

## DERMOCYBE GLOBULIFORMIS: FIRST REPORT OF A HYPOGEOUS SPECIES FOR THE GENUS

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### Abstract

*Cortinarius globuliformis* is recombined as *Dermocybe globuliformis*. This widespread, southern Australian fungus produces button-like, bright yellow basidiomes embedded in conspicuous, mat-like masses of bright yellow mycelium underneath the leaf litter. It is the first hypogeous fungus to be assigned to any subgenus or segregate genus of *Cortinarius*.

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### Introduction

Hypogeous sequestrate fungi are a polyphyletic group of truffle-like macrofungi, with particularly high diversity in Australasia (Bougher & Lebel 2001). Recognition that many hypogeous fungi are closely related to particular epigeous fungi is increasing, e.g. Russulales—*Macowanites* and *Russula*, Amanitaceae—*Torrendia* and *Amanita*, Tricholomataceae—*Hydnangium* and *Laccaria*, Boletaceae—*Gastrotylopilus* and *Tylopilus*. Such inferences on relationships between sequestrate and epigeous fungi have been largely based on morphological similarities (Thiers 1984). More recently molecular data, such as rDNA sequences, have provided supporting evidence (e.g. Peintner *et al.* 2001).

In the Cortinariaceae numerous hypogeous fungi have been aligned with epigeous taxa, e.g. *Descomyces* and *Setchelliogaster* with *Descolea*. Hypogeous fungi presumed to be related to *Cortinarius* include taxa with stipitate basidiomes such as *Thaxterogaster*, and astipitate basidiomes such as *Protoglossum*. In addition several sequestrate species of *Cortinarius* have subemergent, squat basidiomes and a persistent veil but otherwise resemble epigeous *Cortinarius* (Bougher & Malajczuk 1986, Fogel 1994, Thiers & Smith 1969, Watling 1980).

*Cortinarius* is a highly diverse, polyphyletic genus (Høiland & Holst-Jensen 2000, Liu *et al.* 1997), and this is reflected by the large diversity of sequestrate fungi resembling various infrageneric and segregate taxa of *Cortinarius sensu lato*. For example, species of *Thaxterogaster* and *Protoglossum* with a thick viscid peridium and bright purple colours may relate to *Cortinarius* subgenus *Myxacium*.

It is arguable as to whether *Dermocybe* forms a genus distinct from *Cortinarius*. Anthraquinone pigments are common in *Dermocybe* but also occur in some *Cortinarius* species (Gill 1995). Studies based on molecular sequences give conflicting views. Analysis of rDNA ITS sequences by Chambers *et al.* (1999) produced a *Dermocybe* clade within a *Cortinarius* clade. However, we accept *Dermocybe* at generic rank based on its monophyly supported in at least some phylogenetic studies, e.g. Liu *et al.* (1997) used rDNA 5.8S and ITS sequences to determine that three sections of *Dermocybe* form a monophyletic line well separated from *Cortinarius*. Parsimony analyses of ITS rDNA sequences by Høiland & Holst-Jensen (2000) also supported *Dermocybe* as a monophyletic clade, but despite this data these authors advocated retaining *Dermocybe* as a subgenus of *Cortinarius* in order to support two monophyletic main groups—*Cortinarius* and *Telamonia*. To date no hypogeous fungi have been aligned with *Dermocybe*. This paper presents the first designation of a hypogeous *Dermocybe* species.

### *Cortinarius globuliformis*

*Cortinarius globuliformis* produces button-like, bright yellow basidiomes embedded in conspicuous, mat-like masses of bright yellow mycelium underneath the leaf litter (Bougher & Malajczuk 1986, Bougher & Syme 1998). It often occurs with its pileus appressed against the soil surface but may be embedded as deeply as 3 cm. The stipe is much reduced and rarely extends more than 1 cm below the pileus. The pileus is dry, with radially appressed silky-fibrils, initially bright yellow, eventually dulling to yellowish bronze or when long exposed to the air. The stipe, young lamellae, and veil are also yellow. The yellow pigment rapidly changes to dark red in alkali, e.g. 15% KOH on fresh or air-dried basidiomes, and pileipellis tissue mounted in 3% KOH. As with

other hypogeous species of *Cortinarius*, the gills of *C. globuliformis* produce a spore print. The gills disintegrate with age, and the inner veil usually remains mainly unbroken until old age.

*Cortinarius globuliformis* occurs widely throughout southern Australia, including Tasmania. In one study in the south-eastern forests of Australia, the probability of occurrence of basidiomes of *C. globuliformis* increased in areas with a relatively low annual mean moisture index (Claridge *et al.* 2000). Also in the same study, basidiomes increased with decreasing mean minimum temperature of the coldest month and decreased with time since last fire. The ectomycorrhizae formed by *C. globuliformis* with eucalypts are characterized by unswollen, unbranched roots with a loose hyphal mantle, unexpanded epidermal cells and shallow Hartig nets (Bougher & Malajczuk 1986, Malajczuk *et al.* 1987).

By virtue of its bright pigmentation (basidiomes and mycelium) and supportive evidence from rDNA sequence data, which also indicates affinity of this species with *Dermocybe* (Peintner *et al.* 2001), we hereby transfer *C. globuliformis* into the genus *Dermocybe*.

***Dermocybe globuliformis* (Bougher) Bougher & Trappe, *comb. nov.***

Basionym: *Cortinarius globuliformis* Bougher, in Bougher & Malajczuk *Transactions of the British Mycological Society* 86: 301 (1986).

### Discussion

*Dermocybe globuliformis* is the first hypogeous fungus to be assigned to a subgenus or segregate genus of *Cortinarius*. About 10 hypogeous species of *Cortinarius* have been described throughout the world, and several others remain to be described from Australia. Apart from *D. globuliformis*, none of the published or currently known hypogeous cortinariii has pigmentation or other characteristics typical of *Dermocybe*. Extensive collecting programs in Australasia have not revealed any other hypogeous fungi attributable to *Dermocybe*. *Cortinarius* and *Dermocybe* are extremely diverse in Australia and New Zealand (*e.g.* Horak 1987). Sequestrate Cortinariaceae are also diverse in these regions (Beaton *et al.* 1985, Bougher & Lebel 2001). Other sequestrate fungi related to *Dermocybe* probably occur in these regions and will be discovered during continuing collection programs and from re-examination of material currently lodged in herbaria.

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