

KEYS TO THE TASMANIAN FAMILIES AND GENERA OF GILLED FUNGI

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INTRODUCTION

The taxonomy of the macrofungi of Tasmania has, in comparison with the members of the Plant Kingdom, been largely neglected. The higher flora of Tasmania has had a comprehensive treatment dating back to Rodway (1903). The bryophytes (mosses and liverworts) also received attention in a series of papers and booklets issued by the Royal Society of Tasmania beginning with Bastow (1886-1888); and interest in the study of lichens was also shown in the 19th century (Wilson 1893). There is a conspicuous absence of any concerted taxonomic effort for fungi in both the 19th and 20th centuries. Leonard Rodway, as a keen collector and observer of natural history, might have been expected, as Government Botanist, to study the macrofungi. However, he appears to have confined his written output to about a dozen short papers published between 1898-1929 (see May and Wood, 1997, for a list of these).

A consequence of this neglect of systematics is that there do not appear to be any keys available to Tasmanian macrofungi which would enable interested parties, whether they be amateur naturalists, Landcare project participants or professionals such as ecologists, forest managers, plant pathologists, medical practitioners, etc., to classify a given collection to the level of family and genus. For most collections, it would be difficult to go beyond determining the correct genus, since the vast majority of Australian macrofungi have been neither named nor described. Wood (1979) produced a key to the gilled fungi of Australia (Order Agaricales) but that work was based mainly on material collected in New South Wales and did not group the genera into families.

BOUNDARIES OF THE FAMILIES AND GENERA OF AGARICS

There has been considerable controversy amongst taxonomists as to which families and genera should be included in the Agaricales. Thus, R. Singer, arguably the most notable agaricologist of his day, included the families Polyporaceae and Boletaceae, which generally have tubes with pores rather than lamellae for their

spore-bearing surfaces (Singer 1986). Other taxonomists vary in the extent to which they agree with him. In addition to this, the study of ribosomal DNA in fungal genes is resulting in profound changes in the taxonomy of the Agaricales. For example, as a result of recent molecular phylogenetic research, the genus *Coprinus* has been reduced to a handful of species and transferred to the Agaricaceae, with the majority of species shifted to three other genera, viz. *Coprinellus*, *Coprinopsis* and *Parasola*, which are part of a newly proposed family Psathyrellaceae (Redhead *et al.* 2001).

Other taxonomic upheavals which are supported by molecular research include the notions that (1) *Lentinus* is more closely related to polypores than to other gilled fungi (Hibbett and Vilgalys 1991), (2) the white-spored family Lepiotaceae is closer to the dark-spored families Agaricaceae and the new Psathyrellaceae (see above) than to other white-spored families (Moncalvo *et al.* 2000), and (3) the Russulaceae is sufficiently far removed from the Agaricales to be placed in a separate order (see Hawksworth *et al.* 1995). In Australia, the use of restriction fragment length polymorphisms and more sophisticated molecular techniques is aiding the clarification of generic and subgeneric relationships, for example, in *Cortinarius* and *Dermocybe* (Chambers *et al.* 1999). Nevertheless, it is still early days in the use of these advanced techniques and there may be surprises yet to come. Redhead (2001) has cautioned against a premature adoption of the proposed name changes, recommending a "wait and see" attitude while data are accumulated and theories are tested. In this study, we choose a conservative taxonomic approach and use, in most instances, the traditionally accepted names for families and genera.

Opinions about the generic positions in families of the Agaricales change continually, making decisions difficult as to which family to include some genera. For example, *Tubaria* has been placed variously in the Crepidotaceae, the Strophariaceae and the Cortinariaceae (Singer 1986; Grgurinovic 1997; Bougher and Syme 1998), depending upon the emphasis placed upon the various macroscopic and microscopic characters. The use of modern techniques of molecular biology may or may not resolve these arguments.

The authors have chosen to adopt, with some minor modifications, the classification scheme for genera within families of Bougher and Syme (1998), who mostly follow the eighth edition of the Dictionary of the Fungi (Hawksworth *et al.* 1995). That limits the Agaricales to 16 families, of which 15 (all but Gomphidiaceae) occur in Australia (see Bougher and Syme 1998, table 10). Mycologists have

described more genera than those dealt with in this paper, some of which may contain only a single species or a handful of species, whereas other mycologists recognise fewer genera in some families. For example, in Entolomataceae, the five genera listed in Table 5 are probably the ones most likely to be encountered. Another genus, *Alboleptonia*, is sometimes used, e.g. by Bougher and Syme (1998, pp. 222-3). On the other hand, some authors (e.g. Singer 1986) recognise only three genera in this family, viz. *Entoloma*, *Clitopilus* and *Rhodocybe*, these genera having widely different spore shape and/or ornamentation.

Hygrophoraceae is another example of disagreement amongst mycologists. Some authors, e.g. Young and Wood (1997), recognise only a few genera, these being *Hygrophorus* (which may be limited to a single species, viz. *H. involutus*, in Tasmania), *Hygrocybe* (for the vast majority of species within the family) and *Camarophylloopsis* (= *Hygrotrama*, which accommodates a small number of species with a pileipellis that is almost cellular in nature). Conversely, some mycologists (e.g. Horak 1990) split *Hygrocybe* into segregate genera such as *Bertrandia*, *Camarophyllus*, *Gliophorus*, *Humidicutis*, and several others.

THE KEYS

Since the aim here is to provide keys to help the reader identify a given collection to the level of genus, the first step is to determine its correct family. All of the keys are to be seen as "Artificial Keys", i.e. intended to bring the user to the correct family and genus without making any statement about phylogeny. The family and genus to which a species belongs should be recognised primarily by the physical appearance of the fruit body, rather than by the DNA content of the genome. Thus, a *Tricholoma* should be identified by its tricholomatoid habit, its white spore mass, and its lack of an annulus (for almost all species). We recognise, however, that macroscopic features cannot give a complete story, and we have included two microscopic characteristics, viz. the type of pleurocystidia, if present, and whether the spores have a germ pore.

The keys to the families as presented here are summarised in four tables, viz. Table 1 for spore print colour, Table 2 for species having velar remnants, Table 3 for species having an obvious germ pore in the spore wall, and Table 4 for species with pleurocystidia. Use of Tables 1 and 2 relies upon macroscopic characters that may be observed with the naked eye or with a hand lens, while use of Tables 3 and 4 requires a good compound microscope. The taking of a spore print from a mature fruiting body is a routine and important aid in taxonomy both for the novice

and for the experienced. It was at one time almost the sole basis for classification, being the cornerstone of the system devised in the 19th century by the "father of mushroom taxonomy", Elias Fries, who became Professor of Systematic Botany at Uppsala University, Sweden. Although nowadays it is only one of the tools available, it is still an important indicator of the correct family position, recognised by Singer (1986), who devotes the opening pages to this character.

The presence of partial veil remnants such as an annulus on the stipe can be a useful indicator of family, as can the remains of a universal veil, especially if it leaves a volva at the base of the stipe. Whilst spore shape, size and ornamentation are critical aids to correct identification, the presence or absence of an obvious germ pore helps narrow the range of choices. The shape, size and nature of the cheilocystidia and pleurocystidia offer additional tools for correct identification. We choose here to base Table 4 on the pleurocystidia, since these are often more obvious than the cheilocystidia.

After keying to the correct family using Tables 1-4, the reader may then employ Table 5 to determine the correct genus, taking into account the following considerations. Different authors treat Crepidotaceae very variably. Some include *Gymnopilus*, *Galerina* and *Tubaria* in this family (e.g. Courtecuisse and Duhem 1995). In this paper we include only the genus *Crepidotus*, which has a pleurotoid habit, i.e., occurring on wood with a reduced or absent stipe. In the family Paxillaceae, the genus *Tapinella* is sometimes recognised, e.g. by Grgurinovic (1997) and Bougher and Syme (1998), but we follow Singer (1986), who places it in synonymy with *Paxillus*. We have placed the ochraceous-spored *Ripartites* in the family Cortinariaceae, following Largent and Baroni (1988), but other authors (e.g. Courtecuisse and Duhem 1995) put it into the Tricholomataceae. We have also chosen to put *Tubaria* in the Cortinariaceae. Although Largent and Baroni (1988) place *Pseudobaeospora* in the Lepiotaceae, we follow Courtecuisse and Duhem (1995) and Bas (1995) in putting it into the Tricholomataceae.

A glossary of mycological terms is given in the Appendix. Additional definitions may be found in mycological dictionaries, e.g. Snell and Dick (1971) and Ulloa and Hanlin (2000). As the colour of fungi may be an ambiguous character, colour charts are useful. A commonly used one is Kornerup and Wanscher (1978).

TABLE 1

Key to the families of Agaricales in Tasmania, based on spore print colour

- | | |
|--|----------------------------|
| 1.a) Spore print white (or buff, ochraceous or a shade of lilac) | 2 |
| 1.b) Spore print darker than white (i.e. some shade of pink, brown or black, including purple-brown and purple-black) | 7 |
| 2.a) Universal veil leaving remnants in the form of warts or patches on pileus and/or forming a volva at base of stipe | Amanitaceae |
| 2.b) Neither warts nor volva present | 3 |
| 3.a) Veil present, usually forming an annulus on the stipe, or if not, then stipe scaly below the veil; lamellae typically free from the stipe | Lepiotaceae |
| 3.b) Veil absent, or if present, then lamellae not free | 4 |
| 4.a) Lamellae and/or flesh exuding latex when cut or broken and/or stipe snapping like chalk when pressure is applied; pileus and stipe tissue containing rounded cells called sphaerocysts; spores globose to subglobose with amyloid warts or ridges | Russulaceae |
| 4.b) Not combining the above features | 5 |
| 5.a) Lamellae with a waxy feel or texture, thick and distant; basidia length at least 5.5 times the spore length | Hygrophoraceae |
| 5.b) Lamellae not normally waxy; ratio of basidia length to spore length generally less than 5.5 | 6 |
| 6.a) Lamellae decurrent, close, usually forked dichotomously, typically some shade of orange or yellow; pileus and stipe also with some shade of orange or yellow | Hygrophoropsidaceae |
| 6.b) Lamellae various, and if decurrent, not repeatedly forked | Tricholomataceae |
| 7.a) Spore print pink (or may approach sordid reddish) | 8 |
| 7.b) Spore print darker than pink (i.e. some shade of brown or black) | 10 |
| 8.a) Lamellae free at maturity; spores not angled | Pluteaceae |
| 8.b) Lamellae attached at maturity; spores angled or not | 9 |
| 9.a) Spores lacking angles | Tricholomataceae |
| 9.b) Spores angled, either in side view or end view (may be bumpy, warted or ridged when seen in side view) | Entolomataceae |
| 10.a) Lamellae free from stipe; spore print deep brown, chocolate-brown or purple-brown | Agaricaceae |
| 10.b) Lamellae not free; spore print some shade of brown or black, including purple-brown and purple-black | 11 |

11.a) Stipe absent or much reduced, usually growing shelf-like on wood; spore print brown or cinnamon-brown	Crepidotaceae
11.b) Stipe present; on wood or soil; spore print a darker shade of brown or black	12
12.a) Pileipellis typically cellular; spores usually smooth, typically having a germ pore	13
12.b) Pileipellis typically filamentous (but may be hymeniform, as in <i>Descolea</i>); spores smooth or ornamented, and may or may not have a germ pore	14
13.a) Spore print medium brown	Bolbitiaceae
13.b) Spore print deep brown to black or purplish brown	Coprinaceae
14.a) Lamellae typically decurrent, often forked or with cross-veins or pores near the stipe; annulus absent	Paxillaceae
14.b) Lamellae rarely decurrent, neither forked nor veined nor with pores near the stipe; annulus sometimes present	15
15.a) Spores mostly elliptical and smooth, typically with a germ pore, although sometimes difficult to discern	Strophariaceae
15.b) Germ pore absent	Cortinariaceae

TABLE 2

Key to the families of Agaricales in Tasmania, for species having velar remnants

1.a) Remnants of partial veil prominent, generally thick, forming a membranaceous annulus on the stipe, sometimes distinctly flaring, persistent	2
1.b) Remnants of partial veil not membranaceous, often fleeting, although they may be prominent, as in various cortinate veils	9
2.a) Spore print white or yellowish cream	3
2.b) Spore print some shade of brown, black, purple-brown or purple-black	6
3.a) Annulus accompanied by a volva in the form of a sack, collar, concentric scales, a free rim or a swollen, spongy base to stipe	Amanitaceae
3.b) Fruiting body lacking a volva at base of stipe	4
4.a) Stipe with lower portion covered by mealy scales	Tricholomataceae: <i>Cystoderma</i>
4.b) Stipe without mealy scales	5
5.a) Lamellae typically free	Lepiotaceae
5.b) Lamellae attached	Tricholomataceae: <i>Armillaria</i>

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- 6.a) Lamellae free; spore print chocolate brown; pileipellis filamentous
Agaricaceae
- 6.b) Lamellae attached; spore print various shades of brown or black 7
- 7.a) Spores smooth, with a germ pore 8
- 7.b) Spores neither smooth nor with a germ pore
Cortinariaceae: Rozites and Descolea
- 8.a) Fruiting body autodigesting to form an inky residue
Coprinaceae: Coprinus
- 8.b) Fruiting body not autodigesting **Bolbitiaceae: Agrocybe and Conocybe**
- 9.a) Spores typically with a germ pore, although it may appear to be indistinct
Strophariaceae
- 9.b) Spores lacking a germ pore 10
- 10.a) Spores oblong, walls minimally ornamented
Cortinariaceae: Galerina and Tubaria
- 10.b) Spores amygdaliform, walls variously ornamented, ranging from minimally to coarsely warted
Cortinariaceae: Gymnopilus and Cortinarius (incl. Democybe)
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TABLE 3

Key to the families of Agaricales in Tasmania, for species having spores with an obvious germ pore

- 1.a) Spore print white **Lepiotaceae**
- 1.b) Spore print some shade of brown or black, including purple-brown and purple-black 2
- 2.a) Pileipellis typically filamentous 3
- 2.b) Pileipellis cellular 4
- 3.a) Lamellae free (or nearly free) at maturity **Agaricaceae**
- 3.b) Lamellae attached, usually adnate to adnexed, rarely decurrent **Strophariaceae**
- 4.a) Spore print dull brown, medium brown, cinnamon-brown or rusty brown, never a deep brown or purple-brown or purple-black **Bolbitiaceae**
- 4.b) Spore print deep brown to black or purple-brown or purple-black **Coprinaceae**

TABLE 5
Key to Genera of Agaricales in Tasmania

Agaricaceae

- 1.a) Spores brown under the microscope, smooth *Agaricus*
 1.b) Spores pale amber or sepia under the microscope, finely punctate; pileus and
 stipe granular-mealy *Melanophyllum*

Amanitaceae

- Pileus usually with warts (remnants of universal veil), dry or slightly viscid; stipe
 neither viscid nor glutinous *Amanita*

Bolbitiaceae

- 1.a) Fruiting body small to medium-sized; pileus often cracked at maturity; stipe
 usually pliant *Agrocybe*
 1.b) Fruiting body small; pileus not cracking; stipe usually slender, fragile and
 hollow 2
 2.a) Pileus viscid, margins striate; stipe white (rarely pink) throughout; annulus
 absent *Bolbitius*
 2.b) Pileus dry, often conical or campanulate; stipe often coloured, sometimes with
 a moveable annulus *Conocybe*

Coprinaceae

- 1.a) Lamellae parallel-sided, crowded, autodigesting *Coprinus*
 1.b) Lamellae wedge-shaped, close, not autodigesting 2
 2.a) Spores discolouring in concentrated H₂SO₄; usually wood-inhabitants
Psathyrella and *Lacrymaria*
 2.b) Spores not discolouring in H₂SO₄; usually on dung, enriched soil or grass;
 lamellae often mottled *Paneolus*

Cortinariaceae

- 1.a) Spore print dull brown, tobacco brown, milk-coffee brown or ochraceous
 brown, but not rusty brown 2
 1.b) Spore print rusty brown (although some species of *Cortinarius* may have
 pale brown or yellow-brown spores) 8
 2.a) Stipe radicating, the base swollen, then gradually tapering; lamellae deeply
 adnexed to free, often with lilac hues *Phaeocollybia*
 2.b) Stipe not radicating; lamellae more distinctly attached 3
 3.a) Spore print ochraceous or some shade of light brown 4
 3.b) Spore print some shade of dull brown or medium brown 7

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- 4.a) Spores globose or subglobose, spiny *Ripartites*
- 4.b) Spores oblong, amygdaliform or phaseoliform, surface smooth or warty 5
- 5.a) Hyphae of the pileipellis forming a cutis *Tubaria*
- 5.b) Pileipellis hymeniform, or of cellular structure to some degree 6
- 6.a) Stipe with a loose, striate annulus; spores warty-rough *Descolea*
- 6.b) Stipe lacking an annulus; spores smooth *Simocybe*
- 7.a) Pileus usually dry, pileipellis fibrillose, radially cracked or with upturned scales; lamella edge usually paler than lamella face due to cystidia; spores smooth or nodulose *Inocybe*
- 7.b) Pileus usually viscid; spores usually warty-rough, with a callus at the apex *Hebeloma*
- 8.a) Typically on wood 9
- 8.b) Terrestrial, rarely or never directly on wood (except for *Galerina patagonica*) 10
- 9.a) Spores minimally ornamented; fruiting body fragile, on twigs and small branches *Phaeomarasmius*
- 9.b) Spores usually distinctly warty; fruiting body more substantial, on logs and stumps *Gymnopilus* (incl. *Pyrrhoglossum*)
- 10.a) Lamellae adnexed to adnate; cheilocystidia always present *Galerina*
- 10.b) Lamellae usually emarginate; cheilocystidia typically absent or inconspicuous 11
- 11.a) Partial veil membranaceous *Rozites*
- 11.b) Partial veil absent, or if present, cortinate 12
- 12.a) Partial veil absent; pileus and stipe usually squamose or squamulose *Cuphocybe*
- 12.b) Partial veil cortinate; pileus rarely squamulose *Cortinarius* and *Dermocybe*

Crepidotaceae

- Stipe absent or much reduced, usually growing shelf-like on wood; spore print usually brown or cinnamon-brown *Crepidotus*

Entolomataceae

- 1.a) Stipe lateral, reduced or absent; largely wood-inhabitants *Claudopus*
- 1.b) Stipe present, usually central; on soil or wood debris 2
- 2.a) Spores angular in end view only; lamellae usually adnate to decurrent 3
- 2.b) Spores angular in side view; lamellae variously attached 4

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|---|-------------------|
| 3.a) Spores longitudinally ridged in side view | <i>Clitopilus</i> |
| 3.b) Spores warty or bumpy in side view | <i>Rhodocybe</i> |
| 4.a) Pileus scaly or hairy and base of stipe strigose | <i>Pouzarella</i> |
| 4.b) Not combining the above features | <i>Entoloma</i> |

Hygrophoraceae

- | | |
|---|-------------------------|
| 1.a) Pileipellis of inflated hyphae arranged in a hymeniform layer or palisade, usually dry | <i>Camarophyllopsis</i> |
| 1.b) Pileipellis of non-inflated hyphae, viscid or not | 2 |
| 2.a) Pileus viscid, stipe dry; lamellar trama divergent | <i>Hygrophorus</i> |
| 2.b) Pileus and stipe variably dry to viscid; lamellar trama regular to irregular | <i>Hygrocybe</i> |

Hygrophoropsidaceae

- Spore print white to yellowish white; lamellae decurrent, close, with some dichotomous forking *Hygrophoropsis*

Lepiotaceae

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|---|--|
| 1.a) Pileus and stipe mealy; lamellae attached | (see Tricholomataceae : <i>Cystoderma</i>) |
| 1.b) Pileus and stipe may be squamulose or fibrillose, but not mealy; lamellae free | 2 |
| 2.a) Spores lacking a distinct germ pore | 3 |
| 2.b) Spores with a conspicuous germ pore | 4 |
| 3.a) Pileipellis of broadly ellipsoidal or spherical inflated cells | <i>Cystolepiota</i> |
| 3.b) Hyphae of pileipellis not cell-like | <i>Lepiota</i> |
| 4.a) Fruiting bodies large, robust; annulus complex; clamp connections present | <i>Macrolepiota</i> |
| 4.b) Fruiting bodies smaller; annulus simple; clamp connections absent | <i>Leucocoprinus</i> and <i>Leucoagaricus</i> |

Paxillaceae

- | | |
|--|---|
| 1.a) Spore print white to yellowish white | (see Hygrophoropsidaceae : <i>Hygrophoropsis</i>) |
| 1.b) Spore print yellowish brown (clay to ochraceous) or rust-brown | 2 |
| 2.a) Having the habit of a bolete but with lamellae instead of pores | <i>Phylloporus</i> |
| 2.b) Having the habit of a <i>Clitocybe</i> or a <i>Pleurotus</i> , but with lamellae that are often veined or poroid near the stipe | <i>Paxillus</i> |

Pluteaceae

- 1.a) Lacking a universal veil or volva *Pluteus*
 1.b) Having a membranaceous volva at base of stipe *Volvariella*

Russulaceae

- 1.a) Fresh fruiting body exuding latex when cut or broken; lamellulae present *Lactarius*
 1.b) Not exuding latex when damaged; lamellulae often sparse or absent *Russula*

Strophariaceae

- 1.a) Chrysocystidia (sterile cells that turn golden yellow in KOH) often present on lamellae faces 2
 1.b) Chrysocystidia typically absent 4
 2.a) Fruiting body never on wood; spores elliptical in profile, with strongly distinct, usually truncate, germ pore; acanthocytes often found in mycelium *Stropharia*
 2.b) Not combining the above characteristics 3
 3.a) Lignicolous (on living or dead wood); spore print ranging from deep brown to purple-black; pileus smooth and dry, often with some red colour *Hypholoma*
 3.b) Mostly on ground or woody debris; spore print dull brown, cinnamon-brown to rusty brown; spore often with indistinct germ pore; pileus usually viscid or scaly *Pholiota*
 4.a) Stipe poorly developed, eccentric and curved, short; on wood *Melanotus*
 4.b) Stipe well developed, central, sometimes turning blue-green when handled; on soil, wood or dung *Psilocybe*

Tricholomataceae

- 1.a) Fruiting body parasitic on other agarics (usually Russulaceae) *Asterophora*
 1.b) Not growing on other agarics 2
 2.a) Basidia with siderophilous granules 3
 2.b) Not as above 5
 3.a) Fruiting body collybioid *Tephroclybe*
 3.b) Fruiting body tricholomatoid, fleshy 4

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- 4.a) Fruiting bodies generally dull coloured, often staining when bruised; pigments encrusting hyphae *Lyophyllum*
- 4.b) Fruiting bodies generally brightly coloured, but pigments not situated on hyphal walls *Calocybe*
- 5.a) Edge of lamella conspicuously serrate or eroded; spores amyloid; on wood or soil *Lentinellus*
- 5.b) Not combining all of the above characteristics 6
- 6.a) Fruiting body lacking a stipe, or stipe typically lateral or strongly eccentric, usually on wood 7
- 6.b) Stipe present, central or nearly so, on wood or soil 19
- 7.a) Lamellae appearing to be split lengthwise along the edges and rolled backwards *Schizophyllum*
- 7.b) Lamellae not split 8
- 8.a) Fruiting body luminescent, on wood or near buried decaying wood *Omphalotus*
- 8.b) Not luminescent 9
- 9.a) Pileus with some degree of gelatinisation 10
- 9.b) Pileus lacking a gelatinised context 14
- 10.a) Pileus highly gelatinised, rubbery; lamella face with metuloids *Hohenbuehelia*
- 10.b) Pileus to some degree gelatinised, but lamellae lacking metuloids 11
- 11.a) Spores amyloid (except for *P. ligulatus*) *Panellus*
- 11.b) Spores inamyloid 12
- 12.a) Spores disc-like with spiny ornamentation *Conchomyces*
- 12.b) Spores smooth 13
- 13.a) Fruiting body often grey or fuscous, lamellae well developed *Resupinatus*
- 13.b) Fruiting body often whitish or pale grey, lamellae widely spaced, shallow, running together irregularly *Campanella*
- 14.a) Stipe greatly reduced or absent; pileus often thin-fleshed 15
- 14.b) Fruiting body usually more substantial 17
- 15.a) Fruiting body brick red *Anthracophyllum*
- 15.b) Not as above 16
- 16.a) Fruiting body pure white, on wood *Cheimonophyllum*
- 16.b) Fruiting body off-white, on twigs *Marasmiellus*
- 17.a) Subhymenium very reduced or absent *Panus*
- 17.b) Subhymenium more substantial 18
- 18.a) Hyphae of lamellar trama regularly arranged; lamellae often toothed *Lentinus*
- 18.b) Hyphae of lamellar trama irregularly arranged; lamella edge entire *Pleurotus*

- 19.a) Pileus and part of stipe below the veil covered with mealy granules *Cystoderma*
- 19.b) Not as above 20
- 20.a) Veil usually forming a distinct annulus on a tough stipe *Armillaria*
- 20.b) Veil absent or not forming an annulus on stipe 21
- 21.a) Pileipellis cellular or a hymeniform layer; hymenial cystidia absent *Dermoloma*
- 21.b) Not combining the above characteristics 22
- 22.a) Lamellae thick, fairly distant, sometimes intervenose or forked; spores globose, spiny and inamyloid *Laccaria*
- 22.b) Not combining the above characteristics 23
- 23.a) Stipe fleshy, fruiting body generally stout 24
- 23.b) Stipe thin and hollow, or pithy and tough 29
- 24.a) Spores amyloid 25
- 24.b) Lamellae various; spores inamyloid 26
- 25.a) Hyphae with clamp connections *Leucopaxillus*
- 25.b) Hyphae lacking clamp connections *Melanoleuca*
- 26.a) Lamellae adnate to decurrent; pileus often centrally depressed *Clitocybe* and *Lepista*
- 26.b) Lamellae typically notched to adnexed, never decurrent; pileus usually convex, never centrally depressed 27
- 27.a) Spores amyloid; cheilocystidia present *Porpoloma*
- 27.b) Spores inamyloid; cheilocystidia present or not 28
- 28.a) Cheilocystidia conspicuous; on wood *Tricholomopsis*
- 28.b) Cheilocystidia generally absent; on soil *Tricholoma*
- 29.a) Pileus convex, conical or campanulate, with a layer of inflated cells directly beneath the pileipellis, margins often pellucid when wet; stipe usually thin, hollow and fragile; *Mycena*
- 29.b) Not as above 30
- 30.a) Fruiting body small to minute, usually centrally depressed; stipe thin but cartilaginous and tough; lamellae typically decurrent 31
- 30.b) Not combining all of the above characters 34
- 31.a) Spores amyloid *Xeromphalina*
- 31.b) Spores inamyloid 32
- 32.a) Cystidia conspicuous in the lamellae and pileipellis *Rickenella*
- 32.b) Cystidia generally absent 33
- 33.a) Pigment found on or in the hyphal wall *Omphalina*
- 33.b) Pigment in hyphae of the pileipellis intracellular (not found on or in the hyphal wall) *Gerronema*

Stick to Owl

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- 34.a) Fruiting body tall with long, slender stipe with radicating base on earth, or on wood; pileus viscid; lamellae white *Oudemansiella* (incl. *Xerula*)
- 34.b) Not as above 35
- 35.a) Pileus and/or stipe covered with hairs, scales or warts; on wood 36
- 35.b) Stipe and pileus not as above 38
- 36.a) Pileus viscid or sticky due to gelatinous filamentous hyphae underlying a pileipellis of inflated cells *Flammulina*
- 36.b) Pileus not as above 37
- 37.a) Pileus and usually stipe covered with dextrinoid or amyloid hairs *Crinipellis*
- 37.b) Pileus dry, covered with brightly coloured scales *Cyptotrama*
- 38.a) Stipe thin but typically tough, pliant and reviving; lamellae usually adnate or, if decurrent, then usually widely spaced; hyphae of pileipellis arranged in a palisade or various other cell-like structures, or containing broom cells or diverticulate-nodulose elements *Marasmius*
- 38.b) Not combining all of the above characters 39
- 39.a) Odour of fish oil or cucumber; pileipellis and lamellae with extremely large cystidia *Macrocystidia*
- 39.b) Not as above 40
- 40.a) Like *Marasmius*, but pileipellis having a rameales-structure *Marasmiellus*
- 40.b) Hyphae of pileipellis arranged in a cutis, lacking a cellular structure 41
- 41.a) Fruiting body with a foetid odour when crushed; trama with some degree of gelatinisation *Micromphale*
- 41.b) Odour, if present, not foetid; trama without gelatinisation 42
- 42.a) Lamellae adnexed to almost free; spores inamyloid *Collybia*
- 42.b) Not as above 43
- 43.a) Lamellae adnexed to sub-free; spores weakly dextrinoid *Pseudobaeospora*
- 43.b) Lamellae adnate to decurrent; spores amyloid *Clitocybula*

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APPENDIX: A glossary of mycological terms

- acanthocytes – spine-like or needle-like crystals found amongst the mycelium of *Stropharia*
- adnate – of lamellae that are broadly attached to the stipe, often at a right angle
- adnexed – of lamellae that are narrowly attached to the stipe
- Agaricales – the order of gilled fungi, popularly known as mushrooms and toadstools
- amygdaliform – almond-shaped
- amyloid – of spores or other tissues that become blue in Melzer's solution
- annulus – the ring of tissue left around the stipe after rupturing of the partial veil
- autodigesting – of a fruiting body that becomes liquid with maturity, as in *Coprinus*
- basidium (pl. basidia) – a specialised cell, usually terminal, on which the (basidio-) spores are formed on small pedicels called sterigmata; usually club-shaped (clavate) or almost cylindrical
- bolete – one of the fleshy fungi looking like agarics but with the lamellae replaced by tubes and terminating in pores
- broom cell – a cell, usually terminal, with apical appendages giving it a broom-like appearance
- buff – a pale brownish yellow, yellow-brown or creamy grey
- callus – a broad protuberance found at the distal end of the spores of some species
- campanulate – bell-shaped
- cartilaginous – firm, tough, pliant
- cellular – of hyphae that are globose, subglobose or greatly enlarged, often in the pileipellis
- cheilocystidia – sterile cells situated at the margins of lamellae
- chrysocystidia – cystidia with contents that become golden yellow in alkaline solutions
- clamp connections – a microscopic feature of the cross-walls of hyphae, manifested as swellings, loops or projections linking two adjacent hyphal elements
- collybioid – having the habit or the stature of a *Collybia*, i.e. pileus not very fleshy, with margins initially inrolled, lamellae not decurrent and with a slender, cartilaginous stipe

- intervenose – of the condition in which veins are found in the spaces between lamellae
- lamellae – technical name for the spore-bearing “gills” of a gilled fungus; the lamellae usually extend from the pileus margin to the stipe
- lamellar trama – the layer of tissue beneath the hymenium
- lamellulae – shorter than the lamellae, these do not extend all the way to the stipe
- lateral – of a stipe that is attached to the side or the margin of the pileus
- latex – an exuded juice, usually of a milky colour
- macrofungi – fungi that produce a conspicuous fruiting body, such as mushrooms, boletes, bracket and shelf fungi, coral fungi, cup fungi, puffballs, etc.
- mealy – of the surface of a pileus or stipe, covered with flour-like particles
- membranaceous – of a veil that is thin and pliant like a membrane
- metuloids – thick-walled cystidia, usually hyaline, with rounded apices that are often encrusted with crystals
- mycelium – the thread-like or hair-like mass of hyphae that is the vegetative portion of a fungus usually in the substrate beneath the ground
- mycology – the scientific study of fungi
- nodulose – of ornamentation of a knobby kind
- palisade – of a pileipellis having rows of parallel structures arranged next to one another like a picket fence in which the terminal elements are inflated cells that more or less reach the same level
- partial veil – an inner veil extending from the pileus margin to the stipe
- pellucid – of a pileus that is translucent, such that the lamellae are seen as lines when viewed from above
- phaseoliform – bean-shaped
- pileipellis – the outermost layer of the pileus
- pileus – technical name for the “cap” of a fruiting body
- pleurocystidia – large, sterile cells situated on the walls of the lamellae
- pliant – flexible, able to be bent without breaking; not rigid
- poroid – with pores on the underneath surface
- punctate – having small, dot-like spots, hollows or spines
- radicating – of a stipe that has a projection in the soil resembling a root
- rameales-structure – of a pileipellis whose repent outermost hyphae have short, vertical branches, often lacerate or with knobs, or which are irregularly branched
- regular – of lamellar trama which have rows of parallel hyphae
- repent – prostrate
- siderophilous – of basidia that turn purplish black or violet-black in the presence of the reagent acetocarmine

- context – the flesh of the pileus or stipe
- cortinate – of a partial veil that is tissue-like or cobwebby
- cutis – the outer layer of the pileipellis, in which the hyphae are repent and arranged more or less parallel to the surface, giving it a smooth appearance macroscopically
- cystidium – a sterile cell of unknown function situated between the basidia of the hymenium or, more generally, any specialised sterile cell different from neighbouring cells in various parts of the fruiting body
- decurrent – of lamellae that extend or descend downwards on the stipe
- dextrinoid – of spores or other tissues that become red-brown or purplish in Melzer's solution
- dichotomous – divided into two approximately equal parts or branches
- divergent – of lamellar trama that has a central strand of parallel hyphae surrounded by rows of hyphae that turn outwards from the medial line
- diverticulate – of hyphae having numerous short, vertical branchlets or protuberances over their surfaces
- eccentric – of a stipe that is not attached to the centre of the pileus
- emarginate – of lamellae that are notched near the stipe
- fibrillose – having thin, threadlike, hairy filaments
- filamentous – of hyphae that are long and narrow
- foetid – ill-smelling, stinking
- free – of lamellae that are not attached to the stipe
- fruiting body – the reproductive unit of a fungus, containing the spore-bearing organs
- fuscous – dusky, a dark grey, grey-brown, or smoky colour
- gelatinous – jellylike
- germ pore – an opening or an area of reduced wall thickness in the apex of the spore
- globose – spherical
- glutinous – exuding gluten made up of gelatinous hyphae
- hyaline – transparent, clear and colourless
- hymeniform – said of a pileipellis, the terminal cells of which are erect, pear-shaped or club-shaped, and are arranged in the form of a palisade
- hymenium – the spore-bearing layer of the fruiting body, situated on the lamellae, containing the basidia as well as various sterile cells such as cystidia
- hypha (pl. hyphae) – the microscopic filament or thread-like structure that is the basic growth unit of a fungus
- inamyloid – of spores or other tissues that do not become blue or red-brown in Melzer's solution

- sphaerocysts – rounded cells interspersed amongst the hyphae, found in Russulaceae
- spore print – the spore mass obtained by placing the pileus upside down on a glass slide or flat piece of paper or cardboard
- squamose – covered with scales
- squamulose – minutely squamose
- stipe – technical name for the stalk or stem, which supports the pileus
- striate – having fine lines or furrows, radiating on the pileus margin, longitudinal on the stipe
- strigose – having bristles or coarse hairs
- subglobose – almost globose
- subhymenium – the layer of hyphae just below the hymenial surface
- trama – the flesh or interior tissue of a fruiting body
- tricholomatoid – having the habit or the stature of a *Tricholoma*, i.e. mushroom-like with a fleshy stipe, emarginate lamella attachment, and lacking a volva
- truncate – said of a spore with a flat end, as if it had been abruptly cut off
- universal veil – an outer veil that encompasses the entire fungus
- velar – referring to a veil
- viscid – sticky, but not slimy or glutinous
- volva – the remains of the universal veil at the base of the stipe