05'W to *c.* 75°08'S, 12°44'W. All the Bowra collections are labelled 75°00'S, 10°00'W.

The climate in Heimefrontfjella is continental and extreme with low temperatures throughout the year. There are no published long-term climate data.

The presence of lichens in Heimefrontfjella (Tottanfjella) was first reported by Ardus (1964) during a sledge journey 14–17 November 1961, but no species were mentioned. Lichens were described as rare and mainly limited to small cracks, fissures and scree material in reasonably well-protected, north-east facing situations (Ardus 1964, p. 19). Apparently no collections were made during this journey.

In the 1963–64 summer, extensive growths of lichens were discovered at many localities, and collections were made both in Sivorgfjella (as "central Heimefrontfjella") and Tottanfjella (Bowra*et al.* 1966) by G.T. Bowra, who was the medical officer at the British Antarctic Survey Halley Station in 1962–64 (R.I. Lewis Smith, personal communication 1994).

In the preliminary map of Sivorgfjella and Tottanfjella given in Bowra *et al.* (1966, fig. 1) the nunataks were not named and collection sites are marked by "Z" followed by a figure. These locality symbols are usually easily referred to places on the nunataks on the present maps. Some nunatak peaks were also given one or two letters (Bowra *et al.* 1966, fig 1). One peak at a nunatak in northern Tottanfjella, marked "AA" is now called Bowrakammen in honour of G.T. Bowra. Collections from Z.60 and from other localities given by Bowra were not found by the author. Plant and animal specimens are reported to have been obtained from

12 of the localities (table 1 in Bowra *et al.* 1966). In addition to the information given in table 1 in Bowra *et al.* (1966), in the text the localities Z.60, Z.75, Z.89, Z.98 and Z101 are reported as supporting the more conspicuous lichens. Crustose lichens and *Umbilicaria* sp. are reported from Z.98 in the text. For more exact location of the Bowra localities on the different nunataks, the reader is referred to fig. 1 in Bowra *et al.* (1966).

The investigation by the author in 1991–92 was restricted to some nunataks in Sivorgfjella near the Swedish field station Svea on the northernmost tip of Haldorsentoppen (74°34'36"S, 11°13'24"W). None of the Bowra localities were visited by the author with the exception of Torsvikstoppen. Torsvikstoppen (as Z.66–68) is reported as "not sufficiently sampled for description", but the lichen vegetation is reported to resemble that of the northern end of Johnsonhogna (as Z.92), the most productive place visited in the entire range (Bowra *et al.* 1966). I found no collections by G.T. Bowra from Torsvikstoppen. The north-western slope of Torsvikstoppen was found to have a sparse lichen vegetation when visited by the author in 1992.

The Bowra collections

Bowra *et al.* (1966) reported 18 lichen and two moss species. The lichen material was later redetermined by Lindsay (1971) and the number of species was reduced from 18 to 13. The material collected by Bowra was re-examined, and the results are presented below and summarized in Table I. Sixteen lichen and two moss species were found. Taxonomical and nomenclatural improvements during the recent decades have resulted in several changes. Collections from some localities could not be traced.

Twenty six packets including one or more lichen species were found, viz. Bowra 1, 5, 6, 8, 9, 11, 12, 13, 14, 15, 16, 18, 19, 21A, 21B, 22, 23, 24, 25, 26A, 26B, 27, 30, 31, 32 and 33. Eight packets containing mosses were found: Bowra 2, 3, 4, 7, 10, 17, 20 and 28. To facilitate comparison with Bowra *et al.* (1966) and Lindsay (1971), the collection symbols (locality number and the letters following the locality number) are provided here. Information on altitude and collection dates is included on the labels, and together with notes on the habitat is now stored in the Antarctic Plant Database at the British Antarctic Survey.

In some collections more than one species was found. The intermingled species are only reported below if that species is not found in any other collection from that locality. In some collections, fragments of lichen species were found, which could sometimes be accurately identified. These are not included here.

The localities of G.T. Bowra are renamed as follows, indicating if the nunatak is located in Tottanfjella or Sivorgfjella.

Z.51: west of the two Vardeklettane (these are together called "Peaks E" by Bowra (Tottanfjella).
Z.57: west part of Juckeskammen (Tottanfjella).
Z.62: west part of Mathisenskaget (Sivorgfjella).
Z.73: unnamed nunatak marked with the altitude 1667 m on the map *c.* 100 m north-west of Cottontoppen (Tottanfjella).
Z.88: Sunnerkammen (Tottanfjella).
Z.91: north end of Manesigden (Tottanfjella).
Z.92: north end of Johnsonhogna (Tottanfjella).
Z.100: west slope of Poulssonhamaren (Sivorgfjella).
Z.103: north end of Bieringmulen (Sivorgfjella).

Table I. Lichen and mosses found at the different localities in the G.T. Bowra collections from Heimefrontfjella. (x) indicate that the species is found intermingled with some other species.

	Z.51	Z.57	Z.62	Z.73	Z.88	Z.91	Z.92	Z.100	Z.103
Lichens									
Acarospora gwynnii					(x)				
Buellia lignoides					(x)	(x)			
Buellia papillata			x						
Caloplaca citrina							(x)		
Candaleriella flava			(x)			x	x		
Lecanora expectans							(x)		
Physcia caesia			(x)			x	(x)		
Pleopsidium chlorophanum									x
Pseudephebe minuscula						x	x		x
Rhizoplaca melanophthalma						(x)	x		(x)
Rinodina olivaceobrunnea							(x)		
Umbilicaria aprina						(x)	x		
Umbilicaria decussata	x			x	x	x	x		x
Usnea sulphurea							x	x	
Xanthoria elegans						x	x		
Xanthoria mawsonii							(x)		
Mosses									
Grimmia cf. *lawiana*		x	x	x			x		
Sarconeurum glaciale						x	x		

The lichen species

Only the collection symbols and Bowra collection numbers are given. One collection from Z.91 (Bowra 14) is labelled "e" on the packet, and "a" on a paper inside the packet. This collection is reported as "Z.91a" being more likely that the paper inside the packet is the original label (H.J. Peat, personal communication 1994). Both Bowra 28 and Bowra 29 packets are labelled "92B/h".

Acarospora gwynnii Dodge & Rudolph: Not reported by Bowra or Lindsay but found in a collection of *Umbilicaria decussata* from Z.88 (collection Z.88B/b, Bowra 9).

Buellia lignoides Filson: Not reported by Bowra or Lindsay but found in collections of *Umbilicaria decussata* from Z.88 (collection Z.88B/b, Bowra 9) and Z.91 (collection Z.91b, Bowra 11).

Buellia papillata (Sommerf.) Tuckerm.: Not reported by Bowra or Lindsay, but Bowra reported *Lepraria* sp. from Z.74. Lindsay concluded, under *Lepraria* cf. *incana* (L.) Ach., that "no material referable to this genus or species could be found in the collection, and so this record in Bowra and others (1966) has to be deleted". *Buellia papillata* is somewhat similar to *Lepraria* sp. Material (without apothecia) was found (labelled *Lepraria* sp.) from Z.62 (collection Z.62B, Bowra 5; atranorin (TLC)).

Caloplaca citrina (Hoffm.) Th. Fr.: Not reported by Bowra or Lindsay but found in a collection of the moss *Sarconeurum glaciale* from Z.92 (collection Z.92A/a, Bowra 17).

Candelariella flava (Dodge & Baker) Castello & Nimis: Reported by Bowra (as *C. vitellina* (Hoffm.) Müll Arg.) from Z.92. Lindsay reported it (as *Candelariella* sp.) from Z.74 and Z.92. Material was found from Z.91 and Z.92 (collections Z.91g, Bowra 16 and Z.92B/f, Bowra 26A). It was also found in a collection of the moss *Grimmia* cf. *lawiana* from Z.62 (Z.62A, Bowra 4).

Lecanora expectans Darbish.: Not reported by Bowra or Lindsay but found in a collection of the moss *Sarconeurum glaciale* from Z.92 (collection Z.92A/a, Bowra 17).

Physcia caesia (Hoffm.) Fürnr.: Not reported by Bowra *et al.* or Lindsay. One collection labelled *Physcia* sp. was found from Z.91 (collection Z.91f, Bowra 15) which is *Physcia caesia* (atranorin, zeorin (TLC)). *Physcia caesia* was also found in a collection of the moss *Grimmia* cf. *lawiana* from Z.62 (collection Z.62A, Bowra 4; atranorin, zeorin (TLC)), a collection of the moss *Sarconeurum glaciale* from Z.92 (collection Z.92A/a, Bowra 17) and a collection of the green alga *Prasiola crispa* from Z.92 (collection Z.92B/h, Bowra 29).

Pleopsidium chlorophanum (Wahlenb.) Zopf: Reported by Bowra (as *Acarospora* (sect. *Xanthothallia*) sp.) from Z.74. Lindsay reported it (as *Biatorella antarctica* Murray) from Z.51, Z.74 and Z.103. Material was found from Z.103 (collection Z.103c, Bowra 33).

Pseudephebe minuscula (Nyl. ex Arnold) Brodo & Hawksw.: Reported by Bowra (as *Alectoria minuscula* (Nyl. ex Arnold) Degel.) from Z.51, Z.83, Z.91, Z.92, Z.100 and Z.103. Lindsay reported it (as *Alectoria minuscula*) from Z.51, Z.91. Z.92, Z.100 and Z.103. Material is now reported from Z.91, Z.92 and Z.103 (collections Z.91c, Bowra 12; Z.91a, Bowra 14; Z.92B/e, Bowra 25; Z.103b, Bowra 32).

Rhizoplaca melanophthalma (DC.) Leuckert & Poelt: Reported by Bowra (as *Lecanora* (sect. *Placodium*) sp.) from Z.78 and Z.92. Lindsay reported it as *Lecanora rubina* v. *melanopthalma* (Ram.) Zahlbr. from Z.92 (and concludes that the Bowra collection of *Lecanora* (sect. *Placodium*) sp. from Z.92 (collection Z.92B/g) belongs here), and as *Lecanora aspidophora* Vainio from Z.78, Z.83 and Z.92. However, collection Z.92B/g (=Bowra 27) is a collection of *Umbilicaria decussata* and there is no *Rhizoplaca melanophthalma* in that collection. Lindsay concludes that the species reported as *Lecanora* (sect. *Eulecanora*) sp. by Bowra *et al.* from Z.92 (=collection Z.92A/b) was *Rhizoplaca aspidophora* (Vainio) Redón (as *Lecanora aspidophora*). This collection was found (=Bowra 18; usnic acid and zeorin (TLC)) and is labelled *Lecanora aspidophora*. The material is rather scanty (15 × 10 mm) and no substrate is attached to the thallus. It is slightly more bullate than typical *Rhizoplaca melanophthalma* in Heimefrontfjella. *R. melanophthalma* was also found in a collection of *Physcia caesia* from Z.91 (collection Z.91f, Bowra 15), in a collection of *Pseudephebe minuscula* from Z.91 (collection Z.91c, Bowra 12) and in a collection of *Umbilicaria decussata* from Z.103 (collection Z.103a, Bowra 31).

Rinodina olivaceobrunnea Dodge & Baker: Bowra reported *Rinodina* sp. (as *Rhinodina* sp.) from Z.92. Lindsay excluded the species (as *Rinodina* sp.), together with *Toninia* sp., since "no material referable to either of these two genera was found in the collections". No collection labelled *Rinodina* was found among the Bowra collections but it was found in two collections of the moss *Grimmia* cf. *lawiana* from Z.92 (collections Z.92A/d, Bowra 20; Z.92B/h, bowra 28). *Rinodina olivaceobrunnea* was not found by the author during the expedition in 1991–92. The differences between *Rinodina olivaceobrunnea* and *R. turfacea* and their distribution in the Antarctic are discussed by Filson (1975), and Jacobsen & Kappen (1989).

Umbilicaria aprina Nyl.: Not reported by Bowra but added by Lindsay (as *Omphalodiscus spongiosus* (Dodge & Baker) Llano) from Z.92 (collection Z.92B/a). Material was now found from Z.92 (collection Z.92B/a, Bowra 21A). It was also found in a collection of *Pseudephebe minuscula* from Z.91 (Z.91a, Bowra 14) and in a collection of *Physcia caesia* from Z.91 (collection Z.91f, Bowra 15).

Umbilicaria decussata (Vill.) Zahlbr.: Reported by Bowra (as *Omphalodiscus decussatus* (Vill.) Schol. and *Umbilicaria* cf. *leiocarpa* DC. in Lam. & DC.) from Z.51, Z.73, Z.88, Z.91, Z.92 and Z.103. Lindsay reported it (as *Omphalodiscus decussatus*) from Z.51, Z.73, Z.88, Z.91, Z.92 and Z.103. Lindsay concluded that the specimens

referred to as *Umbilicaria* cf. *leiocarpa* by Bowra were *Omphalodiscus decussatus* (=*Umbilicaria decussata*). Material is now reported from Z.51, Z.73, Z.88, Z.91, Z.92 and Z.103 (collections Z.51b, Bowra 1; Z.73 (marked A on the outside of the packet), Bowra 6; Z.88B/a, Bowra 8; Z.88B/b, Bowra 9; Z.91b, Bowra 11; Z.92B/a, Bowra 21B; Z.92B/d, Bowra 24; Z.92B/f, Bowra 26B; Z.92B/g, Bowra 27; Z.103a, Bowra 31).

Usnea sulphurea Th. Fr.: Reported by Bowra from Z.92, Z.100 and Z.103 and by Lindsay from Z.92 and Z.100. Material is now found from Z.92 and Z.100 (collections Z.92A/c, Bowra 19; Z.92B/c, Bowra 23; Z100a, Bowra 30).

Xanthoria elegans (Link) Th. Fr.: Reported by Bowra and Lindsay from Z.91 and Z.92. Material is now found from Z.91 and Z.92 (collections Z.91d, Bowra 13; Z.92B/b, Bowra 22).

Xanthoria mawsonii Dodge: Not reported by Bowra but added by Lindsay (as *Xanthoria candelaria* (L.) Th. Fr.) from Z.92. No material labelled *Xanthoria candelaria* was found among the Bowra collections but it was found in a collection of the moss *Sarconeurum glaciale* from Z.92 (collection Z.92A/a, Bowra 17) and in a collection of the green alga *Prasiola crispa* from Z.92 (Z.92B/h, Bowra 29).

Nine species, referred to by Bowra *et al.* (1966) and/or Lindsay (1971) were not traced, and no packets with these names were found.

Lecidea cf. *autenboeri* Dodge: Reported by Bowra from Z.57, Z.73 and Z.92. It was excluded by Lindsay.

Lecidea cancriformis Dodge & Baker: Reported by Bowra from Z.51, Z.74, Z.81, Z.83, and Z.92 and by Lindsay from Z.73, Z.74, Z.78, Z.83, Z.88 and Z.92.

Lecidea (Eulecidea) sp.: Reported by Bowra from Z.51 and Z.91. Lindsay does not mention the species.

Lecidea sp.: Reported by Bowra from Z.100. Lindsay does not mention the species.

Physconia muscigena (Ach.) Poelt: Reported by Bowra (as *Physcia* cf. *muscigena* (Ach.) Nyl.) from Z.92. Lindsay also reported it (as *Physconia muscigena*) from Z.92. *Physconia muscigena* has a subantarctic distribution (Redón 1985, p. 76), and seems unlikely to occur in Heimefrontfjella.

Pseudephebe pubescens (L.) M. Choisy: Reported by Bowra (as *Alectoria pubescens* (L.) R. Howe) from Z.100. The species was excluded by Lindsay as no labelled specimen could be found in Bowra's collection and because *Pseudephebe pubescens* has a subantarctic distribution (Lamb 1964, Lindsay 1969, 1974). Lindsay (1971) suggested that the record by Bowra referred to *Pseudephebe minuscula.*

Toninia sp.: Reported by Bowra from Z.51 and Z.73. Lindsay excluded the species, together with *Rinodina* sp.

Umbilicaria rufidula (Hue) Filson: Not reported by Bowra but added by Lindsay (as *Omphalodiscus antarcticus* (Frey & Lamb) Llano) from Z.92. The collection referred to by Lindsay (Z.92B/h) is a collection of the moss *Grimmia* cf. *lawiana* (Bowra 28) with *Rinodina olivaceobrunnea* (see these species). No *Umbilicaria* was found in the collection. *Umbilicaria rufidula* has a subantarctic distribution (Filson 1987), and most probably does not occur in Heimefrontfjella.

The moss species

Grimmia cf. *lawiana* J.H. Willis: Reported by Bowra (as *Grimmia* sp.) from Z.57, Z.73, Z.91 and Z.92. Material was also found from Z.57, Z.62, Z.73 and Z.92 (collections Z.57A, Bowra 2; Z.57B, Bowra 3; Z.62A, Bowra 4; Z.73B, Bowra 7; Z.92A/d, Bowra 20; Z.92B/h, Bowra 28).

Sarconeurum glaciale (C.Mull.) Card. & Bryhn: Reported by Bowra from Z.92. Material was also found from Z.91 and Z.92 (collections Z.91a, Bowra 10; Z.92A/a, Bowra 17).

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