

First record of *Favolaschia calocera* in Western Australia

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Abstract

Favolaschia calocera is a saprotrophic fungus that occurs naturally in Madagascar and parts of southern Asia. It was first reported as an exotic New Zealand in the 1950s, and is now common throughout the North Island and the north western regions of the South Island. Genetic studies also revealed that it may have also been introduced to Kenya, Norfolk Island and Réunion Island. In 2002 it was also reported from Italy and in 2005 it was recorded for the first time in south eastern Australia. *Favolaschia calocera* was subsequently added to the list of Fungimap target species in 2006 and has since been reported from Queensland where it is now reported to be relatively common in Lamington National Park and the Springbrook Plateau. This is the first detailed description of Australian material and the first recorded incidence of *F. calocera* in Western Australia.

Key words: *Favolaschia calocera*, exotic fungi, Western Australia.

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Introduction

Favolaschia calocera, a saprotrophic fungus, was first described from Madagascar (Heim 1945). Johnston *et al.* (2006) suggested it was paleotropical, being native in Madagascar, southern China and Thailand. *Favolaschia calocera* appears to have been inadvertently introduced into New Zealand in the 1950s (Johnston 2009). More recently the fungus has been reported from Norfolk Island, Réunion Island, Kenya (Johnston *et al.* 1998, 2006), Italy (Vizzini & Zotti 2002) and eastern Australia including south east Queensland (McMullan-Fisher 2010) and Victoria (ALA 2013). In New Zealand, Italy and eastern Australia it appears to have spread rapidly. Its occurrence in Italy has been linked to wood imports from New Zealand into the Liguria region, on the north-west Mediterranean coast (Vizzini *et al.* 2009).

The weedy nature of *F. calocera* has been attributed to it being homothallic, producing fertile sporocarps from a single basidiospore (Johnston *et al.* 2006). In New Zealand it has been recorded on over 50 host species, including exotic and native species. Whether it may displace native fungi is uncertain as in both New Zealand and Italy it appears to be more abundant in remnant or disturbed habitats (Johnston *et al.* 2006, Vizzini *et al.* 2009).

The first record of *F. calocera* in mainland Australia was in 2004 in Victoria. Following further records in Victoria, northern New South Wales and south eastern Queensland in 2005–06, *F. calocera* was included as a target species in the Fungimap fungi mapping project in 2006 (Anon 2006). The majority of subsequent records from Victoria are linked to the greater Melbourne metropolitan area and in south eastern Queensland, where it appears to be common in both Lamington National Park and the Springbrook Plateau (McMullan-

Fisher 2010, ALA 2013). At present there are 73 records of *F. calocera* from Australia, including 40 from Victoria, 28 from Queensland, one each from north eastern New South Wales and Norfolk Island and no location for three records (ALA 2013). In May 2010, *F. calocera* was found in Western Australia colonizing dead waterbush (*Bossiaea aquifolium* subsp. *laidlawiana*) wood in mature jarrah (*Eucalyptus marginata*) forest in Easter National Park, about 25 km west of Manjimup. A second collection was made in 2012 from mature karri (*E. diversicolor*) forest in Beedelup National Park, about 38 km southwest of Manjimup. In 2013, a third collection was recorded fruiting on dead marri wood in state-managed jarrah forest 30 km west of Manjimup (see ALA 2013).

Materials and methods

Three collections of *Favolaschia calocera* were examined and presently are the only known records of *F. calocera* from Western Australia. Sporophores were photographed *in situ*, and macro-morphological descriptions of fresh specimens were compiled. Specimens were then air dried at 33–35° C and micro-morphological details were compiled from the dried collections using bright field microscopy. Morphological details were then compared with the original description by Heim (1945) and those published for New Zealand (Johnston *et al.* 2006) and Italian (Vizzini and Zotti 2002) collections. All collections have been lodged at the Western Australian Herbarium (PERTH).

Results

Macroscopic and microscopic details of the Western Australian collections of *F. calocera* agree with those described by Heim (1945) as well as those from New Zealand (Johnston *et al.* 2006) and Italy (Vizzini and Zotti 2002) (Table 1).

Table 1. Comparison of morphological features in *F. calocera* collections from Western Australia, New Zealand and Italy.

Characters	Western Australian collections	New Zealand collections (Johnston <i>et al.</i> 2006)	Italian collections (Vizzini & Zotti 2002)
Pileus (diam.)	3–10 mm	5–20 mm	3.5–15 mm
Pores (diam.)	0.5–1 mm	0.3–2.5 mm	1–2 mm
Spores	Broadly ovoid, 11–12 x 7–8 μ m	Broadly ellipsoid to ovoid, 9–12.5 x 6.5–8.5 μ m	Widely oval to subcylindrical, 10–13 x 5–8.5 μ m
Basidia	2-spored, 38–40 x 7–10 μ m	2-spored, 28–35 x 6–10 μ m	2-spored, 55–65 x 9–12 μ m
Gloeocystidia	38–53 x 7–12 μ m	8.5–12.5 μ m diam.	10–22 x 25–70 μ m
Anthocytetes	43–70 x 7–11 μ m	35–52 x 8.5 μ m	25–70 x 8–16 μ m
Clamp connections	No	No	Not observed

Description for Western Australian Collections

Pileus 3–10 mm diameter, flabelliform, broadly convex to plane, margin \pm crenate, surface in a domed reticulate pattern matching the pores beneath, orange to pale orange when fresh, flesh very thin. Dry basidiocarps are brownish orange with a pruinose to downy surface. Hymenophore orange to light orange, poroid, pores polygonal to elliptical, 1–2 pores per mm, smaller with shallower tubes near the margin, pore opening and inner tube surface finely fimbriate. Stipe laterally attached, rudimentary to 5 mm long, < 1mm broad, orange, surface glabrous when fresh, pruinose when dry (Figs 1 and 2). Basidia 38–40 x 7–10 μ m, clavate, 2-spored (occasionally 3-spored). Spores (only a few observed) 11–12 x 7–8 μ m, broadly ovoid, hylar appendix obtuse, walls smooth, hyaline. Gloeocystidia 38–53 x 7–12 μ m, irregularly clavate with oily contents. Acanthocysts 43–70 x 7–11 μ m, cylindrical to irregularly cylindrical, base tapering, walls thin, hyaline with a dense to sparse covering of tuberculate or elongated diverticula (Fig. 3). Clamp connections, none observed. Spore print white.

Substrate and Habitat

Basidiocarps gregarious on dead marri (*Corymbia calophylla*) wood and waterbush (*Bossiaea aquifolium* subsp. *laidlawiana*) twigs. In tall open forest of marri-jarrah on uplands in perhumid and humid zones or tall open forest of karri-marri on slopes in hyperhumid and

perhumid zones. Both forest types include *B. aquifolium* subsp. *laidlawiana* as a major understorey species.

Collection Details:

Dickson Rd, Easter National Park, WA, on dead *B. aquifolium* var. *laidlawiana* wood, 31 May 2010, R.M. Robinson, RR1146WA, PERTH 08164681; Beedalup Falls, Beedelup National Park, WA, on dead *B. aquifolium* subsp. *laidlawiana* wood, 27 May 2012, S. Kenny and G. Hetherington, RR1218WA, PERTH 08164673; along unnamed logging road off Graphite Rd, Andrew Forest Block, WA, on dead *C. calophylla* wood, 16 April 2013, R.M. Robinson, RR1223WA, PERTH 08164711.

Discussion

Favolaschia calocera is a conspicuous fungus, regularly recorded in eastern Australia in recent years. Although it is a Fungimap target species and Western Australia has an active community-based fungal studies group these are the first records of *F. calocera* in Western Australia and the first detailed description of collections in Australia. Despite occurring in native forest, and fruiting on endemic shrub and tree species it must be considered an exotic, as is the case in eastern Australia. Two collections are from national parks and one from state forest managed for timber harvesting. The location



Fig. 1 Sporophores of *Favolaschia calocera* from Easter National Park, Western Australia.

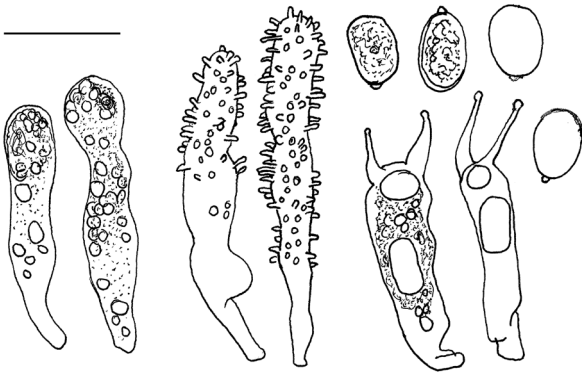


Fig. 2. From left: Gloeocystidia, acanthocytes, spores and basidia of *Favolaschia calocera* from Easter National Park, Western Australia (bar = 20 µm).

in Easter National Park, which is in mature jarrah forest, is particularly isolated, but Beedelup Falls, in mature karri forest, is a popular bushwalking and sight-seeing location for both locals and tourists—especially in the autumn/winter season. Although only collected once from Beedelup Falls, it has been photographed and sighted on several occasions in the past three years (2011–13) along a 1 km section of the walking trail (G. Hetherington and S. Kenny, pers. comm.). To date it has only been observed fruiting on dead *C. calophylla* and *B. aquifolium* subsp. *laidlawiana* wood.

The potential for *F. calocera* to become weedy in Western Australia is uncertain. In south eastern Queensland it appeared to be more common along walking tracks (McMullan-Fisher 2010) but since then it has been observed away from roads and tracks (McMullan-Fisher pers. comm. 2013). Records in Victoria also appear to be associated with locations subject to high visitation. The species of host wood colonized by *F. calocera* in Australia have generally been poorly documented. In New Zealand it has been recorded on over 50 host species, native and exotic, and is established throughout the North Island and the north eastern region of the South Island (Johnston *et al.* 2006). Samples from Kenya, Réunion Island, Norfolk Island, New Zealand and Italy had similar genotypes (Vizzini *et al.* 2009), and introduction to Norfolk Island and Italy is presumed to be via the importation of wood products from New Zealand (Johnston *et al.* 1998, Vizzini *et al.* 2009). In contrast, in its native Madagascar *F. calocera* appears to be rarely collected but highly localized (Vizzini *et al.* 2009). Whether *F. calocera* has the potential to replace native species where it has invaded remains to be seen.

Although it appears to be an aggressive primary colonizer of a wide range of host wood species, including pteridophytes, conifers, mono- and dicotyledons, in both Italy and New Zealand, laboratory tests revealed that it was a weak competitor. Despite being able to produce anti-fungal compounds, *F. calocera* was easily displaced from colonized substrates by more competitive native and other wood decay species *in*

vitro (Johnston *et al.* 1998, 2006). It's been suggested that perhaps *F. calocera* is simply filling a niche left by the absence of native fungi as a result of habitat modification (Johnston *et al.* 1998, Vizzini *et al.* 2009). Further collecting and molecular characterization of samples is needed in order to determine the possible source of its introduction into Western Australia and the ecological implications of its presence.

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