Resupinate fungi (Basidiomycetes, Aphyllophorales) of Macquarie Island, Australia

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Fourteen collections of resupinate higher fungi in the order Aphyllophorales (Basidiomycetes) were made on Subantarctic Macquarie Island (54°30'S, 158°57'E) in 1995. Of the 14, three proved to lack species-determining characteristic basidiospores and 12 were determined to belong to three species in two genera; Athelopsis lembospora (Bourdot) Oberwinkler, Athelopsis subinconspicua (Lirschauer) Julich, the first report of this species from the Southern Hemisphere, and Epithele galzinii Bres., the first report of E. galzinii from an Australian territory and also representing a southern range extension by several hundred kilometers. None are endemic and all are suspected to have reached the Island by long-distance transoceanic wind dispersal from other southern continental sources. Their habitats are restricted to old and clustered culms, frond bracts, and leaf petioles of the fern Polystichum vestitum (G. Forst.) C. Presl, the raised pedestals of old giant russock grass stem bases of Poa foliosa (Hook. f.) Hook. f., and the woody, but thin, stems of Acaena magellanica (Lam.) Vahl (Rosaceae) and Coprosma perpusilla Colenso ssp. subantarctica Orchard (Rubiaceae).

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Introduction

Macquarie Island: the setting

Macquarie Island (latitude 54° 30’ S, longitude 158° 57’E) is an isolated subantarctic oceanic island 34 km long and 2.5 to 5.5 km wide, located 1,000 km south-south-east of Tasmania, Australia (Fig. 1). The island is an uplifted fragment of a submarine ridge at the junction of two tectonic plates that rises to form a narrow, elongate subaerial exposure with an undulating plateau 200–250 (-300) meters above sea level. Macquarie Island is unique among subantarctic islands in having tectonic origins from uplifted oceanic crustal strata. It lies close to but north of an oceanic boundary, the Antarctic Convergence. The nearest land exposures are the New Zealand shelf island groups of Auckland and Campbell Islands, lying 640 and 700 km to the north-northeast, respectively. Macquarie Island is characterized by having an oceanic climate that is cool, moist and windy with low mean annual temperatures (annual mean of 4.8°C, with a range of 3.3°C), a mean annual precipitation of 895 mm over 315 days, high relative humidity (89% average) end a mean wind speed of 9.3 m/sec. While wind, cloud cover, precipitation and relative humidity vary little throughout the year, there is a marked annual cycle in day length from about 7 hours in mid-winter to 17 hours in mid-summer (Selkirk et al., 1990). These conditions are, therefore, very comparable to island climates at the same lati-
Fig. 1. Macquarie Island and its location (inset), showing the plateau margin, major lakes, walking tracks, field huts, the highest point of land on the island (Mt. Hamilton, 433 m) and significant localities mentioned in the text.
The surface of Macquarie Island is dotted with numerous lakes, ponds (rams), and streams, and the margin of the island is bounded by steep scarps, generally with angles of 40–45° but as steep as 80° in places, which fall abruptly from the plateau margin to a generally narrow, low-lying coastal raised beach terrace fringe. The west coast is more rugged with its steeper scarps and broader raised bench terraces than the more gently flowing scarps and narrower terraces on the east. Both coastlines are indented with numerous small bays and coves and are fringed by sea stacks and reefs. Raised beaches, remnants of former shorelines exposed at different times during the Island’s uplift from the ocean floor, can be found at altitudes of 90 to in excess of 200m in some parts of the island.

The diverse topography of Macquarie Island is reflected in a wide range of micro-environmental variation, particularly with regard to site moisture gradients and wind exposure. Five major vascular plant community types exist on the island (Taylor, 1955; Selkirk et al., 1990); tall tussock and short grasslands; herbfield, including several different subtypes; mires; bogs; and exposed feldmark communities. Vegetation communities dominated by grassland and herbfield are habitats of introduced rodents (rabbit, black rat, house mouse) and burrow-nesting sea birds.

**Biological Components**

Macquarie Island has never been connected to any continental landmass. All organisms present have reached the island by long-distance transoceanic dispersal by wind, birds and, to a lesser extent, water (Selkirk et al., 1990). The bryophyte flora is represented by around 90 mosses and 50 hepatics, with apparently no endemic taxa. The lichen flora of around 200 taxa includes many doubtfully endemic species described by Dodge (1948, 1968) and Dodge and Rudolph (1955). Taxonomic evaluation of fungal collections made during our field studies in 1995 are continuing but at least 250 taxa, excluding soil fungi, are known. It is unclear what proportion of the fungal flora may be endemic and there are significant numbers of bipoplar taxa in all groups.

**Vascular flora**

Macquarie Island supports forty-six species of vascular plants, 35% of which are grasses and sedges (Taylor 1955; Jenkin 1972, 1975; Jenkin & Ashton 1979; Copson 1984; Selkirk et al. 1990). There are no trees or shrubs present, no ericaceous plants, nor any ectomycorrhizal plants, such as the dwarf birch (Betula spp.) or willow (Salix spp.) found in subarctic regions. All vegetation is considered to be herbaceous, even though mats of older accumulating Acaena and Coprosma stems can be rather coarse, perhaps constituting the only natural “woody” substrates available other than the large bases of old tussock grasses (Poa foliosa). The depauperate nature of the vascular flora simplifies many of the problems of enumeration, vascular plant identification, and interpretation (e.g., elucidating host-fungus associations for mycorrhizal species) that are inherent in other large-scale ecosystem studies.

**Resupinate fungi**

Fourteen specimens of fungi suspected to be resupinate saprophytic fungi on “woody” or wood-like substrates were collected on Macquarie Island during the Austral summer of 1995 (January–March). What makes this interesting is the fact that no “native” island species of plants are truly woody. Of these specimens two were sterile (non-sporulating at the time of collection) and were not identifiable due to tissue sterility. Others formed thin white mycelial fans, webs or crust-like fructifications giving them the appearance of being resupinate fungi. Eight of the 12 specimens were identifiable to three species in two genera; Athelopsis lombospora (Bourdot) Oberwinkler, Athelopsis subinconspicua (Lituchauer) Julich, and Epithele galzinii Bres. There are almost certainly more resupinate species to be found on the island. However, the effective search for such species in these environs necessitates that it be pursued as the primary research focus, not as a secondary effort. It is somewhat surprising that the number of collection made was as high given that there were none of the traditional woody substrates these fungi inhabit.

Microsites that approximate woody habitats are restricted to old and clustered culms of frond bracts and leaf petioles of the fern Polystichum vestitum (G. Forst.) C. Presl, the raised pedestals
of old giant tussock grass stem bases of Poa foli-oxa (Hook.f.) Hook.f., and the woody, but thin, stems of Acaena magellanica (Lam.) Vahl and Coprosma perpusilla Colenso ssp. subantarctica Orchard. Given the restricted habitat for this group of Basidiomycetes, all belonging to the Aphyllophorales, it is not surprising that so few species have so far been found.

Methods

Anatomical characterizations of basidiocarps were made from dried material mounted in 5 percent KOH and Melzer's reagent. Whenever possible, and when not otherwise stated, basidiospores were measured from basidiospore prints or from basidiospores deposited on fructification surfaces or from the hymenium to eliminate measuring immature basidiospores. Color notations are made from Kornerup and Wanscher (1967), Methuen Handbook of Colour, by page, row and number. A & O, Zeiss and Leitz binocular and compound microscopes and drawing attachments were used for making descriptions and drawings. Macrophotographs were prepared in the field using a Pentax MX-SLR with a 1:4 50-mm macro lens. Specimens are deposited in the University of Alaska Mycological Herbarium (ALA).

Fungal descriptions

1. Athelopsis lembospora (Bourdot) Oberwinkler, Persoonia 7; 3. 1972. (Fig. 2).

Fig. 2. Athelopsis lembospora (Bourdot) Oberwinkler. a, subiculum hyphae. b, spores and spore clusters. c, basidia.

Basidiome broadly effused, smooth, ceraceous, pale cream-color, up to 0.2 mm thick, flaking easily off substrate. Margin concolorous, abrupt, undifferentiated.

Subiculum monomitic, of two layers; one only several hyphal layers thick on the substrate surface, hyphae 4–6 µm diam., hyaline, with slight wall thickening and a large clamp connection at each septum, unencrusted; the second up 10 150 µm thick, of loosely interwoven hyphae, 2.5–4 µm diam., thin-walled, hyaline, unencrusted, consistently nodose septate and with distinct clamp connections.

Hymenium of basidia only. Basidia 18–24 µm long, broadly clavate, apex up to 6 µm diam. immediately below the sterigmata, often with irregular swellings below, consistently nodose septate at basal septa, 4-sterigmate; sterigmata up to 6 µm long. Basidiospores elongate to narrowly navicular, frequently clustered in groups of 2–4. 6–8 × 2–3.5 µm, hyaline, thin-walled, smooth, not reacting with Melzer's reagent.


Discussion: Athelopsis lembospora is often associated with well-decayed lignocellulosic materials whether it is wood or another plant part. It is not unexpected to find it on a substrate such as fern fronds and it might well be found on deteriorating grass in dead tussocks on the Island as well. It is distinguished from other Athelopsis species by possessing narrow, often slightly navicular basidiospores that are longer than usually found in Athelopsis species and are often found in clusters of 2–4 when viewed microscopically.

2. Athelopsis subinconspicua (Litschauer) Jülich, Penoonia 8: 292. 1975. (Fig. 3). = Athelopsis hypochnoidea Jülich, Willdenowia 6: 221. 1971.

Basidiome broadly effused, smooth, ceraceous, white to pale cream, up to 0.1 mm thick, with a slightly velutinous surface. Margin concolorous, abrupt, undifferentiated.

Subiculum monomitic, only several hypha-lay-
Fig. 3. Athelopsis subinconspicua (Litschauer) Jülich. a. subiculum hyphae. b, spores. c, basidia.

ers thick on the substrate surface, hyphae 2.5–5 µm diam., smooth, hyaline, thin walled. consistently clamped, unencrusted.

Hymenium of basidia only. Basidia 18–24 µm long, clavipedunculate to nearly uniform, apex up to 5 µm diam. immediately below the sterigmata, irregularly swollen above the narrowed base, consistently nodose septate at basal septa, 4-stigmatic; sterigmata up to 4 µm long.

Basidiospores elongate to narrowly navicular, 6–8 × 3–4.5 µm, hyaline, thin-walled, smooth, not reacting with Melzer’s reagent.

Material examined Macquarie Island, Australia; Rookery Creek and Finch Creek, Sandy B, on Stilbocarpa polaris (Homb. et Jacquinol) A. Gray, 1995.IV.08, GAL 7077, GAL 7078.

Discussion: This is the first report of A. subinconspicua from the Southern Hemisphere. The specimens examined fit the microscopic description well, but lack the green tint described by Julich (1971). With so little available material it is not appropriate to describe this taxon as a new species until additional material is collected.

3. Epithele galzinii Bres. in Bourdot et Galzin, Bull. Sac. Mycol. France 27: 264. 1911. (Fig. 4).

Fig. 4. Epithele galzinii Bres. a, hyphal pegs. b, spores. c, basidia.

Subiculum monomitic, up to 100 µm thick, of loosely interwoven hyphae, 2.5–4 µm diam., thin-walled, hyaline, unencrusted, consistently nodose septate, clamp connections difficult to observe, giving rise to aggregations of hyphae oriented perpendicular to the substrate that protrude up to 60 µm, these aggregations up to 25 µm diam., composed of hyphae 2–3 µm diam., thin walled, smooth, simple septate, slightly yellow under the microscope.

Hymenium of basidia only. Basidia 15–20 µm long, broadly clavate, apex up to 6 µm diam., consistently nodose septate at basal septa, 4-stigmatic; sterigmata up to 6 µm long.

Basidiospores elongate to nearly cylindrical,
7–9 × 2–3 µm, hyaline, thin-walled, smooth, not reacting with Melzer’s reagent.

Material examined: Macquarie Island, Australia; GAL 6353, on Acaena magellanica (Lam.) Vahl stems, upper herb field, East side of Half Moon Bay 1995.ii.14; GAL 6508, on leaves of Polystichum vestitum (G. Forst.) C. Presl., Head of Rookery Creek. 1995.ii.27.

Discussion: Epithele galzinii is widely distributed geographically, having been described from material collected in France. Cunningham (1963) reported it from several locations in New Zealand. This appears to be the first report of E. galzinii from an Australian territory and extends the southern range of this species by several hundred kilometers. The occurrence on fern parts is consistent with its habitat wherever it is found.

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Literature cited


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