PREDACIOUS FUNGI FROM THE ANTARCTIC

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ABSTRACT. Predacious fungi are reported from the Antarctic for the first time, from four species isolated from amongst moss leaves. The shortage of conidia made the identification of three somewhat doubtful, but *Meria coniospora* Drechsler was positively identified, from Signy Island, South Orkney Islands.

DURING the examination of fresh material of many moss species on Signy Island, South Orkney Islands (lat. 60°43′S., long. 45°38′W.), the frequent occurrence of nematodes amongst the shoots and leaves prompted a search for fungal predators. Several species of predacious fungi attacking eelworms were observed and isolated from a number of mosses, their occurrence being of particular interest since they represent the first records of such fungi in the Antarctic. A passing reference to their existence as a component of certain terrestrial ecosystems in the maritime Antarctic has been made by Tilbrook (1970).

The fungi described below were isolated from the locally common hydrophytic moss, provisionally identified as a very slender form of *Calliergidium* cf. *austro-stramineum*. Samples of this moss were collected on 2 April 1966 at an altitude of *c.* 50 m. a.s.l. on the north-west-facing slope on the east side of Factory Cove, above the British Antarctic Survey station. The moss formed a pure stand in a wet depression where snow lay late into the summer; in winter the moss had been encased in ice over which *c.* 1·5 m. of snow accumulated for between 8 and 9 months. Nematodes, rotifers, Protozoa and, to a lesser extent, tardigrades were abundant in the moss, particularly in the leaf axils.

A preliminary examination of the fresh moss revealed a network of *Thyronectria antarctica* var. *hyperantarctica* D. Hawksw. mycelium together with numerous very fine septate hyphae, some bearing occasional thick three-celled constricting rings while others bore frequent five- to nine-celled hyphal loops in several of which nematodes were ensnared. At least two species of endozoic fungi parasitic in nematodes were also observed. The moss was grown for 10 months in a covered clear Perspex container at room temperature (*c.* 18° C) and throughout this period the nematode-trapping fungi thrived. Subsequent examination (by C.H.E.W. and C.L.D.) of slide preparations (by R.I.L.S.) has revealed the presence of four species of predacious fungi, of which three were endozoic hyphomycetes. The material is preserved in the British Antarctic Survey herbarium, at present housed in the Department of Botany, University of Birmingham.

IDENTIFIED MATERIAL

Nematode-trapping hyphomycete

Nematodes were observed to be entangled among adhesive branches, mainly of one, two or three cells, produced by a mycelium of septate hyphae that were mainly 3-4 μm. in diameter. Occasionally the branches anastomosed to form simple loops comprising up to nine comparatively thick cells (Fig. 1). No spores were available to enable positive identification of the fungus, but from the characteristic form of the nematode traps it was probably *Monacrosporium cionopagum* (Drechsler) Subramanian (Drechsler, 1950).

Endozoic hyphomycetes

Meria coniospora Drechsler (Drechsler, 1941). The body of the infected nematode was filled with a mycelium of branched septate hyphae mostly of about 3 μm. in diameter. Fertile hyphae, extruded through the integument of the nematode, bore numerous conical spores on short sterigmata. The spores were *c.* 5–6 μm. long by *c.* 2–3 μm. wide at their broad proximal ends and were formed in reasonably large numbers. Their measurements, together with the

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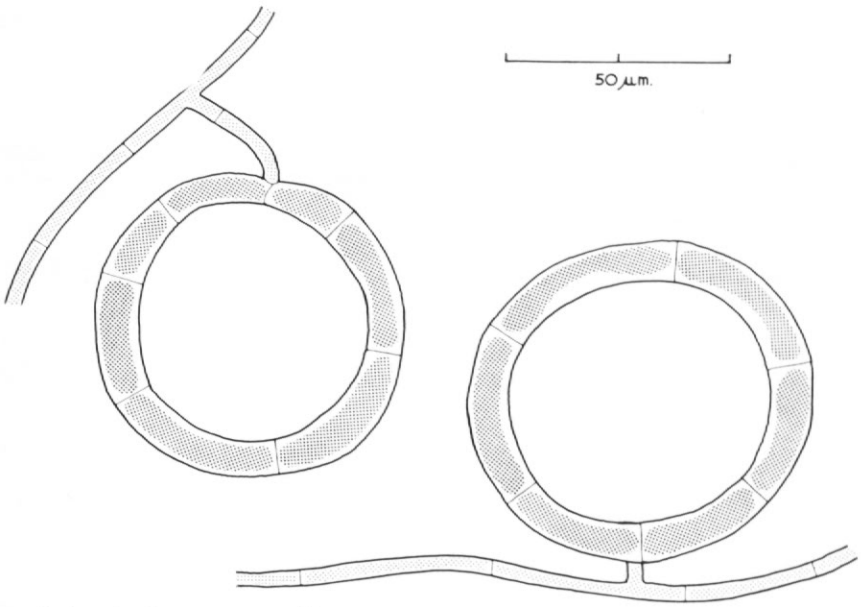

Fig. 1. A predacious hyphomycete, possibly *Monacrosporium cionopagum*, with six- and seven-celled hyphal loops formed by the anastomosis of short branches, isolated from *Calliergidium* cf. *austro-stramineum* from Signy Island, South Orkney Islands.

characteristic way in which they were borne on the fertile hyphae, enabled the fungus to be positively identified.

Harposporium sp. The body of an infected nematode contained a mycelium of branched septate hyphae *c.* 2–3 µm. wide. Fertile hyphae extruded through the integument of the nematode and bore sub-spherical phialides *c.* 3 µm. in diameter, each with a single neck *c.* 2 µm. long by *c.* 1 µm. wide. The fungus was clearly a species of *Harposporium*, but insufficient spores were available for measurement, so that specific identification was impossible; its general form suggested *Harposporium oxycoracum* or *H. helicoides* (Drechsler, 1941).

Acrostalagmus sp. The infected nematode was filled with branched, septate hyphae *c.* 2 µm. in diameter. Fertile hyphae, projecting through the integument of the nematode, bore flask-shaped phialides, mostly 7–8 µm. long by 2–3 µm. wide. No spores were observed, so that specific identification was not possible, but from the form of the phialides it was clearly a species of *Acrostalagmus*, possibly *A. obovatus* (Drechsler, 1941).

Other Material

What appeared to be the same species of *Monacrosporium*, producing hyphal loops as described above, was isolated from living material of a number of mosses from Signy Island, i.e. *Brachythecium austro-salebrosum*, *Calliergon sarmentosum*, *Drepanocladus uncinatus* (all hydrophytic mosses) and *Andreaea depressinervis* (a mesophytic-xerophytic species). Fungi bearing constricting rings comprising three swollen cells attached by a short stalk have been isolated from seven species of moss as well as from soil associated with the two Antarctic phanerogams, *Deschampsia antarctica* and *Colobanthus quitensis*, on Signy and Coronation Islands, South Orkney Islands, and on Elephant Island, South Shetland Islands (personal communication from V. W. Spaull). Spaull has also noted a similar type of fungus, although possibly of a non-constricting species, from a mixed sample of *Cephaloziella* sp. and *Cladonia metacorallifera* from one of the Terra Firma Islands in Marguerite Bay (lat. 68°42′S., long. 67°33′W.). Full identification of these fungi was impossible owing to the lack of spores, but it was thought probable that more than one species was present. The known Antarctic distribution of predacious fungi isolated from plants and soil is summarized in Table I.

TABLE I. RECORDS OF PREDACIOUS FUNGI IN THE MARITIME ANTARCTIC

Locality	*Fungus species*	*Plant or soil from which fungus was isolated*
South Orkney Islands Signy Island (lat. 69°43′S., long, 45°38′W.)	? *Monacrosporium cionopagum*	*Andreaea depressinervis; Brachythecium austro-salebrosum; Calliergidium* cf. *austro-stramineum; Calliergon sarmentosum; Drepanocladus uncinatus*
	Meria coniospora	*Calliergidium* cf. *austro-stramineum*
	Acrostalagmus cf. *obovatus*	*Calliergidium* cf. *austro-stramineum*
	Harposporium sp.	*Calliergidium* cf. *austro-stramineum*
	Unidentified three-celled constricting ring fungus	*Calliergidium* cf. *austro-stramineum; Drepanocladus uncinatus*
		* *Andreaea gainii; Tortula excelsa;* mixed *Calliergidium* cf. *austro-stramineum* and *Calliergon sarmentosum;* mixed *Chorisodontium aciphyllum* and *Polytrichum alpestre;* soil beneath *Colobanthus quitensis;* soil beneath *Deschampsia antarctica*
Coronation Island, to east of Lynch Island (lat. 60°40′S., long. 45°38′W.)	Unidentified three-celled constricting ring fungus	* Soil beneath *Deschampsia antarctica*
South Shetland Islands Elephant Island (lat. 61°10′S., long. 55°14′W.)	Unidentified three-celled constricting ring fungus	* *Chorisodontium aciphyllum; Drepanocladus uncinatus; Polytrichum* sp.; soil beneath *Deschampsia antarctica*
Antarctic Peninsula Marguerite Bay, Terra Firma Islands (lat. 68°42′S., long. 67°33′W.)	? Unidentified three-celled constricting ring fungus	* Mixed *Cephaloziella* sp. and *Cladonia metacorallifera*

* Information provided by V. W. Spaull.

The importance of living bryophytes as sources of predacious fungi was first illustrated by Duddington (1951) and he attributed the rich yield of these fungi from mosses to the fact that there is generally a large amount of water held externally amongst their shoots and leaves which produces a favourable environment for large populations of nematodes and other micro-fauna. Both of these factors prevailed in the samples of Antarctic material examined, although it is worth noting that in the Antarctic this micro-habitat is frozen and usually snow-covered for up to 9 months of the year. During the short summer, however, the temperature at ground level and within the vegetation is considerably more favourable than the ambient conditions suggest (Longton and Holdgate, 1967).

Unfortunately, owing to lack of conidia, only one of the fungi was identified positively to the species level. But this species, *Meria coniospora*, and the other three taxa from Signy Island are common and widespread in Europe and North America, although their distribution in the Southern Hemisphere is not known. Both *Acrostalagmus obovatus* and *Monacrosporium cionopagum* have been isolated from various soils in areas of intensive cultivation, permanent pasture and native forest in New Zealand (Fowler, 1970). None appears to show any particular ecological preference. It would appear from Spaull's observations that predacious fungi are relatively common throughout the maritime Antarctic and associated with a wide variety of terrestrial plants.

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