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Extensive colonization of volcanic ash by an unusual form of *Peltigera didactyla* at Deception Island, maritime Antarctic

Peltigera didactyla (With.) J. R. Laundon has a cosmopolitan distribution, but in the Antarctic it is very restricted and is nowhere common or abundant, occurring at a number of sites in the northern maritime Antarctic extending to 65°S (Øvstedal & Lewis-Smith, 2001). Within its Antarctic distribution it appears to be most frequent on Signy Island, South Orkney Islands. Typically, this species grows as small colonies amongst mosses in relatively dry, gravelly, sheltered habitats, forming aggregations of lobed sorediate thalli up to *c.* 10–15 (rarely to *c.* 25) cm diameter.

Deception Island (62°57′S, 60°38′W), in the South Shetlands archipelago, is an active volcanic horseshoe-shaped flooded caldera *c.* 15 km in diameter, with numerous geothermal sites, several with steaming fumaroles. Most of these support a unique flora, especially of bryophytes (Lewis-Smith 2005*a*, *b*). The island has had several eruptive phases during the past two centuries, the most recent being in 1967, 1969 and 1970 (Baker *et al.* 1975). The 1969 eruption caused a lahar (mud flow) to bury large swathes of terrain between Pendulum Cove and Whalers Bay, on the inner east side of the caldera, with fine mud and ash up to several metres deep. An ancient shallow crater below the west side of Ronald Hill, to the north of Whalers Bay, that formerly supported a diversity of sparse bryophytes and lichens and the only population of the native Antarctic hairgrass (*Deschampsia antarctica* Desv.), probably avoided the lahar, but was covered to a depth of 10–20 cm by aerial deposition of ash, as well as by 5–10 cm of ash during the 1967 eruption. All of the sparse vegetation in the area was thus destroyed. Several visits by the author to the area between 1981 and 2005 have shown that recolonization of the fine ash, especially by mosses, is proceeding relatively rapidly (Lewis-Smith 1984*a*, *b*, 1988, 2005*a*, *b*). Of particular interest was the discovery in January 2002 of the colonization of part of this crater floor by tiny, lobed greyish thalli of a lichen. These were mostly individual thalli, *c.* 1–5 mm diameter, often 1–3 cm apart at a density often of from 25–50, sometimes more, per 100 cm^2 and only occasionally coalescing with neighbours. Most thalli comprised a single irregularly rounded lobe, grey in colour with a whitish margin where the lower cortex was incurved. These tiny thalli, all virtually identical in size and therefore presumably in approximate age, occurred throughout an area of *c.* 100 × 100 m on a substratum of fine, nutrient-deficient, porous and frequently very dry ash. Many of the thalli were parasitized by prominent pink ascocarps of a fungus (possibly *Pronectria* sp.). The habitat was also colonized by sparse colonies of *Psoroma cinnamomeum* Malme, and very occasional mosses. Comparable thalli were not observed anywhere else on the island.

The lichen has been identified as a diminutive form of *Peltigera didactyla*, although it bears little morphological resemblance to that species. It had not been noticed during several previous visits to the site prior to 2002. All thalli are of similar dimensions, but there appeared to be no increase in their size between observations made in January 2002 and January 2005. There are several possible options regarding the age of the population: (a) the thalli became established up to three decades ago, and are mature but have a very slow growth rate resulting in a depauperate morph of *P. didactyla* which were undetected during previous visits to the site, (b) the thalli colonized quite recently and are a mature but depauperate morph with a fairly rapid

growth rate, or (c) the thalli colonized recently but are immature with a relatively rapid growth rate; in time they may develop into larger more typical thalli. Option (b) is favoured by the author. Typical *P. didactyla* does occur very rarely on Deception Island, and several thalli were recorded in 1964 and 1987 on moss-covered rock ledges on Ronald Hill, about 300–400 m from the present site. Some also bore a parasitic ascomycete. Fertile *P. didactyla* is unknown in the Antarctic, so its relatively rapid and abundant spread to an area several hundred metres from an extant, if very small population of only several mature thalli, is most likely to have been by dispersal of soredia. However, why such an apparently massive soredial influx, probably at the same time, should have occurred is unknown.

The climate of Deception Island is conducive to cryptogam growth (mean monthly summer air temperatures of *c.* 1–3 °C, high precipitation and humidity, and low solar irradiance due to almost perpetual cloud cover). The remarkable flora of the geothermal areas has been reported by Lewis-Smith (2005*a*, *b*). However, no raised soil temperatures down to 15 cm were detected in 2002 and 2005 at the site of the *P. didactyla* population, but it is only a few hundred metres away from Kroner Lake, a lagoon with hot springs. This area is linked to the Ronald Hill crater floor by a very shallow valley, and it is suspected that both may occasionally be affected by geothermal activity. Several such areas within the vicinity of Whalers Bay have soil temperatures fluctuating between 20 and 50 °C. Thus, it is possible that there was a phase of geothermal activity at the time of colonization of the crater floor by *P. didactyla* which may have benefited development of the soredia.

The shallow valley contains small populations of several mosses absent or very rare elsewhere on the island, and even within the Antarctic as a whole (Lewis-Smith 2005*a*, *b*), and the site has been recognized as one of several on the island with unique (as regards the Antarctic biome) bryophyte and lichen communities. The Ronald Hill crater-Kroner Lake site will be designated by the Antarctic Treaty Consultative Meeting (Stockholm, 2005) as an Antarctic Specially Protected Area within a newly designated Antarctic Specially Managed Area for Deception Island. Each will have a management plan, and the ASPA will be afforded protection by restricting access into and activities within the site. Entry will be by permit issued by the government or national agency of the person(s) proposing to visit the site (Lewis-Smith 2005*a*).

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