

**AUSTRALASIAN SEQUESTRATE (TRUFFLE-LIKE) FUNGI.
XI. GUMMIVENA POTOROOI GEN. & SP. NOV. (BASIDIOMYCOTA, MESOPHELLIACEAE), WITH
A KEY TO THE 'GUMMY' GENERA AND SPECIES OF THE MESOPHELLIACEAE**

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Abstract

Gummivena potorooi is described as a new genus and species from Western Australia. It is intermediate between *Castoreum* and *Gummiglobus*, with a gleba permeated by compact veins of gummy tissue that separate fertile locules and a peridium with three, well-defined layers. *Castoreum* has a powdery gleba with only scattered hyphae at maturity and a peridium with three, poorly differentiated layers, whereas *Gummiglobus* has a robust columella and a peridium with two, poorly differentiated layers. *Gummivena potorooi* is known only from the range of the rare and endangered Gilbert's potoroo (*Potorous gilbertii*). This fungus and a wide diversity of others form a substantial part of the animal's diet.

J.M. Trappe & N.L. Bougher (2002). Australasian sequestrate (truffle-like) fungi. XI. *Gummivena potorooi* gen. & sp. nov. (Basidiomycota, Mesophelliaceae), with a key to the 'gummy' genera and species of the Mesophelliaceae. *Australasian Mycologist* 21 (1): 9–11.

Introduction

While examining unidentified sequestrate fungi in the CSIRO Forestry and Forest Products Mycological Herbarium at Wembley, Perth, we encountered collections with gummy, peridial tissues similar to those of the genera *Castoreum* and *Gummiglobus* but differing from those two genera by having a gleba with veins of gummy tissue and with three, strongly differentiated peridial layers. We describe this taxon as a new genus and species.

Materials and Methods

Colour and size of specimens are recorded from dried material, although the colours are essentially the same as recorded when the specimens were fresh. In our experience, drying specimens of the Mesophelliaceae does not noticeably change colour or size from the fresh state. Colours are designated according to Kornerup & Wanscher (1978). For microscopy, hand sections were mounted in 3% KOH and Melzer's reagent.

Results

Gummivena potorooi Trappe & Bougher, gen. et sp. nov. (Figures 1, 2)

Etymology: Latin *gummi* (gum) and *vena* (vein), in reference to the gummy veins in the gleba, and 'of the potoroo', in reference to occurrence of *Gummivena potorooi* in the habitat of the rare and endangered Gilbert's potoroo (*Potorous gilbertii*) and the presence of the fungus in dung of this animal.

Basidiomata hypogaea, subglobosa vel globosa, brunea, glabra, basi caespite hypharum gummosarum et filorum, interdum rhizomorpha prominenti. Peridium 1–1.6 mm crassum, stratis tribus: stratum externum angustum, brunneum, arcte intertextum, hyphis ferrugineis; stratum medium crassum, album, hyphis hyalinis, gummosis, radicellis et mycorrhizis inclusis; stratum internum angustum, fuscum, arcte intertextum, hyphis ferrugineis. Gleba loculis brunneolis, sporis repletis, inter venas latas gummosas aggregatis. Basidiosporae maturatae pulveraeae, pallide luteae, angustae ellipsoideae vel subfusiformes, lineis et punctis minutis ornatae. Fibulae non detectae. Holotypus hic designatus: Western Australia, Two Peoples Bay Nature Reserve, 16.vi.1995, leg. A. Danks (PERTH).

Basidiomata hypogeous, subglobose to globose, 7–15 × 7–16 mm, the surface brown (6E7) and glabrous with scattered patches of adhering soil, the base with a prominent, emergent tuft of gummy, white hyphae, mycelial strands and soil, sometimes with a conspicuous, brown, basal rhizomorph. *Peridium* 1–1.6 mm thick, 3-layered: outer layer <0.1 mm thick, brown (6E7); middle layer 1–1.5 mm thick, white, of gummy interwoven hyphae, incorporating rootlets and mycorrhizae; inner layer <0.1 mm thick, brownish black, the tissue compact. *Gleba* with light brown (7D6), spore-filled locules aggregated among broad, compact, subtranslucent, brown (7E7) veins of tissue 0.2–0.5 mm thick, consisting of tightly adpressed, gummy hyphae that tend to stretch and separate where the veins are cut; locules 0.3–0.6 × 0.2 mm, rounded to elongate, the spore mass becoming powdery at maturity. *Odour* and *taste* not recorded.

Peridium with an outer layer of tightly interwoven, light orange-brown hyphae 2–4 µm broad; middle layer of loosely interwoven, sinuous, branched, hyaline, strongly gelatinised, infrequently septate hyphae 1–3 (–4) µm broad; inner layer of tightly interwoven, thick-walled, orange-brown hyphae 2–4 µm broad. *Glebal veins* of parallel, tightly adpressed, hyaline, gelatinized hyphae 1–4 µm broad that stretch when pulled. *Basidia* and *subhymenium* collapsing and by maturity disintegrating. *Trama* of hyaline, thin- to thick-walled hyphae 1–4 µm in diameter, with occasional cells inflated up to 6 µm, collapsing by maturity. *Clamp connections* not detected.

Basidiospores 10–12 × (4–) 5–5.5 µm, narrowly ellipsoidal to subfusiform, the length-width ratios 2–2.4 (–2.7), smooth in youth, at maturity ornamented with minute (<0.5 µm tall or broad) lines and dots or an occasional swelling up to 0.5 µm tall and 2 µm broad, the sterigmal attachment 1.5 (–2) µm broad, prominent or inconspicuous; in 3% KOH spores pale yellow singly, light greyish brown in mass, in Melzer's reagent light yellow singly, light orange-brown in mass, occasional spores faintly dextrinoid.

Distribution, Hosts and Season: Western Australia, in coastal shrub and woodland communities, probably mycorrhizal with *Gastrolobium*, *Eucalyptus* and *Corymbia*; March–July.

Collections Examined: Western Australia. HOLOTYPE: Two Peoples Bay Nature Reserve, in *Gastrolobium bilobum* thicket, 16.vi.1995, A. Danks (PERTH; isotype H0894 in herb. CSIRO Forestry and Forest Products Mycological Herbarium, Perth, W.A.). PARATYPES: Two Peoples Bay Nature Reserve, Firebreak Gully, vegetation not recorded, 23.iii.1998, K. Syme & G. Evans KS 939/98 (MEL). Two Peoples Bay Nature Reserve, under *Eucalyptus megacarpa*, *Corymbia calophylla*, 30.vi.1998, K. Syme KS 1004/98 (MEL). Two Peoples Bay Nature Reserve, Firebreak Gully, under *Eucalyptus megacarpa*, *Corymbia calophylla*, 30.vii.1998, K. Syme, G. Evans & A. Carroll KS 1014/98 (MEL).

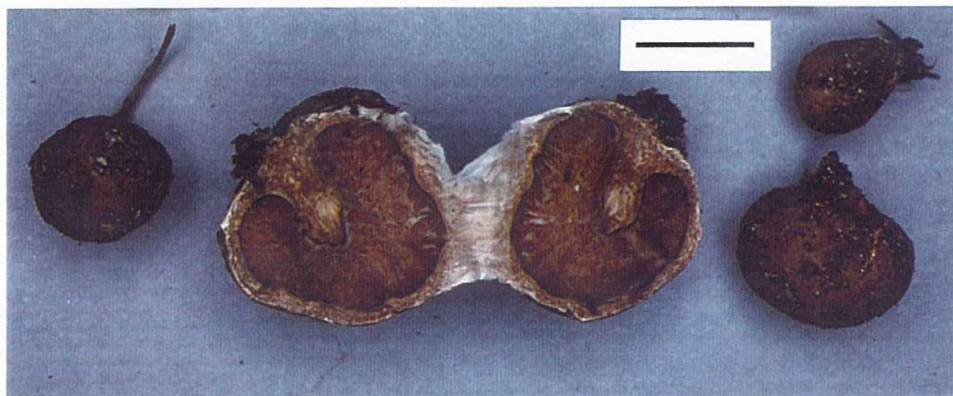


Figure 1. Basidiomes of *Gummivena potorooui* (Holotype). The cross-sectioned specimen in the centre has an invagination of hyphae and soil, but this is separated from the gleba by the peridium and is not a columella. Note the conspicuous, brown rhizomorph attached to the basidiome at far left. Scale bar = 1 cm.

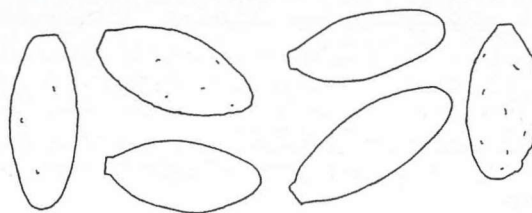


Figure 2. Basidiospores of *Gummivena potorooui* (Holotype); surface views with minute ornamentation. 2000×.

Remarks: *Gummivena* is intermediate in its combination of characters between *Castoreum* and *Gummiglobus*. All three genera have when immature hymenium-lined locules that disintegrate to leave a powdery spore mass at maturity and the curious, gelatinous-walled hyphae that stretch when pulled (Trappe unpublished data, Trappe *et al.* 1996). *Castoreum* has three peridial layers consisting of similar hyphae but differentiated in that the outermost is tightly interwoven, the middle is looser and incorporates rootlets and mycorrhizae, and the inner is again tightly interwoven (Beaton & Weste 1984). *Gummiglobus* lacks the outer, tightly interwoven layer but otherwise resembles *Castoreum* (Trappe *et al.* 1996). The three peridial layers of *Gummivena*, in contrast, are differentiated by hyphal morphology as well as compactness of tissue: the outer and inner layers are of tightly interwoven, orange-brown, thick-walled hyphae, whereas the middle, more loosely interwoven layer is of hyaline hyphae with gelatinous-thickened walls. The mature gleba of *Gummivena* is transversed by veins of gummy tissue, as opposed to the rubbery columella of *Gummiglobus* and the strictly powdery gleba of *Castoreum*. Originally we were reluctant to erect a new genus for this new Western Australian taxon, but it cannot be forced into either of the other two related genera without major generic emendation. On morphological grounds we regard *Gummivena*, *Gummiglobus* and *Castoreum* as sister genera arising from a common ancestor. This hypothesis can be tested by molecular methods once adequate material becomes available.

In one specimen (Fig. 1) the gleba was invaginated half way through its diameter, the invagination 3 mm broad and filled with hyphae and incorporated roots to resemble the middle peridial layer. Although superficially seeming to be a columella, this structure was separated from the gleba by the brownish black inner peridial layer. It appeared in only one specimen and is not a columella.

Spores and gummy mycelium resembling those of *G. potorooi* occur in the dung of Gilbert's Potoroo from Two Peoples Bay Nature Reserve (Bougher 1998, Bougher *et al.* 1999), indicating that this fungus contributes to the animal's diet during several months of the year including at least March to July. Indeed Gilbert's Potoroo consumes a wide diversity of fungi and may be one of Australia's more fungal-dependant indigenous mammals.

Key to the genera and species of 'Gummy' Mesophelliaceae

1. Gleba totally loculate in youth, totally powery at maturity. *Castoreum* 2
1. Gleba from youth transversed by persistent veins of gummy tissue or with a prominent, rubbery columella 3
 2. Spores $8-12 \times 4-7 \mu\text{m}$ *Castoreum radicum*
 2. Spores $12-18 \times 7-9 \mu\text{m}$ *Castoreum tasmanicum*
3. Gleba with locules or spore powder nested amongst veins of gummy tissue *Gummivena potorooi*
3. Gleba with locules or spore powder aggregated amongst the dendroid arms of a prominent columella 4
 4. Spores $(10-11-13 (-15) \times (4-5-6 (-6.5) \mu\text{m})$, the length:width ratio 1.9-2.8 *Gummiglobus joyceae*
 4. Spores $9-11 (-13) \times 5.5-6.5 (-7) \mu\text{m}$, the length:width ratio 1.5-2 *Gummiglobus agglutinosporus*

Acknowledgements

This research was supported by grants to Bougher from (a) Environment Australia delivered through the Natural Heritage Trust Bushcare, and (b) Edith Cowan University arranged by Jackie Courtenay, and to A.W. Claridge and J.M. Trappe from the Australian Biological Resources Study for study on taxonomy and biogeography of Australian sequestrate fungi. We thank Alan Danks (CALM) who collected the holotype and Dr Teresa Lebel (Royal Botanic Gardens Melbourne) for alerting us to the 1998 collections made by K. Syme, G. Evans, and A. Carroll.

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