

# Observations on Malaysian Bolbitiaceae with Records from Solomon Islands

ROY WATLING

Royal Botanic Garden,  
Edinburgh EH 3 5LR  
Scotland, UK

EFFECTIVE PUBLICATION DATE : 31 MARCH 1994

## Abstract

Fifteen taxa of Bolbitiaceae, belonging to the three main genera and sections thereof, are described from Malaysia including four new taxa viz. *Agrocybe malesiana*, *Bolbitius malesianus*, *Conocybe mitrispora* & *C. huijsmanii* var. *conica*. Some interesting records from the Solomon Islands are also included.

## Introduction

Through the kindness of Professor E. John H. Corner it has been possible to examine collections of Bolbitiaceae he made over the years in S.E. Asia, particularly the results of his expeditions to Mt Kinabalu, Borneo (= Sabah) and the Solomon Islands. To these have been added collections made by the author whilst staying at the Forest Research Institute Malaysia, Kepong (Watling, 1992a) and miscellaneous material from other workers.

## Methods and Materials

Fresh collections were described by both E.J.H Corner and the author following long traditions summarized in Henderson, Orton & Watling (1969). Microscopic characters in Corner's notes and in the present contribution follow this same publication in addition to Josserand (1952). Whenever possible, water-colour paintings were made of the fresh material to later accompany the dried specimens.

Herbarium material was prepared by drying specimens at a relatively low temperature (40-45 °C) in a well ventilated drier. The dried material was sectioned by hand using a single edged razor blade or saturated in a 10% aqueous solution of glycerol before being sectioned on a freezing microtome (Reichert OmP 399) with a thermocouple cooling attachment stage.

All material was mounted in water or in 10% aqueous solutions of ammonium hydroxide. Microscopic examinations were carried out using a Leitz Diaplan microscope with drawing tube (Camera lucida) and phase contrast facilities.

## Taxonomic Account

This listing has been arranged as outlined by Watling & Gregory (1981) and Watling (1982).

Abbreviations used in references to some collections are:

RSNB = Royal Society Expedition to Borneo in 1961.

RSS = Royal Society Expedition to the Solomon Islands in 1965.

The author's collections and those from Professor E.J.H. Corner and G. Hadley have been deposited in the Herbarium, Royal Botanic Garden, Edinburgh (E).

### Agrocybe Fayod

Ann. Sci. nat. (Bot.) VII 9: 358, 1889

Subgenus **Agrocybe**

**Section Pediadeae (Fr.) Singer in Beih. Bot. Centralblatt. 56B : 167, 1936**

1. **A. arenicola** (Berk.) Singer

Fig. 1, J & N.

Beih. Bot. Centralblatt, 56B: 167, 1936.

Syn.: *Naucoria arenicola* (Berk.) Sacc. in *Sylloge Fungorum* 5: 845 1887.

*Pileus* 23-55 mm wide, convex then plane or concave, dry, smooth, more or less irregularly rugulose when young, then radially rimose on drying in the sun, pale cream-tan with the disc or slight umbo pale brownish tan; margin slightly incurved at first, without veil. *Stipe* 30-60 x 3-5 mm, gradually attenuate from subbulbous, white, villous base 5-8 mm wide, fibrous, firm, hollow, pallid then pale cream-ochraceous downwards, white pruinose upwards, appressedly fibrillose-floccose downwards. *Gills* rounded-attached, rather crowded, 40-46 primaries 4-7 mm wide, 3(-4) ranks, pallid then greyed fuscous brown. *Flesh* 2-3 mm thick in centre of pileus, rather soft but tough at maturity, whitish, unchanging. *Odour* slightly earthy. *Spore-mass* fuscous brown.

*Basidia* 4-spored, 8-10 x 24-25  $\mu$ m. *Basidiospores* 13-14 x 8.5-9.5  $\mu$ m, ellipsoid, slightly flattened in side-view, mid-ochraceous in water, darker in alkaline solutions, thick-walled, smooth with central germ-pore. *Cheilocystidia* scattered, 12-24 x 28-38  $\mu$ m, clavate, hyaline; *Pleurocystidia* not abundant, scattered, only towards margin, 12.5-15 x 30-36  $\mu$ m, clavate, hyaline. *Clamp-connections* present.

*Habitat*: in grass by sandy seashore.

*Material examined*: Sarawak, Bako National Park, 25 viii 1972, *Corner P-140*. Also holotype in K: South Africa, Uitenhage, *Zeyher 110*.

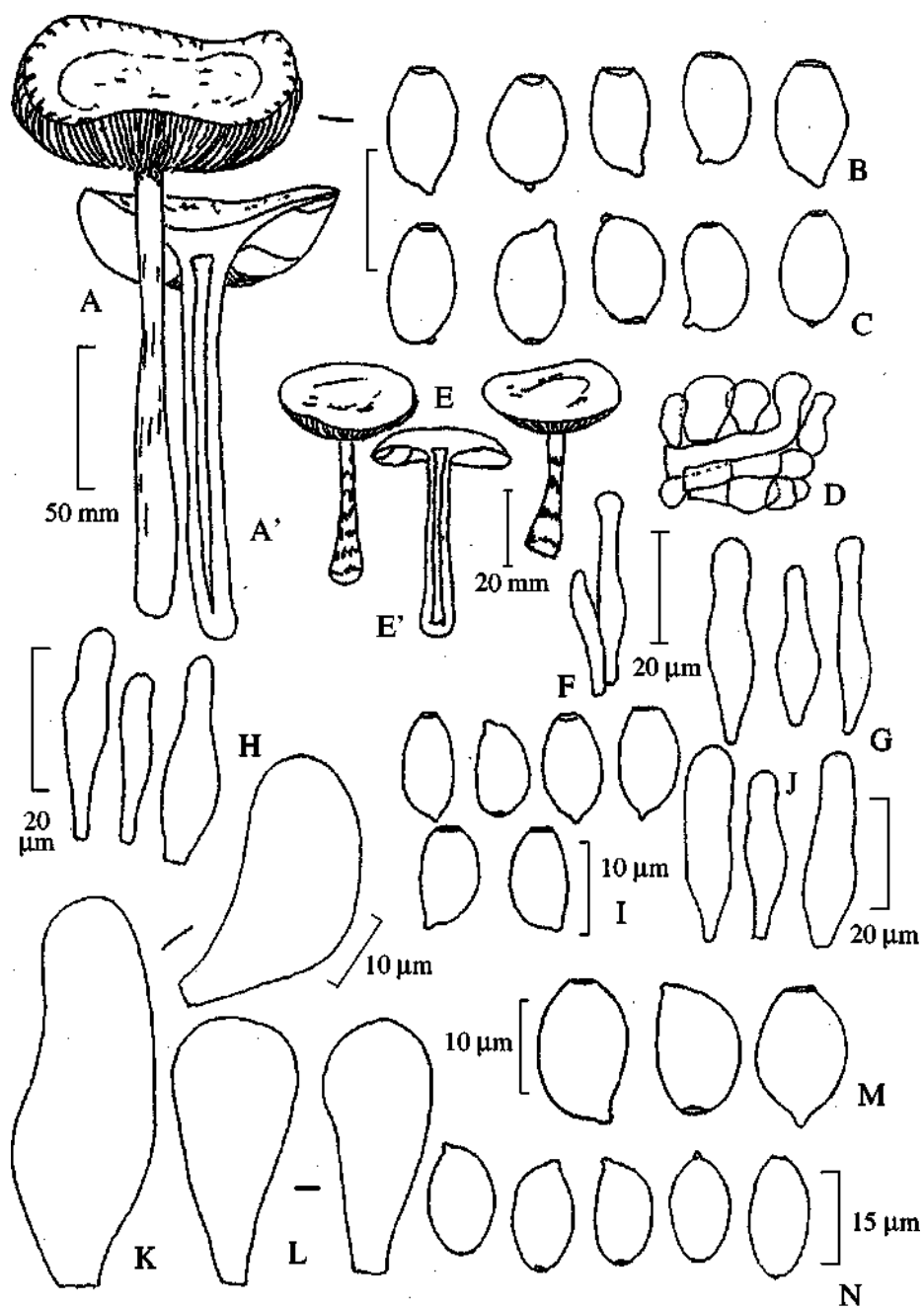


Figure 1.

*Agrocybe arenicola* was originally described from sandy ground at Uitenhage, S. Africa (Berkeley, 1843 as *Agaricus*). Its relationship with *Agrocybe arvalis* (Fr.) Singer and *A. vervacti* (Fr.) Singer was recognised at that stage and Saccardo (1887) made the necessary transfer to *Naucoria* when the genus *Agaricus* was dissected and where *A. vervacti* was ultimately placed. Singer (1936) when surveying the taxa of *Naucoria* with cellular pileipelles and brown basidiospores with a central germ-pore recognised the close relationship of *A. arenicola* with *A. semiorbicularis* (Bull.: St. Amans) Fayod, a view which Reid (1975) took even further after examining the type of *A. arenicola* by synonymizing Berkeley's fungus with *A. semiorbicularis*. Reid says 'The figure quoted by Fries from Paulet, under *A. vervacti* gives a tolerable notion of its general appearance'.

However, Singer (1968 & 1978) maintained the autonomy of *A. arenicola* based on the presence of 4-spored basidia and basidiospores measuring (11-) 12-15 (-18) x 7.5-9.5(-10.8)  $\mu\text{m}$ ; type material in *K* has spores 12-14.75 x 6.5-9  $\mu\text{m}$ .

Singer (1968) records the fungus from not only South Africa and Russia (N. Caucasus) but also from Uruguay & Argentina. He cites a single record from the Netherlands. From personal observations made in the Netherlands Singer (in *L*) had previously incorrectly considered this species to be *A. arvalis* (see Singer 1968 & 1969; Watling & Gregory, 1981).

Corner (pers. comm.) indicates that this agaric 'is a common species in grassy, sandy soils, especially by the sea'. He records it from the east coast of Johore at Jason Bay 'on bare sand in front of *Casuarina* trees accompanying *Inocybe* sp. just above the high-tide mark, in the full open, growing on runners of grasses and sedges (*Remirea*)'; Corner J-36, 17 vi 1972 - one packet with this same accession number only includes an *Inocybe* (*Mallocybe*) sp. with brownish, encrusted suprapellis elements and rather mummy-shaped basidiospores. Several species within the *A. semiorbicularis* group actively decompose straw, grass tillers etc.

2. *A. broadwayii* (Murr.) Dennis

Fig. 1,1, K & L.

**Bull. Soc. Mycol. Fr. 69:179, 1953.**

*Pileus* 20-40 mm wide, convex then plane, subumbonate slightly depressed at centre, glabrous, smooth, smeary viscid, soon drying tomatate, pale straw-yellow with disc pallid ochraceous tan, or wholly pallid ochraceous with darker disc, margin slightly incurved at first with very thin, fugaceous, arachnoid veil. *Stipe* 2.5-5.5 x 2.5-5.5 (3-6.5 mm at base) slightly swollen downwards, pale straw-yellow, fibrous to subsquamulose, white villose at base, hollow. *Gills* adnexed, sometimes nearly free, fairly crowded, subventricose, 2-3 ranks, 28-47 primaries, pallid then pale dirty fawn or subcinnamon. *Flesh* 20-45 mm thick

under pileus-disc, 0.5-1.5 mm towards margin, rather soft, pale straw-white, unchanging. *Odour* strong mealy. *Spore-mass* fuscous ferruginous or dingy fuscous fawn.

*Basidia* 4-spored, 10-12.5  $\mu$  x 25-35  $\mu$ m. Basidiospores, (10.5-)11-14(-15) x 6.8-8.3(-9.5)  $\mu$ m, ellipsoid, slightly flattened in side-view, dull golden yellow in water, darker in aqueous alkaline solutions, thick-walled, smooth with central germ-pore. *Cheilocystidia* variable, globose to vesiculose or clavate, hyaline, 30-45 x 10-30  $\mu$ m; *pleurocystidia* collapsed, apparently similar to cheilocystidia.

*Habitat*: on bare soil.

*Material examined*: Pahang, Tembeling, amongst young maize plants in village holding, 15 xi 1930, legit Corner as *Naucoria* 5.

*Agrocybe broadwayii* is a common pantropical member of the genus occurring on soil along roadsides, in gardens, in grassland etc. It is known from the New World, Africa as well as S. E. Asia. It was originally described from the Caribbean as *Hebeloma broadwayii* Murr.: Grenada, St Georges along roadside, NY!. *A. broadwayii* differs from *A. manihotis* Pegler in the paler and viscid pileus and lack of pleurocystidia. A full description is given as the Malaysian collection shows evidence of an arachnoid veil a character not always recorded for *A. broadwayii*. The occurrence of this structure parallels the presence of faint velar remains in other members of the *Pediadae*, eg. *A. pediades* (Fries) Fayod (Watling, 1982).

### 3. *Agrocybe malesiana* Watling *nov. sp.*

Fig. 1, A-G.

*Pileus* 15-50 mm conico-campanulatus dein planus interdum subumbonatus siccus glaber livido-fulvus vel ochraceus ad discum obscuriore coloratus. marginem versus pallido appendiculato-albus. *Stipes* 25-120 x 2.5-6 mm (ad basim 9 mm) cylindricus ad basim leviter incrassatus albus vel pallido ochraceus vel pallido-luteus apicem albo-pruinose, substriatum sed basim minute floccoso. Lamellae adnexae dein liberae subdistantes albido vel pallide fuliginosae dein pallido-fuscae vel fuligineo-brunneae. *Caro* alba vel pallido-luteola. *Basidia* 4-sporigera, 32-40 x 11-15  $\mu$ m. *Sporae* ellipsoideo-ovoideae, poro germinative (10-)11-16 x (6.5-)7-9  $\mu$ m. *Cystidia* aciei lamellarum ventricosa vel clavata; pleurocystidia praesentia. Ad terram. *Holotypus*: Singapore Bot. Gardens, vii 1929, Corner as *Naucoria* 3 (Malaya) - E.

*Pileus* 15-50 mm wide, conico-campanulate then plane, subumbonate, over the limb at first livid clay-colour then ochraceous, often tan or fawn ochraceous over the disc, drying pale and atomate, smooth not viscid, non-striate; margin thin, at first slightly appendiculate with a thin, white, evanescent cortinoid veil, often becoming subsulcate or rimose in old basidiomes. *Stipe* 25-120 x 2.5-6 mm, cylindric or slightly thickened at base (-9) fibrous, often becoming hollow, white to pale ochraceous or pale yellowish, the apex white pruinose and substriate, generally slightly floccoso-peronate with a few drying ochraceous peronate zones near the white, villous base. *Gills* adnexed becoming free, scarcely crowded, 2-3(-4) ranks, 30-46 primaries 3-9 mm wide, white then pale fuliginous or earth-colour finally

pallid fuscous to pale fuliginous brown. *Flesh* 1.5-3 mm thick over disc, firm, not hygrophanous, white or pale yellowish. *Odour* faint, rather unpleasant, slightly mealy.

*Basidia* 4-spored, 32-40 x 11-15  $\mu\text{m}$ ; sterigmata 4-6  $\mu\text{m}$  long. *Basidiospores* pale fuscous ferruginous or dingy fuscous fawn in mass, (10-)11-16 x (6.5-)7-9  $\mu\text{m}$ , ellipsoid-ovoid, flattened in side-view, thick-walled, smooth with central germ-pore, strongly pigmented in water and alkali solutions. *Cheilocystidia* 30-55 x 13-25  $\mu\text{m}$ , abundant, hyaline, clavate to ventricose; *pleurocystidia* scattered to abundant, 35-95 x 15-35  $\mu\text{m}$ , clavate, subcylindric or subventricose, obtuse or subcapitate, thin-walled, hyaline, granular at apex within and often slightly encrusted with amorphous material over apex. *Pileipellis* a hymeniderm 60-70  $\mu\text{m}$  deep of clavate cells 20-90 x 7-50  $\mu\text{m}$  with pale yellowish, firm but scarcely thickened walls seated on interwoven hyphae, 3-30  $\mu\text{m}$  broad below. *Stipitipellis* of filamentous, thin-walled hyphae, 3-5  $\mu\text{m}$  broad overlying hyphae 3-30  $\mu\text{m}$  wide; *caulocystidia* grouped, scattered, 25-27 x 7-20  $\mu\text{m}$  resembling cheilocystidia but narrower and more frequently subcapitate, apex 3-14  $\mu\text{m}$  broad. *Pileus trama* of interwoven, hyaline hyphae 3-25  $\mu\text{m}$  broad.

*Habitat*: on soil and amongst grass.

*Material examined*: Singapore, Botanic Gardens, viii 1929, legit Corner as *Naucoria* 3 (Malaya) (Holotype in E); Malaysia, Bantong, Oil Palm Research Station, 22 v 1967, legit G. Hadley.

The macroscopic details are taken from the field notes of two additional collections also numbered *Naucoria* 3 (Malaya) and considered to be the same taxon by Corner (9 iii 1941 & 30 x 1941). Microscopic examination of the material available confirms their conspecificity. It is also noted (as *Naucoria* 3a; Malaya, 23 ix 1942 (with coloured illustration)) by Corner from burnt padi husk also at the Botanic Gardens, where it seems to be well established.

Although very closely related to several species already recognized the author believes it is autonomous based on the following combination of characters: well-pigmented, scrobiculate-reticulate pileus; dark, fairly distant gills; velar remnants at margin of pileus giving in some old dried collections a frosted appearance; the presence of pleurocystidia; and broad basidiospores.

The reticulate pileus resembles that of *A. retifera* (Speg.) Singer, the frosted appearance approaches that of *A. viscosa* Sing, a South American species with much larger basidiospores. The morphology of the pleurocystidia approaches *A. manihotis* Pegler from East Africa, but the last species is in Sect. Microspora. *A. earlei* (Murrill) Watl. to which *A. retifera* is undoubtedly closely related has significantly smaller basidiospores. *A. broadwayii* (Murr.) Dennis and *A. arenaria*

(Peck) Sing, have similarly coloured and arranged gills but in common with members of sect. *Pediadeae* pleurocystidia are lacking.

4. *A. semiorbicularis* (Bull.: St Amans) Fayod

Fig. 1, H & M

*Ann. Sci. Nat. (Bot.)*, Series 5,9: 358 (1889).

Syn.: *Naucoria semiorbicularis* (Bull, per St Amans) Gillet.

For other synonyms and genera to which *A. semiorbicularis* has previously been assigned see Watling & Gregory (1981).

*Pileus* 18 mm wide, convex then plane, pale livid, striate with disc watery yellowish when moist, drying atomate, opaque and very pale tan with the disc slightly darker, with a few brownish scurfy flecks in the centre. *Stipe* 25 mm x 1.5 mm, cylindric, slender, white, sparsely cottony puberulous to pruinose, white villous at base. *Gills* ascending adnate, rather crowded, thin, 3-4 ranks, 22 primaries 3 mm wide, pale brown. *Flesh* thin, concolorous. *Odour* none.

*Basidia* 2-spored, 30-46 x 11-13  $\mu\text{m}$  with sterigmata 3-5  $\mu\text{m}$  long. *Basidiospores* 15-18 x 8.5-10  $\mu\text{m}$ , pale cinnamon-brown, ellipsoid, thick-walled, smooth, with germ-pore, aguttate. *Cheilocystidia* forming distinct sterile edge to gill, 35-60 x 13-20  $\mu\text{m}$  tapering to obtuse apex 7-13  $\mu\text{m}$  broad, more or less ventricose, often slightly curved, thin-walled, hyaline; *Pleurocystidia* absent. *Pileipellis* a palisadoderm of subglobose to clavate cells 20-60 x 10-40  $\mu\text{m}$ .

*Habitat*: on decayed banana stump.

*Material examined*: Singapore, Botanic Gardens, 20 ix 1939, legit Corner as *Naucoria* 7.

*Agrocybe semiorbicularis* has been found only once in Corner's collections and, as he rightly notes, it is close but not conspecific with his *Naucoria* 3 viz. *A. malesiana* (see above). *Naucoria* 7 of Corner has been interpreted in the sense of the British Fungus Flora (Watling, 1982) viz. with 2-spored basidia, large basidiospores (15-18 x 8.5-10  $\mu\text{m}$ ) and lack of veil (see Singer, 1978). the Singapore collection is rather unusual in its habitat. Usually this species is found in grass but the present collection, which is undoubtedly identical, was growing on a decayed banana stump.

## BOLBITIUS Fries

*Epicrisis Systematicus Mycologici* 253,1838

Subgenus **Pluteolus** (Fries) Watling

Notes Roy. Bot. Gdn., Edinb. 26:296,1965.

1. ***Bolbitius malesianus* Watling** nov.sp.

Fig. 2: A & B.

*Pileus* 25-37 mm planus viscido-glutinosus non-reticulatus purpureo lilaceus ad discum obscuriore coloratus dein purpureo lividus vel pallido brunneus. *Stipes* 25-40 x 2-3 mm (3-5 mm a basim) albus, pruinosis, fragilis, subaequales ad basim leviter incrassatus. *Lamellae* liberae confertae testaceo-fulvae. *Basidia* 4-sporigera. *Basidiosporae* ellipsoideo-fusoideae, 8.7-9.6(-11) x 3.9-4.8(9-5.2)  $\mu\text{m}$ . *Cystidia* aciei lamellarum lageniformia vel clavata 17-27.5 x 7.5-10.5  $\mu\text{m}$ ; pleurocystidiata absentia. Ad lignum putridum in silva. Holotypus: Sabah, Mt Kinabalu, *RSNB 5456* (-E.)

*Pileus* 25-37 mm wide, plane wholly viscid-glutinous non-reticulate or disc rugulose under the gluten, limb rivulose, purplish mauve darker at disc, to purplish umber, pale brownish towards the margin finally losing purple tinge and becoming merely umber with colour less gluten. *Stipe* 25-40 x 2-3 mm (base 3-5 mm) attenuated upwards, white, pruinose, fragile. *Gills* 2-3.5 mm wide, free, crowded, thin, light cinnamon-fawn, 3-4 ranks (48 primaries). *Flesh* 1.5 mm thick under pileus-disc, white then purple near surface of pileus. *Smell* none.

*Basidia* 4-spored. *Basidiospores* 8.7-9.6(-11) x 3.9-4.8(-5.2)  $\mu\text{m}$ , elongate fusoid, slightly boletoid to amygdaliform in side-view, relatively thick-walled, golden yellow in water, darker in aqueous alkaline solutions, smooth with central or slightly oblique germ-pore. *Cheilocystidia* irregularly shaped, lageniform with cylindrical neck or with subcapitate head, 17-27.5 x 7.5-10.5 ( $\mu\text{m}$ , hyaline, thin-walled. Intermixed with some vesiculose cells 15-25  $\mu\text{m}$  broad.

*Habitat*: on rotten wood or sawdust at base of dead trunk.

*Material examined*: Sabah, Mt. Kinabalu, Bembangan River, 1700 m, 25 ii 1964, *Corner RSNB 5456* (Holotype in E); Mesilau, 1700 m, 19 iv 1964, *Corner RSNB 8350*; 28 iv 1964, *Corner RSNB 8350A*.

This species is close to the temperate *B. reticulatus* (Pers.: Fr.) Ricken which is widespread on old deciduous logs, often amongst moss etc. It differs in the less reticulate pileus-disc and particularly the rather narrow amygdaliform almost boletoid basidiospores. The colour of the pileus is close to that of *B. glaucopurpureus* (Berk.) & Br.) Kiihner ex Watling & Gregory which differs markedly in the much larger basidiospores (11.5-15 x 4.5-6.2  $\mu\text{m}$ ). The type of *B. glaucopurpureus* is fragmentary consisting of two longitudinal sections and a small fragment of pileus but sufficient tissue is available to indicate it is very different to the present fungus although close, judging from the spore-shape. Spores distinctly flattened in side-view are not seen in the dung-inhabiting



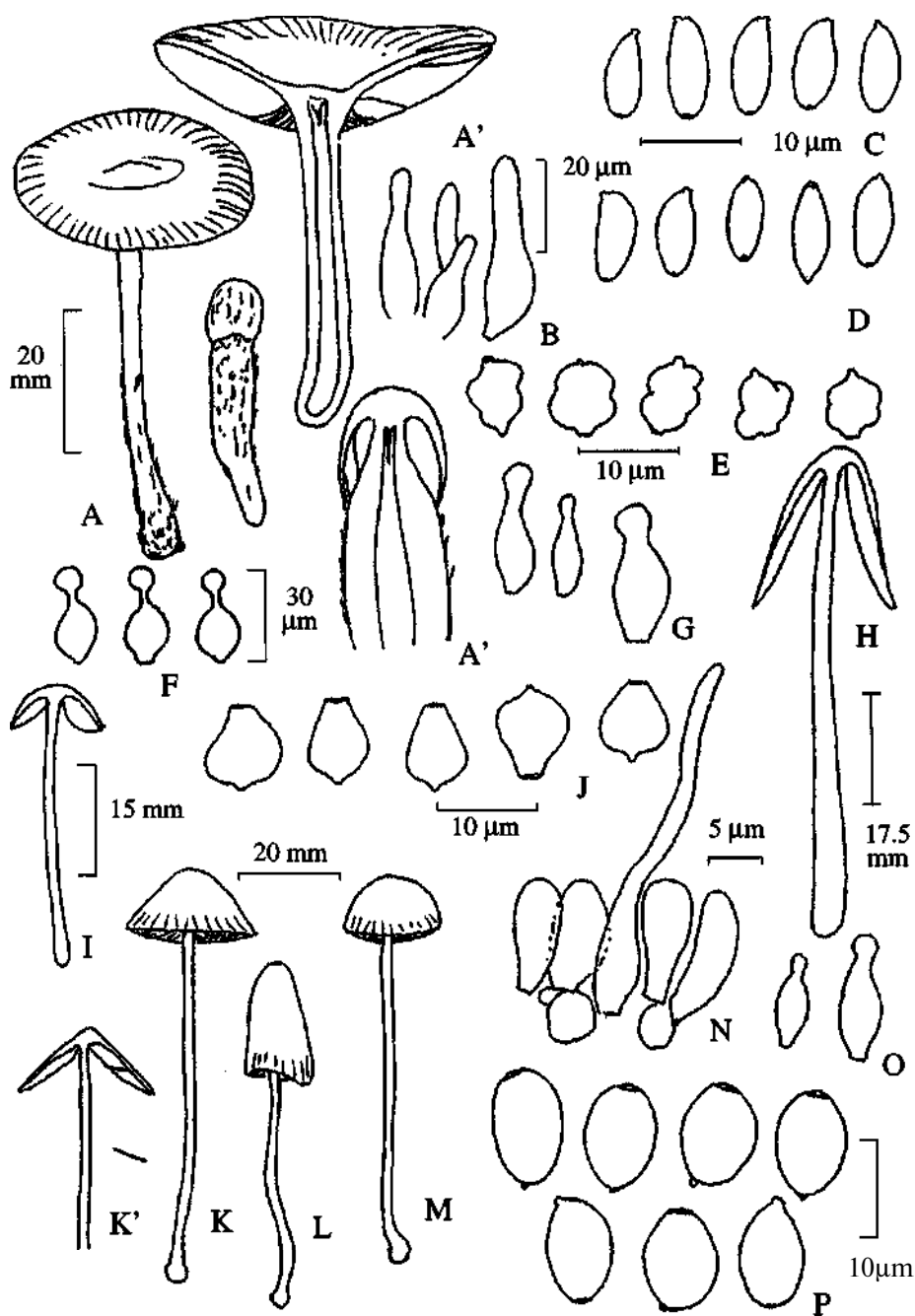


Figure 2.

species of *Bolbitius*, eg. *B. vitellinus* (Pers.: Fr.) Fr. and the phenomenon is only slightly developed in *B. reticulatus*.

*Bolbitius mexicanus* (Murr.) Murr. might be considered as conspecific but the pileus is avellanceous, lacks the purple-mauve colours, does not darken to umber and is reported to have a yellow stipe (Dennis, 1953); the basidiospores are indicated as being broader but there is some discrepancy between those given by Murrill (1912 as *Mycena*) and those found by the author in the single type specimen deposited in NY and examined by Dennis (1953).

The reticulate pileus is not considered significant by some authors but if parallels can be made in members of a single population of *6. varicolor* Atk., a full range from smooth to reticulate-venose has been found. In parallel *B. reticulatus* is often considered to be purely a larger more reticulate form of *6. aleuriatus* (Fr.: Fr.) Singer; the violaceous colour in *B. reticulatus* as in the present taxon may vary in intensity and fades at maturity.

## Subgenus **Bolbitius**

### 2. **B. coprophilus** (Peck) Hongo

Fig. 2: C-D.

Mem. Fac. Lib. Arts Educ. Shiga Univ. Nat. Sci. 9:82 (1959).

*Pileus* 30-70 mm wide, at first conical then plane or concave, subumbonate and rugulose below the superficial gluten. Finely rimosely striate towards margin, pale grey darker towards brownish or fuscous disc, or pale livid ochraceous with fuscous disc and pale brown straight margin. *Stipe* 50-100 x 2.0-3.5 mm (5-10.5 mm at base) rather stout, fibrous, attenuate upwards, hollow, wholly scurfy pruinose or scurfy floccose downwards with upward pointing flocci, white then pale yellowish, easily separable from pileus. *Gills* free 2-3 ranks, 50-98 primaries, 2-9 mm wide, very thin, crowded, white then light fawn and finally ferruginous cinnamon with whitish edge. *Flesh* 1-1.5 mm thick under pileus-disc, very thin over limb, white or pale yellowish with age.

*Basidia* 4-spored, 20-35 x 13.5-16  $\mu\text{m}$ , swollen-clavate; *sterigmata* 3.5  $\mu\text{m}$  long. *Basidiospores* 11.5-14.5 x 7.5-9.5  $\mu\text{m}$ , light ferruginous in mass, smooth, ellipsoid, aguttate, with germ-pore. *Brachycystidia* abundant, 20-35 x 15-30  $\mu\text{m}$ , swollen-clavate. *Cheilocystidia* 20-55 x 8-20  $\mu\text{m}$ , clavate to ventricose with obtuse apex, very variable in shape, hyaline, thin-walled, smooth. *Pileipellis* a hymeniderm 70-100  $\mu\text{m}$  deep of clavate cells 40-75 x 9-25  $\mu\text{m}$ , thin-walled, colourless, immersed in mucilage or separated by it. *Caulocystidia* cylindrical or subventricose often lobed one or twice, not gelatinized and seated on hyphae 3-6  $\mu\text{m}$  broad, scattered in tufts in upper stipe and as flocci below. *Stipe-trama*

of longitudinal hyphae with long inflated cells 300-2000 x 15-40  $\mu\text{m}$ . *Pileus trama* similar to that of stipe but cells not as long, 20-50  $\mu\text{m}$  broad; *hypoderm* 50-70  $\mu\text{m}$  thick in pileus, of radiating, fairly compact hyphae 3-9  $\mu\text{m}$  broad, gelatinized in the outer layer, non-gelatinized within. *Hymenophoral trama* of inflated cells as in pileus; *subhymenium* of hyphae 5-12  $\mu\text{m}$  broad, slightly inflated towards margin.

*Material examined*: Singapore, Botanic Gardens, scattered on old cow-dung compost, or subgregarious on old rotting rice straw. 26 iii 1940 and 6 xii 1944.

*B. coprophilus* was described from dung heaps at West Albany, New York by Peck (1893) but it is widespread from Canada to the Mid-States of the United States. It is also known from Europe and from Japan. Hongo (1959) has noted it from Australia. It is probably widespread and might be expected elsewhere, but it is less common than *B. vitellinus*. *B. variicolor* Atk. might be considered conspecific because of its olivaceous fuscous pileus with age but it differs markedly in the yellow stipe and more strongly pigmented pileus. *B. varicolor* is however, judging from examination of the type, very close and has similar habitat requirements. *B. variicolor* also has a much wider distribution than first thought, viz. Australia, Europe, and probably also India.

Unfortunately no material has been retained, or it was lost during World War II. A water-colour and notes accompanying the record agree in essential details, viz. pileus size and shape and floccose white stipe, with the descriptions of *B. coprophilus*. Microscopic details given by Corner (*pers. comm.*) also agree with the results for the author's examination of the type in NY. Although the coloured illustration lacks any hint of pink *B. coprophilus* is recorded in the literature as sometimes lacking the pink hues (Morgan, 1895). This is in keeping with other species in the genus where the pigment may vary in intensity depending on the size of the cells in the hymenodermal pileipellis or the age of the basidiome. Further material agreeing with this same taxon is reported by Corner to have been found in the same locality in March four years previously (*pers. comm.*)

Basidiome ontogeny: Corner had studied his collections in great detail and developmental data accompanies his water-colours. His notes are reproduced herein as little appears in the literature on the development of members of the genus *Bolbitius*.

'Gymnocarpic but the pileus-margin pressed closely against the stem from the earliest stage and some superficial stem-hyphae growing up against this margin, anastomosing with its tissue, and making a very slight marginal veil. Stem soon becoming swollen and beginning to inflate before the formation of the pileus, the cells of the stem-hyphae at first c. 15 x 3  $\mu\text{m}$ , inflating and lobing to produce lateral hyphae often only a few cells long. Palisade of the pileus becoming delimited in primordia 0.8-1 mm high.'

'The hymeniderm arises from the outer part of the hypoderm which is about 50-70  $\mu\text{m}$  thick in the pileus-centre and is composed of radiating and fairly compact hyphae 3-9  $\mu\text{m}$  broad, with gelatinized walls in the outer layers. Many new cells are incorporated into the hymeniderm as the pileus develops.'

'Stem-elongation mainly in the morning before expansion of the pileus during the ensuing night; collapse of the basidiome was by noon on the next day.'

### Conocybe Fayod

Ann. Sci. Nat. (Bot.) series 7,9: 357,1889.

Subgenus Conocybe

Section **Singerella** Watling

Sydowia 8: 408,1979

#### 1. **C. corneri** Watling

Beih. Sydowia 8.: 401,1979

*Pileus* 20-60 mm, at first conic and 15-25 mm high, then umbonate, finally more or less plane, smooth, finely puberulous with whitish hairs, hygrophanous, finely striate at first, intensely dark rich purple then on expansion livid vinaceous to vinaceous drab or dingy pinkish grey with centre fuscous, or becoming light fulvous fawn and drying fulvous melleous. *Stipe* 100-160 mm/2-3 mm (5-7 mm at the base), attenuate upwards, long, cartilaginous, wholly puberulous, finely spirally striate more or less concolorous, white towards the apex and base, with irregularly split or bifid, free, smooth, floccose-membranous, white volva, 8-12 x 7-9 mm. *Gills* free or very slightly adnexed, very crowded, thin, narrow, 3-4 ranks, 27-48 primaries 1.5-2 mm wide, the secondaries nearly as long as the primaries, white turning pale ochraceous cinnamon from distal edge near the margin of pileus towards stem. *Flesh* 1-1.5 mm thick in the centre of the pileus, brittle, concolorous. *Odour* none. *Spore-mass* brown (from deposit on stipes in pickled specimens).

*Basidia* 4-spored, 26-30 x 11-12  $\mu\text{m}$ , clavate-cylindric, hyaline in water and alkali mounts. *Basidiospores* 8.5-11 x 6-6.5  $\mu\text{m}$ , smooth, broadly ellipsoid to distinctly angular in face-view, slightly flattened on one side in side-view, very distinct apiculus and very prominent germ-pore. *Brachycystidia* abundant, 25-30  $\mu\text{m}$  broad; pleurocystidia absent. *Cheilocystidia* 20-35 x 10-20  $\mu\text{m}$ , lecythiform with neck 1-3  $\mu\text{m}$  long and head 4-6  $\mu\text{m}$  broad, hyaline in water and alkali mounts, thin-walled, smooth. *Pileipellis* a compact palisadoderm of smooth, broadly clavate to vesiculose, thin-walled cells 25-55 x 12-30  $\mu\text{m}$ , hyaline with pedicel darkened; pileocystidia replaced by thin-walled, filiform pilocystidia < 300  $\mu\text{m}$  long and 3-5  $\mu\text{m}$  wide. *Caulocystidia* numerous in bunches in rows on the stipe, mixture of vesiculose, clavate and lecythiform elements, the last commoner

towards the apical and basal zones. *Pileus trama* of only slightly inflated cells, *Hymenophoral trama* with distinct filamentous, little inflated hyphal strands forming central strand and more inflated subhymenial zone.

*Habitat*: On elephant dung from the forest.

*Material examined*: Johore, near Jemaluang Road, v 1940, legit Corner - *Locellina* 1.

This taxon was introduced with a second collection also from S.E. Asia made by Egon Horak in New Guinea. Subgenus *Singerella* of which *C. corneri* is the type is characterised by the presence of a volvate base to the stipe and Watling (1979) has discussed the origin of this. Since *Singerella* was erected Singer & Hausknecht (1989) have demonstrated the presence of member of the subgenus in Europe, viz. *C. hornana* Sing. & Hausk. Subsequently Bon (1991) elevated the section to subgeneric rank.

*Locellina* Gillet, and *Acetabularia* (Berk.) Mass. in early texts, were considered to be brown-spored equivalents of *Volvaria* DC. (= *Volvariella* Speg.: pink-spored), *Amanitosis* Roze (= *Amanita* Pers.: white-spored), and *Chitonia* Clements s. Massee (= *Macrometrula* Donk & Singer: purplish brown-spored). As descriptions and illustrations of members of these two genera superficially resembled *C. corneri* Watling (1979) had occasion to discuss both genera especially as in Corner's notes there exists a painting by Ridley (No. 83) of a Malaysian agaric labelled *Locellina*. Corner (*pers. comm.*) also provisionally labelled *C. corneri* '*Locellina* sp.' The painting was dated 2 November 1907 and depicts a volvate-stemmed agaric with brown gills. Unfortunately no material has been located in *K* to accord with the illustration. The gills of many species of *Volvariella* take on a cinnamon brown colouration on drying and so exsiccata can resemble members of the Bolbitiaceae or even Cortinariaceae. Many collectors, some quite experienced, have learnt this to their embarrassment, and it would appear that from the volva's appearance Ridley's painting in fact depicts a species of *Volvariella*.

### Section **Nodulosporae** Watling

Rev. Mycol. Paris NS 40: 33,1976.

#### 2. *C. nodulospora* (Hongo) Watl.

Fig. 3: E, F & H.

Rev. Mycol. Paris, NS 40: 33,1976

Basionym. *Pseudoconocybe nodulospora* Hongo in J. Jap. Bot. 42: 25,1967.

*Pileus* 20-30 mm wide, 40 mm high, conical, faintly striate, dull ferruginous ochraceous with white pilosity. *Stipe* 60-70 x 4 mm, slightly swollen below ( x 6mm), dull ferruginous ochraceous, white-pilose, solid or slightly hollow, base abrupt. *Gills* ascending adnexed, narrow, very crowded, 3 ranks with about 48 primaries, pallid at first then dull ferruginous ochraceous. *Flesh* about 3 mm thick

at centre of pileus, soft, hygrophanous. *Odour* not recorded.

*Basidia* 4-spored, 22-26 x 6-8  $\mu\text{m}$ . *Basidiospores* 7-8.7 x 5.2-6.1(-6.5)  $\mu\text{m}$ , 5-6-nodulose, fairly thick-walled, orange-brown in alkaline solutions, smooth. *Cheilocystidia* 25-30 x 7.5-10  $\mu\text{m}$ , lecythiform, with apex 2.5-3.5  $\mu\text{m}$  diameter, hyaline; *pleurocystidia* absent. *Caulocystidia* 15-35 x 7-8.5  $\mu\text{m}$ , cylindrical to elongate-clavate, hyaline, intermixed with ellipsoid to subglobose cells 26-40 x 10-20  $\mu\text{m}$ . *Pileipellis* a palisadoderm of pyriform to pedicellate cells, 25-45 x 12.5-17.5  $\mu\text{m}$

*Habitat*: on rotten wood in forest.

*Material examined*. Sabah, Mt Kinabalu, Bembangan River, 1700m, 25 ii 1964, *Corner RSNB 5453*.

The nodulose basidiospores characterise the Section *Nodulosporae* and as yet there is only one known member. There is little doubt that a relationship should be sought with the strongly mitriform spored members of the genus (see below). Reference should be made to details published on the type material (Watling, 1976) with which the present collection agrees. The distribution of *C. nodulospora* is extended considerably by the present collection but this follows a pattern seen in other groups of agarics (Watling, 1992a).

Section **Pilosellae** Kiihner  
ex Singer in *Sydowia* 15: 69, 1962.

3. *C. fragilis* (Peck) Singer

Fig. 2, 1: Fig. 3, J & K.

*Acta Bot. Inst. Komarov Acad. Sci. URSS, Series 2* 6: 438 (1950)

*Basionym*: *Gatera fragilis* Peck in *Bull. Torrey Bot. Club* 24: 144 (1897).

*Pileus* 5-10 mm, conical to convex, scarcely umbonate, striate, pale fawn drab. *Stipe* 20-40 x 1-1.5 mm, concolorous with pileus, pallid and striate upwards. *Gills* ascending adnate, 3 ranks, 13-16 primaries 1-1.5 mm wide, pale cinnamon-fawn. *Flesh* characters and odour not recorded.

*Basidia* 4-spored, 17.5-25 x 7.5-10  $\mu\text{m}$ . *Basidiospores* (7.9-) 8.3-9.2(-9.6) x (4.8-)5.2-6.1  $\mu\text{m}$ , ellipsoid or very slightly amygdaliform in side-view, yellow-brown in alkaline solutions, thick-walled, smooth, with large, central germ-pore. *Cheilocystidia* 17.5-25 x 5.5-8  $\mu\text{m}$ , lecythiform, with apex 3.5-4.5  $\mu\text{m}$ , hyaline; *pleurocystidia* absent. *Caulocystidia* 15-35 x 6-8.5  $\mu\text{m}$  cylindrical to elongate-clavate, hyaline, intermixed with ellipsoid cells 25-40 x 10-20  $\mu\text{m}$ . *Pileipellis* a palisadoderm of pyriform to sphaeropedunculate cells 25-40 x 12.5-17.5  $\mu\text{m}$ .

*Habitat*: on moss on rotten wood in forest.

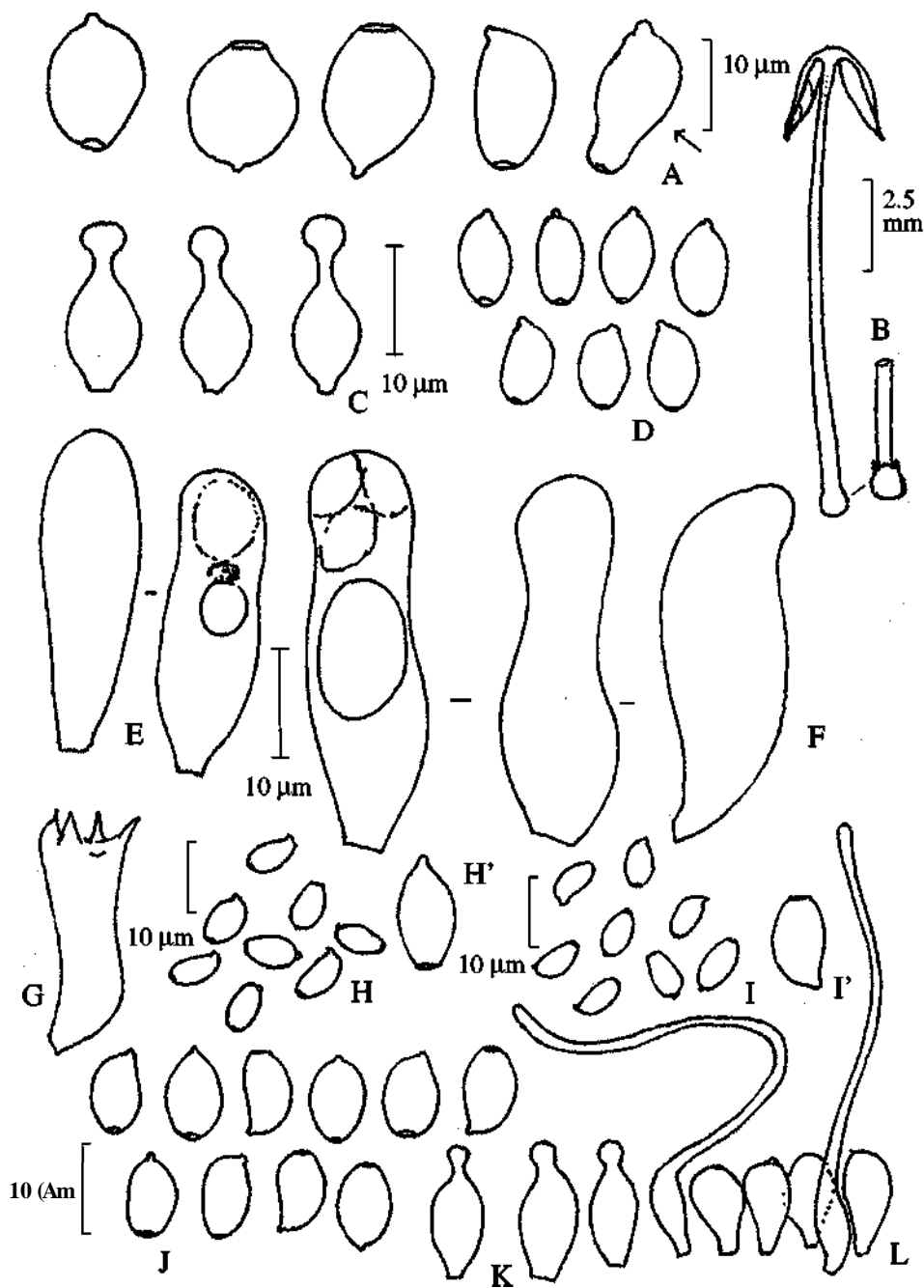


Figure 3.

*Material examined:* Sabah, Mt Kinabalu, Bembangan River, 1700m, 27 ii 1964, Corner RSNB 5512.

Although the fresh pileus is described as 'pale fawn drab' the dried material exhibits a distinct purplish tinge in accordance with Peck's type material in NY, and later descriptions (Murrill, 1917; Kuhner, 1935). Several collections from cucumber beds collected by Daams are deposited in the Leiden Herbarium (L) agree in all major details with Corner RSNB 5512. Unfortunately the production of cucumbers by using nutrient enriched straw-bales has changed (Daams 1972; pers. comm.) and the fungus has not been seen in the Netherlands as frequently (Daams, 1972).

The colour of the pileus is very distinctive and undoubtedly influenced J. Schaeffer (1930) to describe his *Galera incarnata* J. Schaeff. which is considered a synonym of the N. American agaric (Kuhner, 1935). The habitat (grassland) and colours are slightly different to that described in the British Fungus Flora Vol. 3 (Watling, 1982) although the microscopic characters are the same. This calls for cultural studies in the future.

#### 4. *Conocybe* sp. 1

Fig. 3, A-C.

*Pileus* 25 mm wide, 20 mm high, conical rather vinaceous fawn, disc browner, wholly minutely pubescent, striate. *Stipe* 100 x 1.5 mm (5 mm at base) pale brownish, tinged vinaceous, finely white fibrillose-pruinose, subvillous, subbulbous base, thinly felted as if with an adnate volva. *Gills* ascending adnate, thin, crowded 3-4 ranks, c. 24 primaries, -4 mm wide, concolorous. *Flesh* thin, almost white in stipe. *Smell* none.

*Basidia* 2-spored, 10-12  $\mu\text{m}$  broad, clavate, hyaline. *Basidiospores* (12.2-) 12.7-14 x 10.5-12.2  $\mu\text{m}$ , lenticular, flattened in side-view, almost rounded rhomboid, with central or slightly oblique germ-pore, very thick-walled, deeply pigmented in both water and aqueous alkaline solutions, smooth, a high percentage of spores drawn out into a snout and then more ellipsoid in overall shape. *Cheilocystidia* 10-12.5 x 15-17.5  $\mu\text{m}$ , lecythiform, hyaline with capitulum 2-3.3  $\mu\text{m}$  diam.; *pleurocystidia* absent. *Caulocystidia* hyaline, a mixture of filamentous cells with globose, ellipsoid or vesiculose cells forming discrete patches, a few with a capitate apex. *Ammonia reaction* negative

*Habitat:* on the ground in forest.

*Material examined:* Solomon Islands, Guadalcanal, Tsuva, 9 ii 1965, Corner RSS 1784.

The reference to the subvillous base which is thinly felted and so resembling an adnate volva emphasises the closeness of several *Conocybe* spp. of both Sect.



*Pilosellae* and Sect. *Conocybe* with those in Sect. *Singerella*. This is why the volva itself in *Conocybe* is not considered sufficient for generic separation.

The basidiospores of this collection are extremely striking in their honeydew melon-shape in face-view and the colour, viz. rich tawny even in water is probably a result of the very thick-walls. In addition a fairly significant proportion of the spores of the present collection do not have the rounded shape but are elongate elliptic with a drawn-out end (Fig. 3, A'). Before formal description can be conducted this feature must be examined in greater detail, and further collections will assist in understanding whether it is constant feature or merely an aberration.

5. *Conocybe* sp. 2.

Fig. 3, D.

*Pileus* 5-20 mm high, 7-28 mm wide, conical then plano-convex slightly umbonate, finely striate, hygrophanous, dark ferruginous cinnamon becoming fulvous honey-colour, wholly pilose with minute white hairs when fresh. *Stipe* 40-100 x 0.7-2 mm (1.5-5 mm at base) dense, straight, wholly finely white pruinose-pilose, rather striate, pale tawny to pale cinnamon ochre, white at apex and base. *Gills* adnate, thin, crowded, narrow, 3-4 ranks, 20-30 primaries, 1.5-2 mm wide, pale watery cinnamon, pallid brownish white at first. *Flesh* very thin, hygrophanous. *Smell* none.

*Basidia* 4-spored, 20-30 x 10-12.5  $\mu\text{m}$ ; *sterigmata* 2.5-3  $\mu\text{m}$  long. *Basidiospores* (8-) 8.7-10.5(-11) x (5-) 5.2-6.1(-7)  $\mu\text{m}$ , broadly ellipsoid slightly broader above  $\frac{1}{2}$ -way in face-view, amygdaliform in side-view relatively thick-walled with central germ-pore, smooth. *Cheilocystidia* lecythiform, 14-25(-26) x 6-10(-11)  $\mu\text{m}$ , with neck 2-3  $\mu\text{m}$  long surmounted by capitulum 2.5-5  $\mu\text{m}$ , thin-walled, hyaline. *Caulocystidia* grouped in bunches, filamentous hair-like 52-105 x 2.2-3.5  $\mu\text{m}$ , hyaline or honey-coloured, intermixed with some ellipsoid or ovoid cells. *Ammonia* reaction negative.

*Habitat*: on elephant dung in forest.

*Material examined*: Johore, Mawi, v 1940, Corner - *Galera*-3

In his notes Corner compares this collection with *C. huijsmanii* Watl. (as *Galera* -2) but the basidiomes are more strongly coloured with purple tinge around the pileus-margin; the basidiospores are also smaller. It is described by the collector as nocturnal. Many species of *Conocybe* and *Bolbitius*, and *Coprinus* develop overnight even in Europe; in the tropics this is accentuated and occurs in several additional genera eg. *Russula* sect. 'Pelliculariae' in W. Africa; *Leucocoprinus*.

The basidiospores under the microscope are rather dull coloured for a member of the genus *Conocybe*, but the structure of the pileipellis, presence of lecythiform

cheilocystidia and general facies do not place this in *Agrocybe*. There are several genera which are now known to contain a few species in which the spore-print colour diverges from the 'norm' or the classically accepted, eg. *Bolbitius* aff. *nobilis* Peck from N. America (Singer 1986) with dull brown spores, *Psathyrella sarcocephala* (Fr.: Fr.) Sing, with pink spores. It should be noted that *Psathyrella michiganense* Smith even with its dull spore-print is closer to *Conocybe* spp. than it is to members of the genus *Psathyrella*, where a special section had to be erected for it (Singer, 1951).

### Section *Conocybe*

(= *Farinosae* p.p. Kiihner, 1935)

#### 6. *Conocybe mitrispora* Watling *nov. sp.*

Fig. 2. G. & J.

*Pileus* 20 mm conico-campanulatus obscureo-umbrinus siccate pallidoferrugineus. *Stipes* < 80 x 2.5 mm pruinoso-striatus concolores radicatus. *Lamellae* adnexae confertae subferrugineae. *Basidia* 4-sporigera. *Sporae* mitriformes (7.4-)7.9-8.7 x (6.1-)6.5-7.4 (-7.9)  $\mu\text{m}$ . *Poro* germinativo. *Cystidia* aciei lamellarum lecythiformia 22.5-25 x 10-12  $\mu\text{m}$  capitula 4-5  $\mu\text{m}$  lata.

Ad humum in silva. Holotypus: Sabah, Corner - 'Galera - Borneo' in Herb E

*Pileus* 20 mm wide, 15 mm high, conico-campanulate, dingy umberferruginous, drying light fawn ferruginous. *Stipe* - 80 x 2.5 mm, wholly finely pruinose and striate, concolorous to pileus but paler slightly rooting at base. *Gills* - 3 mm wide ascending, adnexed 3-4 ranks, 30 primaries, crowded, thin, light fawn cinnamon or subferruginous.

*Basidia* 4-spored. *Basidiospores* mitriform with distinct truncate germ-pore, (7.4-)7.9-8.7 x (6.1-)6.5-7.4(-7.9)  $\mu\text{m}$ , thick-walled, rich golden yellow in water, darker in aqueous alkaline solutions, smooth. *Cheilocystidia* numerous, lecythiform, thin-walled, hyaline, 22.5-25 x 10-12.0  $\mu\text{m}$ , with distinct neck - 6.5  $\mu\text{m}$  long, surmounted by capitulum 4-5  $\mu\text{m}$  diam. enveloped by a mucilaginous, drop-5.5  $\mu\text{m}$  broad. *Caulocystidia* in groups, lecythiform, thin-walled, hyaline, < 15 x 6-7.5  $\mu\text{m}$ , with tapered neck and capitulum 3-3.5  $\mu\text{m}$  diam. *Ammoniacal reaction* negative.

*Habitat*: in humus in forest.

*Material examined*: Sabah, Mt Kinabalu, 1200m. 1 viii 1961, solitary, legit Corner as 'Galera - Borneo'

The collector indicated that this collection agreed with *G. tenera* (ie *Conocybe tenera* (Schaeff.: Fr.) Fayod) a group with which he would have been familiar in Europe.

The mitriform basidiospores have apparently evolved in *Conocybe* in unrelated groups. The present fungus in virtue of its lecythiform caulocystidia and negative

reaction with ammoniacal solutions is related to the *C. rickeniana* Sing, ex Orton group. However, in Queensland the author has found a species of *Conocybe* with a similar spore-shape but it is a member of Section Pilosellae. Similar spore-shape is found in *C. lentispora* Singer (Section Pilosellae) and *C. lenticulospora* Watling (Section Pilosellae).

Section **Candidae** Kiihner ex Singer

*Sydowia* 15: 69, 1962

7. ***Conocybe huijsmanii*** Watl.

Norw. J. Bot. 3 262, 1993.

Fig. 2, M.

**var. *conica*** Watling *var. nov.*

Fig. 2, K, N--P.

A typo differt pileo ad conicum. Holotypus: Kepong, Malaysia, *Watling 24446* in £.

*Pileus* 10-25 mm wide/10-15 mm high, conical retaining acute apex even when collapsing, minutely pubescent at first then smooth, minutely tomentose, faintly sulcato-striate on outer limb, fawn ochraceous with persistent darker ochraceous or ochre centre, paler towards margin to become pale ochraceous clay-colour, drying pale ochraceous tan with darker centre and slightly rugulose towards margin. *Stipe* 40-100 x 1-2 mm, cylindric with slightly thickened or bulbillose base (2-4 mm diam.), straight, hollow, very fragile wholly finely cottony pubescent, becoming smooth, white, at most pallid. *Gills* 1-2 mm wide slightly adnexed, narrow, linear, crowded, thin, 3-4 ranks, 16-36 primaries, pale cinnamon fawn; edge white. *Flesh* 0.5-0.8 mm thick in the centre of pileus, very thin over limb, hygrophanous, very fragile, white in stipe, pallid in pileus. *Odour* none.

*Basidia* 4-spored, 17-24.5 x 8-10.5 µm. *Basidiospores* (8.5-) 11-13 x (6.7-)-7.5 (-9) µm; broadly ellipsoid to slightly lenticular, often slightly broader in lower half, deep golden yellow in water, with rust tawny tinge in aqueous alkaline solutions, thick-walled with prominent central germ-pore, smooth. *Cheilocystidia* lecythiform, 20-30 x 7-15 µm, with capitulum 5-7 µm diam., hyaline, thin-walled. *Pleurocystidia* absent replaced by abundant brachycystidia 17.5-22 x 8-11 µm. *Pileipellis* a hymeniderm of clavate-pedicellate cells, 15-40 µm diam., with scattered, thin-walled, hyaline, flexuous, filamentous pileocystidia. *Caulocystidia* similar to pileocystidia, flexuous, filamentous but at stipe-apex mixed with some thin-walled, hyaline, lecythiform cells similar to cheilocystidia, 21-32 x 8-13.5 µm.

*Habitat*: in grass of lawns; sometimes amongst *Ischaemum*.

*Material examined*: Singapore, Botanic Gardens, 27 ix 1934, legit Corner as *Galera 2* (supported by coloured illustration from 30 Cluny Road 2 vii 1940); Nelgeri Selangor, Kepong, Library lawns, 10 iii 1992, *Watling 24446* (Holotype in E); Kepong, 12 iii 1992, *Watling 24448*; Kepong, playing fields, 11 iii 1992;

Kuala Lumpur, Tourist Centre lawn, 25 iii 1992, *Wading* 24447.

This agaric grows immediately following rain showers especially after dry periods, and might be expected throughout the region. It grows scattered on lawns. Although *C. huijzmanii* was described from Europe this variety is widespread in other tropical areas (see Watling 1992); the coloured illustrations in Dennis (1953 as *C. crispa*) agree with the author's collections and with the painting accompanying Corner's material. It is neither *C. crispa* (Longyear) Singer which differs in its crisped gills, 2-spored basidia, nor *C. lactea* which has a non-expanding (Fig. 3, L.) cylindrical pileus. The later also grows in Australasia in grass on lawns; a collection by the author is available in *E* from the Governor's House lawn, Adelaide, south Australia. It retains all the characters typical of European material.

Corner in his field notes drew attention to the similarity to *Bolbitius* in the rapidly collapsing, thin-fleshed pileus. Indeed in the author's collections the pileus has collapsed on pieces of paper to give what looks now only like an outline. The presence of brachycystidia in the hymenium supports a placement in *Bolbitius* and indeed Bon (1992) transferred this group from *Conocybe* to *Bolbitius*. Since the cheilocystidia and some caulocystidia are lecythiform (symmetric) and not simply capitate as one sees in *Bolbitius*, and since the pileus pigment is membranal not vacuolar, a placement in *Conocybe* is preferred. As the present fungus is so common, it is likely that it has been described before and two possible candidates are *Galera grisea* Earle and *G. simulans* Earle (see Murrill, 1917) which have been synonymised with *G. crispa*. The problems of typification of *G. crispa* have been discussed earlier (Watling, 1992b).

Subgenus **Pholiotina** (Fayod) Ktihner

Le Genre *Galera*, 139, 1935

## 8. *Conocybe* sp. 3

Fig. 3, E-H.

*Pileus* -25mm, convex, subviscid, smooth, striate at the margin, umber brown, then fawn ferruginous in centre, pallid fawn ochraceous towards margin with whitish fibrillose-membranous, evanescent, appendiculate veil. *Stipe* 30-35 x 2mm, cylindrical, slightly fibrillose white and satiny fibrillose then pale dingy sub-ochraceous. *Gills* sinuate-adenate or adenate-decurrent rather crowded, thin, 3-4 ranks, 18-36 primaries, -3mm wide pallid whitish then fawn drab to pale fuscous umber. *Flesh* hygrophanous, concolorous with pileus. *Smell* slight.

*Basidia* 4-spored, 56-65 x 7-8  $\mu\text{m}$ , hyaline or slightly honey-coloured. *Basidiospores* 7-9.6 x 4.4-6.1  $\mu\text{m}$ , elliptic in face-view, slightly amygdaliform in side-view, fairly thick-walled, smooth with central germ-pore. *Cheilocystidia* elongate fusiform to utriform, 24-33 x 8.6-9.6  $\mu\text{m}$  venter hyaline to pale honey-coloured often with amorphous material within, 9-11.5  $\mu\text{m}$  broad. *Caulocystidia*,

long, filamentous, hair-like, 79-122 x 3.5-3.9  $\mu\text{m}$ . *Pileipellis* a collapsed hymeniderm with rounded cells, 8.5-26.5  $\mu\text{m}$  diameter (x 32.5  $\mu\text{m}$ ) intermixed and seated on filamentous units and with a few superficial, clamped, red-brown hyphae scattered on surface.

*Habitat*: in small groups in river gravel and on humus and on sticks.

*Material examined*: Sabah, Mt. Kinabalu, Mahamed River, 1300m, 3 viii 1961, Corner as *Naucoria* RSNB 1604.

This species is distinctive in the elongate fusiform to elongate citriform cheilocystidia which are often filled with honey-yellow amorphous material; some may even be slightly encrusted. In this character the species resembles the *Agrocybe putaminum* group but because of the delicate nature of the pileus and stipe a placement in *Conocybe* is at present preferred. Unfortunately the pileipellis is collapsed but there is ample evidence of some former velar development. Hyphal fragments, some clamp-connected, have been seen on the surface of the pileipellis in a similar fashion to those in *C. brunnea* (J. Lge. & Kiihner) ex Watling which is a member of subgenus *Pholiotina* (Watling, 1971). The cheilocystidia except for the inclusions parallel the equivalent structures in several members of this subgenus.

#### Subgenus **Piliferae** (Kiihner ex Singer) Watling

Notes Roy, Bot. Gdn., Edinb. 26: 289-323, 1965

#### 9. *Conocybe* sp. 4

Fig. 3,1 & I\

*Pileus* 7-12 mm wide, convex then plane, strongly umbonate, smooth, dry, bay brown when moist with blackish umbo, becoming cinnamon honey-colour with brown umbo on drying; margin slightly incurved at first, becoming straight and splitting radially. *Stipe* 16-24 x 1-1.5 mm at apex, 2-2.5 mm at base, cartilaginous, solid or with loose pith, rather tough, smooth, dark fuscous bay; base abrupt. *Gills* adnexed, scarcely crowded, thin, dry, firm, 3-4 ranks, 18-20 primaries, 1-1.5 mm wide, cinnamon honey-colour or tawny ochraceous. *Flesh* c. 1 mm thick beneath disc, rather tough, hard, concolorous when moist, drying pale yellowish in pileus; *smell* radishy and earthy not strong.

*Basidiospores* (5.2-)5.5-6(-6.5) x 3.5-4  $\mu\text{m}$ , ellipsoid-amygdaliform in side-view, elongate ovoid in face-view, smooth with relatively thick wall and central germ-pore slightly truncate at base, yellow tawny in water, rich orange tawny in aqueous alkaline solutions. *Basidia* 4-spored, clavate, hyaline 18-23 x 5-6  $\mu\text{m}$ ; *sterigmata* < 3  $\mu\text{m}$  long. *Cheilocystidia* 20-30 x 3-5  $\mu\text{m}$ , subcylindric-clavate to elongate, sometimes flexuous, not capitate, thin-walled, hyaline; *pleurocystidia* absent. *Pileipellis* collapsed; some sphaeropedunculate cells 8.7-12.5  $\mu\text{m}$ . *Stipitipellis* of parallel, compact hyphae 7-15  $\mu\text{m}$  broad with yellowish walls,

darker towards the cortex. *Gill trama* of very compact, pale yellowish hyphae 4-8  $\mu\text{m}$  broad. *Clamp-connections* present.

*Habitat*: on mouldy earth and woody remains around very rotten stump in secondary forest.

*Material examined*: Singapore, Reservoir Jungle, 28 iv 1931, legit Corner as *Naucoria 2b*.

This collection, typified by a rather tough consistency and tiny amygdaliform basidiospores, belongs in this subgenus because of the subcylindric-clavate to elongate sometimes flexuous, non-capitate, thin-walled, hyaline cheilocystidia. This combination of characters is unknown in subgenus *Piliferae* and must be recorded; the specimens unfortunately are not suitable to designate as type-material.

### References

- Berkeley, M.J. (1843). Enumeration of Fungi collected by Herr Zeyher in Uitenhage. *Hooker's London J. Bot.* 2: 507-527.
- Bon, M. (1991). Novitates - 1 (Cortinariaceae et aff.) Espèces "galero-naucorioides" stat. et comb. nov. *Documents Mycologiques* 21(83) 37-39.
- (1992). Cle monographique des especes Galero-Naucoroides. *Documents Mycologiques* 21(84) 1-89.
- Daams, J. (1972). De Mycoflora in Komkommerskassen. *Coolia* 15: 145-155.
- Dennis, R.W.G (1953). Les Agaricales de File de la Trinite Rhodosporae-Ochrosporae. *Bulletin Societe Mycologique de France* 69; 145-198.
- Henderson, D.M., Orton, P.D. & Watling, R. (1969). *British Fungus Flora. Agarics and Boleti: Introduction* HMSO, Edinburgh 58 pp.
- Hong, T. (1959). Agaricales of Japan (1)1. *Memoirs Faculty Liberty Arts Education, Shiga University Nat. Sci.* 9: 47-94.
- Josserand, M. (1952). *La description des champignons supérieurs: technique descriptive, vocabulaire rdisonnée du descripteur*. Paris, Lechevalier: 338 p.
- Kiihner, R. (1931). *Le Genre Galera*, Paris.
- Morgan, A.P. (1895). New North American fungi. *J. Cincinnati Soc. for Nat. Hist.* 18:3645.
- Murrill, W.A. (1912). The Agaricaceae of Tropical North America - V. *Mycologia* 4:72-83.

- (1917). *North American Flora* - Agaricales - Agariceae subtribe Pholiotinae. 10(3) 145-226.
- Peck, C.H. (1893). Report of the State Botanist. *Ann. Rep. New York State Mus. Nat. Hist.* 46: 1-69.
- Reid, D.A. (1975). Type Studies of the larger Basidiomycetes described from Southern Africa. *Contributions from the Bolus Herbarium!*: 1-225.
- Saccardo, P.A. (1887). *Sylloge Fungorum* 5: 1-1146, Patavii.
- Schaeffer, J. (1930). Die Sammethaubchen (*Galera*). *Zeitschrift für Pilzkunde* 14(9): 163-174.
- Singer, R. (1936). Studien zur Systematik der Basidiomycetes I & II. *Beihefte zum Botanischen Centralblatt* 56. Abt. B. 137-174.
- (1951). The Agaricales in Modern Taxonomy. *Lilloa* 22 (1949): 1-832.
- (1968). Sand-dune inhabiting fungi of the south Atlantic coast from Uruguay to Bahia, Brazil. *Mycopathologia et Mycoapplicata* 34: 129-143.
- (1969). Mycoflora Australis. *Beih. Nova Hedw.* 29: 1-405.
- (1978). Keys to identification of the species of Agaricales I: *Agrocybe Sydowia* 30 (1911): 194-200.
- (1986). Agaricales in Modern Taxonomy, Ed. 4, 1-981, Koeltz Königstein.
- & Hausknecht, A. (1989). *Conocybe horana* - eine neue Art mit Volbv aus Österreich. *Beiträge zur Kenntnis der Pilze Mitteleuropas* 5: 87-91.
- Watling, R. (1971). The genus *Conocybe* subgenus *Pholiotina* II. *Persoonia* 6: 313-339.
- (1979). Observations on the Bolbitiaceae XV. The taxonomic position of those species of *Conocybe* subgenus *Pholiotina* II. *Persoonia* 6: 313-339.
- (1982). *British Fungus Flora: Agarics & Boleti*. Vol. 3. Bolbitiaceae 1-139, Her Majesty's Stationery Office, Edinburgh.
- (1992a). *Report to Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH*. Edinburgh 11 pp.
- (1992b). Observations on the Bolbitiaceae 30. Some Brazilian taxa, *Boleyn Societ argentina Botanica* 20: 77-103.
- & Gregory, N.M. (1981). Census Catalogue of World Members of the Bolbitiaceae. *Bibliotheca Mycologica* 82: 1-224.