

A RECORD OF GREGARIOUS FRUITING OF BLUE *ENTOLOMA* FUNGI AT BUKIT TIMAH NATURE RESERVE

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INTRODUCTION

This brief communication reports the recent flush of a spectacular deep blue fungus in the Bukit Timah Nature Reserve (BTNR), Singapore. The species is of the genus *Entoloma* (family Entolomataceae, order Agaricales, class Agaricomycetes, phylum Basidiomycota). Fruit bodies of *Entoloma* are mushroom-shaped and though often brown in colour, may be cream, pink, violet, or blue, as encountered in this case. As with most members of macrofungi with mushroom or toadstool-like forms, the dark blue visible parts of this species that emerge above ground are only the reproductive structures or fruit bodies of a much larger organism living underground. The well-known tropical mycologist and botanist, E. J. H. Corner had collected various species of stunning blue *Entoloma* from Singapore which were subsequently fully described and detailed by Horak (1980).

Entoloma is a large genus characterised by a pink spore print, and angular to cuboid spores (Horak, 1980; Noordeloos 1992; Breitenbach & Kranzlin, 1995; Wartchow, 2006). Other characteristics used in the identification include the shape of the fruiting body, in particular, the shape of the cap (pileus)—whether it is conical, bell-shaped (campanulate), hemispherical, convex, plane (flat), raised in the centre (umbonate), or depressed in the centre (umbilicate). In addition, “scalps” or radial sections of the centre of the cap surface (pileipillis) can reveal further useful species identification characteristics such as hyphal dimensions, and details of pigmentation (intracellular or encrusted).

Most species of *Entoloma* are saprotrophic (decomposers of dead organic materials) with a few forming partnerships with plants in mycorrhizal relationships (Brandrud, 1995). The genus may be found in a wide variety of habitats, including forests as well as grasslands (Horak, 1980; Noordeloos, 1992, 2007).

OBSERVATIONS

The blue fruiting bodies of the *Entoloma* fungus were observed from 26 Feb.2009 to 1 Mar.2009 on the rain-saturated forest floor along the Catchment Path and Cave Path of the BTNR (Fig. 1). Approximately 15 fruit bodies varying in size were observed along the routes, occurring solitarily, in twos or gregariously inside the forest as well as on the path sides on soil and among leaf litter.

The fruiting bodies ranged in height from 80–100 mm. The caps were 60–130 mm across (Fig. 2), appearing convex when young, later expanding and becoming plane or flat (Fig. 3). The surface of the cap is a matte, deep blue with an acute margin that is slightly upturned in very mature specimens. The flesh is white to cream. The gills or lamellae are well-spaced, broad, adnate, smooth-edged, creamy-white when young, pale brownish-pink when old (Fig. 4). The stalk or stipe is 60–80 mm long, cylindrical, solid, elastic but breakable with a smooth greyish-white surface and faintly longitudinal, bluish, fibrillose striations along its length which appear darker in younger fruiting bodies (Fig. 1).

Although the spores en masse appeared brownish-pink (Fig. 4), they appeared greyish-pink under the microscope in 10% ammonium hydroxide. The spores appeared six-angled, with thick walls and numerous inclusions or guttules in the cytoplasm. Spores were neither amyloid nor dextrinoid in Melzer’s Reagent (Fig. 5).

The fully expanded fruiting bodies started to decompose after two to three days. There was no fading of colour of the caps. Although some larvae or grubs were found in a few specimens, the fruiting bodies may not be edible to other animals as there were no obvious signs of the caps or stipes having been bitten or eaten. The spores are most probably dispersed by air currents.



Fig. 1. Solitary fruit body of *Entoloma* species (tentatively identified as *Entoloma burkillae*) growing on soil among thick leaf litter along Cave Path in the Bukit Timah Nature Reserve. Cap width = 130 mm.



Fig. 2. The cap of the fruiting body is a deep blue colouration and 130 mm across.



Fig. 3. Fruiting bodies are convex when young, expanding to become flat and slightly concave when mature.



Fig. 4. Mature fruiting body with upturned margins, revealing broad gills. Brownish-pink spore deposits can be seen on the stalk or stipe.

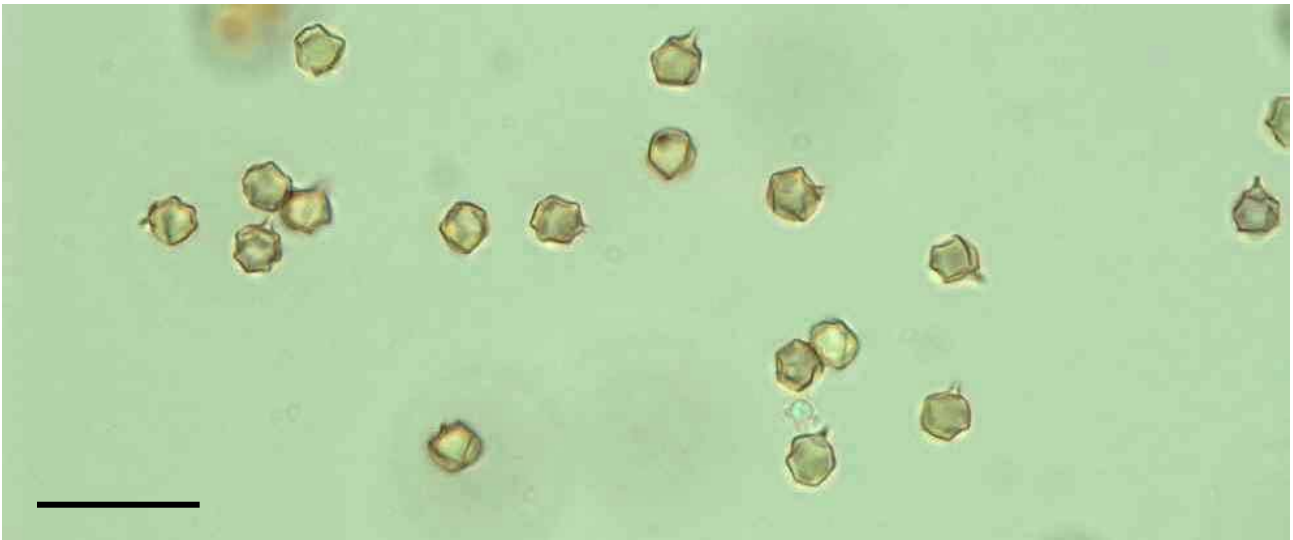


Fig. 5. Angular spores of the *Entoloma* sp. in Melzer's reagent as seen under the microscope. Scale bar = 20 μ m.

Solitary fruiting bodies of this fungus had been observed previously on another occasion to occur after heavy rain along the Summit Path, Catchment Path, and Cave Path from the 10–12 of Sep.2008. Although the first three weeks of Feb.2009 were unusually dry for the North-East monsoon period which typically stretches from Dec. to early Mar. in Singapore, the final week of Feb.2009 saw prolonged, heavy showers on consecutive afternoons in most parts of the island, with most of the rain falling over the central parts (National Environmental Agency, 2009). Rainfall of 210–240 mm (40–60% above average) was recorded in this region. These wet conditions following an extended dry period could have triggered off the gregarious fruiting of this fungus.

The fungus is tentatively identified as *Entoloma burkillae* Masee. However, more fruit bodies need to be examined microscopically as the cuticle in this collection is not distinctly a hymeniderm (palisade of erect hyphae) or a cutis (repent, entangled hyphae). *Entoloma burkillae* has been reported to be previously collected from the Singapore Botanic Gardens' Jungle at the turn of the last century as well as from Bukit Timah on soil in the forest by E. J. H. Corner in Mar.1930 (Horak, 1980).

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