THE BIOTA OF A LATERAL MORAINE AND HINTERLAND OF THE BLUE GLACIER, SOUTH VICTORIA LAND, ANTARCTICA

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After a zoological field trip to the foothills of Mount Kowalczyk (77° 56′ S, 163° 42′ E) near the Blue Glacier (Fig. 1), Horning and Sagar (1976) reported 'extensive carpets of moss that extend along the edge of the glacier and up the hill for nearly 1 kilometer'. To investigate this report further with a view to suggesting the establishment of a Site of Special Scientific Interest (L. G. Greenfield, pers. comm.), the area was revisited in the summer of 1982–83. The findings were also to be related to colonization studies within the BAS Fellfield Ecology Research Programme.

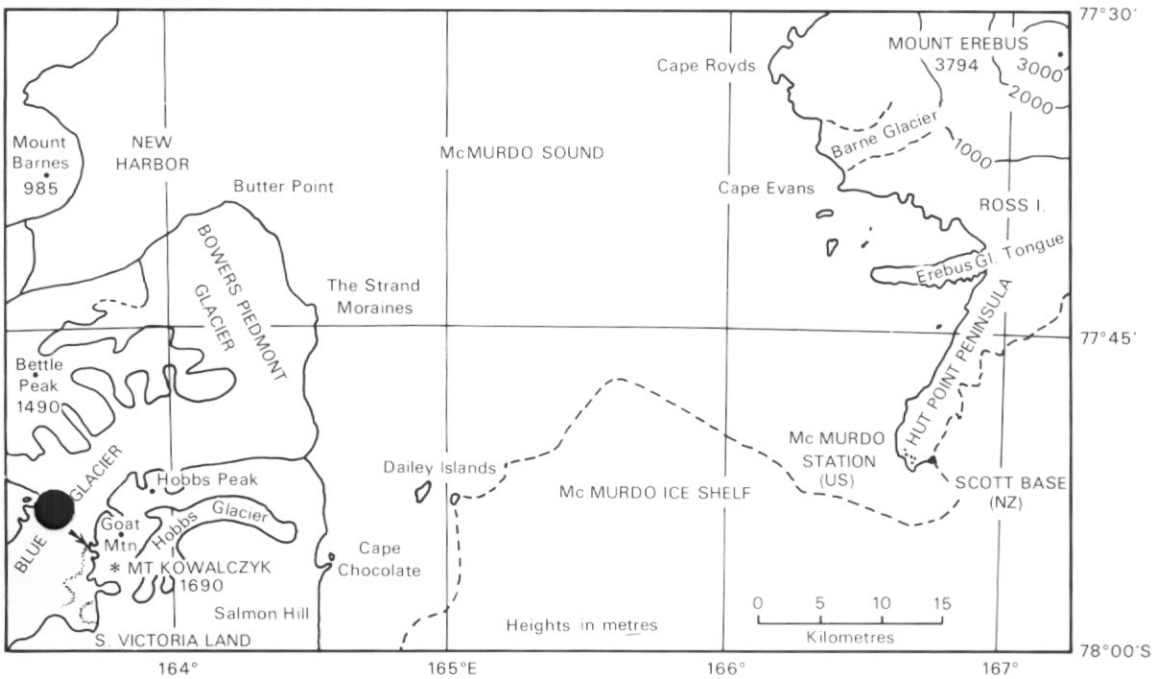

Fig. 1. Map of McMurdo Sound, Ross Dependency, showing the location of the Blue Glacier. The arrow indicates the position of the study area.

Unlike the maritime Antarctic, 'extensive carpets of moss' are rare in this region of continental Antarctica, and are localized to sheltered areas with a source of moisture such as the streams at Cape Bird (Broady, 1983; Greenfield and Wynn-Williams, 1983). Terrestrial algae are also limited by the availability of moisture but

are more widespread, being abundant in and around the lakes and streams of the dry valleys of southern Victoria Land (Seaburg and others, 1979). Most surveys of the distribution of algae have been concentrated in the Wright, Taylor and Miers Valleys (Seaburg and others, 1979). Lichens are more tolerant of dry conditions. However, they may be sensitive to high salt concentrations, as exemplified by their scarcity at Cape Bird where salt encrustations whiten the substratum in late summer, in contrast to the local abundance of *Xanthoria* on salt-free ash at Cape Crozier only 60 km S.E. of Cape Bird, where the maritime influence is smaller (D. D. Wynn-Williams, unpublished).

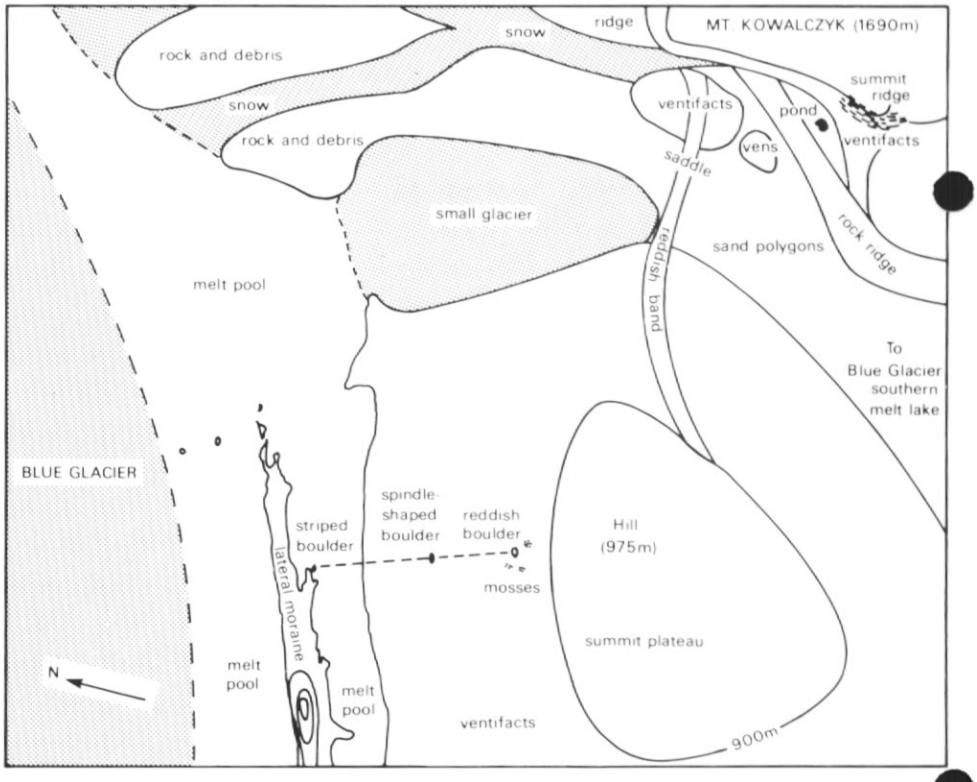

Fig. 2. Sketch map of the Blue Glacier near Mt. Kowalczyk (not to scale).

The area studied (Fig. 2) consisted of a lateral moraine bordered by the Blue Glacier and delimited on three sides by melt streams and a melt pool. These are fed partly by the Blue Glacier and partly by a small glacier between Mt. Kowalczyk (1690 m) and a hill (*c.* 975 m) conspicuously covered with hollowed granitic ventifacts. The moraine had a fringe of a partly desiccated Cyanophycean algal community dominated by *Nostoc commune* (P. A. Broady, pers. comm.). Stands of this almost black thalloid alga were also occasionally seen adjacent to the small glacier. It is suggested that the dark *Nostoc*-dominated mats were what Horning and Sagar (1976) had referred to as 'carpets of moss', which they resemble at a distance and which can be expected in moist, sheltered areas. The extent of this algal community was determined from its estimated percentage cover extending from the waterline up the moraine in 3 m

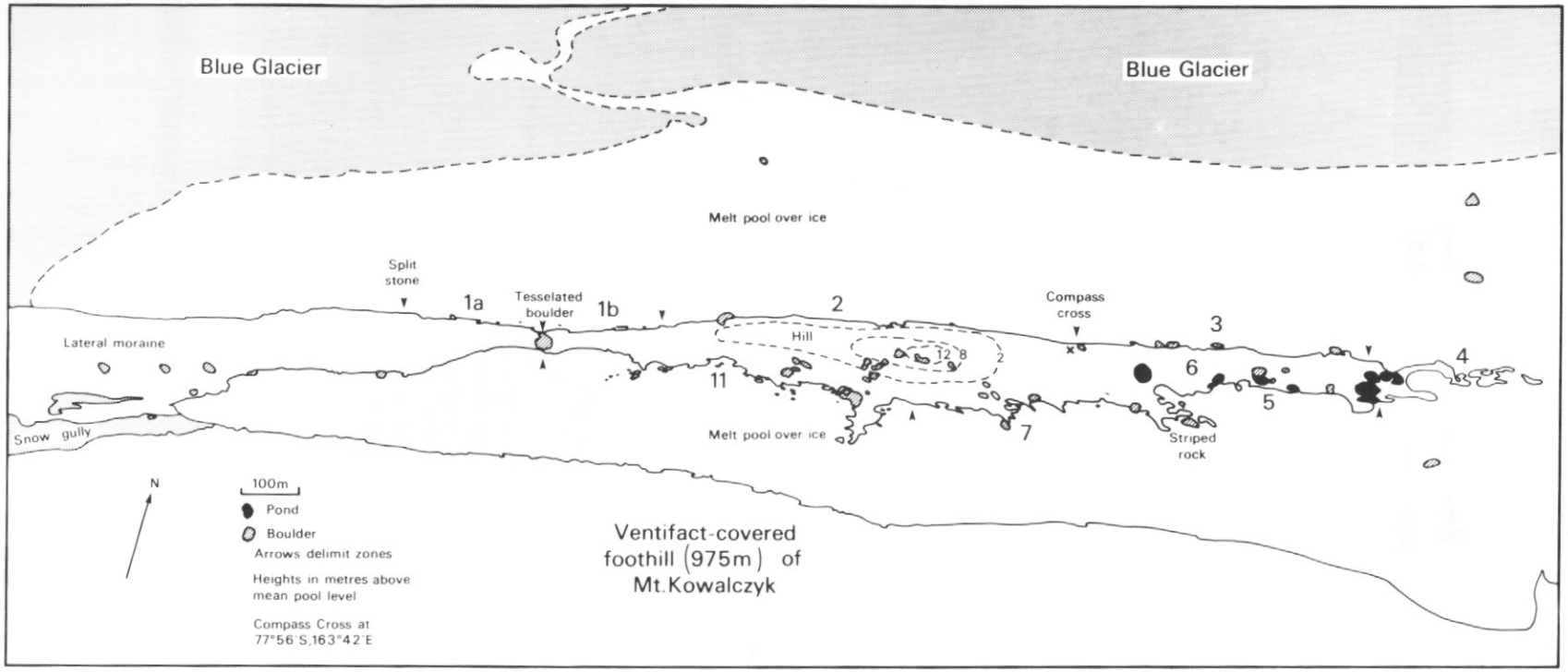

Fig. 3. Scale map of the lateral moraine of the Blue Glacier near Mt. Kowalczyk showing the zones of the littoral *Nostoc* community quantified in Table I.

Table I. Distribution of *Nostoc* on the lateral moraine of the Blue Glacier near Mt. Kowalczyk.

*Zone no.**	*Zone description*	*Area* (m^2)	*Total cover* (m^2)	*Mean cover* ($cm^2\ m^{-3}$)
1a, b	NW strand from Split stone to Extinction point	150	0.71	48
2	Extinction point to Compass cross	405	0	0
3	Compass cross to Shingle spits	270	1.76	65
4	Shingle spits at NE end	55	1.08	197
5	E and SE strand	159	28.86	1815
6	NE plateau	100	0	0
7	SE shore; high density zone	311	52.55	1690
8	Pond peripheries (2) at E end	25	9.50	3800
9	Hollows and depressions on plateau	38	6.40	1684
10	Central plateau	346	0.12	4
11	SE shore	163	1.61	99
Total	(excluding the central hill)	2022	102.60	—

* See Fig. 3.

sections paced along its margin. The field map was corrected from aerial photography (helicopter at *c.* 100 m altitude) to produce Fig. 3. The algal abundance in the numbered zones is summarized in Table I. A total of 102.6 m^2 of *Nostoc* was detected in the 2022 m^2 of littoral zone surveyed. During the 4-day period of observation a prolonged thaw (mean daytime temperatures of *c.* $+2°C$) caused the water level in the melt pools to rise *c.* 20 cm. This inundated much of the previously examined *Nostoc* mats, which became khaki-coloured. The observation of a raised beach around the margin of the moraine bearing desiccated *Nostoc* thalli up to 1 m above the initial level of the pools was consistent with the periodic accumulation of melt-water.

A small pond within 200 m of the north-west face of Mt. Kowalczyk (see Fig. 2) was found to have a total of 15.5 m^2 of *Nostoc* mat, including 5.25 m^2 with a 100% cover. On the saddle west of the pond, sand polygons supported extensive thin algal crusts which formed almost hollow domes over light, sandy soil, particularly along the edges of the sand wedges. These crusts dominated by *Phormidium uncinatum* (and other Oscillatoriaceae), *Synechococcus aeruginosus*, *Navicula muticopis* and *Nostoc* microthalli (P. A. Broady, pers. comm.), resemble moribund cushions of *Bryum* and may also have been previously mistaken for mosses. True moss cushions were very rare, with only one species noted. A single cushion (10 cm^2) of *Bryum antarcticum*, recently re-classified as *Pottia heimii* by Kanda (1981), was found 300 m west of the small pond. A more extensive stand, comprising three 1–2 m^2 patches of discontinuous small (*c.* 3 cm diameter) cushions, was found on the north face of the ventifact-covered hill, 30–60 m below its summit (Fig. 2) on sandy terraces where melt-water might linger. This moss appeared moribund, similar to dehydrated cushions at Cape Bird. However, the *Bryum antarcticum* at Cape Bird expanded on moistening to form soft brown cushions which occasionally produced green shoots.

No foliose lichens were seen, but epilithic crustose lichens were locally common, especially on the lower surfaces of rocks adjacent to moist soil. A 20 cm^2 patch of *Xanthoria* (probably *X. mawsoni*) occurred near the small pond and *Buellia frigida* was frequently on boulders on the summit of the hill.

These lichens and algae supported considerable populations of the collembolan *Gomphiocephalus hodgsoni* on the moraine, saddle and hill. The moraine also yielded a species of the mite *Nanorchestes*. Both genera have been reported elsewhere in this region (see Block, 1984). Subsequent microbiological analyses of soils from this area yielded several bacterial strains and a yeast. Chasmolithic fungi were observed in

exfoliating granitic ventifacts. It is concluded that although the report of extensive moss cover was shown to be mistaken, the abundant algal and lichen flora, supporting a considerable invertebrate fauna and microflora, merits further investigation with particular reference to the stresses of the temperature-linked regime of fluctuating inundation of the moraine shore.

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