SHORT NOTES

Pseudoicichthys australis (PISCES, CENTROLOPHIDAE): AN ADDITION TO THE MARINE FAUNA OF SOUTH GEORGIA AND CONFIRMATION OF ANTARCTIC DISTRIBUTION

By M. G. WHITE *and* A. W. NORTH

ABSTRACT. The British Antarctic Survey initiated during 1978 an Offshore Biological Programme (OBP) to study the biology of krill and its principal predators. From a station 36 nautical miles north of South Georgia, a large epipelagic fish was caught which was found to be a specimen of *Pseudoicichthys australis*. This observation confirms that the distribution of this species extends to the south of the Antarctic Convergence. The meristic characters of this specimen are compared with those of specimens caught near New Zealand, Patagonia and the South Orkney Islands.

THE British Antarctic Survey initiated in 1978 an Offshore Biological Programme (OBP) to study the biology of *Euphausia superba* and the role of its predators in the Southern Ocean ecosystem (Bonner and others, 1978). During the first season's cruises from January to March, 444 biological stations were worked off the northern coast of South Georgia and in the Scotia Sea between South Georgia and the South Orkney Islands. At station OBP 204, 36 nautical miles north of South Georgia, a large epipelagic fish was caught, using an IOS rectangular midwater trawl (RMT 8+1) net, in the upper 120 m and the specimen was subsequently identified as *Pseudoicichthys australis* (Haedrich).

This species was originally described from a single 77 mm fingerling caught off the south coast of New Zealand (Haedrich, 1966) and has also been recorded from off the Patagonian continental shelf (von Krefft, 1969). Collections from *Akademic Knipovich* during 1967 produced further material from between Patagonia and the Falkland Islands and two specimens from south of the Antarctic Convergence, from an area to the north-east of the South Orkney Islands (Permitin, 1969). The specimen caught during the 1978 OBP investigations confirms that the distribution of this species extends south of the Antarctic Convergence.

A comparison of the meristic characters of the previously described specimens with the OBP specimen (Table I) showed that the values of the diagnostic characteristics for the specimen from South Georgia lie within one standard deviation of the mean of the collective data from the others except that the proportions of length of anal fin/standard length and the pre-dorsal distance/standard length was shorter and the inter-orbital distance/head length was wider. This, however, is not thought to be significant because this group of fish normally demonstrates marked allometric growth. Haedrich (1967) and Parin and Permitin (1969), who have made revisions of the stromateoid fish, noted that relative proportions of the body changed considerably with overall size. This was particularly noticeable in the relative proportions of the head to the total length and the total length to the body depth.

A number of Southern Hemisphere fish are thought to migrate between the Antarctic, where growing and adult specimens feed, and the warmer sub-Antarctic waters, where breeding and early development take place. Permitin (1969) and Parin and Permitin (1969) considered that *Anotopterus pharao*, *Paralepis atlantica* and *Paradiplospinus graciatus* behave in this manner, and Basalaev and Petukhov (1969), Wysokinski (1974) and Shubnikov and others (1969) have reported *Micromesistius australis* and *Merluccius polylepis* to the south of the Antarctic Convergence.

It is likely that the behaviour of *Pseudoicichthys australis* is similar and it may be a member of a group of species which migrates to the Southern Ocean during the summer to feed on krill or other components of the Antarctic plankton.

TABLE I. COMPARISON OF MERISTIC CHARACTERS OF *Pseudoicichthys australis* (Haedrich)

Character	*Holotype* Haedrich (1966)	Parin and Permitin (1969)					von Krefft (1969)				$\bar{x}$	s	*OBP specimen*
Total length (TL) (mm)	89.5	109	154	189	300	330	363	375	400	454			338
Standard length (SL) (mm)	77.2	86.5	130.5	163	239	267	309	323	338	385			275
Percentage of standard length													
Length of head	31	29	23	23	26	24	22	22	20	21	24.1	3.5	23
Length of pectoral	19	19	15	14	15	15	11	12	10	11	14.1	3.2	14
Length of pelvic	10	—	7	6	5	4	4	4	4	4.5	5.4	2.0	4
Length of dorsal	53	51	52	53	53	55	57	61	55	56	54.6	2.9	55
Length of anal	30	—	28	31	31	30	30	29	—	27	29.5	1.4	26
Pre-dorsal distance	43	43	42	37	44	40	36	37	38	38	29.8	3.0	35
Pre-anal distance	62	—	61	61	65	62	59	57	60	60	60.8	2.2	61
Maximum depth	41	—	40	40	42	36	35	35	32	30	36.8	4.3	36
Height caudal peduncle	11	10	9	11	13	10	11	10	8	8	10.1	1.5	10
Percentage of head length													
Length of snout	25	21	20	22	21	20	24	—	23	25	22.3	2.0	20
Eye diameter	28	30	27	25	19	19	22	21	23.5	19	23.4	4.0	22
Length of maxilla	36	33	—	33	28	29	30	26	24	31	30	3.7	28
Inter-orbital distance	30	28	37	31	36	36	21	29	22	30	29	6.5	39
Number													
Dorsal fin rays	42	42	40	44	40	40	41	43	40	40	41.2	1.4	41
Anal fin rays	28	—	27	28	28	27	26	25	—	26	26.9	1.1	25
Pectoral fin rays	16	16	17	16	17	16	17	16	16	15	16.2	0.6	16
Gill rakers	5+1+12	6+1+11	5+1+11	4+1+12	5+1+12	5+1+11	6+1+11	6+1+12	6+1+12	6+1+11			5+1+12
Vertebrae	51	52	52	52	—	50	50	50	50	50	50.8	1.0	50

STATION AND SPECIMEN DATA

OBP 204, 20 February 1978, 21.09 h, lat. 53°22′S, long. 38°03′W, 21.51 h, lat. 53°22′S, long. 37°57′W, 1 200–1 310 fathoms [2 195–2 395 m], double oblique haul, RMT 8+1, 0–115 m depth.

The specimen has been deposited in the British Museum (Nat. Hist.) under the number BMNH 1978–6–19:1.

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REFERENCES

BASALAEV, V. V. *and* A. G. PETUKHOV. 1969. Opytny lov putassu v more skotiya s naychno-promsyslovogo sydna "Akademik Knipovich" [Experimental fishing for poutassou in the Scotia Sea from the research factory ship "Akademik Knipovich"]. *Trudy vses. nauchno-issled. Inst. morsk. ryb. Khoz. Okeanogr.*, **66,** 307–10.

BONNER, W. N., CLARKE, A., EVERSON, I., HEYWOOD, R. B., WHITAKER, T. M. *and* M. G. WHITE. 1978. Research on krill in relation to the Southern Ocean ecosystem by the British Antarctic Survey. *International Council for the Exploration of the Sea. Biological Oceanography Committee*, C.M. 1978/L:23, 6 pp.

HAEDRICH, R. L. 1966. The stromateoid fish genus *Icichthys:* note and a new species. *Vidensk. Meddr dansk naturh. Foren.*, **129,** 199–213.

————. 1967. The stromateoid fishes. Systematics and classification. *Bull. Mus. comp. Zool. Harv.*, **135,** 31–139.

PARIN, N. V. *and* Y. E. PERMITIN. 1969. K poznaniyu pelagicheskoy ikhtiofauny Antarktiki: novy rod stromateevidnydh ryb—*Pseudoicichthys* (Pisces, Centrolophidae) [Information on the pelagic fish fauna of the Antarctic: a new genus of stromateoid fish—*Pseudoicichthys* (Pisces, Centrolophidae)]. *Vop. Ikhtiol.*, **9,** No. 6, 981–87. [English translation: *Problems of Ichthiology*, **9,** No. 6, 789–94.]

PERMITIN, Y. E. 1969. Novye dannye o vidovom sostave i rasprostranenii ryb morya Skotiya v Antarktike (soobshchenie vtoroe) [New data on species composition and distribution of fishes in the Scotia Sea, Antarctica (second communication)]. *Vop. Ikhtiol.*, **9,** No. 2, 221–39. [English translation: *Problems of Ichthiology*, **9,** No. 2, 167–81.]

SHUBNIKOV, D. A., PERMITIN, Y. E. *and* S. P. VOZNAK. 1969. Materily po'iologii putassu (*Micromesistius australis* Norman) [Some data on the biology of poutassou (*Micromesistius australis* Norman)]. *Trudy vses. nauchno-issled. Inst. morsk. ryb. Khoz. Okeanogr.*, **66,** 299–306.

VON KREFFT, G. 1969. Ergebnisse der Forschungsreisen der FFS "Walther Herwig" nach Südamerika, VI. Fische der familie Centrolophidae (Perciformes Stromateoidei). *Arch FischWiss.*, **20,** No. 1, 1–9.

WYSOKINSKI, A. 1974. Taxonomic position of hake, *Merluccius polylepis* Ginsburg, 1954, from the Falkland Islands and Tierra del Fuego region. *Acta Ichthyol. Piscat.*, **4,** No. 2, 19–31.

THE FRESHWATER FAUNA OF SOUTH GEORGIA

By H. J. G. DARTNALL *and* R. B. HEYWOOD

ABSTRACT. Biological collections have been made in lakes and rivers in the Cumberland Bay area of South Georgia. Sixteen species of Rotifera, 11 species of Arthropoda and single representatives from each of the Protozoa, Platyhelminthes, Gastrotricha, Nematoda, Tardigrada and Annelida were found. The freshwater faunas of South Georgia and Signy Island, South Orkney Islands, were found to be similar and the zoogeography of the Scotia arc is discussed.

SOUTH GEORGIA (lat. 54–55°S, long. 36–38°W) is a crescent-shaped island 160 km long and varying in width from 5 to 30 km. The island is situated within the Antarctic Convergence and lies almost due east of, and about 2 000 km from, the southern tip of South America. South Georgia is the largest and the first of a chain of islands emerging from the Scotia arc, a submarine ridge linking South America with Antarctica. The island was visited by several national

expeditions at the turn of the century and was the shore base for the Discovery Investigations, 1925–38. The British Antarctic Survey has maintained a research station at King Edward Point (lat. 54°16′S, long. 36°30′W) since 1969. However, there has never been an official programme of limnological research, although numerous lakes and streams, and even small rivers, occur wherever there is an area of coastal lowland on this otherwise mountainous, ice-capped and glacierized island. Sporadic and casual collection of specimens has provided meagre information, mainly on the species composition of the crustacean fauna. The information is widely scattered throughout the literature. Some recent collections by British Antarctic Survey personnel have considerably extended the faunal lists. The opportunity has been taken to collate all the available data in this paper.

The British Antarctic Survey collections were made in the Cumberland Bay area (for location map see Clapperton (1971)); from the Maiviken lakes, the Lonnberg Valley River, the Sörling Valley River and Gull Lake by SCUBA divers, who brought up samples of benthic vegetation from deep and shallow water. Fresh and preserved (FAA) samples of vegetation were examined under a dissecting microscope. The species found and an additional four species recorded by earlier investigators are given in Table I. Harding (1941) also recorded two other copepods from South Georgia—*Pseudoboeckella silvestri* Daday and *Harpacticus furcatus* Lang. *Pseudoboeckella silvestri* has been excluded because of the taxonomic confusion that exists between this species and *P. poppei* (Heywood, 1977*a*), and *Harpacticus furcatus* because it is normally found in salt water.

Many of the species found are cosmopolitan and they have presumably colonized South Georgia from South America. Some of them are also found in the lakes on Signy Island (lat. 60°43′S, long. 45°38′W), South Orkney Islands (Heywood, 1967, 1977*a*; Dartnall, 1975; Priddle and Dartnall, 1975), which have been intensively studied for more than 5 years. The

TABLE I. THE FRESHWATER FAUNA OF SOUTH GEORGIA

Protozoa	? *Centropyxis* sp.*†
Platyhelminthes	1 species
Rotifera	*Notholca* sp.*†
	*Euchlanis parva**†
	Mytilina mucronata†
	Lepadella patella†
	Lepadella sp.*†
	Lecane 2 spp.*†
	*Cephalodella gibba**†
	Cephalodella sp.*†
	*Eosphora najas**†
	Trichocerca 4 spp.**†
	Rotatoria sp.†
	? *Macrotrachella* sp.*†
Gastrotricha	1 species
Nematoda	*Monhystera* sp.*
Tardigrada	1 species*
Annelida	1 species (Enchytraeid)*
Anthropoda	(*Branchinecta gaini* (Daday))*
	Pseudoboeckella poppei Mrázek*
	(*Parabroteas sarsi* (Daday))*
	Cypridopsis frigogena H. Graf*
	Macrothrix hirsuticornis Norman and Brady*
	Ilyocryptus brevidentatus Ekman*
	Alona rectangula Sars*
	(*Alona weinechi* Studer)
	Chydorus sphaeroides O. F. Müller
	(Amphipod species)
	Lancetes claussi (Müller)

* Species present at Signy Island.
† Probable identifications.
The species in parentheses are present but not recorded in this study.

two islands probably have many more species in common. For example, Signy Island has many species of small rotifer which are normally difficult to detect *in vivo* and virtually impossible from preserved material, and none of them has yet been found at South Georgia. Some of the lakes on South Georgia have aquatic mosses as part of the benthic vegetation (Light and Heywood, 1973). Examination of fresh moss samples will probably reveal further species, since similar lakes on Signy Island have a rich and specific fauna of rotifers associated with the aquatic moss (Priddle and Dartnall, 1978).

Faunal lists from this region of the world currently reflect the thoroughness of collecting rather than the actual animals present. It would appear, however, that South Georgia will prove to have a richer freshwater fauna than Signy Island, although it lies almost 500 km farther from South America but also 6° of latitude farther north. The species already known to occur at South Georgia but not at Signy Island are the aquatic beetle *Lancetes claussi*, the cladocerans *Alona weinechi* and *Chydorus sphaeroides*, an unidentified platyhelminth, and the rotifers *Mytilina mucronata*, *Lepadella patella*, one *Lecane* sp., two *Trichocerca* spp. and *Rotatoria* sp. There is some evidence to suggest that the variety of freshwater fauna rapidly decreases farther south. The decline can be demonstrated most accurately by the Crustacea which are the most readily observed and collected group of the freshwater fauna (Table II).

TABLE II. DISTRIBUTION OF CRUSTACEA IN THE ANTARCTIC AND SUB-ANTARCTIC

		Falkland Islands	*South Georgia*	*Signy Island*	*Antarctic Peninsula*	*Alexander Island*
Anostraca	*Brachinecta gaini*	+[1]	+	+[2]	+[3]	—
Copepoda	*Pseudoboeckella poppei*	+[4]	+	+[2]	+[3]	+[6]
	Parabroteas sarsi	+[4]	+	+[2]	+[5]	+[6]
Amphipoda	Amphipod sp.	+[1]	+	—	—	—
Ostracoda	*Cypridopsis frigogena*	—	+	+[2]	—	—
	Eucypris sp.	—	—	+[2]	—	—
Cladocera	*Macrothrix hirsuticornis*	+[4]	+	+[2]	+[3]	—
	Ilyocryptus brevidentatus	+[4]	+	+[2]	—	—
	Alona rectangula	+[5]	+	+[2]	—	—
	Alona weinechi	+[4]	+	—	—	—
	Chydorus sphaeroides	+[4]	+	—	—	—
	Cladocera sp. 1 ? *Macrothrix*	+[5]	—	—	—	—
	Cladocera sp. 2 ? *Daphnia*	+[5]	—	—	—	—

[1] Weller, 1975; [2] Heywood, 1967, 1977*a*; [3] Harding, 1941; [4] Ekman, 1905; [5] Unpublished results; [6] Heywood, 1977*b*.

The change in the faunal lists could reflect less favourable environments for colonization or dispersal difficulties. The former reason certainly explains the differences between the Falkland Islands (cold temperate) and South Georgia (sub-Antarctic), and between the South Georgia and Signy Island (Antarctic) lists. However, after studying lakes on Signy Island, the Antarctic Peninsula (to lat. 67°46′S) and Alexander Island (to lat. 71°20′S), one of us has concluded that dispersal difficulties form the major factor determining the biota in these areas because the environments appear to be of equal severity (Heywood, 1977*b*).

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REFERENCES

CLAPPERTON, C. M. 1971. Geomorphology of the Stromness Bay–Cumberland Bay area, South Georgia. *British Antarctic Survey Scientific Reports*, No. 70, 25 pp.

DARTNALL, H. J. G. 1975. Freshwater invertebrates of Signy Island. II. Rotifera (B.A.S. No. N5/1975/H), 44 pp. [Unpublished.]

EKMAN, S. 1905. Cladoceren und Copepoden aus antarktischen und subantarktischen Binnenge-wassern. *Wiss. Ergebn. schwed. Südpolarexped.*, Bd. 5, Lief. 4, 1–40.

HARDING, J. P. 1941. Lower Crustacea. *Scient. Rep. Br. Graham Ld Exped.*, **1,** No. 6, 319–22.

HEYWOOD, R. B. 1967. The freshwater lakes of Signy Island and their fauna. (*In* SMITH, J. E., *organizer*. A discussion on the terrestrial Antarctic ecosystem. *Phil. Trans. R. Soc.*, Ser. B, **252,** No. 777, 347–62.)

————. 1977*a*. The correct identity of a *Pseudoboeckella* sp. (Copepoda, Calanoida) from Signy Island, South Orkney Islands. *British Antarctic Survey Bulletin*, No. 45, 147.

————. 1977*b*. A limnological survey of the Ablation Point area, Alexander Island, Antarctica. (*In* FUCHS, V. E. *and* R. M. LAWS, *organizers*. A discussion on scientific research in Antarctica. *Phil. Trans. R. Soc.*, Ser. B, **279,** No. 963, 39–54.)

LIGHT, J. J. *and* R. B. HEYWOOD. 1973. Deep-water mosses in Antarctic lakes. *Nature, Lond.*, **242,** No. 5399, 535–36.

PRIDDLE, J. *and* H. J. G. DARTNALL. 1975. Freshwater invertebrates of Signy Island, South Orkneys. I. Protozoa, Arthropoda, Nematoda, Annelida and Tardigrada (B.A.S. No. N12/1975/H), 18 pp. [Unpublished.]

————. *and* ————. 1978. The biology of an Antarctic aquatic moss community. *Freshwater Biol.*, **8,** No. 5, 469–80.

WELLER, M. W. 1975. Notes on formation and life of ponds of the Falkland Islands and South Georgia. *British Antarctic Survey Bulletin*, No. 40, 37–47.

TWO MYXOMYCETES FROM SOUTH GEORGIA

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ABSTRACT. Two myxomycetous fungi, *Diderma niveum* and *Didymium dubium*, are reported for the first time from southern polar regions. Their occurrence on South Georgia considerably extends their known geographical range but confirms their validity as components of an ecological group of chionophilous myxomycetes.

ONLY a single species of myxomycete has been recorded from the Antarctic and sub-Antarctic regions. Horak (1966) described *Diderma antarcticolum* Horak from the vicinity of the Argentine station "Almirante Brown" on the Danco Coast, Antarctic Peninsula (lat. 64°53′S, long. 62°53′W), where it occurred on living and dead moss. The myxomycete flora of Tierra del Fuego has been monographed recently by Arambarri (1975). In tundra regions of the Northern Hemisphere, myxomycete species colonizing short vegetation at the edge of melting snow were intensively studied in the Swiss Jura Mountains by Meylan (1914) and have been found in alpine regions in various parts of Europe, North America and in the Himalaya. However, no comparisons have been made between the myxomycetous flora of northern and southern tundra regions.

Two species belonging to this suite of chionophilous myxomycetes are now known from the sub-Antarctic island of South Georgia.

South Georgia (lat. 54–55°S, long. 36–38°W) is a large (*c.* 160 km by 5–40 km) island situated *c.* 2 000 km east of Tierra del Fuego in the South Atlantic Ocean. It has an alpine topography of which about 60% is covered by permanent ice and many large glaciers reach the sea at the head of fjords. It has a cool oceanic climate with prevailing westerly winds, high precipitation (1 200–2 000 mm per annum) with frequent summer snowfalls, low temperatures, but with a small annual range (annual mean 1.8 °C; warmest monthly mean 5.3 °C; coldest monthly mean −1.5 °C), and deep snow lying for up to 6 months or more during the year at sea-level. Closed phanerogamic vegetation is restricted to coastal lowlands, where extensive

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grassland and bog communities predominate. Elsewhere, open fellfield communities are widespread on the snow-free ground (Smith and Walton, 1975).

Diderma niveum (Rost.) Macbr. (Fig. 1) was locally frequent on old woody stems of *Acaena magellanica* (Lam.) Vahl, leaves of *Rostkovia magellanica* (Lam.) Hook. f. and shoots of *Polytrichum alpinum* Hedw. growing in boggy ground behind the whaling station at Grytviken, King Edward Cove, Cumberland East Bay, in October 1976. The sporangia had developed on plants only recently uncovered by the melting winter snow. It was also seen, mainly on *Acaena* stems, in several places around King Edward Cove. This species is widespread in the Northern Hemisphere; in the Southern Hemisphere it is so far known only from mountainous parts of Argentina and Chile.

Didymium dubium Rost. (Fig. 2) was found under similar conditions in October 1976, on dead leaves of *Rostkovia magellanica* in boggy ground and on the leaves of *Festuca contracta* T. Kirk in dry grassland around King Edward Cove, at Maiviken (Cumberland West Bay), on Barff Peninsula and on Dartmouth Point (Cumberland East Bay). The host plants were again recently uncovered as the snow melted. This very variable species has been found on decaying plant remains in Europe, North America and India, and may also occur in Argentina (Farr, 1976). It is both a snow-line species and an inhabitant of lowland litter. The South Georgian material is typical of the taxon found in alpine situations in Europe.

A third species of myxomycete with a stalked sporangium was collected on *Acaena magellanica* rhizome near Grytviken but unfortunately the specimen was lost. It resembled a species of *Lamproderma*.

These records represent an interesting extension of the known range of the chionophilous myxomycetes and confirm the validity of this ecological group.

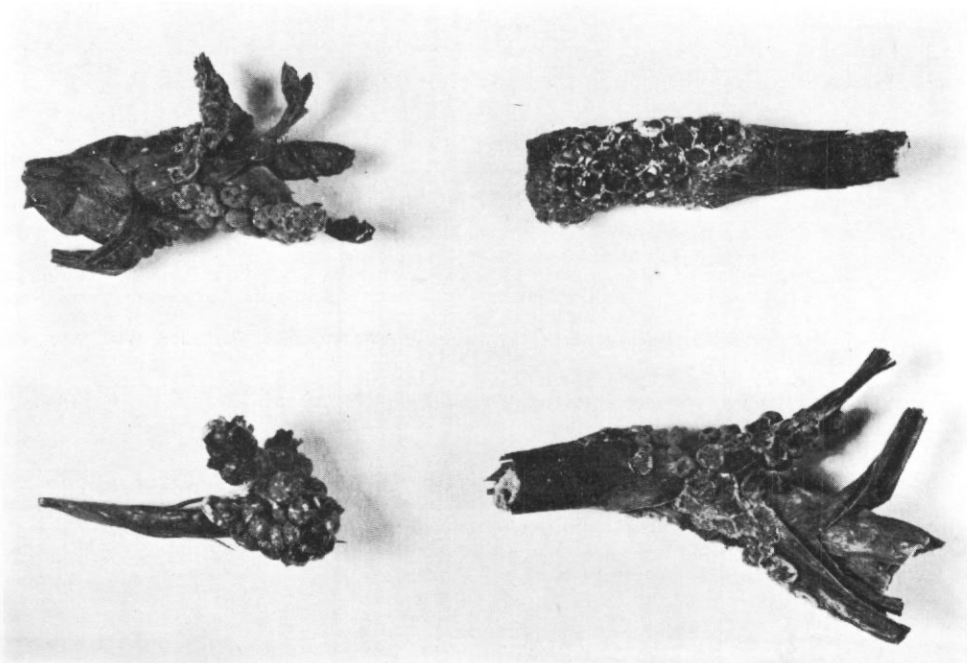

Fig. 1. *Diderma niveum* on dead woody *Acaena magellanica* rhizome and *Polytrichum alpinum* (lower left). King Edward Cove, South Georgia. 28 October 1976.

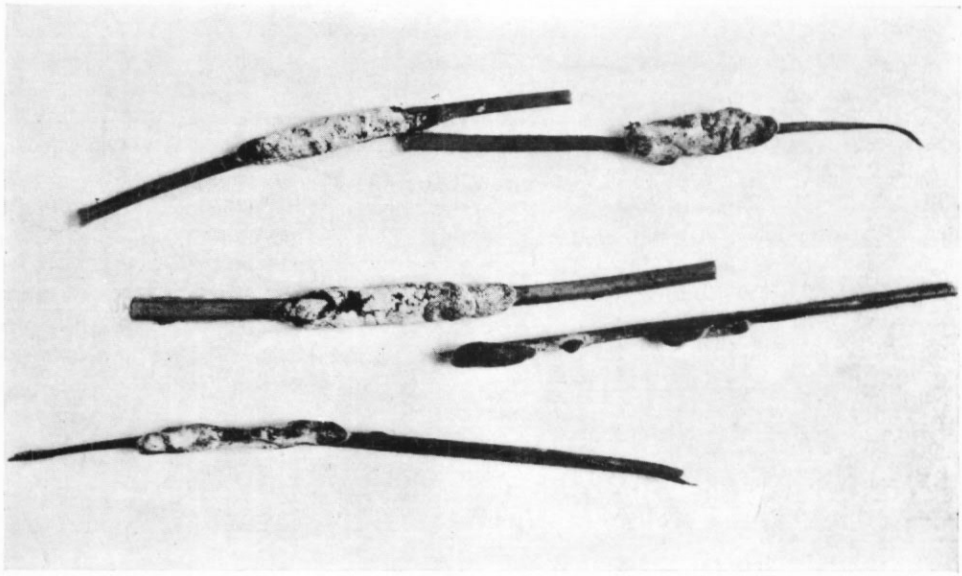

Fig. 2. *Didymium dubium* on dead leaves of *Rostkovia magellanica*. Numerous perithecia of unidentified microfungi are also visible. King Edward Cove, South Georgia. 28 October 1976.

The specimens were collected by R. I. Lewis Smith and identified by B. Ing; material is deposited in the Herbarium of the British Antarctic Survey and in the private collection of B. Ing.

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REFERENCES

ARAMBARRI, A. M. 1975. *Flora criptogamica de Tierra del Fuego. Tomos II. Myxophyta, Myxomycetes*. Buenos Aires, Fundacion para la Educacion, la Ciencia y la Cultura.

FARR, M. L. 1976. *Flora neotropica. Monograph 16. Myxomycetes*. New York, New York Botanic Garden.

HORAK, E. 1966. Sobre dos nuevos especies de hongos recolectados en el Antártico. *Contrnes Inst. antárt. argent.*, No. 104, 13 pp.

MEYLAN, C. 1914. Remarques sur quelques espèces nivales de myxomycetes. *Bull. Soc. vaud. Sci. nat.*, **50**, No. 182, 1–14.

SMITH, R. I. L. *and* D. W. H. WALTON. 1975. South Georgia, subantarctic. (*In* ROSSWALL, T. *and* O. W. HEAL, *ed.* Structure and function of tundra ecosystems. *Ecol. Bull.*, No. 20, 399–423.)

Note added in proof

Since this note was prepared *Diderma niveum* has been found (by R.I.L.S.) growing on the tall turf-forming moss *Chorisodontium aciphyllum* (Hook. f. et Wils.) Broth., with associated *Polytrichum alpestre* Hoppe and *Pohlia nutans* (Hedw.) Lindb., on Signy Island, South Orkney Islands (lat. 60° 43′ S, long. 45° 36′ W).