SHORT NOTES

OBSERVATIONS OF GLACIAL FEATURES NEAR FOSSIL BLUFF BETWEEN 1936 AND 1979

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During October 1936 Bertram, Fleming and Stephenson, members of the British Graham Land Expedition 1934–37, discovered and mapped the position of a large bowl-shaped depression in George VI Ice Shelf near Fossil Bluff (Fig. 1). They described the feature as being 'nearly a mile across, bordered by ice cliffs 100 ft high'. At the bottom of the bowl there were several piles of contorted angular ice-blocks up to 12 m high (Stephenson and Fleming, 1940). They called the depression an 'ice caldera' because of its similarity to a caldera formed by the collapse of a volcanic cone. Although Mellor (1960) suggested ice 'doline' as a more appropriate term for this type of feature, a suggestion with which I would agree, 'ice caldera', is used in this paper to be consistent with previous descriptions. The geomorphology of the caldera has never been studied in detail so it is not possible to discuss its formation without speculation.

In 1949 the ice caldera was mapped by V. E. Fuchs (*Falkland Islands Dependencies, Alexander Island*, 1:200 000, Sheet W71 68; Tolworth, Directorate of Overseas Surveys, 1960). The map shows the caldera to be roughly circular with a diameter of about 1.5 km, similar to when it was discovered in 1936. In 1966 the area was photographed from the air (U.S. Navy, TMA 1845, F-31, Nos. 200–210; 27

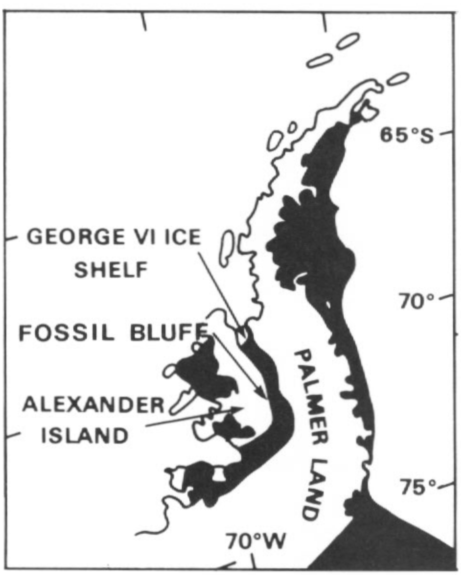

Fig. 1. The Antarctic Peninsula showing the position of George VI Ice Shelf.

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Fig. 2. The ice caldera as seen from the air in January 1967. Uranus Glacier is top left in the photograph. The dark streaks on the ice shelf are melt-water lakes. A pattern of lakes which lies at the terminus of Eros Glacier can be seen between the caldera and the cliffs.

October 1966) and the feature can be recognized, especially in air photograph No. 202. The caldera is marked as a melt-water lake on a map compiled from the 1966 US Navy photographs (*Antarctica Sketch Map, Palmer Land (north part), 1:500000*; Reston, Virginia, United States Department of the Interior Geological Survey, 1979). The caldera was photographed from the air in January 1967 (Fig. 2) by Dr C. W. M. Swithinbank. In August 1969 glaciologists based at Fossil Bluff established a stake scheme around the caldera to monitor ice movement and local accumulation (Wager, 1970). Kistruck (1971) reports observations made during visits to the caldera during April 1970. He states '. . . that the surface topography of the area has changed greatly. The conspicuous central dome of 1969 and earlier years had disappeared, and it and its surrounding pressure ridges had merged into a single line of disturbance'. A melt-water lake pattern evidently associated with the caldera can be identified on a Landsat image (1170–12251–7) taken on 9 January 1973. Only the outline of the caldera was clearly visible when I flew over the area in December 1979. These few observations show that the surface definition of the feature has deteriorated over the years. The caldera has been identified over a period of 44 years making it possible to draw some conclusions about the ice shelf at that point.

Mass Balance and Changes in the Ice Caldera Area

A study of melt-water lakes on George VI Ice Shelf, especially those near Fossil Bluff, has found that they form where the net accumulation rate is less than $0.2\,Mg\,m^{-2}\,a^{-1}$ (Reynolds, 1981). The same area is known to be in a precipitation shadow (Bishop and Walton, 1981; Pearson and Rose, in press). The stake scheme set around the caldera in August 1969 had melted out completely and had been lost by the following year (Kistruck, 1971). This suggests that the net mass balance was slightly negative. The fact that the caldera has survived in the Fossil Bluff area for at least 44 years is consistent with the local mass balance being close to zero.

The aerial photographs and satellite image cannot provide position fixes with accuracies comparable to those from ground surveys. Large uncertainties in estimates of the position of the caldera have made any assessment of ice velocities for the area inconclusive. The reliability of the estimates of the position of the caldera is sufficient to deduce that the caldera has moved southwards. The caldera has changed its shape from being circular in 1936 (Stephenson and Fleming, 1940) to elliptical by 1969, with its major axis aligned parallel to the deduced direction of movement.

Glaciers in the Vicinity of Fossil Bluff

Tributary glaciers, such as McArthur Glacier (Fig. 3) drain the Palmer Land ice sheet and feed George VI Ice Shelf which flows westwards. At its western margin, the ice shelf impinges against the eastward-flowing glaciers from Alexander Island, such as Uranus and Eros glaciers (Fig. 3). The major glaciers that flow into the ice shelf dominate its general flow behaviour (Bishop and Walton, 1981; Pearson and Rose, in press). During the height of the ablation season the principal pattern of melt-water lakes mirrors the main flow lines within the ice shelf (Reynolds, 1981). These lake patterns are clearly depicted on the Landsat image of 9 January 1973. The various glacier units around Fossil Bluff have been delimited (Fig. 3) from the Landsat image and from oblique aerial photographs taken by the US Navy, by Dr Swithinbank and by the author. The melt-water lakes which lie within 5 to 10 km of the western edge of George VI Ice Shelf, tend to form in troughs of undulations caused by the influx of glaciers from Alexander Island into the ice shelf (Fig. 2). Of the glacier units identified around Fossil Bluff (lettered in Fig. 3) only glaciers A (Eros Glacier) and D (Uranus Glacier) have the melt-lake patterns in the vicinity of their termini. Bishop and Walton (1975) report that one site in a stake scheme off Eros Glacier gives an ice velocity of $30\,m\,a^{-1}$ in a south-easterly direction (Fig. 3). The

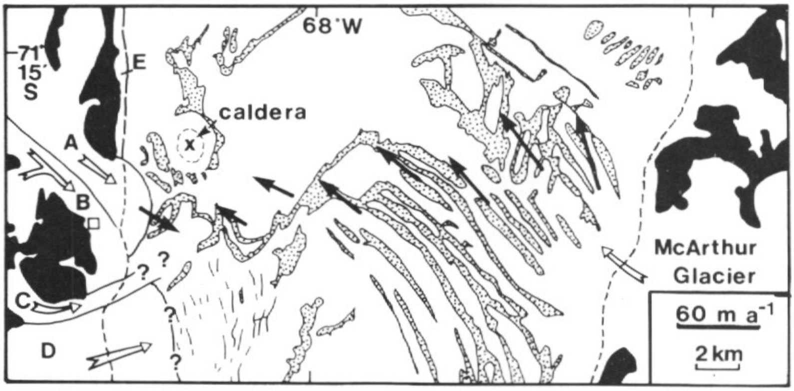

Fig. 3. Fossil Bluff is marked by an open square and the ice caldera by a cross enclosed by a dashed line. Ice velocities are from Bishop and Walton (1975); lengths of solid arrows are proportional to the magnitude of velocity (upper bar scale). Black shading represents nunataks. Melt-water lakes are shown either stippled or as thin, short lines (based on Landsat image 1170–12251–7, 9 January 1973). Open arrows indicate general flow direction of glaciers. Letters A to E label glacier units discussed in the text. Dashes indicate grounding lines, and solid lines represent boundaries between glacier units.

effect of glacier D (Uranus Glacier) is confined to the area more than 10 km south of the caldera. Its size is sufficient to cause the flow of the ice shelf to be deflected northwards as can be clearly seen from the melt-lake patterns and velocity vectors shown in Figure 3. From aerial photographs, glacier C has no noticeable effect on the ice shelf and cannot be traced once afloat; neither can the exact location of the terminus of Uranus Glacier be seen, hence the question marks in Fig. 3. Neither Glacier B nor E shows any morphological indications of significant movement which suggests that glaciers B and E have little effect on the ice shelf. A southwards movement of the caldera and the distinctive pattern of melt-water lakes adjacent to Eros Glacier suggest that Eros Glacier has the overriding control of the movement of the caldera area.

Conclusion

The aerial photographs and satellite image have been useful in understanding the large-scale movement of the glaciers in the vicinity of the caldera. The reliability of the estimates of the position of the caldera from the source maps is sufficient to provide precise information about ice velocities, but is sufficient to indicate that the caldera has moved southwards.

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A FULL LIST OF OFFICIALLY RECOGNIZED NAMES FOR THE LAKES OF SIGNY ISLAND, SOUTH ORKNEY ISLANDS

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The 17 lakes on Signy Island have been the subject of scientific study for over 15 years. Originally they were designated by the numbers 1 to 17 for reference purposes. In 1974 the Antarctic Place Names Committee approved proposals to name ten of the lakes. The other seven lakes remained designated by number only. These were receiving virtually no scientific attention at the time due to their remote

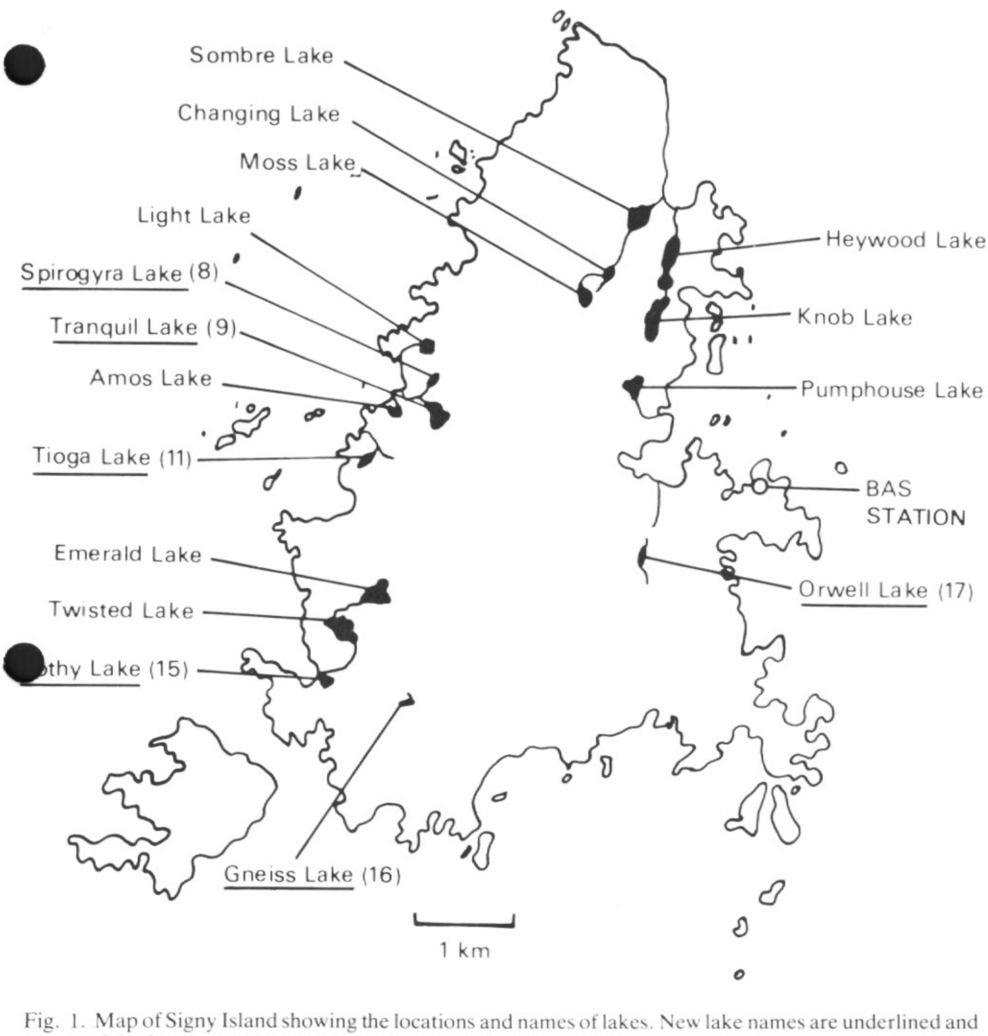

Fig. 1. Map of Signy Island showing the locations and names of lakes. New lake names are underlined and their former number designations given in brackets.

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locations, so the inconsistency was essentially ignored. Recently, however, these remote lakes have come under more detailed scrutiny and the use of the old numbering system alongside the official names in publications has caused some confusion to readers. As the existing lake names are already featured on Antarctic maps and in many scientific publications, it was considered appropriate to replace all the numbers with official names. One of the numbered lakes (Lake 13) has drained and virtually disappeared. The locations and names of the remaining six are shown in Fig. 1. All future scientific papers and reports concerning the lakes will use lake names approved by the Antarctic Place Names Committee and not numbers.

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FURTHER MYXOMYCETE RECORDS FROM SOUTH GEORGIA AND THE ANTARCTIC PENINSULA

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ABSTRACT. Two new records of myxomycetes (*Lamproderma arcyrioides* and *Stemonitopsis subcaespitosa*) are reported from South Georgia, both new to the sub-Antarctic biome. *Diderma niveum* is also recorded for the first time from the Antarctic Peninsula and is the southernmost known occurrence of any myxomycetous fungus.

Following the collection of two myxomycetes by one of the authors (R.I.L.S.) from South Georgia (*Diderma niveum* and *Didymium dubium*) and from Signy Island, South Orkney Islands (*Diderma niveum*) (Ing and Smith, 1980), additional collections of three species have been made (by R.I.L.S.). Of particular interest is the second record of a myxomycete from the Antarctic Peninsula.

Diderma niveum (Rost.) Macbr. was found on decaying shoots of *Polytrichum alpestre* Hoppe in March 1981 at Cape Tuxen, Graham Coast, on the west coast of the Antarctic Peninsula (lat. 65° 16′ S, long. 64° 08′ W). Cape Tuxen is one of the richest botanical sites in the Antarctic Peninsula region and its steep rocky north-west-facing slopes are extensively vegetated by a wide range of bryophyte and lichen communities from sea level to an altitude of about 350 m (Smith and Corner, 1973). The area experiences long winters with deep snow cover and temperatures down to −40°C, but it becomes snow-free relatively early in the summer due to its steep northerly aspect. *D. niveum* occurred on moribund *P. alpestre* shoots overlying a deposit of peat formed by the moss, at an altitude of *c.* 20 m. This occurrence is 5° of latitude farther south than the previous record of this species from Signy Island (Ing and Smith, 1980), and is the southernmost record of any myxomycete yet reported. The only other myxomycete known from the Antarctic Peninsula is *Diderma antarcticolum* Horak from Coughtrey Peninsula, Danco Coast, near the Argentine station Almirante Brown (lat. 64° 54′ S, long. 62° 52′ W). This new material is scanty and nearly limeless, indicative of the calcium-deficient moss turf habitat (pH 3.8).

Lamproderma arcyrioides (Sommerf.) Rost. was found as colonies of stalked sporangia attached to the underside of stones in a loose south-facing scree above Hope Point, Cumberland East Bay, South Georgia (lat. 54° 17′ S, long. 36° 29′ W), in January 1981. The upper surface of the stones in the scree were extensively covered with encrusting lichens and occasional fruticose lichens and short cushion mosses. The site is covered by deep snow in winter but is relatively dry throughout the summer. This habitat appears unusual but is not unlike the situation in alpine communities where the soil and litter-inhabiting plasmodium produces fructifications on stones and plant debris under the snow-pack, to be revealed after the thaw. Kowalski (1970) considered this to be the commonest species of *Lamproderma* in montane communities and suggested that it is probably cosmopolitan in mountainous areas in which heavy snow-pack develops. It is widely distributed throughout the world; the nearest record to South Georgia is from Argentina (Deschamps, 1976) but it is not yet known from Tierra del Fuego. Ing and Smith (1980) reported what may have been a species of *Lamproderma* on the woody rhizomes of *Acaena magellanica* (Lam.) Vahl from the same vicinity of South Georgia, but the specimen was lost and only a verbal description of its appearance was available.

Stemonitopsis subcaespitosa (Peck) Nann.-Brem. was found on tussock grass (*Poa flabellata* (Lam.) Hook. f.) litter on Gony Ridge, Bird Island, South Georgia (lat. 54° 01′ S, long. 38° 04′ W), in March 1980. *P. flabellata* is the dominant plant species throughout South Georgia. It is a very large plant with winter-green leaves and a large amount of attached dead foliage and detached litter surrounding the base of the plants. The Bird Island site is under deep snow for several months in winter although temperatures are seldom much below 0°C. Under the cool, wet and cloudy summer climatic regime of the island, tussock litter has been found to be a rich source of macrofungi. These probably contribute significantly to its decomposition and the formation of a distinctive peat beneath the grass. The usual habitat for this species is dead wood but it is also occasionally isolated from the bark of living trees. It has not been reported from alpine or polar regions, being widespread but uncommon in temperate regions of the Northern Hemisphere, although it is also known from Argentina (Deschamps, 1976) and other countries in South America and from India.

These new records bring the total number of myxomycete species reported from the sub-Antarctic to five, with four occurring on South Georgia and two from the maritime Antarctic (including one from the South Orkney Islands and two from the Antarctic Peninsula). Material is deposited in the herbarium of the British Antarctic Survey (AAS).

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