

Myxomycetes of the New Zealand subantarctic islands

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Myxomycetes (plasmodial slime moulds or myxogastrids) collected during surveys carried out on Campbell Island in March 2000 and the Auckland Islands in March 2000 and March 2006 are reported. Prior to the initial survey on Campbell Island, only a single myxomycete had been reported previously from these subantarctic islands of New Zealand. Specimens collected in the field during the surveys were supplemented with additional specimens obtained in the laboratory from moist chamber cultures prepared with various types of dead plant material. Information on distribution and ecology is provided for each of the species recorded during the surveys, and the assemblages of myxomycetes recorded for Campbell Island and the Auckland Islands are compared with that reported for Macquarie Island.

Keywords: Auckland Islands, biogeography, Campbell Island, plasmodial slime molds

The myxomycetes (plasmodial slime moulds or myxogastrids) are a group of fungus-like organisms usually present and sometimes abundant in terrestrial ecosystems (Martin & Alexopoulos 1969). The exact evolutionary affinities of the myxomycetes are still debated, but these organisms constitute a well-defined and homogenous group of approximately 900 species (Lado 2001). The reproductive, or spore-producing, stage in the myxomycete life cycle can achieve macroscopic dimensions and be collected and preserved for study in much the same way as the fruiting bodies of fungi. However, most species of myxomycetes tend to be rather inconspicuous or sporadic in their occurrence and thus not always easy to detect in the field. Moreover, fruiting bodies of most species are relatively ephemeral and do not persist in nature for very long. Myxomycetes also spend a portion of their life cycle as do other true eukaryotic microorganisms, when their very presence in a given microhabitat is virtually impossible to determine. Because of their life history strategy and inconspicuous nature, myxomycetes provide an immense challenge in biodiversity assessments and, consequently, often have been neglected in such studies.

McKenzie & Foggo (1989), who reviewed all previous records of fungi collected on the New Zealand subantarctic islands, listed only

two myxomycetes. These were *Trichia favoginea* (Batsch) Pers. from the Auckland Islands and *Lamproderma echinulatum* (Berk.) Rostrup from the Snares Islands. During a survey of fungal biodiversity carried out on Campbell Island during a two-week period (March 6–18) in 2000, the types of substrata upon which these organisms typically occur were investigated for the presence of myxomycete fruiting bodies that had developed under field conditions. In addition, samples of various kinds of dead plant material were collected. Later, these samples were placed in moist chamber cultures of the type used for the laboratory isolation of myxomycetes. Although the primary focus of the survey was on the fungi of Campbell Island, an opportunity to spend several days (March 20–23) on the Auckland Islands yielded a number of field collections of myxomycetes and a series of samples for moist chamber cultures. The 21 species recorded as a result of this effort were reported, without providing any other information, by Stephenson (2003) in his monograph on the myxomycetes of New Zealand. A second and longer (March 22–31) visit to the Auckland Islands in 2006 allowed additional field surveys and laboratory isolations to be carried out, which increased the number of species known from these islands. The purpose of this paper is first to report the species represented by the specimens collected as a result of these surveys and then to compare the assemblages of species recorded on Campbell Island and the Auckland Islands with that reported from Macquarie Island by Stephenson *et al.* (2007).

Study areas

Campbell Island (52°33'S, 169°09'E) is a small island located about 700 km southeast of the New Zealand mainland. The nearest land masses are the Auckland Islands and Macquarie Island, located 300 km to the northwest and 700 km to the southwest, respectively (Fig. 1). Campbell Island has a total area of 113 km², and the highest point is 569 m. The climate is cloudy, cool, moist and extremely windy (McGlone *et al.* 1997). Meurk *et al.* (1994) recognized 21 plant community types on the island. The most extensive of these are tussock (*Chionochloa* Zotov and *Poa* L.) grasslands, megaherb communities, bogs, and *Dracophyllum* Labill. shrublands/dwarf forests. Among the more common and conspicuous members of the megaherb communities are *Anisotome latifolia* Hook. f., *Bulbinella rossii* (Hook. f.) Cheeseman, three species of *Pleurophyllum* Hook. f. and *Stilbocarpa polaris* (Homb. et Jacq.) Gray. Campbell Island is the southernmost of the New Zealand subantarctic islands with some areas of woody vegetation.

The Auckland Islands (50°40'S, 166°05'E) form the largest of the New Zealand subantarctic island groups. They are located about 465 km south of the New Zealand mainland and approximately 650 km northeast of Macquarie Island, thus falling between Campbell Island

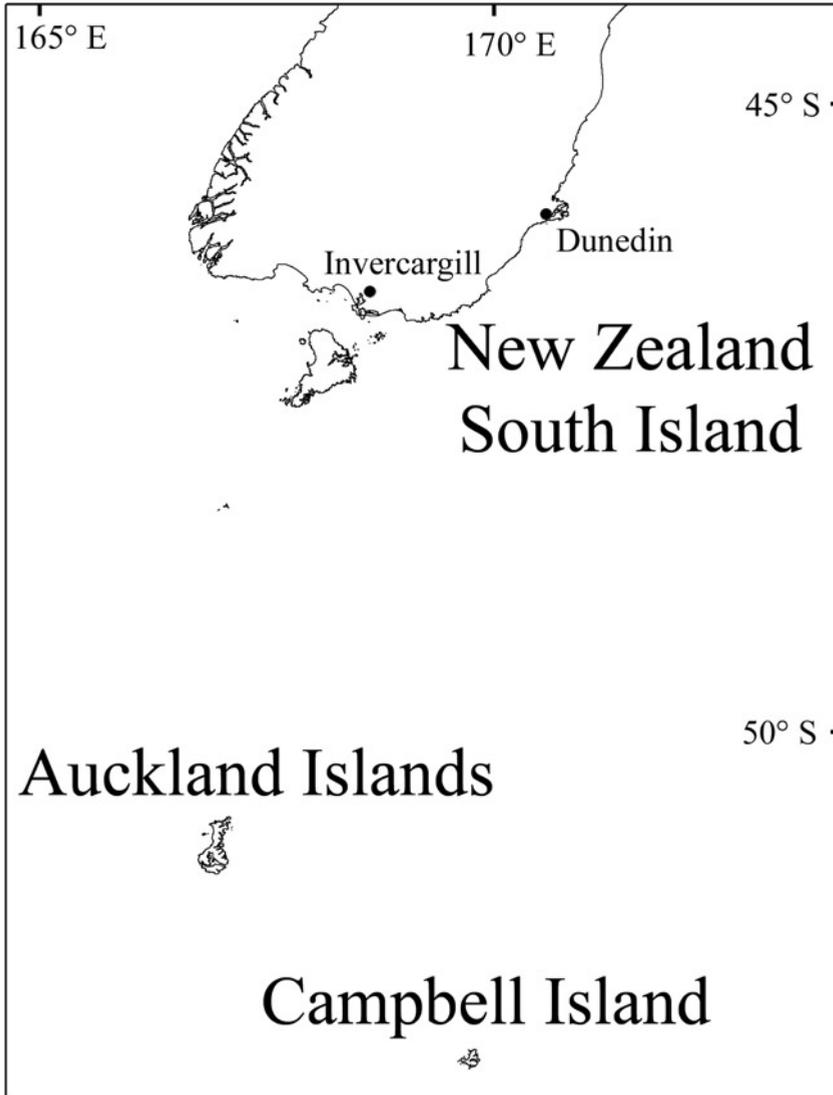


Fig. 1. – The New Zealand subantarctic islands.

and Snares Island. The Auckland Islands cover an area of approximately 612 km²; the two main islands are Auckland Island itself (510 km²) and Adams Island (101 km²). The other islands include Enderby Island and Ewing Island, both located off the northeast tip of Auckland Island. The climate is similar but slightly warmer than that of Campbell Island (De Lisle 1965). This island group has the richest plant diversity of any of the subantarctic islands, and it is the only one with an extensive cover of trees, with a narrow coastal strip of *Metro-*

sideros umbellata Cav. forests. Other major vegetation types include tussock (*Poa*) grasslands, dense subalpine shrublands (with *Dracophyllum*, *Coprosma*, J. R. Forster & G. Forster, *Metrosideros umbrellata*, and *Myrsine* L. the predominant taxa), megaherb fields and scattered outcrops of fellfield in alpine areas (Johnson & Campbell 1975).

Both Campbell Island and the Auckland Islands are situated on the Campbell Plateau (O'Connor 1999), a large continental fragment adjacent to the South Island of New Zealand. The plateau was originally part of west Gondwana, adjacent to Antarctica, before rifting separated the two land masses about 80 million years ago (Yan and Kroenke 1993). Macquarie Island, politically part of Australia and located to the southwest, is an oceanic island and not part of the Plateau.

Materials and methods

The methods used in the field and laboratory components of the surveys that produced the specimens of myxomycetes described herein were essentially the same as those described by Stephenson (1988, 1989) for a study of the myxomycetes associated with upland forest communities in the eastern United States. At each locality visited during the course of each survey, all potential substrata for myxomycete fruiting bodies were examined carefully, and any specimens present collected. Because many myxomycetes are lignicolous (Martin & Alexopoulos 1969), particular emphasis was placed on examining woody substrata. For the purposes of the present study, a 'collection' was defined as one or more fruiting bodies sharing the same substratum and considered to have originated from a single plasmodium (Stephenson 1988). In virtually all cases, this could be determined without difficulty. The method used in making a collection involved removing all or most of the fruiting bodies along with a portion of the substratum upon which they occurred. In the laboratory, collections were air-dried and then glued in small boxes for permanent storage.

In many of the localities visited during the surveys, samples of dead plant material were collected. These samples included dead basal leaves, ground litter, old inflorescences, woody twigs, bark, and aerial portions of dead but still standing herbaceous plants. All samples were placed in small paper bags, air-dried, and transported to the laboratory, where 281 moist chamber cultures (166 with samples from Campbell Island and 115 with samples from the Auckland Islands) were prepared in the manner described by Stephenson & Stempen (1994). The moist chambers used consisted of disposable plastic Petri dishes (10 cm diam.) lined with filter paper. Samples were moistened with distilled water adjusted to pH 7.0 with KOH. After a period of approximately 24 h, the pH of each culture was measured using a flat plate electrode and an Orion model 610 pH meter. After pH had been determined, excess water in each dish was poured off. Cultures were kept at room

temperature (22–25 °C) in diffuse daylight and examined with a stereomicroscope on a regular basis for a period of up to three months in order to detect plasmodia and/or fruiting bodies. When necessary, a small amount of water was added to each culture to maintain moist conditions. After several months, all cultures were allowed to dry out completely, after which they were rewet and examined at less frequent intervals for another 4–6 weeks.

Myxomycete plasmodia and/or fruiting bodies were noted and recorded each time the cultures were checked. When fruiting bodies of a given species developed more than once in the same culture, they were considered to represent a single collection. As a result, some collections consisted of a single fruiting body, whereas others consisted of numerous fruiting bodies. As soon as fruiting bodies were judged to be fully mature (usually at least 1–2 days after they were first noticed), the portion of the substratum upon which they occurred was removed from the moist chamber, air-dried, and then glued in a small box in the same manner used for field collections. Identifications of collections (both field and moist chamber) were made using the descriptions and keys provided by Martin & Alexopoulos (1969) and other monographs. Vouchers of all species reported herein were deposited in the herbaria of the University of Arkansas (UARK) or the Plant Diseases Division (PDD) of Manaaki Whenua Landcare Research in Auckland.

After collections were identified, the frequency distributions of the species represented among (1) the set of field collections from Campbell Island, (2) the set of field collections from the Auckland Islands, (3) the set of moist chamber culture collections from Campbell Island, and (4) the set of moist chamber culture collections from the Auckland Islands were used as input data for the program SPADE (Chao and Shen 2003) to derive Abundance-based Coverage Estimator (ACE) and Chao 1 values that represented estimates of the maximum number of species to be expected from a complete sampling effort in each instance and, by extension, the overall effectivity of each of the surveys actually carried out (Table 1). The data sets for field collections and moist chamber collections reported for Macquarie Island by Stephenson *et al.* (2007) were subjected to the same type of analysis. ACE and Chao 1 values were evaluated as recommended by Chao *et al.* (2006).

In addition, the assemblages of species recorded from Campbell Island and the Auckland Islands along with the assemblage reported from Macquarie Island (Stephenson *et al.* 2007) were compared by calculating coefficient of community (CC) indices (Stephenson 1989). The formula used, which is based solely on the presence or absence of species, is $CC = 2c/a + b$ where a is the total number of species in the first assemblage being considered, b is the total number in the second assemblage, and c is the number of species common to both assemblages. The value of CC ranges from 0 (when no species are present in both assemblages) to 1.0 when all species are present in both assemblages.

Tab. 1. – Summary data on the diversity analyses carried out on the sets of collections from Macquarie Island, Campbell Island and the Auckland Islands. Note: MC = collections from moist chamber cultures and FC = field collections.

Diversity data	Macquarie Island		Campbell Island		Auckland Islands	
	25		31		35	
	MC	FC	MC	FC	MC	FC
Total number of species recorded						
Number of collections	14	395	60	43	39	160
Number of species	5	22	11	22	12	25
Expected number of species (ACE)	11	23	14	61	17	27
Expected number of species (Chao 1)	7	23	13	45	15	26
Completeness of survey (%)	45–71	95	78–84	36–48	70–80	93–96
Expected number of additional species	4	1	2	31	3	1

Results

The present study yielded a total of 302 collections of myxomycetes representing at least 49 species in 24 genera. Two hundred and three collections were represented by specimens that fruited in the field under natural conditions and 99 were harvested from moist chamber cultures. Overall, 104 of the 281 (37 %) moist chamber cultures prepared with samples collected during the present study produced some evidence (either plasmodia or fruiting bodies) of myxomycetes. The set of cultures from the Auckland Islands was slightly more productive (46 of 115 or 40 %) than those from Campbell Island (58 of 166 or 35 %). Approximately 95 % of all collections could be identified to species with a reasonable degree of certainty. However, the remaining 5 % were old and weathered (field collections) or consisted of very limited or apparently aberrant material (collections from moist chamber cultures), thus allowing identification only to genus. Specimens whose determinations are considered as questionable are indicated with the note ‘cf.’ (compare). This usually indicates scanty or aberrant material.

Annotated list of species

The annotated list that follows includes all species of myxomycetes recorded from Campbell Island and/or the Auckland Islands; these are listed in alphabetical order. Nomenclature follows Lado (2005–2010). Except for one collection from David W. Mitchell (DDW), numbers given for the collections listed for each species are those of the author. The New Zealand Fungal Herbarium (PDD) number is provided for collections that have been deposited in this herbarium. To conserve space, information (island from which recorded, specific locality where the collection was made, type of vegetation, substratum upon which fruiting occurred [and, for moist chamber culture collections, the value of pH recorded for the culture], and [for field collections] the date on which it was collected) is provided for no more than

three collections of any particular species. The total number of collections is indicated in parentheses for each species.

***Arcyria cinerea* (Bull.) Pers. (13 collections)**

This species is considered as cosmopolitan (Martin & Alexopoulos 1969) and is common throughout mainland New Zealand. It was first reported from Campbell Island by Stephenson (2003), but there are no previous records from the Auckland Islands. In the present study, *Arcyria cinerea* was one of the few myxomycetes recorded both as a field collection and from moist chamber cultures.

Collections examined: Campbell Island, NW coast of Perseverance Harbour, *Dracophyllum* dwarf forest, appearing in moist chamber culture on *Dracophyllum* twigs (pH 6.4), samples collected March 2000, 13129 [PDD 74963]; Campbell Island, NW coast of Perseverance Harbour, subantarctic herbfield, appearing in moist chamber culture on *Anistotome latifolia* litter (pH 7.8), samples collected March 2000, 13134 [PDD 74964]; Auckland Island, Laurie Harbour of Port Ross, *Metrosideros* dwarf forest, appearing in moist chamber culture on the bark of *Metrosideros umbellata*, sample collected in March 2006, 21398.

***Arcyria incarnata* (Pers. ex J. F. Gmel.) Pers. (7 collections)**

Species of *Arcyria* often form large fruitings in temperate regions of the world (Stephenson, pers. obs.), but specimens collected in the present study tended be relatively small, typically consisting of only a few sporocarps. Some of these were relatively old and thus difficult to identify. This was the case for several collections of *A. incarnata*, which are only provisionally assigned to this species. *Arcyria incarnata* is probably cosmopolitan and there are a number of records from mainland New Zealand (Stephenson 2003).

Collections examined: Campbell Island, NW coast of Perseverance Harbour, *Dracophyllum* dwarf forest, decaying wood, 14 March 2000, 12800; Auckland Island, Erebus Cove of Port Ross, *Metrosideros* forest, decaying wood, 22 March 2000, 12851 [PDD 74977].

***Arcyria leiocarpa* (Cooke) G. W. Martin & Alexop. (2 collections)**

This species was first reported from Campbell Island by Stephenson (2003). It does not appear to be common worldwide (Martin & Alexopoulos 1969), and the two collections from Campbell Island represented just the second and third records of the species from all of New Zealand (Mitchell 1992, Stephenson 2003).

Collections examined: Campbell Island, NW coast of Perseverance Harbour, *Dracophyllum* dwarf forest, appeared in moist chamber culture on *Dracophyllum* twigs, sample collected in March 2000, 12806 [PDD 74940]; Campbell Island, NW coast of Perseverance Harbour, subantarctic herbfield, appeared in moist chamber culture on *Pleurophyllum* sp. litter (pH 6.4), sample collected in March 2000, 13091 [PDD 74960].

***Arcyria major* (G. Lister) Ing (7 collections)**

This apparently uncommon species was reported previously from Campbell Island by Stephenson (2003). Interestingly, this was the first record of *Arcyria major* from anywhere in New Zealand. However, it should be pointed out that *A. major* has not always been recognized as distinct from *A. insignis* (Ing 1967, Martin & Alexopoulos 1969), so its true world distribution is not yet known. Based on the total number of collections obtained during the present study, the species appears to be relatively common in the New Zealand subantarctic.

Collections examined: Campbell Island, NW coast of Perseverance Harbour, *Dracophyllum* dwarf forest, decaying wood, 15 March 2000, 12832 [PDD 77071]; Auckland Island, Chambres Inlet, *Metrosideros* forest, decaying wood, 27 March 2006, 21123; Auckland Island, Erebus Cove of Port Ross, *Metrosideros* forest, decaying wood, 29 March 2006, 21175.

Arcyria pomiformis (Leers) Rostaf. (1 collection)

This species was first reported from the Auckland Islands by Stephenson (2003). Although *Arcyria pomiformis* is known from scattered localities throughout the world (Martin & Alexopoulos 1969), it does not appear to be particularly common. The species is known from several localities in mainland New Zealand (2003).

Collections examined: Auckland Island, Erebus Cove of Port Ross, *Metrosideros* forest, appeared in moist chamber culture on bark of *Metrosideros umbellata* (pH not determined), sample collected March 2000, DWM 6166 [PDD 77042].

***Arcyria* sp. A** (1 collection)

One of the specimens appearing in moist chamber culture on a sample of litter collected on Campbell Island consists of just the basal portion (stalk and calyculus) of two small sporocarps of an *Arcyria*. It could be identified to genus on the basis of the few fragments of capillitium still attached to the calyculus, but a determination to species was not possible. However, the overall color and very deep calyculus indicated that the specimen did not represent one of the other species of *Arcyria* listed above.

Collections examined: Campbell Island, S coast of Perseverance Harbour, appearing in moist chamber culture on *Pleurophyllum* sp. litter (pH 7.1), 13080.

Badhamia nitens Berk. (1 collection)

Badhamia nitens was first reported from Campbell Island by Stephenson (2003). This is a species that appears to be rather rare worldwide (Martin & Alexopoulos 1969), and there are only two other records from mainland New Zealand (Mitchell 1992).

Collections examined: Campbell Island: NW coast of Perseverance Harbour, *Dracophyllum* dwarf forest, bark of twig, 7 March 2000, 12768 [PDD 77063].

Badhamia utricularis (Bull.) Berk. (3 collections)

This species was first reported from the Auckland Islands by Stephenson (2003) and is probably the most common species of *Badhamia* throughout mainland New Zealand. Fruitings of *B. utricularis* are often found in association with the sporocarps of higher fungi, upon which its plasmodium is known to feed. One immature fruiting of *Badhamia utricularis* observed but not collected on the Auckland Islands was more than 30 cm across. This far exceeded the size of any other specimen the author has encountered in the subantarctic (pers. obs.)

Collections examined: Enderby Island, *Metrosideros* forest, dead bark of a decaying trunk of a small tree, 21 March 2000, 12826 [PDD 74943]; Auckland Island, Waterfall Inlet, *Metrosideros* forest, 26 March 2006, 21102; Auckland Island, Erebus Cove at Port Ross, *Metrosideros* forest, 29 March 2006, 21171.

Calomyxa metallica (Berk.) Nieuwl. (2 collections)

Widely distributed in temperate regions of the Northern Hemisphere, this species commonly appears on bark samples placed in moist chamber cultures but is

rarely collected in the field (Stephenson 2003). All previous records from mainland New Zealand have been from moist chambers (Mitchell 1992), but the specimens reported herein are field collections.

Collections examined: Auckland Island: Erebus Cove of Port Ross, *Dracophyllum* forest, decaying wood, 29 March 2006, 21166; same locality, substratum and date, 21177.

***Ceratiomyxa fruticulosa* (O. F. Müll.) T. Macbr. (13 collections)**

Ceratiomyxa fruticulosa was first reported from Campbell Island and the Auckland Islands by Stephenson (2003). During the summer months, after a period of rainy weather, this species is often exceedingly common on coarse woody debris in forests throughout mainland New Zealand. As will be noted later in this paper, *C. fruticulosa* was not recorded from Macquarie Island (Stephenson *et al.* 2007), but this is almost certainly the result of the total absence of naturally occurring coarse woody debris. Although included in virtually all taxonomic treatments of the myxomycetes, this organism is more closely related to another group of slime moulds (the protostelids) than to the myxomycetes (Olive 1975).

Collections examined: Campbell Island, S coast of Perseverance Harbour, *Dracophyllum* dwarf forest, decaying wood, 13 March 2000, 12784 [PDD 74934]; Enderby Island, *Dracophyllum* dwarf forest, decaying wood, 21 March 2000, 12837; Auckland Island, Chambres Inlet, *Metrosideros* forest, decaying wood, 27 March 2006, 21128.

***Clastoderma debaryanum* A. Blytt (4 collections)**

There are no previous records of this species from the subantarctic islands of New Zealand. *Clastoderma debaryanum* is known from scattered localities throughout mainland New Zealand (Stephenson 2003). However, it is probably more common than the relatively few records would indicate, since the very small fruiting bodies are easily overlooked in nature.

Collections examined: Auckland Island, Camp Cove of Carnley Harbour, *Metrosideros* forest, ground litter (pH 4.7), samples collected March 2006, 21400; Ewing Island, *Olearia* forest, appeared in moist chamber culture on bark from *Olearia lyallii* Hook. f. (pH 4.5), samples collected March 2006, 21716.

***Collaria arcyronema* (Rostaf.) Nann.-Bremek. ex Lado (1 collection)**

As will be discussed later in this paper, many of the specimens of myxomycetes collected in the present study were represented by very limited material. This was the case for the collection of *Collaria arcyronema*, which consisted of a single sporocarp. This species was reported as cosmopolitan by Martin & Alexopoulos (1969), but there are only a few records from mainland New Zealand (Stephenson 2003).

Collections examined: Ewing Island, *Olearia* forest, appeared in moist chamber culture on bark from *Olearia lyallii* (pH 4.5), samples collected March 2006, 21716.

***Comatricha nigra* (Pers.) J. Schröt. (2 collections)**

In its typical expression, this cosmopolitan myxomycete (Martin & Alexopoulos 1969) is one of the more morphologically distinct species in the genus *Comatricha*. It is known from a number of localities throughout mainland New Zealand (Stephenson 2003), but the records cited herein are the first from the subantarctic.

Collections examined: Campbell Island, S coast of Perseverance Harbour, *Dracophyllum* dwarf forest, decaying wood, 12 March 2000, 12813; Auckland Island, Laurie Harbour of Port Ross, *Metrosideros* forest, decaying wood, 28 March 2006, 21154.

***Craterium minutum* (Leers) Fr. (2 collections)**

This apparently cosmopolitan species (Martin & Alexopoulos 1969) is the most common *Craterium* found throughout mainland New Zealand (Stephenson 2003). There are no previous records of this species from the subantarctic islands of New Zealand, but it was recorded from Macquarie Island (Stephenson *et al.* 2007).

Collections examined: Auckland Island, Waterfall Inlet, *Metrosideros* forest, decaying wood, 25 March 2006, 21096; Auckland Island, Chambres Inlet, *Metrosideros* forest, decaying wood, 27 March 2006, 21130.

***Cribraria cancellata* (Batsch) Nann.-Bremek. (1 collection)**

Cribraria cancellata, which is listed as *Dictydium cancellatum* (Batsch) T. Macbr. in all but the most recent taxonomic treatments of the myxomycetes, was considered to be cosmopolitan by Martin & Alexopoulos (1969). This species is known from a number of localities throughout mainland New Zealand and was first reported from Campbell Island by Stephenson (2003).

Collections examined: Campbell Island, NW coast of Perseverance Harbour, *Dracophyllum* dwarf forest, decaying wood, 8 March 2000, 12770 [PDD 74930].

***Cribraria macrocarpa* Schrad. (1 collection)**

Most records of this species are from temperate regions of the Northern Hemisphere, where it is usually associated with the decaying wood of conifers (Martin & Alexopoulos 1969). The majority of the few previous records from mainland New Zealand are from Stewart Island and the southern portion of the South Island (Stephenson 2003). The collection cited here in is the first from the subantarctic.

Collections examined: Ewing Island, W side near coast, *Olearia* forest, on decaying wood, 31 March 2006, 21850.

***Cribraria microcarpa* (Schrad.) Pers. (1 collection)**

This species is often common on various types of litter in tropical forests but is also widely distributed in temperate regions of the world (Stephenson 2003). It is known from a number of localities in mainland New Zealand but does not appear to be particularly common (Stephenson 2003). There are no previous records of *Cribraria microcarpa* from the subantarctic islands of New Zealand.

Collections examined: Campbell Island, NW coast of Perseverance Harbour, subantarctic herbfield, appearing in moist chamber culture on *Pleurophyllum* sp. litter (pH 6.5), samples collected March 2000, 13210 [77062].

***Cribraria persoonii* Nann.-Bremek. (3 collections)**

Cribraria persoonii has not always been recognized as distinct from *C. vulgaris* (Nannenga-Bremekamp 1991). As such, the world distribution remains unclear, although available records suggest that *C. persoonii* is restricted to temperate regions of the world. There is only a single previous report of the species from mainland New Zealand (Mitchell 1992), and the collections cited herein are the first from the subantarctic islands.

Collections examined: Campbell Island, NW coast of Perseverance Harbour, *Dracophyllum* forest, decaying wood, 13 March 2000, 12789; Adams Island, along N coast, *Metrosideros* forest, decaying wood, 24 March 2006, 21068.

Cribraria vulgaris Schrad. (2 collections)

Most records of this species are from the Northern Hemisphere (Martin & Alexopoulos 1969), but there are several previous records from mainland New Zealand (Mitchell 1992). The collections from the Auckland Islands are the first known records from the subantarctic islands.

Collections examined: Erebus Cove of Port Ross, *Metrosideros* forest, decaying wood, 29 March 2006, 21172; Auckland Island: Erebus Cove of Port Ross, *Metrosideros* forest, decaying wood, 29 March 2006, 21174.

Diachea leucopodia (Bull.) Rostaf. (1 collection)

Diachea leucopodia, one of the more distinctive species of myxomycetes, was regarded as cosmopolitan by Martin & Alexopoulos (1969). However, Stephenson *et al.* (2000) suggested that it was absent from high-latitude regions of the world. The collection from Auckland Island, which is the first from the entire subantarctic region, indicates that this is not always the case. *Diachea leucopodia* is common throughout mainland New Zealand (Stephenson 2003).

Collections examined: Auckland Island, Erebus Cove of Port Ross, *Metrosideros* forest, appeared in moist chamber culture on aerial litter (pH 5.3), samples collected March 2006, 21916.

Diderma effusum (Schwein.) Morgan (10 collections)

Diderma effusum is one of the more common and widely distributed species associated with dead leaves and other plant debris throughout the world. There are surprisingly few records from mainland New Zealand (Stephenson 2003), and the species was not known previously from the subantarctic islands of New Zealand, where it appears to be not uncommon.

Collections examined: Campbell Island, NW coast of Perseverance Harbour, appearing in moist chamber culture on mixed litter (pH 6.1), 13146 [PDD 77156]; Adams Island, Fairchild's Garden, subantarctic herbfield, appearing in moist chamber culture on mixed litter (pH 6.5), samples collected in March 2006, 21306; Auckland Island, Erebus Cove of Port Ross, *Metrosideros* forest, appeared in moist chamber culture on forest floor litter (pH 6.5), 21301.

***Diderma* sp. A** (1 collection)

One specimen collected from ground litter in a *Dracophyllum* forest on Campbell Island consisted of several hundred sporocarps. The latter were 0.7–0.9 mm in diameter and characterized by an apparently single, pure white peridium, a prominent hemispherical orange-brown columella and spores 10–11 µm in diameter. Although clearly a *Diderma* and unquestionably distinct from any other member of the genus recorded from the New Zealand subantarctic islands, this specimen could not be identified to species.

Collections examined: Campbell Island, S coast of Perseverance Harbour, *Dracophyllum* forest, ground litter, 14 March 2000, 12787.

***Diderma* sp. B** (2 collections)

Two of the specimens collected from the side of a small ravine on Campbell Island were in such poor condition as a result of having been colonized by fungi that they could be assigned only to the genus *Diderma*. However, the features that could be determined, including the relatively large sporocarps (0.8–1.2 mm in diameter), reddish brown peridium and spinulose spores (11–13 µm in diameter), indicated that

they did not represent either of the other species of *Diderma* (*D. effusum* and the other as yet known species mentioned above) recorded during the present study.

Collections examined: Campbell Island, S coast of Perseverance Harbour, subantarctic megaherb community, occurring on bryophytes growing over peat on the bank of a small ravine, 14 March 2000, 12792; same locality, habitat, substratum and date, 12802.

***Didymium anellus* Morgan (1 collection)**

This widely distributed species but rather inconspicuous species was reported from Campbell Island by Stephenson (2003), and there appear to be no other records from anywhere in New Zealand.

Collections examined: Campbell Island: S coast of Perseverance Harbour, subantarctic herbfield, bryophytes, 15 March 2006, 12812 [PDD 77078].

***Didymium squamulosum* (Alb. & Schwein.) Fr. (9 collections)**

Didymium squamulosum is exceedingly common worldwide, where it typically occurs in association with decaying plant debris. It often forms large fruitings on the decaying fronds of nikau palm where the latter occurs in mainland New Zealand and is also known from scattered localities as far south as Steward Island. It was first reported from Campbell Island by Stephenson (2003), but there are no previous records from the Auckland Islands. Stephenson *et al.* (2007) reported the species from Macquarie Island.

Collections examined: Campbell Island, NW coast of Perseverance Harbour, subantarctic herbfield, appeared in moist chamber culture on *Stilbocarpa polaris* litter (pH 6.8), samples collected March 2000, 13095 [PDD 74961]; Campbell Island, NW coast of Perseverance Harbour, subantarctic megaherb community, appeared in moist chamber culture on *Pleurophyllum* sp. leaf litter (pH 6.1), samples collected March 2000, 13132 [PDD 77107]; Adams Island, along N coast, *Dracophyllum* wetland, aerial litter (pH 5.1), samples collected March 2006, 21721.

***Echinostelium minutum* de Bary (10 collections)**

This species, which is almost invariably represented by specimens appearing in moist chamber cultures, was first reported from Campbell Island by Stephenson (2003). There are no previous records from the Auckland Islands, but the species was one of the few myxomycetes recorded from moist chamber cultures prepared with samples of plant debris collected on Macquarie Island (Stephenson *et al.* 2007).

Collections examined: Campbell Island, NW coast of Perseverance Harbour, *Dracophyllum* dwarf forest, appeared in moist chamber culture bark from *Dracophyllum* (6.9), samples collected March 2000, 13057 [PDD 74952]; Campbell Island, NW coast of Perseverance Harbour, *Dracophyllum* dwarf forest, appeared in moist chamber culture bark from *Dracophyllum* twigs (6.3), samples collected March 2000, 13059 [PDD 74953].

***Enerthenema papillatum* (Pers.) Rostaf. (4 collections)**

Although reported as probably cosmopolitan by Martin & Alexopoulos (1969), virtually all records of *Enerthenema papillatum* are from temperate regions of the Northern Hemisphere. The species is known from mainland New Zealand, but these records are from moist chamber cultures (Mitchell 1992). It was first reported from Campbell Island by Stephenson (2003). Interestingly, the Campbell Island material is represented by specimens that had fruited in the field.

Collections examined: Campbell Island: NW coast of Perseverance Harbour, *Dracophyllum* dwarf forest, decaying wood, 6 March 2000, 12766 [PDD 77127]; Campbell Island, NW coast of Perseverance Harbour, *Dracophyllum* dwarf forest, decaying wood, 10 March 2000, 12778 [PDD 77129]; S coast of Perseverance Harbour, *Dracophyllum* dwarf forest, decaying wood, 14 March 2000, 12788 [PDD 77128].

***Fuligo septica* (L.) F. H. Wigg. (5 collections)**

Because it is found worldwide and can produce aethalia that can exceed 20 cm in total extent, *Fuligo septica* is one of the most conspicuous and best known of all myxomycetes. This species is known from numerous localities throughout New Zealand (Stephenson 2003) and was first reported from the Auckland Islands by Stephenson (2003). All five of the specimens collected in the present study are characterized by relatively small aethalia.

Collections examined: Enderby Island, *Dracophyllum* dwarf forest, decaying wood, 21 March 2000, 12824 [PDD 74942]; Auckland Island, Erebus Cove of Port Ross, *Metrosideros* forest, decaying wood, 29 March 2006, 21158; Ewing Island, W side near coast, *Olearia* forest, on bryophytes growing over decaying wood, 31 March 2006, 21179.

***Hemitrichia clavata* (Pers.) Rostaf. (3 collections)**

Hemitrichia clavata is another example from the group of myxomycetes that appear to have a distribution restricted to cool temperate regions of the world. In early monographs, this species was not recognized as distinct from the morphologically very similar *H. calyculata* (Speg.) M.L. Farr, and some of the early reports of *H. clavata* from New Zealand probably refer to *H. calyculata* (Stephenson 2003). *Hemitrichia clavata* has now been reported from a few localities in mainland New Zealand, but the collections cited herein are the first for the subantarctic islands.

Collections examined: Auckland Island, Waterfall Inlet, *Metrosideros* forest, decaying wood, 25 March 2006, 21092; Auckland Island, Laurie Harbour of Port Ross, *Metrosideros* forest, decaying wood, 28 March 2006, 21145; Auckland Island, Erebus Cove of Port Ross, *Metrosideros* forest, decaying wood, 29 March 2006, 21173.

***Lamproderma columbinum* (Pers.) Rostaf. (10 collections)**

Prior to the present study, there were only two records of *Lamproderma columbinum* from all of New Zealand, which suggests that it is not particularly common. Most records are from temperate regions of the Northern Hemisphere, where the species is almost always collected from a substratum with bryophytes present. *Lamproderma columbinum* was first reported from Campbell Island by Stephenson *et al.* (2003), but there are no previous records from the Auckland Islands.

Collections examined: Campbell Island, S coast of Perseverance Harbour, subantarctic megaherb community, occurring on bryophytes growing over peat on the bank of a small ravine, 14 March 2000, 12808 [PDD 77044]; same locality, substratum and date, 12805 [PDD 77132] and 12810 [PDD 77135].

***Lamproderma scintillans* (Berk. & Broome) Morgan (1 collection)**

The majority of species in the genus *Lamproderma* appear to be limited to alpine snowbank habitats, but *L. scintillans* has been reported from localities throughout the world (Martin & Alexopoulos 1969). It is known from two localities in mainland New Zealand, but there are no previous records of this species from the subantarctic islands.

Collections examined: Auckland Island, Laurie Harbour, *Metrosideros* forest, appearing in moist chamber culture on forest floor litter (pH 4.9), 21799.

***Lamproderma* sp. A** (3 collections)

Among the specimens collected from the side of the same ravine mentioned in the context of the *Diderma* (mentioned above) that could not be identified to species were three specimens of what appears to be a *Lamproderma*. Both specimens were so colonized by filamentous fungi that any identification to species was not possible. However, it was clear from the features that could be observed (e.g., the short-stalked to almost sessile sporocarps 1.0–1.2 mm in diameter) that they represented a species of *Lamproderma* other than the two mentioned above.

Collections examined: Campbell Island, S coast of Perseverance Harbour, subantarctic megaherb community, occurring on bryophytes growing over peat on the bank of a small ravine, 14 March 2000, 12772; same locality, habitat, substratum and date, 12793 and 12803.

Metatrichia floriformis (Schwein.) Nann.-Bremek. ex Nann.-Bremek. (16 collections)

Metatrichia floriformis is widespread in temperate regions of the Northern Hemisphere and is also one of the most commonly encountered species in the forests of mainland New Zealand. It was first reported from Campbell Island and the Auckland Islands by Stephenson (2003). Stephenson *et al.* (2007) reported a single collection from Macquarie Island.

Collections examined: Campbell Island, NW coast of Perseverance Harbour, *Dracophyllum* dwarf forest, decaying wood, 15 March 2000, 12801 [PDD 74939]; Adams Island, along N coast, *Metrosideros* forest, decaying wood, 24 March 2006, 21062; Auckland Island, Waterfall Inlet, *Metrosideros* forest, decaying wood, 26 March 2006, 21109.

Perichaena depressa Lib. (13 collections)

This cosmopolitan species was known from only two records from all of New Zealand until Stephenson (2003b) reported it as common on old decaying fronds of nikau palm. *Perichaena depressa* was first reported from Campbell Island by Stephenson (2003). Interestingly, all 12 collections now known from the subantarctic are from Campbell Island; the species was not recorded from Auckland Islands.

Collections examined: Campbell Island, NW coast of Perseverance Harbour, subantarctic herbfield, appearing in moist chamber culture on *Bulbinella* sp. litter (pH 6.7), 13212; Campbell Island, appearing in moist chamber culture on *Stilbocarpa polaris* litter (pH 7.0), 13093; Campbell Island, NW coast of Perseverance Harbour, subantarctic herbfield, appearing in moist chamber culture on *Stilbocarpa polaris* litter (pH 7.0), samples collected March 2000, 13094 [PDD 77158].

Physarum cinereum (Batsch) Pers. (18 collections)

Physarum cinereum is a cosmopolitan species that often forms extensive fruitings on living plants as well as various types of plant debris (Martin & Alexopoulos 1969). These fruitings are often conspicuous, and *P. cinereum* is known from numerous localities throughout mainland New Zealand (Mitchell 1992). It was first reported from Campbell Island by Stephenson (2003), but there are no previous records from the Auckland Islands.

Collections examined: Campbell Island, S coast of Perseverance Harbour, subantarctic herbfield, appeared in moist chamber culture on *Anistotome*

latifolia litter (pH 7.3), samples collected March 2000, 13089 [PDD 77055]; Auckland Island, S coast of Perseverance Harbour, subantarctic herbfield, appeared in moist chamber culture on *Stilbocarpa polaris* litter (pH 7.4), samples collected March 2000, 13097; Auckland Island, Hanfield Inlet, *Metrosideros* forest, forest floor litter, 26 March 2006, 21116.

***Physarum cf. globuliferum* (Bull.) Pers. (1 collection)**

This record is based upon a specimen that is poorly developed, and it is possible that the material represents another species. However, the features that can be observed do seem to suggest *Physarum globuliferum*. The latter was reported as cosmopolitan by Martin & Alexopoulos (1969). There are several records from the South Island of New Zealand but no previous records from the subantarctic.

Collections examined: Auckland Island, along coast of Ross Bay, *Metrosideros* forest, on decaying wood, 21 March 2000; 12829.

***Physarum viride* (Bull.) Pers. (24 collections)**

This cosmopolitan species is the most common representative of the genus *Physarum* in the forests of mainland New Zealand and was first reported from Campbell Island and the Auckland Islands by Stephenson (2003).

Collections examined: Campbell Island, NW coast of Perseverance Harbour, *Dracophyllum* forest, decaying wood, 10 March 2000, 12775 [PDD 74931]; NW coast of Perseverance Harbour, *Dracophyllum* forest, decaying wood, 12 March 2000, 12777 [PDD 74932]; Auckland Island, Chambres Inlet, *Metrosideros* forest, decaying wood, 27 March 2006, 21126.

***Physarum* sp. A (2 collections)**

These two collections are provisionally assigned to the genus *Physarum* on the basis of overall shape and the apparent presence of lime on the peridium of several of the sporocarps. Each sporocarp is small (<0.5 mm tall), stalked (with the stalk representing about two-thirds of the total height), and has a globose sporotheca. All appear to be immature, but they clearly represent a different taxon than anything else on this checklist.

Collections examined: Auckland Island, Laurie Harbour of Port Ross, *Metrosideros* forest, appeared in moist chamber culture on ground litter (pH 5.1), samples collected March 2006, 21742; same locality, substratum (pH 5.2) and date, 21744.

***Stemonitis axifera* (Bull.) T. Macbr. (2 collections)**

Stemonitis axifera is one of the more common and widely distributed members of the genus *Stemonitis* (Martin & Alexopoulos 1969) and is known from numerous localities throughout mainland New Zealand (Mitchell 1992). However, the records cited herein are the first from the subantarctic.

Collections examined: Auckland Island, Western Harbour, *Metrosideros* forest, decaying wood, 25 March 2006, 21095; Auckland Island, Waterfall Inlet, *Metrosideros* forest, decaying wood, 25 March 2006, 21098.

***Stemonitis flavogenita* E. Jahn (2 collections)**

Although known from scattered localities throughout the Northern Hemisphere (Martin & Alexopoulos 1969), there are few records of this species from the Southern Hemisphere. It was first reported from New Zealand by Macbride (1926),

based on a specimen cited from the country but without naming a specific locality. There are no collections in PDD. The species has not been reported previously from the subantarctic.

Collections examined: Auckland Island, Musgrave Inlet, track to Lake Hinemoa, *Metrosideros-Dracophyllum* forest, appeared in moist chamber culture on ground litter (7.3), samples collected March 2006, 21418; Ewing Island, *Olearia* forest, appeared in moist chamber culture on ground litter (pH 4.1), samples collected March 2006, 21735.

***Stemonitis fusca* Roth (17 collections)**

This is a cosmopolitan species known from numerous localities in mainland New Zealand (Martin & Alexopoulos 1969, Stephenson 2003). The concept of *Stemonitis fusca* used herein is that used by Stephenson (2003) in his monograph on the myxomycetes of New Zealand. As such, it encompasses those forms traditionally recognized as *S. nigrescens* in some taxonomic treatments of this group of organisms. *Stemonitis fusca* is common in mainland New Zealand, but there are no previous records from the subantarctic. Most of the specimens obtained in the present study are from moist chamber cultures and would be assigned to *S. nigrescens* if the latter is recognized as a distinct species. Stephenson *et al.* (2007) reported one record of *S. fusca* from a moist chamber culture prepared with plant debris collected on Macquarie Island.

Collections examined: Auckland Island, Erebus Cove of Port Ross, decaying wood, 22 March 2000, 12845; Campbell Island, NW coast of Perseverance Harbour, *Dracophyllum* dwarf forest, appeared in moist chamber culture on *Dracophyllum scoparium* twigs (pH 6.4), samples collected March 2000, 13081 [PDD 77103]; Ewing Island, *Metrosideros* forest, decaying wood, 31 March 2006, 21313.

***Stemonitis cf. smithii* T. Macbr. (1 collection)**

The collection upon which this record is based consists of a single sporocarp, but the total height (2.5 mm) and spore size (5 µm) suggest *Stemonitis smithii*. It should be noted that this species is not always recognized as distinct from *S. axifera*. *Stemonitis smithii* was reported from New Zealand by Martin & Alexopoulos (1969), but they did not name a specific locality. There are no collections of the species in PDD, and the record cited herein is the first for the subantarctic.

Collections examined: Campbell Island, NW coast of Perseverance Harbour, *Dracophyllum* dwarf forest, on decaying wood, 8 March 2000, 12771.

***Stemonitopsis typhina* (F. H. Wigg.) Nann.-Bremek. (6 collections)**

Stemonitopsis typhina was considered as cosmopolitan by Martin & Alexopoulos (1969), and there are records from numerous localities throughout mainland New Zealand (Mitchell 1992). The species was first reported from the Auckland Islands by Stephenson (2003), but it was not recorded from Campbell Island.

Collections examined: Adams Island, along N coast, *Metrosideros* forest, decaying wood, 24 March 2006, 21083; Auckland Island, Waterfall Inlet, *Metrosideros* forest, 25 March 2006, 21091; Auckland Island, Erebus Cove of Port Ross, *Metrosideros* forest, 29 March 2006, 21161.

***Trichia botrytis* (J. F. Gmel.) Pers. (1 collection)**

This species is widely distributed in temperate regions of the Northern Hemisphere (Martin & Alexopoulos 1969) and records exist for a number of localities throughout mainland New Zealand. However, there are no previous records of this

species from the subantarctic islands. Stephenson *et al.* (2007) reported that *Trichia botrytis* was collected twice on Macquarie Island.

Collections examined: Campbell Island, NW coast of Perseverance Harbour, *Dracophyllum* dwarf forest, dead bark, 10 March 2000, 12776.

***Trichia decipiens* (Pers.) T. Macbr. (24 collections)**

Although listed as cosmopolitan by Martin & Alexopoulos (1969), *Trichia decipiens* is predominantly associated with coniferous forests in temperate and boreal regions of the Northern Hemisphere. There are records of this species from a number of localities throughout mainland New Zealand (Mitchell 1992). It was first reported from Campbell Island by Stephenson (2003), but there are no previous records from the Auckland Islands, where it appears to be fairly common.

Collections examined: Campbell Island, S coast of Perseverance Harbour, *Dracophyllum* dwarf forest, decaying wood, 13 March 2000, 12782 [PDD 74933]; Adams Island, along N coast, *Metrosideros* forest, decaying wood, 24 March 2006, 21072; Auckland Island, *Metrosideros-Dracophyllum* forest, decaying wood, 19 March 2006, 12817 [PDED 74941].

***Trichia erecta* Rex (1 collection)**

This species appears to have an unusual distribution. It is relatively common in the subalpine coniferous forests of eastern North America but rarely reported from elsewhere in the world (Martin & Alexopoulos 1969, Ing 1999). There are two collections of *Trichia erecta* in PDD, but the species is not common in mainland New Zealand (Stephenson 2003). There are no previous records of this species from the subantarctic islands.

Collections examined: Campbell Island, NW coast of Perseverance Harbour, *Dracophyllum* dwarf forest, decaying wood, 13 March 2000, 12781 [PDD 77137].

***Trichia favoginea* (Batsch) Pers. (20 collections)**

Trichia favoginea is an extremely common and widely distributed myxomycete, both worldwide and in mainland New Zealand (Martin & Alexopoulos 1969, Stephenson 2003). It should be noted that this species is probably best considered as a species complex (Farr 1958), with the number of taxonomic entities recognized varying among different authors. Martin & Alexopoulos (1969) regarded *T. favoginea* to be a single rather variable species, which is the concept followed herein. *Trichia favoginea* species was first reported from Campbell Island by Stephenson (2003), but there are no previous records from the Auckland Islands, where the species was represented by 17 collections.

Collections examined: Campbell Island, S coast of Perseverance Harbour, *Dracophyllum* dwarf forest, decaying wood, 14 March 2000, 12785 [PDD 74935]; Adams Island, along N coast, *Metrosideros* forest, decaying wood, 24 March 2006, 21067; Auckland Island, *Metrosideros* forest, decaying wood, Laurie Harbour of Port Ross, 28 March 2006, 21135.

***Trichia verrucosa* Berk. (15 collections)**

Trichia verrucosa is another species with an unusual distribution pattern. Widely distributed throughout temperate regions of the world (Martin & Alexopoulos), it appears to be rare in many areas of the Northern Hemisphere but often common at comparable latitudes in the Southern Hemisphere. For example, *T. verrucosa* is often the single most common species one is likely to encounter in *Nothofagus* forests on the South Island of New Zealand. This species was first reported from

Campbell Island by Stephenson (2003), but there are no previous records from the Auckland Islands. Interestingly, *T. verrucosa* does not appear to be particularly common on the subantarctic islands of New Zealand but was the single most abundant species on Macquarie Island (Stephenson *et al.* 2007).

Collections examined: Campbell Island, S coast of Perseverance Harbour, subantarctic herbfield, occurring on bryophytes growing on peat in a small ravine, 13 March 2000, 12797 [PDD 74937]; Adams Island, along N coast, *Metrosideros* forest, decaying wood, 24 March 2006, 21064; Auckland Island, Laurie Harbour of Port Ross, *Metrosideros* forest, decaying wood, 24 March 2006, 21139.

***Willkommlangea reticulata* (Alb. & Schwein.) Kuntze (1 collection)**

Willkommlangea reticulata was reported as cosmopolitan but not particularly common by Martin & Alexopoulos (1969). The species is known from several localities in mainland New Zealand (Stephenson 2003), but there are no previous records from the subantarctic islands.

Collections examined: Campbell Island, S coast of Perseverance Harbour, subantarctic herbfield, developed in moist chamber culture from a plasmodium collected in the field, 5 March 2000, 12774.

Discussion

The survey for myxomycetes carried out on Macquarie Island (Stephenson *et al.* 2007) yielded more species (25) than might have been anticipated, based on the limited number of records reported previously from the entire Subantarctic and Antarctic. The numbers recorded for Campbell Island (31 species) and the Auckland Islands (36 species) in the present study are higher, which might have been expected, since environmental conditions are less severe and the diversity of vascular plants is higher (Table 1). In general, the three assemblages shared few species in common, and only five species (*Didymium squamulosum*, *Echinostelium minutum*, *Metatrichia floriformis*, *Stemonitis fusca* and *Trichia verrucosa*) were recorded in all three instances. Coefficient of community indices calculated for pairwise comparisons of the three assemblages of species were low, ranging from 0.233 to 0.485. Macquarie Island shared just seven species with both Campbell Island and the Auckland Islands, whereas 16 species were present on both Campbell Island and the Auckland Islands (Table 2). Although the assemblage of species present on each island appears to be distinctly different, this is most apparent for Macquarie Island, the southernmost of the islands being considered.

Tab. 2. – Pairwise comparisons of the assemblages of myxomycetes recorded for Macquarie Island, Campbell Island and the Auckland Islands. Data are coefficients of community values (upper right) and number of species shared in common (lower left).

	Macquarie Island	Campbell Island	Auckland Islands
Macquarie Island	***	0.250	0.233
Campbell Island	7	***	0.485
Auckland Islands	7	16	***

Distribution of species in each of the six orders traditionally recognized for the myxomycetes is given in Table 3. Representatives of all six orders were recorded on Campbell Island and the Auckland Islands, but no member of either the Ceratiomyxales or Liceales was present on Macquarie Island. The absence of the Ceratiomyxales is undoubtedly due to the fact that there was no coarse woody debris on the island, and *Ceratiomyxa fruticulosa*, by far the most common species in the genus and the only one likely to be found at high latitudes, is almost completely restricted to this type of substratum. The absence of any member of the Liceales is more problematic and is possibly ecologically significant. The relative proportions of the myxomycete biota contributed by members of the Physarales, Stemonitales and Trichiales were fairly comparable in each instance, although members of the Physarales were more predominant on Macquarie Island, where they made up almost half (48 %) of all species present, than on either Campbell Island or the Auckland Islands.

Tab. 3. – Taxonomic distribution of species (percentages) represented in the assemblages of myxomycetes recorded from Macquarie Island, Campbell Island and the Auckland Islands.

Orders	Macquarie Island	Campbell Island	Auckland Islands
Ceratiomyxales	0.0	3.1	2.8
Echinosteliales	4.0	3.1	2.8
Liceales	0.0	9.4	8.3
Physarales	48.0	31.2	30.6
Stemonitales	20.0	18.8	25.0
Trichiales	28.0	34.4	30.6

The survey on Macquarie Island was unusual because it extended over a period of almost four months. Most biodiversity surveys for myxomycetes are relatively short-term (often no more than a few days or weeks), and this was the case for both Campbell Island and the Auckland Islands. Presumably, the Macquarie Island survey captured most of the island's myxomycete biota, whereas the two other surveys would have been somewhat less complete. Since an appreciable number of the species recorded in the present study from Campbell Island and the Auckland Islands were represented by one or a few collections, often consisting of limited material, there is little question that some of these would have been missed in a less intensive survey. The ACE and Chao 1 values calculated from an analysis of frequency distributions of species in the various data sets (Table 1) suggest that the survey for field collections on Macquarie Island was rather complete (estimated at 95 %), with few additional species likely to have been added as a result of a more intensive collecting effort. Surprisingly, this also seems to have been the case for field collections from the Auckland Islands

(93–96 % complete) but not for Campbell Island (36–48 % complete, with a significant number of additional species likely to be added with a more intensive collecting effort). The most likely explanation for this difference is the fact that the Auckland Islands were visited twice (in 2000 and 2006), while only a single visit was made to Campbell Island (in 2000). The actual number of days during which collecting was carried out was fairly comparable for both Campbell Island and the Auckland Islands. Results obtained from moist chamber cultures were fairly comparable for both of these surveys (78–84 % and 70–80 % complete) but somewhat less so (45–71 %) for Macquarie Island. In this context, it is probably worth noting that the total number of species recorded for the latter would have been higher if plasmodia appearing in moist chamber cultures could have been induced to form fruiting bodies. Plasmodia that never fruited were observed on a number of instances in the set of cultures prepared with samples from Macquarie Island. Although this same situation is typical for cultures prepared for particular sets of samples, it was especially evident for sample material from Macquarie Island.

One of the more surprising discoveries on Campbell Island related to a particular type of microhabitat that appears to be unusually favorable for myxomycetes. Thick layers of peat cover flat and gentle slopes at lower elevations on the island, and in some places small streams have cut through the layers of peat to create small ravines with almost perpendicular walls. One such ravine, located on the south side of Perseverance Harbour below Mount Honey had walls that were covered almost completely with bryophytes, with two liverworts (*Lepidozia laevifolia* (Hook. f. et Taylor) Gottsche, Lindenb. et Nees and an unidentified species of *Chiloscyphus* Corda) and one moss (*Breutelia pendula* [Sm.] Mitt.) the dominant taxa present. The bryophytes represented the substratum for extensive fruiting of several species of myxomycetes, with *Lamproderma columbinum* and *Trichia verrucosa* the most conspicuous. In a number of instances, fruitings of these two species extended over an area of 10 to 20 cm². The apparent association of some species of myxomycetes with bryophytes was discussed by Stephenson & Studlar (1985) and Smith & Stephenson (2007), but the substrata for the bryophytes involved were decaying wood or soil and not peat.

In summary, the results reported herein conform to those reported earlier by Stephenson *et al.* (2007) for Macquarie Island, which indicated that myxomycetes do not represent a conspicuous element of the biota of the isolated islands in the New Zealand subantarctic. However, the total number of species now known from these islands would seem surprisingly high, since low temperatures, a limited range of potential substrata and possibly the relative isolation of each of the islands undoubtedly place severe constraints on their occurrence.

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