OBSERVATIONS ON THE BOLBITIACEAE 11:
A species of Bolbitius with ornamented basidiospores

ROY WATLING

ABSTRACT. The new species *Bolbitius viscosus* Watling, characterised by its verrucose basidiospores, is described from N America; sect. *Verrucisporae* Watling is described to accommodate it.

Ornamented basidiospores, although common in certain agaric genera, are rare in members of the family Bolbitiaceae. A few workers have, however, recorded taxa exhibiting this character. Veselský & Watling (1972) described a member of *Conocybe* subgenus *Piliferae* (*C. subverrucispora* Ves. & Wat.) with minutely verrucose basidiospores. Kühner (1931) described *C. subnuda* from Algeria with surface 'subtilement rugeuse (absolument lisse si on l'étude avec un objectif à sec) . . . .' and *C. laricina* from France with ornamented spores, although he mentions a collection of the latter from Algeria with smooth basidiospores. Of Kühner's species, *C. laricina* is not infrequent in the British Isles especially in limestone-woodland communities and the same or a similar species to *C. subnuda* has been found in North America (unpublished data).

Singer (1947, 1973) introduced *Conocybe* subgenus *Ochromarasmius* with *C. juruensis* (Henn.) Singer as type and *Pholiotina* subgenus *Verrucisporae* with *P. verrucispora* Singer as type, both characterised by their ornamented spores. Although Singer (1969) hints that several unnamed species with ornamented spores are yet to be described from South America, the ratio of these species to the known members of the family is still small (Watling, ined.).

Amongst material of agarics housed in the University of Michigan herbarium is a collection of an unnamed species of *Bolbitius* (*Smith* 21740). It not only has a glutinous, well pigmented pileus and pale stipe, but also rather unusually ornamented spores. Close inspection of the hymenium shows the absence of pleurocystidia and rarity of brachycystidia or what have been variously termed brachybasidioles, paraphyses, pseudoparaphyses, coprinoid paraphyses and pavement cells. Apparently this collection represents a new species of the subgenus *Pluteolus*; possession of thin, poorly pigmented basidiospore walls falls more in line with this subgenus than with a placement in subgenus *Bolbitius* where the spores are complex and strongly pigmented and the brachycystidia well-developed. The brachycystidia are not confined to *Bolbitius vitellinus* and its allies as they appear as a well-developed trait in *Conocybe* subgenus *Conocybe* sect. *Candidae*—i.e. the *C. lactea* group. The differences between *Bolbitius* subgenus *Pluteolus* and *Conocybe* are also rather poorly defined, but the presence in *Conocybe* of distinctly coloured fruit-bodies, typical of *Bolbitius*, is very rare, although Romagnesi (1969) has recently described and figured *C. aeruginosa* with a bluish-green pileus. Romagnesi's fungus belongs in *Conocybe* subgenus *Piliferae*.

It is therefore proposed to accommodate this North American fungus in *Bolbitius* subgenus *Pluteolus* because of the combination of lignicolous habit (plate 8 E), glutinous-viscid pileus, strongly cystochroic pileal hymeniderm, chroic stipe-tissue, irregular lageniform caulo- and cheilocystidia (plate 8 F–H), and ornamented basidiospores (plate 8 D).

Bolbitius viscosus Watling, **sp. nov.**

Pileus 5–10 mm (–12 mm) latus, e convexo vel expanso-convexo vulgo leviter umbonatus, olivaceo-niger, nitidus, glutinosus dein olivaceo-brunneus; caro pilei fragilis, obscuriore. *Stipes* 20–30 × 1 mm, aequalis, fragilis, cavus, pallido-griseus, pruinoso-pubescentibus. *Velum* nullum. *Lamellae* adnatae, olivaceo-griseae vel ferrugineae. *Odor* nullus.

Basidiosporae ellipsoideae vel leviter amygdaliformes, poro germinativo, 7·5–9·5 × 4–4·5 μm. *Basidia* 4-sporigera. *Cystidia* aciei lamellarum obtuse cylindrico-clavata, subutriformia vel inequaliter fusiformes. *Cellulae cuticulae pilei* pyriformes vel spheropedunculatae.

N America: Michigan, Emmet Co., Cross Village, gregarious on maple (*Acer*) log, *Smith* 21740 (holo. MICH; slide, E).

Pileus 5–10 mm (–12 mm) broad, obtuse expanding but retaining an obtuse umbo, shining when young becoming translucent striate with age, olivaceous black, paler with age, tinged with brown ('Army brown' of Ridgway) and olivaceous buff or sepia with age, olive-colours more or less disappearing at maturity, viscous with detritus attached and margin inrolled, wrinkled. *Stipe* 20–30 × 1 mm, equal, fragile, hollow, pale greyish when fresh, drying pale ochraceous, entirely pruinose-pubescent and in fresh condition beaded with droplets, pale yellowish mycelium at base. *Gills* adnate, moderately broad, olivaceous grey when young soon pale avellaneous, finally ± rust-brown; edge even to crenulate and white floccose. *Flesh* thin, dark under pileal disc. *Veil* not evident.

Basidia 4-spored, clavate with short pedicel, hyaline or pale yellow in alkali solutions. *Basidiospores* 7·5–9·5 × 4–4·5 μm, slightly to distinctly amygdaliform in side-view, elliptic in face-view tapered off slightly to small although distinct germ-pore and apiculus; punctate-rugulose, honey-yellow in water and ammoniacal solutions, slightly greyed in Melzer's reagent. *Brachycystidia* rare and *pleurocystidia* not seen; *cheilocystidia* hyaline, irregularly cylindric or fusiform with or without poorly developed subcapitate to obtuse head 4–6 μm broad. *Hymenophoral trama* of hyaline, regularly arranged swollen cells. *Pileipellis* a hymeniderm of hyaline to distinctly brown, saccate, ellipsoid to clavate cells (20–)23–25(–30) μm broad with mid-brown pedicel; *pileocystidia* absent. *Stipe cortex* of parallel, hyaline hyphae giving rise to irregularly clavate cells 14–33 × 3·5–11 μm. *Clamp-connections* present and numerous on hyphae towards stipe-base. *Vegetative hyphae* filamentous, hyaline, pale reddish brown in Melzer's reagent.

Type. Six carpophores; gregarious on maple (*Acer*) log, Cross Village, Emmet Co., Michigan, North America, 13 vii 1947, *Smith* 21740 (holo. MICH; slide E).

The basidiospores are faintly but distinctly ornamented. Transmission and scanning electron microscope studies show that the basidiospores have a

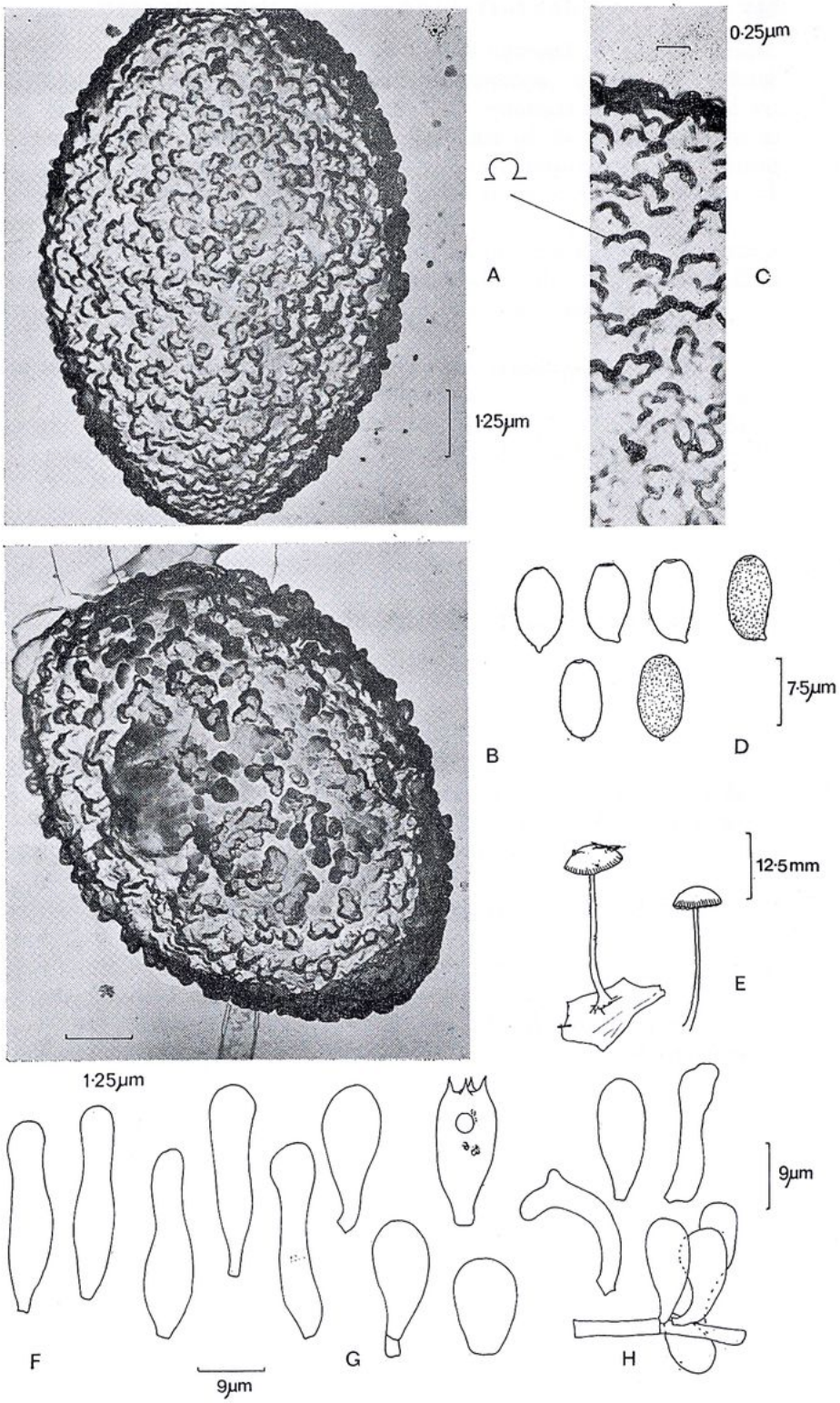

PLATE. 8. *Bolbitius viscosus* Watling: A & B, basidiospore carbon replicas—transmission E.M.; C, part of basidiospore surface; D, basidiospores—camera lucida; E, habit sketch; F, cheilocystidia; G, brachycystidia and basidium; H, caulocystidia.

distinct verrucose pattern; that is the surface is covered by small, smooth prominences. However, under the light microscope, even using phase contrast, one cannot discern whether the faint ornamentation revealed on the epispore is raised or depressed. The magnitude of the ornamentation in *Bolbitius viscosus* is the same as that in *Conocybe subverrucispora*, but carbon replicas show clearly the ornamentation is a more complex pattern of surface irregularities (plate 8 A–C).

It is proposed because of the rather unusual spore ornamentation to erect a section within subgenus *Pluteolus* to accommodate this new species thus emphasising the differences between it and *P. reticulatus* and its alliance.

Bolbitius subgenus **Pluteolus** sect. **Verrucisporae** Watling, **sect. nov.**

Pileus glutinosus. *Annulus* absens. *Pleurocystidia* absentia; *cheilocystidia* fere elongata utriformia, altera elongato-clavata ad apicem semper obtusa, etiam lageniformia vel inaequaliter subcapitata; caulocystidia similia. *Basidiosporae* subverrucosae.

Type species. *Bolbitius viscosus* Watling.

Acknowledgment

My great thanks are extended to Mrs Heather Thomson for the electron microscope preparations.

References

Kühner, R. (1931). Le Genre Galera. *Encycl. Mycol.* 7, Paris.

Romagnesi, H. (1969). Un nouveau Conocybe de la Section des Piliferae Kühner, Conocybe aeruginosa nov. sp. *Bull. Soc. Mycol. Fr.* 84:365–368.

Singer, R. (1947). New Genera of Fungi III. *Mycologia* 39:77–89.

—— (1969). Mycoflora Australis. *Beih. Nova Hedwigia* 29.

—— (1973). Diagnoses Fungorum Novorum Agaricalium III. *Beih. Sydowia* 7:1–106.

Veselský, J. & Watling, R. (1972). A new species of Conocybe with ornamented basidiospores. *Česka Mykol.* 26:201–209.

Watling, R. (ined.). Observations on the Bolbitiaceae: species with ornamented basidiospores. *Commemorative volume to M. Josserand, Lyons.*