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UNESCO: Man and the Biosphere National Committee
for Sri Lanka

Publication No: 5



A HANDBOOK

to the

AGARICS OF SRI LANKA

by **Umarany Coomaraswamy**

Department of Botany, University of Colombo, Colombo 3, Sri Lanka.

With illustrations

by **Padma Arulgnanam**

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Publications
of
UNESCO — MAB National Committee
for Sri Lanka

The absence of Handbooks and guides to most groups of plants and animals of Sri Lanka has limited the development of interest in our flora and fauna, and this has also been a very serious handicap to ecological studies in the island.

The UNESCO — MAB Committee set up jointly by the Ministries of Science and Education is sponsoring therefore, the publication of Check Lists of Species and Hand books to the identification of Genera of various groups of plants and animals. The committee welcomes any additions, corrections and suggestions for improvement of these publications.

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Umarany Coomaraswamy & R. N. de Fonseka

PREFACE

The UNESCO — Man and the Biosphere (MAB) National Committee for Sri Lanka is sponsoring the preparation of a series of guides to the identification of the various groups of the plants and animals of Sri Lanka. The first hand book in this series deals with the parasitic fungi of the plants of Sri Lanka. This hand book, the second in the series, is devoted to the agarics of Sri Lanka.

This group of fungi has attracted the attention of mycologists, tree physiologists and the foresters, from early times, because of the immensely significant role they play in nature, in the decay of litter, dung, compost etc., and because of the ectomycorrhizal associations that some of them have, with the forest trees. In recent years, however, there has been an awakening of popular interest in these fungi because of their edibility. *Mycophagy* — the eating of mushrooms seems to be on the increase. For mycophagists and to a beginner in the field of mycology, identifying even the commoner and the more conspicuous fungi has been a serious problem, because of the lack of easily accessible literature. This hand book is designed, both, to introduce the subject to non-mycologically trained persons and for the professional mycologists.

The introductory part aims to outline the principles and techniques involved in the collection, preservation, and identification of the agarics. For the benefit of mycophagists a discussion of poisonous and edible agarics is included. A list of the agarics, reported to be poisonous and hallucinogenic, and a brief account about the cultivation of mushrooms, are also given.

A simple dichotomous key to the local genera, with a detailed but concise description of each genus is given. The local species are listed. This is based primarily on Petch and Bisby's Fungi of Ceylon (1950). The letter P, after each specific name, refer to the page in Petch and Bisby: The fungi of Ceylon (1950). A few of the local species have been illustrated. Illustrations have been adapted from the original drawings by Petch. Most of the characters used to separate the genera have been diagrammed. For the convenience of the non-mycologists a glossary of terms used in the text is given at the end of the book.

The author is indebted to Dr. S. N. de S. Seneviratne (Head, Division of Pathology, C.A.R.I., Gannoruwa) for the loan of the original drawings of agarics of Sri Lanka. The author would like to thank Prof. R. N. de Fonseka, Dr. (Mrs.) K. Abeynayake, Dr. Kramer and Mr. M. A. B. Jansen for their kind assistance during the preparation of the hand book and above all Mrs. Padma Arulgnanam, whose illustrations contribute much to the usefulness of this hand book.

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INTRODUCTION

The mushrooms, toadstools and the boleti are collectively called the agarics. They belong to the order Agaricales of the subdivision Basidiomycotina (Ainsworth 1966). The order Agaricales has about 143 genera and 4200 species distributed in fifteen families (Ainsworth and Bisby 1963). The agarics are mostly saprophytic, playing an important role in the decay of woodland and grassland litter, wood, dung and composts. Now mycologists and ecologists are beginning to appreciate that these fungi can be just as good indicators of soil conditions, if not better, than any other plants. A few species eg. *Armillariella mellea*, *Pholiota squarrosa*, and *Marasmius stenophyllum*, are serious pathogens of woody hosts. Many agarics, form symbiotic associations with living cells of roots, especially of forest trees — mycorrhizae, (Harley 1969). Trappe (1962) listed 81 genera consisting of over 525 species to be mycorrhizal with over 280 species of trees. Since Trappe's listing, an additional 10 - 15 have been identified (Zak 1973). Many of the listed fungal species are agarics. Besides aiding the tree nutrition, mycorrhizae are believed to protect root tissue from attack by root pathogens (Marx 1969; Marx and Davey 1969); and offer resistance against root aphid and nematode attack (Zak 1967). Most of the fleshy forms are edible, and some are specially cultivated for food, eg. *Agaricus bisporus* in the temperate, *Volvariella volvacea* — the Paddy straw mushroom in the tropics, *Lentinus edodes* the shiitake of East Asia (Singer 1961). Some agarics are poisonous eg. *Amanita phalloides* (Ramsbottom 1953) whilst others have hallucinogenic properties eg. *Amanita muscaria* (Gray 1959). The newly developing field of *Ethnomycology* deals with hallucinogenic fungi.

1. Morphology and Anatomy

The first thing to realise, is that, what we collect, is really the fruitbody (basidiocarp) of an agaric rather than the fungus itself. The vegetative phase of fungus — the mycelium, lies buried in the soil, leaf litter, rotten or burnt wood etc. Usually these fungi are found in moist situations which are damp at least at sometime of the year. Their habitat includes woodlands, grasslands, manured fields, straw heaps, compost, dung, decaying and burnt wood etc. Although the mycelium may be perennial in the substratum, the fruit bodies begin to form, only under favourable conditions for the species concerned. In the warmer, drier, regions fruit bodies appear soon after the rains. When the mycelium begin to form fruit bodies they usually grow rather quickly. The rate of growth differs for the different species. The fruit bodies of some species eg. *Coprinus* need only a few hours for their complete development. Others may grow very slowly.

The fruit body begins as a button on the mycelium. The total number of hyphal cells for a particular species is originally laid down, in the young primordia ie. at the button stage. The expansion of the young primordia into a mature fruit body, is very rapid and almost entirely by cell extension (Bonner *et al* 1956), with a considerable force of expansion.

The general form of a mature fruit body, is umbrella shaped, with a stem — the *stipe* (Fig. 1Ea) supporting an expanded upper portion or cap — the *pileus* (Fig. 1Eb). Both these parts of the fruit body are distinguished from each other, by both the outward appearance and the internal structure. The hyphae which compose the stem, have thicker walls and are more closely inter-twined. The surface of the stem is usually characteristic for the different species. In many species, the tissue of the stem, passes gradually into the tissue of the cap, but in others the differentiation of the stem tissue and cap tissue is marked, so that the stem is distinct from the cap. In some, the distinct stem is easily recognised, as it can be easily broken out of the cap. eg. *Lepiota*, *Amanita*, *Volvariella*, *Pluteus*, *Agaricus*. In others, the distinction is not marked, and the stem forms one body with the cap, so that stem is *confluent* with the cap. In the mushrooms and toadstools the cap bears on its lower surface, flat radially arranged plates — the *gills* or *lamellae* extending from the margin of the cap to the stem, like spokes of a wheel (Fig. 1Fc). In the boleti, there are vertical tubes opening to the exterior by individual pores, (Fig. 2Bd). The fertile layer which produces the spores is called the *hymenium*. This covers the face of the gills or lines the tubes. The cap is covered on the surface by a *cuticle*, usually composed of hyphae

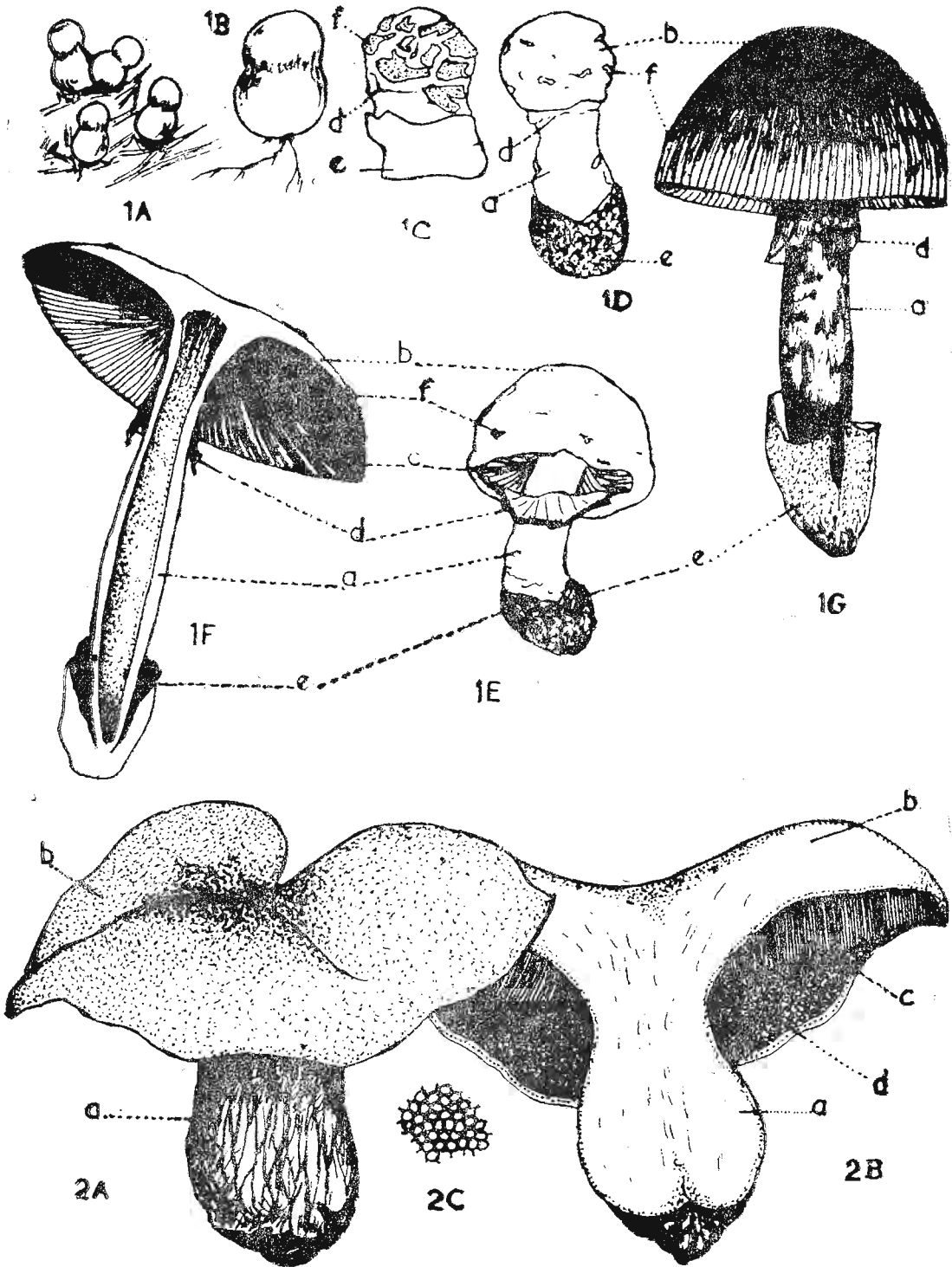


PLATE I

which are different from those of the flesh of the cap. In many, the cuticle can be partly or completely detached. Under the cuticle, is the flesh proper which is variously thick and is composed of different hyphae, some thick, some thin, and irregularly inter-twined or radiating etc. According to this, the flesh is soft or hard, juicy or dry, in consistency.

The young fruit body may be enclosed in a mass of tissue called the universal veil or *velum universale*. This becomes broken by the growth of the cap, and a part is sometimes seen round the base of the stem as the *volva* (Fig. 1Fe) and on the top surface of the mature cap as *scales* (Fig. 1Ef). In some agarics, the hymenium may at first be protected by a partial veil or *velum parziale*, which may later remain as a distinct ring — the *annulus* (Fig. 1Ed) around the stem. The progressive stages in the development of *Amanita hemibapha* is shown in Fig. 1.

The lamellae on the cap can be free or attached to the stem in various ways (see page 9). In many species the lamellae and the tubes, descend far into the stem. These are very important taxonomic characters. Anatomical structure of the inner flesh of the lamellae in the different species and genera, is fairly different. In the lamellae, there is a central group of longitudinally running threads, termed the *trama* (Fig. 4B). According to the course of the hyphal threads, one can distinguish four main types of trama (Fig. 3). The organization of this tissue, is very important in classification. In tangential longitudinal sections, some groups of agarics have an *irregular trama*, lacking any clear pattern of hyphal arrangement eg. *Lentinus* (Fig. 3 A, A'). Some have a *regular trama* with hyphae, the long axis of which run more or less parallel with the lamellae eg. *Lepiota* (Fig. 3 B, B'); some have a *bilateral or divergent trama*, where there is a thin central zone of parallel hyphae, from which arise hyphae, spreading downwards and outwards on both sides eg. *Amanita* (Fig. 3 C, C') and yet other have an *inverse trama* (Fig. 3 D, D') where there is a central zone of parallel hyphae, like in the bilateral one, but from which the hyphae curve upwards and outwards on both sides eg. *Volvariella*.

Ends of the tramal hyphae turn outwards to form a distinct layer of shorter cells, the *sub-hymenium*, which lies immediately beneath the *hymenium*—Fig. 4B. The hymenium consists of palisade-like layer of ripe *basidia*, developing basidia, and sometimes other structures such a *paraphyses*, *cystidioles* and *cystidia* Fig. 4 & 5. Cystidiole is a simple thin walled hymenial cell of about the same diameter as the basidia but remaining sterile and protruding only slightly beyond the hymenial surface. Cystidia are more varied. They are sterile, conical, prismatic, or hair-like projections of sterile hyphae, in the hymenium or other parts of the fruit body such as gill margins, cap, stipe etc. The basidia produce *basidiospores*, externally on sterigmata. The number of spores produced by one fruit body is enormous. It has been calculated that a cap of *Agaricus vampetris*, measuring 8 cm. in diameter formed 1,800,000,000 spores of which 40,000,000 spores matured within one hour (Bonner *et al* 1956). However, only a very few of these spores germinate.

Some genera have hyaline spores, whereas other have coloured spores. The colouration is diluted in stronger magnification and therefore the colour can only be recognised from spores in the mass, which can be obtained from a spore-print (see page 7). The

PLATE I

Fig. 1 — (A — E) — Stages in the progressive development of a mushroom, *Amanita hemibapha* (xo. 5) A — B — button stages, covered with the universal veil. C & D — elongation of the stipe. Note the remnants of the universal veil as *volva* (e), and *scales* (f). E — Partial veil breaks through. Note the remnants as *annulus* or ring. F — longitudinal section through mature fruiting-body; (a — stipe, b — pileus or cap, c — gills, d — ring, e — *volva*, f — *scales* on cap.)

Fig. 2 — (A — C) — *Boletus portentosus* (xo. 25) A — entire fruiting-body; B — longitudinal section through fruiting-body; C — pores enlarged. (a — stipe; b — pileus; c — vertical tubes; d — pores).

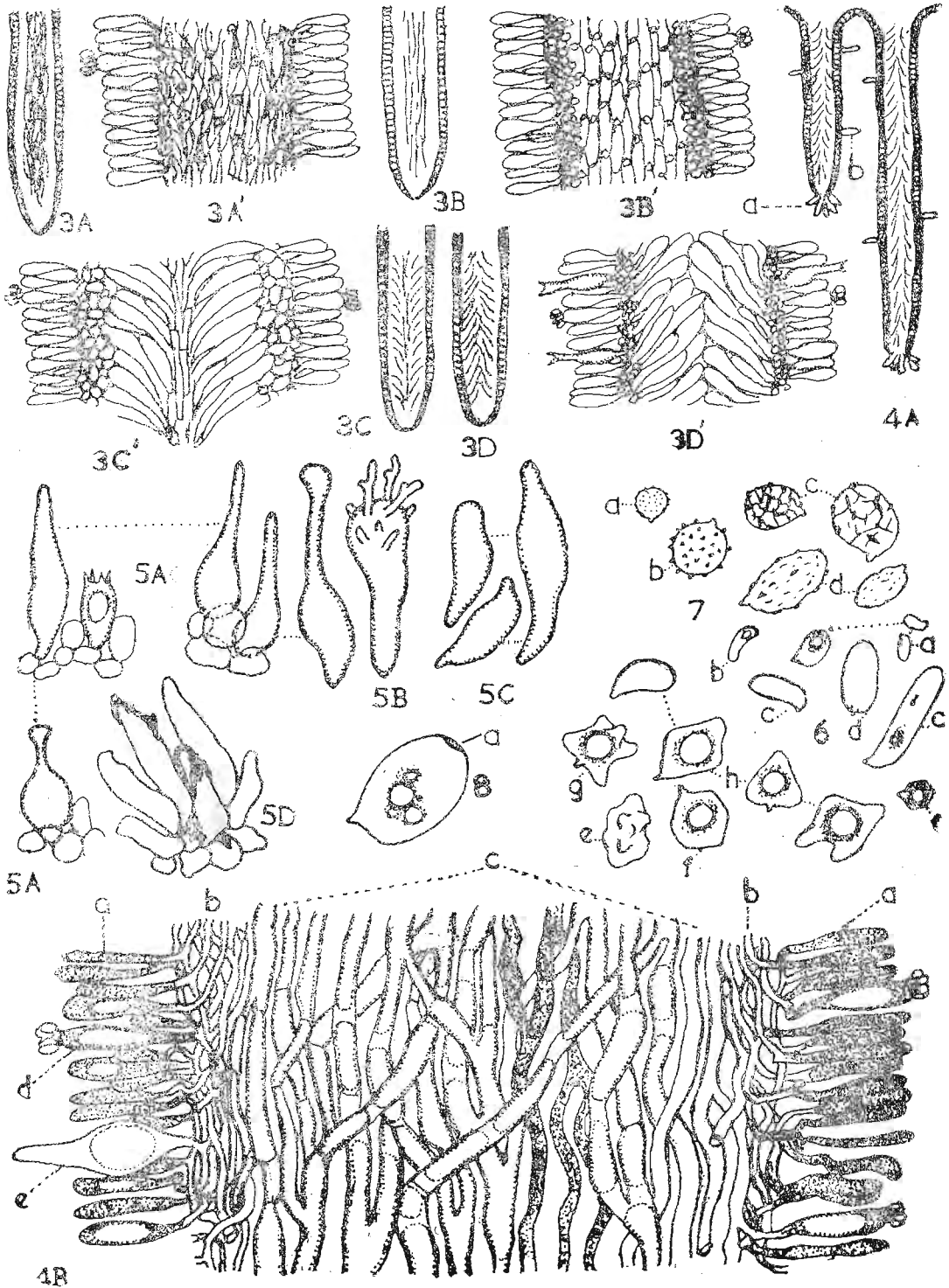


PLATE II — Figs. 3 — 8

colour of the spore mass, is an important taxonomic character. The spores when coloured, colour also the maturing and mature lamellae, which thus change colour in the course of their development. Further the colour of the gill may get masked by the colour of the spores. Therefore it is very important that young, maturing and mature specimens, be examined before describing the colour of the lamellae of any species.

Size and shape (Fig. 6) of the spores, also very greatly. The spore wall, usually has an outer and inner layer. The outer layer may be smooth or ornamented in the form of spines, combs, warts or relief reticulations (Fig. 7). At one end of the spore, is a place of attachment to the basidium. This is referred to as the *apiculus*. At the other end of the spore, there is a rounded spot called *germ pore*, (Fig. 8) through which young hyphae break through when the spore germinates. The presence or absence of a clear germ pore is also a taxonomic criterion.

2. Collection and Preservation

In the tropics fleshy fungi develop and decompose vary quickly. The best place therefore to examine them, is in the field, at the time of collection. The specimens should be collected preferably during the morning and all the field data such as size, colour, smell, texture, etc. immediately noted. If time does not permit this, they should be brought home, treating them with the tenderest care because they are very easily damaged, and examined as soon as possible.

While collecting, it is desirable to select several specimens showing different stages of development, so that one of them may be used to cut sections for observations, another for the preparation of the spore print etc. The whole fruit body must be dug up intact from the ground, special care being taken not to break them. Unless the whole fruit body is dug up, it is impossible to know about the base of the stem, presence or absence of a volva etc. which are valuable characters for the identification of these fungi. Where the agarics are wood inhabiting, they have to be cut and removed with the portion of the wood on which they are growing. The agarics are then wrapped individually in newspaper or wax paper, which are then placed carefully in flat bottomed baskets, for transporting. Tubes and tins may also be used in place of papers.

-
- PLATE II
- Fig. 3 — (A—D) — L.S. of Gill and the types of trama :—3A. A — irregular trama ; 3B, B — regular trama ; 3C, C — divergent trama ; 3D, D — inverse trama,
- Fig. 4 — Structure of Gill
A — L.S. Gill (diagrammatic), showing marginal (a) and facial (b) cystidia
B — A section \times 400
(a — hymenium ; b — sub-hymenium ; c — trama ; d — basidium ; — marginal cystidium).
- Fig. 5 — Types of Cystidia \times 400
A — marginal cystidia ; B — appendaged marginal cystidia ; C — facial cystidia ; D — fascicle of cystidia.
- Fig. 6 — Spore shape
(b — ellipsoid ; c — elongate ; a — curved ; e — cuboid ; d — almond shape ; f — nodulose ; g — stellate ; h — other shapes).
- Fig. 7 — Ornamentation of spores
(a — small and minutely spiny ; b — globose and spiny ; c — net-work ; d — roughened).
- Fig. 8 — Single spore enlarged to show germ-pore (a).

On returning from the collection trip, material should be examined the same day, and if it is not possible to identify the specimen on the same day, the information on characters likely to be altered by preservation must be obtained. The specimens can be dried rapidly eg. in a drier for preserving them. Microscopic characters are usually unaffected by this method. Another useful method of preserving is to slice them vertically from the middle of the cap down to the bottom of the stalk and to try dry this between blotting paper, as done for a flowering plant (Bohus 1963). A better method is to freeze dry the specimens, as specimens preserved in this way show very little change in either colour or shape. Some prefer to preserve specimens by dipping them in a mixture of polyurethane and white spirit (polyurethane 2 : white spirit 1) and then drying at 50 - 60° C (Onions 1971 ; Kendrick 1969). Specimen can also be preserved in formalin-acetic-alcohol.

3. Examination and Identification

One important point is to remember, that examination and identification should be done methodically as soon as possible after the specimen has been gathered. Notes on the habitat should include, the type and pH of the soil from where the specimen was collected, the vegetation and whether specimen was found solitary or in clumps or rings.

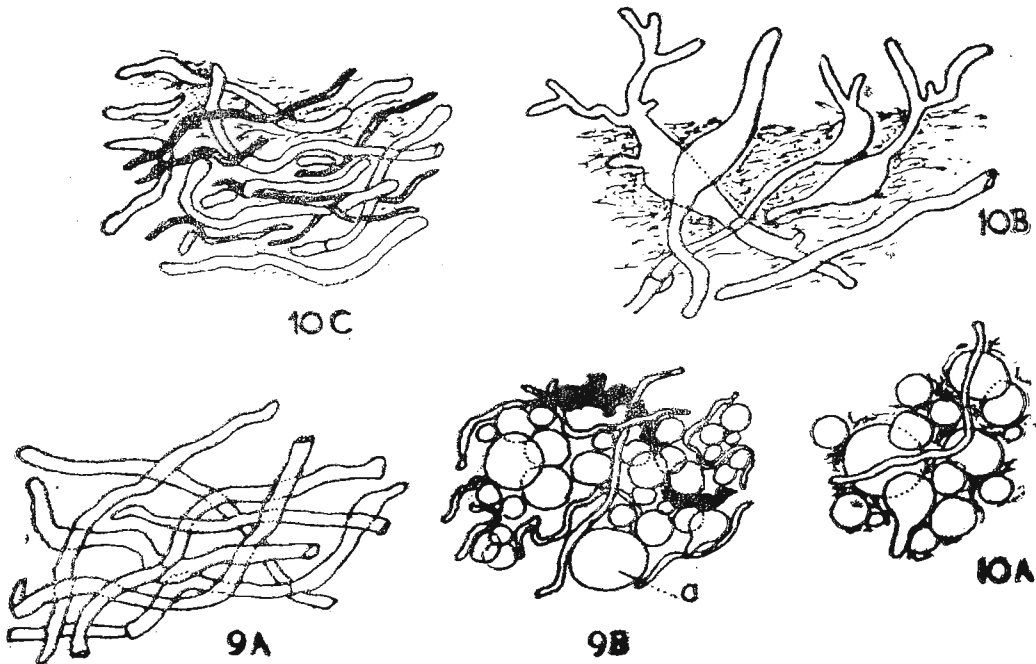


PLATE III — Figs. 9 & 10 — Types of cells of the flesh

Fig. 9 — A — Homoiomerous flesh cells
B — Heteromerous flesh cells, C — Sphaerocysts.

Fig. 10 — Cap-surface cells
A — cellular cells ; B — branched cells ; c — filamentous cells.

3.1 Spore print

The first step in the identification of any species is to determine its spore colour. The spore colour means, the colour of a great mass of spores to the unaided eye. One would think that to determine the spore colour of an agaric, one would only have to glance at the gills, but this is not so. It cannot be assumed that colour of the gills is the colour of the spores. For eg. a species with white spores and brown gills for instance may be mistaken for a brown spored species.

Sufficient quantities of spores to enable a proper judgement regarding colour are obtained by making a spore print. A spore print is made simply by cutting off the stem (stipe) from a fresh mushroom (if dry place a drop of water on the cap) close beneath the cap (Fig. 12 A) and placing the gills on a piece of paper and then covering it with a cup, beaker or any other container, to prevent too rapid drying out. Usually within an hour or two (or less if mushroom is fully mature) enough spores mature and fall to the paper to make a visible print. Spore prints when complete should be allowed to dry under normal

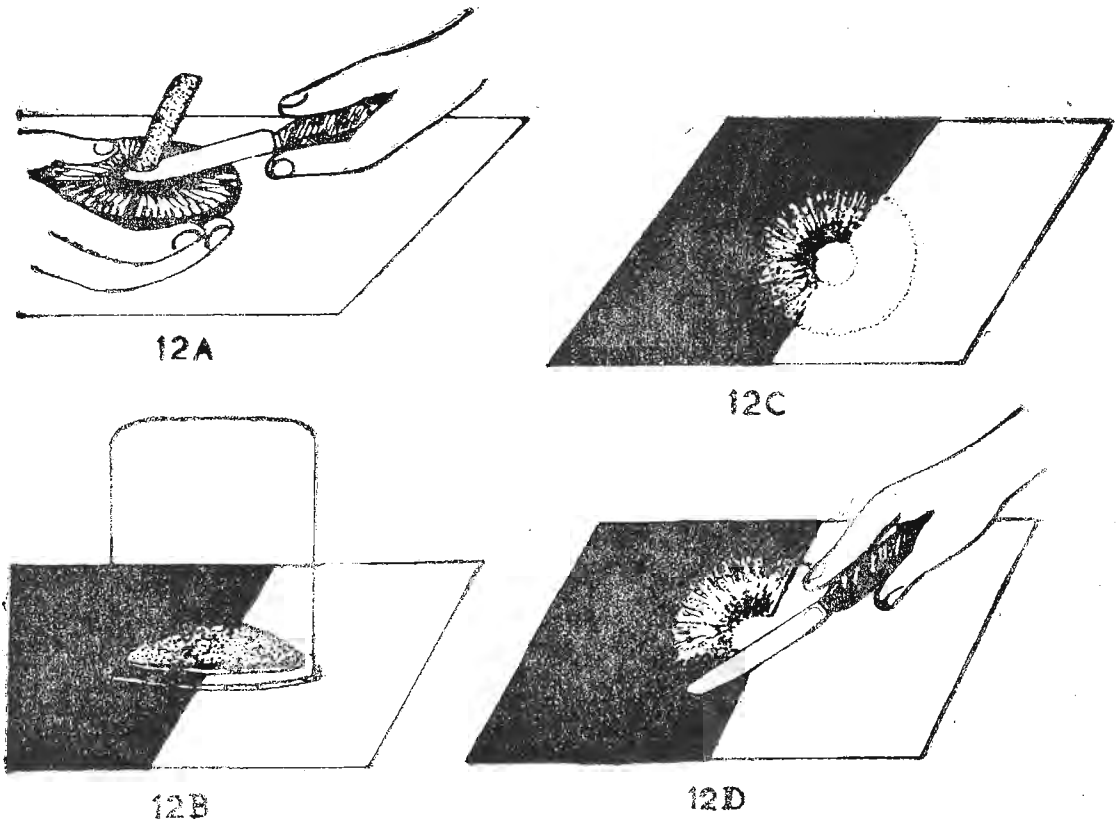


PLATE IV — Fig. 12

Fig. 12 — Steps in the preparation of a spore-print.

A — cut off stipe close to the cap of healthy agaric: B — place cap with its undersurface downwards on a sheet of half-black and half-white paper. Cover the cap with a beaker and leave for a few hours. C — remove cap carefully. The spores deposited on the paper leaves a spore-print. D — scrape the spores together and study the colour *enmass*.

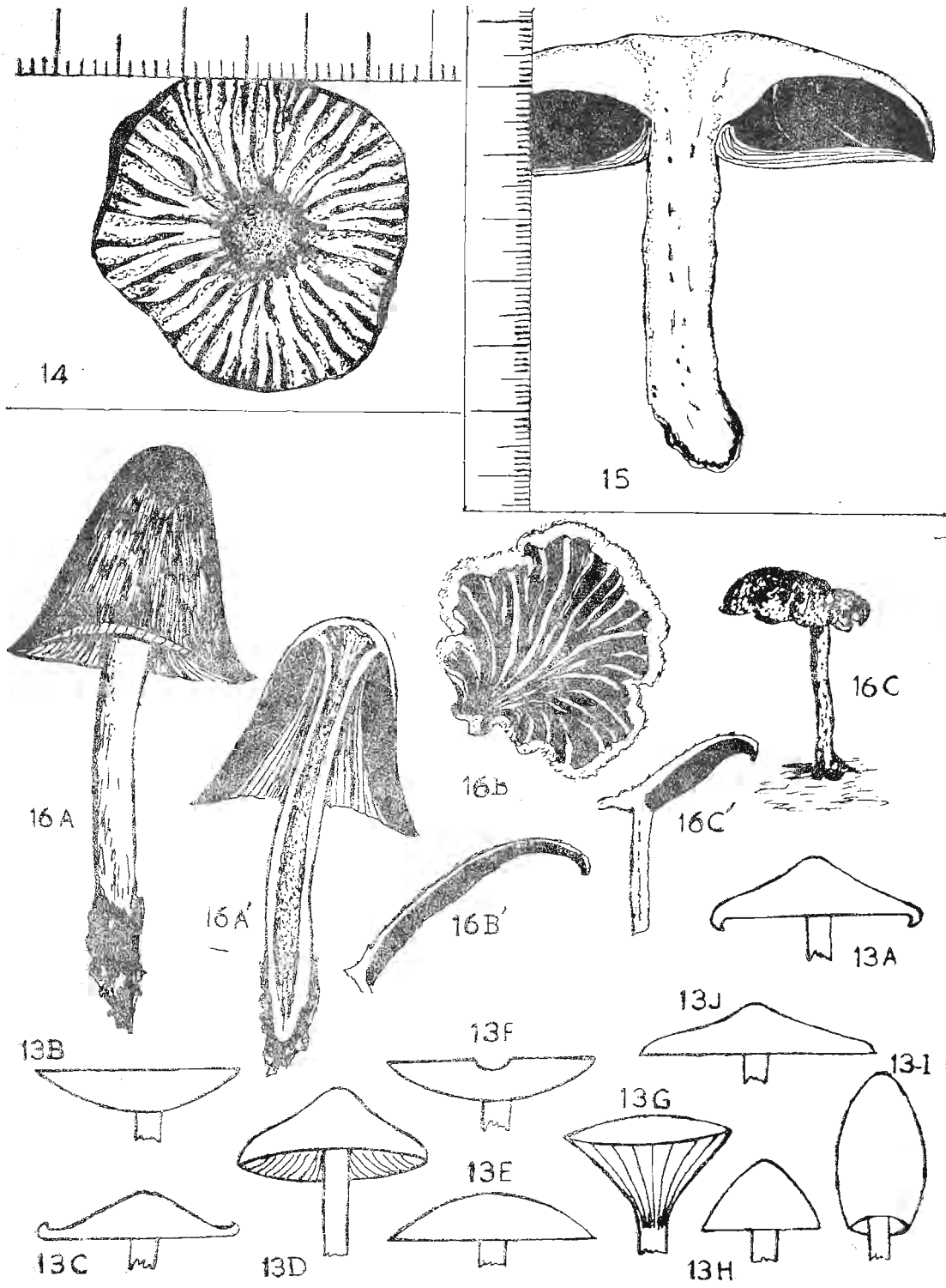


PLATE V — Fig. 13 — 16

conditions and then the spore mass should be scraped together with a scalpel, into a small pile. A cover slip is then placed on top of the pile and gently pressed down. The colour of the spore mass can be easily determined on sight. This is then compared with a standard colour chart. Spores are also mounted in water and examined under a microscope. It is desirable to make a print on both white and black paper at the same time; that is to place one half of the pileus on white paper and other half on black paper as shown in the Fig. 12 B. The reason for this is that white spores do not show up well on white paper but will be quite obvious on the black paper, and the black spored species will be quite obvious on the white paper. Some prefer to use grey paper (Watling 1973). The Method of making a spore print is illustrated in Fig. 12.

The five basic colours of the spores are black, white, pink, yellow, brown and purple-brown. The great majority of the agarics have spores that are easily classed as having one of these five basic colours. There are few exceptional species which have colours different from these five. Among the exceptions are *Lepiota morgani* green spored but classified with white spored types; species of *Russula* with yellow spores but classified with white spored types and *Pleurotus sapidus* having lilac spores and classified under white spored types.

3.2 Macroscopic characters

Whilst one is waiting for the spore-print to form, the specimen should be examined first for all the macroscopic features and then for the microscopic details. All the characters which may change on drying must be noted immediately. These include the colour, shape, texture, stickiness and smell. A sketch preferably in colour should be made thereafter, with suitable notes.

Cap or pileus is usually the largest and most obvious part of an agaric and its characteristics are especially useful in identification. Although most agarics have the general appearance of an umbrella, not all caps are shaped alike. Fig. 13 shows the general shapes of caps. The characteristics of the surface of the cap (viscid, glutinous, greasy, waxy, smooth, hairy, scaly, etc.), the characteristics of the margin of the cap (regular, wavy, incurved, smooth, rough furrowed or striate) presence or absence of the universal veil and its characteristics are all diagnostic characters which are necessary in making a positive identification.

Characters of the gills are also important. Among the diagnostic features are, whether the gills are crowded or distant (the number of gills at the margin of the pileus per cm. is counted as shown in the Fig. 14); the width of the gills (measured as shown in the Fig. 15); whether the gills are easily separable from the cap tissue; the consistency of the gill (brittle, pliable, fleshy, waxy); the shape of the gills and the method of attachments as diagrammed in Fig. 17. The trama may be composed of inflated cells (vesiculose) or otherwise (fibrillose).

The features of the stipe are also important. In most genera the stipe is centrally placed (Fig. 16 A A') but in some it may be lateral or eccentric (Fig. 16 C C') or even be absent (Fig. 16 B B'). The colour, length, thickness, whether hollow (Fig. 1 F) or solid (Fig. 2 B), consistency i.e. whether fleshy, stringy, cartilagenous, leathery or woody; the

PLATE V

Fig. 13 — A — I : Cap shapes (B — plane; E — convex; H — conical; J — umbonate; G — infundibuliform; A — involute; C — reflexed; — umbilicate; D & I — campanulate).

Fig. 14 — Measurement of Gill number (11 gills per cm.)

Fig. 15 — Measurement of gill width.

Fig. 16 — Stipe position — A — centric; B — eccentric; C — absent.

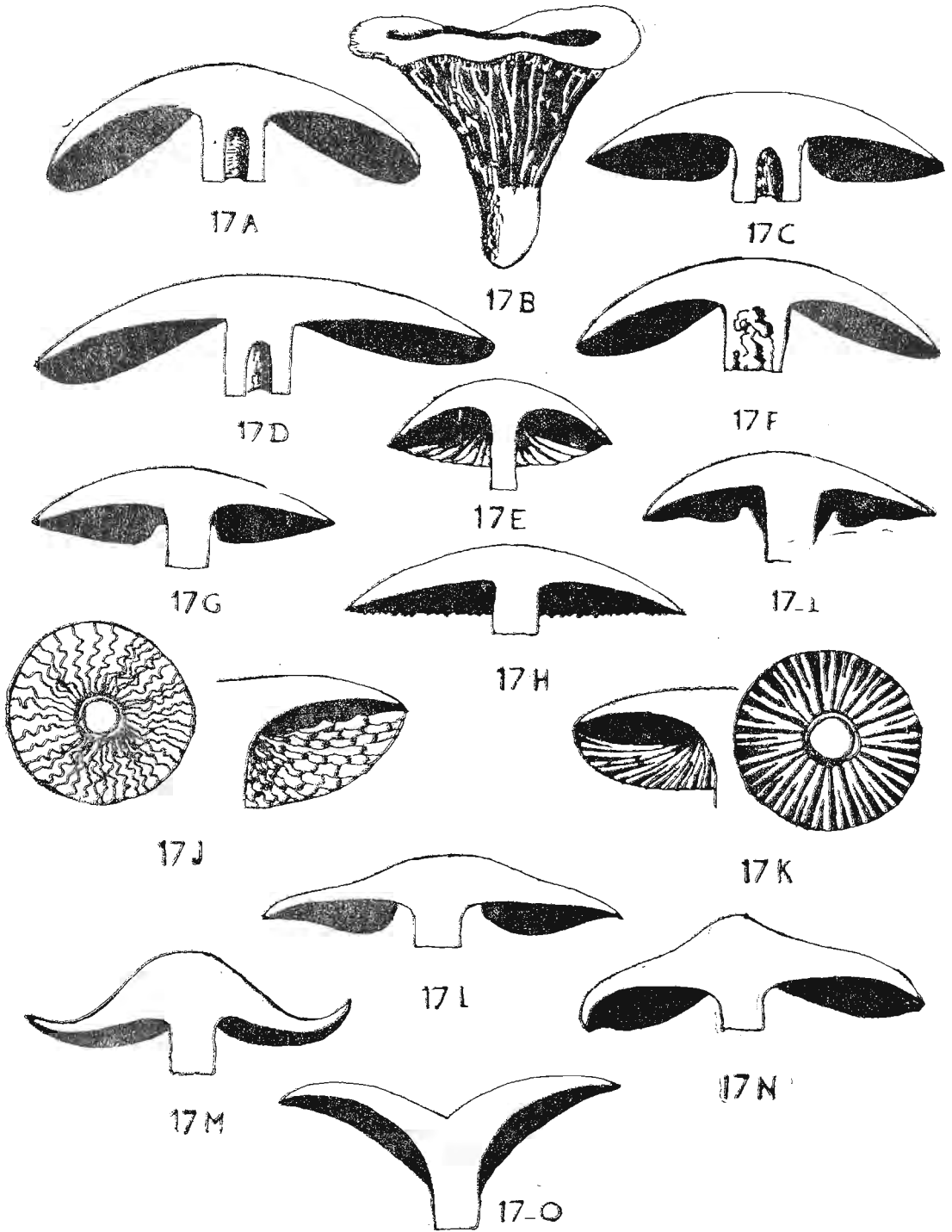


PLATE VI — Fig. 17

characters of the surface of the stipe (fibrillose, dry, scaly, smooth or viscid) ; whether or not it is easily separated from the pileus, are all characters that serve to identify the genera. The presence or absence of volva at the base of the stem and the shapes of the volva (Fig. 18) should also be noted. Also to be noted are the presence or absence of a ring, its position (Fig. 19) i.e. whether median, apical or basal, and whether it is persistent, membranous, filamentous, and mobile.

3.3 Microscopic characters

After the microscopic features have been noted, the microscopic characters have to be studied. Some of the microscopic features must be studied, using fresh material. These features include the size, shape, ornamentation of the spores, distribution of pigments etc. Other features such as hyphal details, presence and nature of cystidia, may be studied, on preserved material. The simplest technique of preparing a mount, is to cut a section of the necessary portion, with a razor blade. Small pieces can be soaked in water for a few minutes, to make them turgid, and then placed in the cleft end of a piece of pith. Drops of water are then placed on a razor blade, and after cutting, the sections are brushed into a watch glass containing water, and then mounted on a slide. In this way the relative position of hymenium elements, structural details of the hymenium, arrangement of the hyphae, presence or absence of cuticle, cystidia etc. may be observed. When hyphal structures of the other regions are to be observed, thick sections of the fruit body may be cut with a razor blade and soaked in 10% potassium hydroxide solution for 5 — 10 mins. This is then teased apart with two very fine pointed needles and the hyphal structure then examined. The microscopic characters to be observed include, the characters of the spore viz. shape, size, ornamentation ; size and shape of germ pores ; reaction to Mehlers reagent (chloral hydrate 100 g ; potassium iodide 5.0 g ; iodine 1.5 g, distilled water 100.0 ml. Potassium iodide is first dissolved in a small quantity of water. Iodine is then mixed in and the mixture is thoroughly stirred and finally chloral hydrate is added. The specimens must be first wetted in ammonia for a few seconds on a glass slide. Then ammonia is completely removed with filter paper and a large excess of the reagent added. If the spores turn blue-black they are amyloid ; if brownish pseudo-amyloid ; if yellow to nearly colourless inamyloid and reddish-brown dextrinoid) ; the number of sterigmata on the basidium ; type of constituent cells, of the cap ; type and arrangements of cells in the gill tissue (Fig. 9) type of cells on the cap surface (Fig. 10) and presence of cystidia, their location etc. (Fig. 4A).

3.4 How to use the keys

An unknown agaric can only be identified through a proper use of a reliable key, followed by a comparison of the characteristics of the specimen with a written description and a good illustration. Let us suppose that one has found an agaric, with gills on the cap. Immediately he should make a spore-print as illustrated on page 7. Fig. 12. The spores *en masse* turn out to be white in colour. The collector then finds that early in the key, (page 16) white spored mushrooms are separated from the coloured spored ones. The first two choices offered to him in the key are :

3. Hymenium on veins	4
Hymenium on lamellae	5

The specimen on examination had hymenium (i.e. the basidial layer) over the surface of the lamellae or (gills). So his choice is an easy one and he proceeds as directed in the key to the fifth set of statements.

PLATE VS

Fig. 17 — A — O, Gill shapes and attachment: A — rounded anteriorly; B — veined; C — rounded posteriorly; D — lanceolate; E — uventricose; F — unequal; G — sinuate; H — serrated; I — emarginate, also adnate and having decurrent tooth; J — flexuose, waved; K — dichotomous; L — free; M — narrow; N — slightly adnexed; O — decurrent.

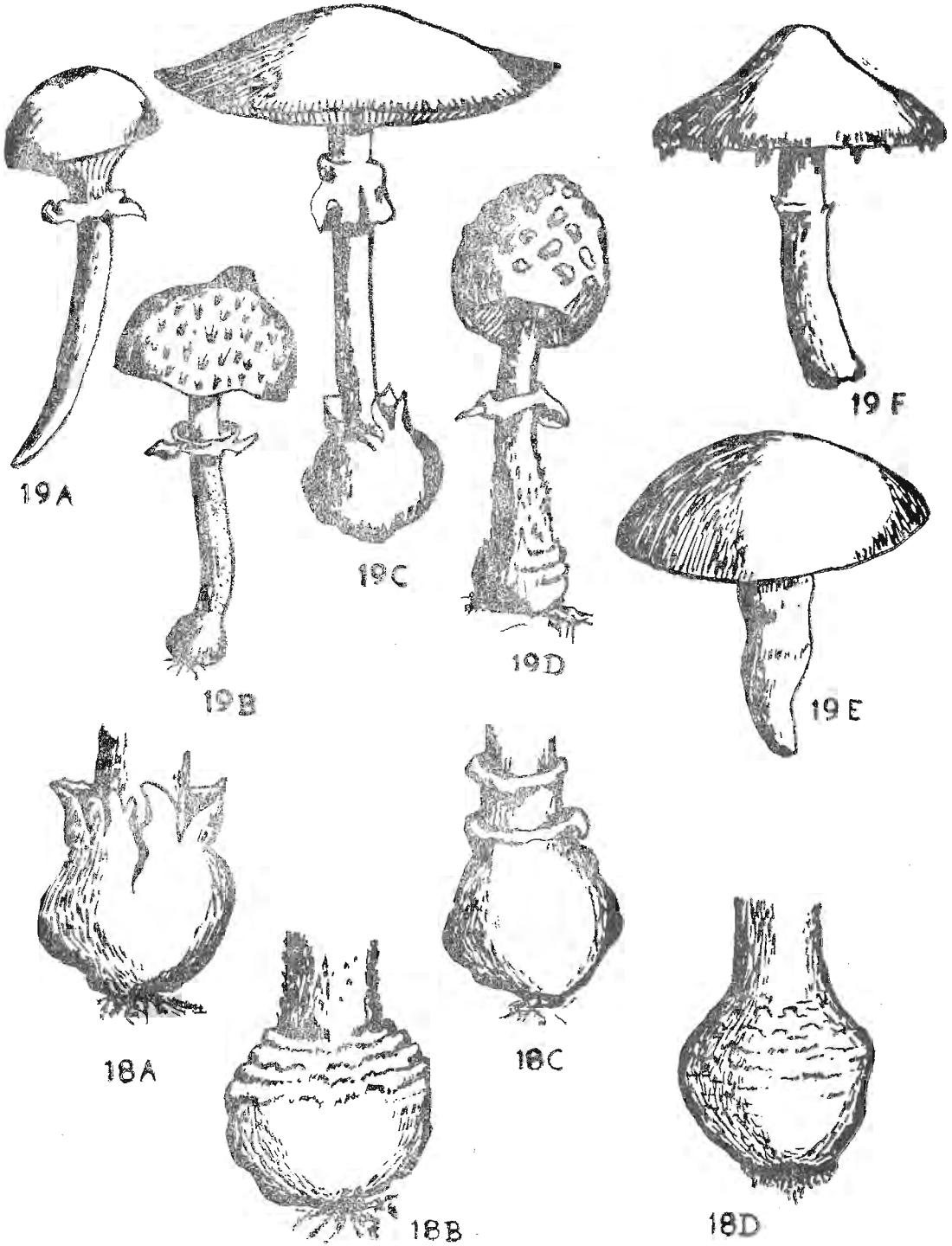


PLATE VII — Figs. 18 & 19

- | | |
|--|----|
| 5. Fruit body fleshy and readily decaying .. | 6 |
| Fruit body tough and not easily decaying .. | 22 |

Fruit body is fleshy and readily decaying. He therefore proceeds to the sixth set of statements.

- | | |
|---|---------------------|
| 6. Spore bearing layer, on fold like often forked
gills | <i>Cantharellus</i> |
| Spore bearing layer, on distinct well formed
gills, not forked | 7 |

The spore bearing layer of the specimen is on fold-like gills. Hence the specimen is *Cantharellus*. He then turns to page 26 where he finds a brief description of the Genus *Cantharellus* and the list of the local species which have been already recorded. fits the He then has to read the description of the genus and satisfy himself that the description specimen he has found.

4. Edible and Poisonous fungi

In common parlance the term mushroom is applied to an edible agaric and the term toadstool to a poisonous one. Most people are very firmly convinced that there is a fundamental difference between a mushroom and a toadstool. However, the french language makes no distinction between the mushrooms and the toadstools, the word champignon being used for both. Moreover in markets all over Europe, many different kinds of edible toadstools are offered for all. The term toadstool has no valid meaning; toads rarely if ever sit on a mushroom.

Although a considerable number of agarics have been variously reported to be poisonous, by one or more authors, the fact remains that non-poisonous fungus species, far outnumber the poisonous ones. Over 2000 species are said to be edible, of which 25 species are widely accepted as food (Chang and Antonio 1977). 20 genera with over 72 species have been recorded as poisonous (Table I, Gray 1973). It is evident from the table that the great majority of the poisonous agarics are white spored. On the basis of the published evidence to date, it is apparent that the most poisonous species of mushrooms are members of the genus *Amanita*. Of these, *Amanita phalloides*, *A. verna*, *A. bisporigera* and *A. virosa* are the deadliest. Ramsbottom (1945) set the mortality rate of *A. phalloides* poisoning as high as 90% but Henrici (1945) reported it as being between 50 — 70%. Deaths and near fatalities in Europe and North America are recorded annually, due to eating of these fungi. The high mortality rate is due in part to the fact that, symptoms of poisoning appears 12 — 48 hours after ingestion and by this time the poison has reached the liver, heart, lungs, and kidneys. The symptoms are violent abdominal pains, vomiting, a fetid diarrhoea, and finally a collapse. Other fungus poisonings are usually less serious. Finally many fungi are only mildly toxic, and their effect is limited to ebriety and hallucination. These real poisonous fungi should be differentiated from those which become poisonous as a result of damage or deterioration. Potamine poisons — similar to those produced

PLATE V98

Fig. 18 — A — D — shapes of volva

A — free; B — separating, circumscissile; C — irregularly circumscissile;
D — friable, disappearing.

Fig. 19 — (H — F) Ring shapes and position

A — superior, broad; B — persistent, sometimes movable; C — medial
pendulous; D — inferior, lower down; E — narrow, fragments appendi-
culate; F — fibrillose.

by the putrefaction of food in general — will occur in over-ripe fungi. There are many species, though not directly poisonous, taste, acrid, bitter or unpleasant, so that for most people they are inedible.

The poisonous, inedible, and edible species can be found in the same genus, eg. although *Amanita* includes several deadly poisonous species, it also has *A. rubescens*, *A. vaginata* and *A. fulva* which are good to eat. There is no general rule that can be applied in all cases, for distinguishing between edible and poisonous species. Acridity or bitterness is an indication that the mushroom is not edible but it does not follow that it is poisonous. There are several myths and traditional methods for testing fungi but these are all unreliable. The test of the breadcrumb, of garlic, of a silver spoon are all worthless. Likewise, feeding doubtful specimens to a dog or cat is also useless. Further it is dangerous to believe that fungi which have been nibbled by snails or slugs are not poisonous. Even though some wild animal may eat or nibble mushrooms with no apparent ill effects, this does not necessarily mean that man can do likewise. It has been shown that deadly poisonous, *A. phalloides* are eaten by animals, apparently with no outward results.

Thus all folklores about methods of distinguishing poisonous and edible mushrooms should be discarded. The only reliable method of identifying an unknown mushroom, is through the proper use of a reliable key, based on botanical characters. Furthermore, even when it is found that it is an edible species, only a little should be eaten first. This is because some unfortunate people are allergic to mushrooms that are harmless to others.

5. Cultivation of mushrooms

Although man had been using mushroom in his diet for long, the food value has only been recently recognised. With a steady rise in the world population there is a serious shortage of protein and an increasing world wide demand for diversity in protein foods. Different food evaluation methods based upon the quality and the quantity of crude protein and the essential amino-acids, of some commonly cultivated species, indicate that protein content of mushrooms is 2 — 5% wet weight and 30 — 47% dry weight. These proteins contain all 8 essential amino-acids and can be classed as an intermediate, between high grade animal protein and low grade vegetable protein. Thus it has a potential to be a good source of protein (Chang 1977; Chang and Antonio 1977). It is also believed to be a good source of vitamin B complex, vitamin D and folic acid.

The cultivation of edible mushrooms is now widespread all over the world. In 1975 the total world production of cultivated mushrooms was evaluated at about 916,000 tons; *Agaricus bisporus* is by far the most important and is grown in 71 countries but is mainly confined to Europe and USA, with almost 75% of the total world production, then *Lentinus edodes*, with Japan as its world biggest producer with 14%, and *Volvariella volvacea* a tropical and sub-tropical favourite but mainly confined to South East Asian countries having 4% (Chang and Antonio 1977) of the world production. Other commercially cultivated species include *Flammulina velutipes*, *Pholiota nameko*, *Pleurotus ostreatus*, *Pleurotus cornucopiae*, *Lyophyllum ulmarins*, *Auricularia polytricha*, *Auricularia auricularioides*, *Tricholoma matsutake* (Hashioka 1977). In the South East Asian countries including Sri Lanka *Volvariella volvacea* is the most successful species because it is fast growing (fruit bodies appear 10 — 14 days from the time of planting), very favourable climate and the abundance and readily available bedding materials.

In the South East Asian countries a wide variety of agricultural residues and industrial wastes that are of no nutritional value, but found in abundance, are used as substrata for mushroom cultivation. The substrates include paddy straw, banana leaf, oil-palm waste, cotton waste (Chang 1977), wood logs, rice bran, rice hull (Hashioka 1977), Corn cobs (Gerlind Eger 1977). The methods of cultivation of the mushroom on these substrata vary and include bundle method, tray method, shelf method and bag method.

Among the consideration for a successful mushroom cultivation are a good spawn, suitable preservation methods and satisfactory pest and disease management.

The mycelium of the mushroom prepared for the purpose of propagating mushroom production is called a "spawn." Before the spawn production, the first stage is to obtain a pure culture spawn. A pure culture spawn, is the mycelium grown from a selected mushroom, either by germination of the basidiospores or by growing pieces of the inside tissue of the cap or stipe of the mushroom, in a suitably sterilised culture medium eg. Potato dextrose agar — PDA. The resulting mycelium, the pure culture spawn, is then inoculated into containers filled with sterilised compost like rice straw, cotton waste, used tea leaves, sorghum grain, lotus seed stalk, stable manure, saw dust etc. When the compost is completely impregnated with the growing mycelium it is ready for use as spawn. No matter how carefully all other requirements for cultivation of mushrooms are fulfilled, failure will be inevitable, if the spawn is poor.

Another problem faced by the mushroom producers in the tropical countries, is the high perishability of the mushroom. Eg. *Volvariella volvacea* the principal cultivated mushroom of South East Asian countries, is a young button in the morning, emerges from the volva before morning and will open fully in the afternoon (Alicbussan 1977). A matter of even two hours after it has opened could mean a distinct physiological change in the mushroom. The mushroom therefore has to be marketed in forms other than a fresh mushroom. The mushrooms are preserved by several ways, each process having its own advantages and disadvantages. The methods used widely include chilling, dehydration, canning or bottling, pickling in vinegar etc.

Pests and disease management is another important consideration in the mushroom industry. Exercise of the strictest hygiene in and around the growing areas, efficient and complete pasteurisation, fumigation with formaldehyde between crops, disinfection of the bedding material with chlorinated water, zineb dust, Benolate etc. are some of the general methods practiced to prevent and control the common pests and diseases.

KEY TO THE GENERA OF AGARICS

1.	Hymenophore lamellate or vein like	...	...	...	...	2
	Hymenophore poroid	...	...	...	...	52
2.	Spores white or very faintly coloured in mass, and hyaline under the microscope	...	...	...	...	3
	Spores distinctly colored in mass, and individually, under the microscope	...	...	...	...	26
3.	Hymenium on veins	...	...	...	...	4
	Hymenium on lamellae	...	...	...	...	5
4.	Veins simple	...	...	...	...	<i>Arrhenia</i>
	Veins anastomosing	...	...	...	...	<i>Campanella</i>
5.	Fruit body fleshy and readily decaying	...	...	...	...	6
	Fruit body tough and not easily decaying	...	...	...	...	22
6.	Spore bearing layer, on, fold-like, often forked gills	...	...	...	...	<i>Cantharellus</i>
	Spore bearing layer, on distinct well formed gills, gills not forked	...	...	...	...	7
7.	Cap easily separable from the stem	...	...	...	...	8
	Cap not easily separable from the stem	...	...	...	...	10
8.	Stem with a volva	...	...	...	...	<i>Amanita</i>
	Stem without a volva	...	...	...	...	9
9.	Marginal part of cap, splitting at maturity	...	...	...	...	<i>Leucocoprinus</i>
	Marginal part of cap, not splitting at maturity	...	...	...	...	<i>Lepiota</i>
10.	Cap, stem and the gills brittle ; stem never stiff	...	...	...	...	<i>Russula</i>
	Cap stem and gills soft ; if stem stiff, then snapping when bent	...	...	...	...	11
11.	Gills waxy, or with a bloom as if powdered with talc	...	...	...	...	12
	Gills not waxy ; not with a bloom	...	...	...	...	13
12.	Gills rather watery and waxy ; spores smooth	...	...	...	...	<i>Hygrophorus</i>
	Gills rigid not watery, with powder bloom ; spores with distinct spines	...	...	...	...	<i>Laccaria</i>
13.	Stem with an annulus, and / or eccentric	...	...	...	...	14
	Stem lacking a ring, and central	...	...	...	...	16
14.	Stem central and possess annulus	...	...	...	...	15
	Stem eccentric	...	...	...	...	<i>Pleurotus</i>
15.	Gills attached to the stipe and descending down the stem (decurrent)	...	...	...	...	<i>Armillariella</i>
	Gills usually not decurrent	...	...	...	...	<i>Armillaria</i>
16.	Stem fibrous	...	...	...	...	17
	Stem not fibrous, stiff only in outer layer	...	...	...	...	18

17.	Pileus fleshy convex	...	...	...	...	...	<i>Tricholoma</i>
	Pileus sub-gelatinous, hypocateriform	...	...	...	...	...	<i>Phlebophora</i>
18.	Gills attached to the stem, and descending down the stem (decurrent); Sterile cells absent on gills and surface of cap	...	...	...	...	...	19
	Gills attached, but not descending (adnate or adnexed), or if descending, then distinct sterile cells on gills, cap, and stem	...	...	...	...	...	20
19.	Cap normally symmetrical, generally fleshy at the centre, and becoming thin towards the centre	...	...	...	...	...	<i>Clitocybe</i>
	Cap thin, usually umbilicate at first, then funnel shaped	...	...	...	...	...	<i>Omphalina</i>
20.	Cap edge straight, and usually striate when young	...	...	...	...	...	<i>Mycena</i>
	Cap edge incurved and not striate	...	...	...	...	...	21
21.	Cap viscid; stipe usually rooting; fruit body growing directly on wood or attached to wood by rhizomorphs	...	...	...	...	...	<i>Oudemansiella</i>
	Cap not viscid; if viscid, then fruit body not attached to wood nor stipe with a rooting base	...	...	...	...	...	<i>Collybia</i>
22.	Stem central; gills often interconnected by veins; cap can be dried, later revived purely by moistening	...	...	...	...	...	<i>Marasmius</i>
	Stem not central; fruit body although persistent, not easily revived to natural shape after being dried	...	...	...	...	...	23
23.	Gills appearing as if split down their middle	...	...	...	...	...	<i>Schizophyllum</i>
	Gills not splitting	...	...	...	...	...	24
24.	Pileus and gills variegated with bluish or greenish colored stains	...	...	...	...	...	<i>Trogia</i>
	Not as above	...	...	...	...	...	25
25.	Gills notched, or toothed along their edge	...	...	...	...	...	<i>Lentinus</i>
	Gills even along their edge	...	...	...	...	...	<i>Panus</i>
26.	Spores pinkish in mass	...	...	...	...	...	27
	Spores blackish or some shade of brown in mass	...	...	...	...	...	35
27.	Stem laterally attached to the cap or absent	...	...	...	...	...	28
	Stem centrally attached	...	...	...	...	...	29
28.	Cap often rests upon its back and is attached by a point when young, but it becomes turned backward with age	...	...	...	...	...	<i>Claudopus</i>
	Not as above	...	...	...	...	...	<i>Clitopilus</i>
29.	Stipe with a volva at the base	...	...	...	...	...	<i>Volvariella</i>
	Stipe lacking a volva	...	...	...	...	...	30
30.	Gills free, or part attached, and descending down the stipe (decurrent)	...	...	...	...	...	31
	Gills attached to the stipe but not descending down	...	...	...	...	...	33
31.	Gills remote to free from the stipe	...	...	...	...	...	<i>Pluteus</i>
	Gills distinctly attached and descending down the stem	...	...	...	...	...	32

49. Gills broadly attached to the stem (adnate), and with a ring *Stropharia*
- Gills narrowly attached to the stem (adnexed) or with concave dentation near the stem
(sinuate) or if adnate then lacking a ring 50
50. Gills sinuate *Hypohelia*
- Gills not sinuate 51
51. Stipe stiff, but breaking with a snap when bent; edge of cap incurved at first; cap
surface composed of filamentous cells *Psilocybe*
- Stipe fragile; edge of cap straight throughout; cap surface composed of rounded cells *Psathyrella*
52. Spore — print white *Filoboletus*
- Spore — print coloured *Boletus*

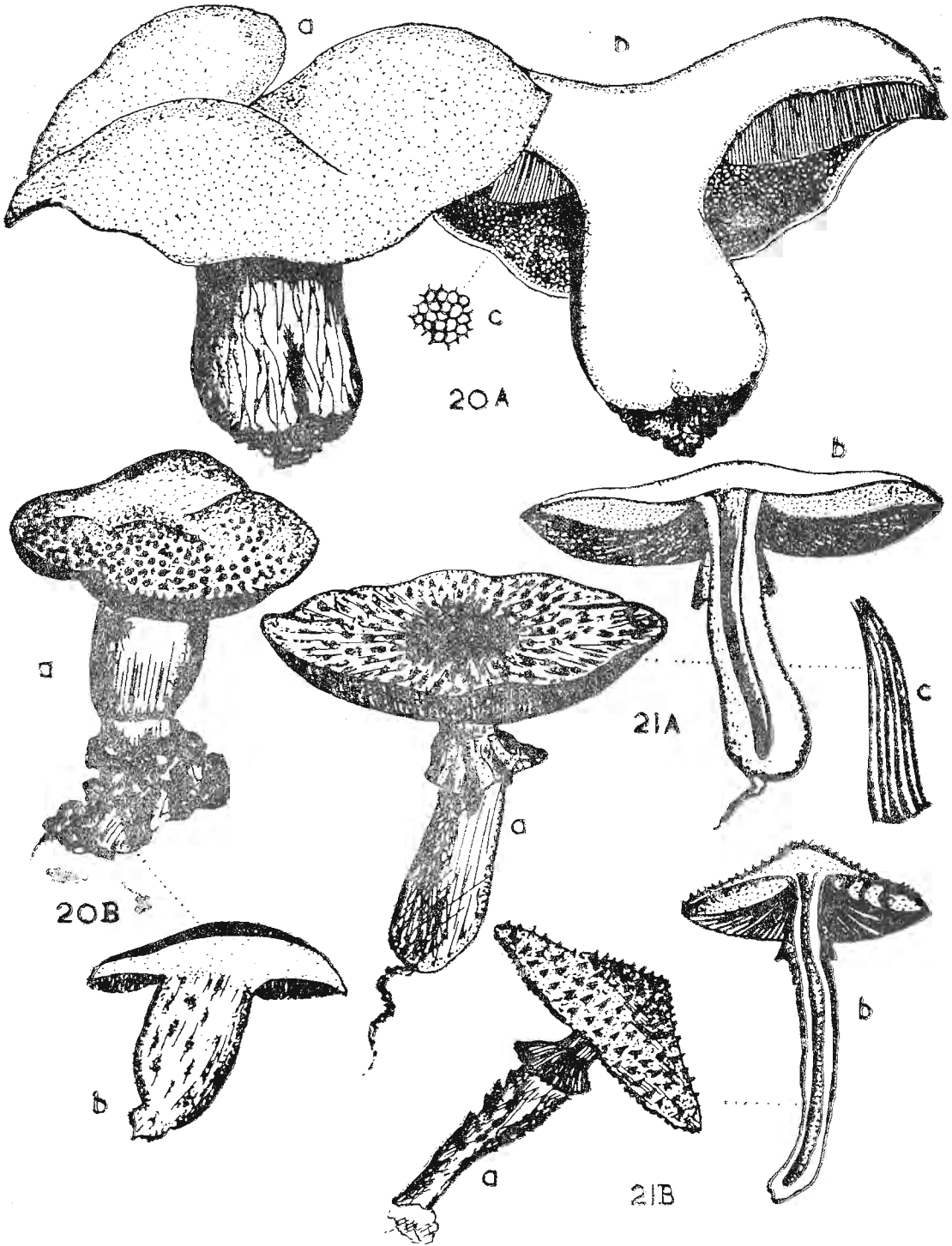


PLATE VIII — Figs. 20 & 21

CHARACTERISTICS OF THE GENERA

Agaricus L. ex Fr. (Fig. 21)

= *Psalliota* (Fr.) Kummer (Ainsworth 1963)

Pileus fleshy. Stipe (stem) central, furnished with a distinct ring; context often becoming reddish when bruised or changing to yellow when touched. No volva. Gills at first enclosed by the secondary veil, free, white when young, then pink or reddish, at length dark purplish-brown, due to the presence of attached spores. Spore — print brownish, or purplish-brown. Spores smooth, no germ pore; basidia two spored; cystidia absent. Analogous with *Lepiota* of the white spored species.

60 species, terrestrial cosmopolitan. All species but a few are edible. *A. bisporus* is grown commercially in many countries. Species of *Agaricus* eg. *A. trisulphuratus*, are mycorrhiza forming.

26 species recorded in Sri Lanka.

(1) <i>A. alphitochroa</i> B. & Br.	..	P: 63
(2) <i>A. argineus</i> B. & Br.	..	P: 64
(3) <i>A. arvensis</i> Schaeff.	..	P: 64
(4) <i>A. bolorhizus</i> B. & Br.	..	P: 64
(5) <i>A. callipeplus</i> B. & Br.	..	P: 53
(6) <i>A. campestris</i> L. ex Fr.	..	P: 64
(7) <i>A. chloroconius</i> B. & Br.	..	P: 53
(8) <i>A. chrysocyclus</i> B. & Br.	..	P: 53
(9) <i>A. crocopeplus</i> B. & Br.	..	P: 64
(10) <i>A. didactylus</i> B. & Br.	..	P: 53
(11) <i>A. dyspines</i> B. & Br.	..	P: 53
(12) <i>A. endo xanthus</i> B. & Br.	..	P: 64
(13) <i>A. erythrospila</i> B. & Br.	..	P: 64
(14) <i>A. hemilaisus</i> B. & Br.	..	P: 64
(15) <i>A. illotus</i> B. & Br.	..	P: 53
(16) <i>A. lituratus</i> B. & Br.	..	P: 64
(17) <i>A. microcosmus</i> B. & Br.	..	P: 64
(18) <i>A. nymphidus</i> B. & Br.	..	P: 53
(19) <i>A. plumarius</i> B. & Br.	..	P: 53
(20) <i>A. rhodochrous</i> B. & Br.	..	P: 53
(21) <i>A. rufo-albus</i> Berk.	..	P: 53
(22) <i>A. silvaticus</i> Schaeff.	..	P: 64
(23) <i>A. simulans</i> Berk.	..	P: 64
(24) <i>A. spilocephalus</i> B. & Br.	..	P: 53
(25) <i>A. subaerugenosus</i> B. & Br.	..	P: 64
(26) <i>A. torno cephalus</i> B. & Br.	..	P: 53

One more species described and recorded under the genus *Psalliota* as
(27) *P. stadii* Petch.

PLATE VIII

Fig. 20 — A — *Boletus portentosus* (x0.25) a^{*} — entire, b — L.S. c pores.
B — *Boletus rubescens* (x1) a — entire, b — L.S.

Fig. 21 — A — *Agaricus campestris* (x0.5) a — entire, b — L.S. c — gills.
B — *Agaricus inocobaphus* (x1) a — entire, b — L.S.

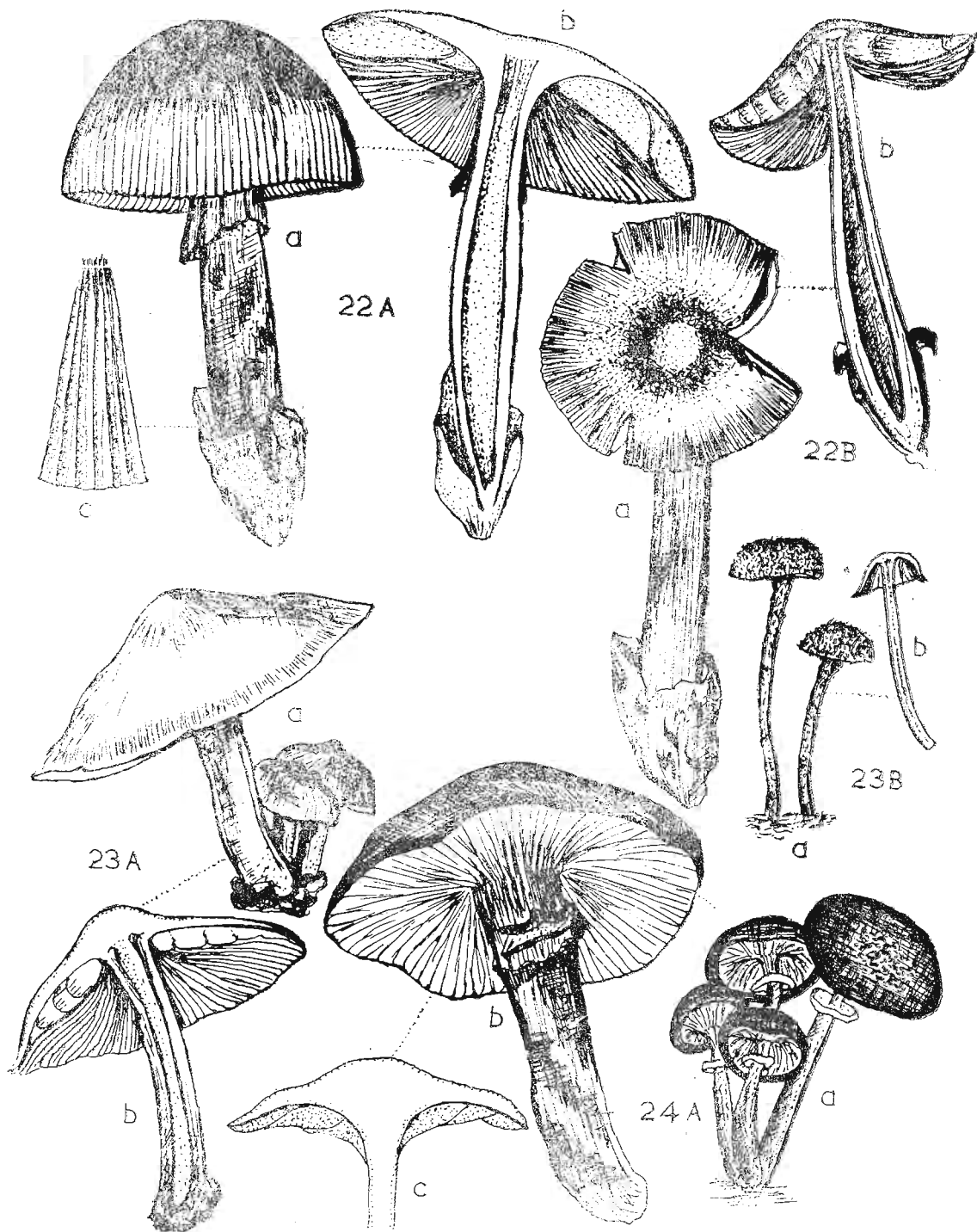


PLATE IX — Figs. 22 — 24

2. *Amanita* (Pers. ex Fr.) S. F. Gray (Fig. 22)

Cap with the lamellae distinct and easily separable from the stem, which leaves a socket in the flesh when it is removed. Pileus fleshy, convex. Gills free, occasionally sub-adnate or decurrent by a tooth. Universal veil at first enclosing the entire plant, which as it grows bursts through, generally carrying the upper part on the pileus, where it appears as scales, the remainder enclosing the stem at the base as a volva either in a cup-like form closely adherent or friable, and evanescent. Stem is furnished with a ring or annulus. Spore-print white, rarely coloured.

Because of the ovate or button-like form when young, *Amanita* is frequently mistaken for the *Agaricus*. The nearest allied genus *Lepiota* is separated from this, by the absence of volva. *Volvariella* may resemble this genus but the spore-print is coloured.

50 species, widespread. Several deadly poisonous mushrooms belong to this genus; notably the death cap *A. phalloides*, *A. verna*, *A. virosa*. Some others whilst, definitely poisonous are less deadly. This includes the fly — agaric, *A. muscaria* which has hallucinogenic properties. Some other species eg. *A. rubescens*, *A. vaginata*, *A. fulvus* are edible. *A. vaginata* and *A. fulvus* were earlier classified in a separate genus *Amanitopsis*, because of the absence of a ring, but this distinction is no longer maintained. Many species including *A. fulvus*, *A. rubescens*, *A. citrina*, *A. hemibapha* are mycorrhizal.

2 species recorded in Sri Lanka.

- (1) *A. hemibapha* (B. & Br.) Sacc. .. P : 53
 (2) *A. vaginata* (Bull. ex Fr.) Rozo .. P : 53
 = *Amanitopsis vaginata*

3. *Armillaria* (Fr.) Kummer (Fig. 23)
 = *Aeruginospora* Hohnel (Ainsworth 1963)

Pileus symmetrical, smooth scurfy or sometimes slightly scaly. Hymenophore confluent and homogeneous with the stem. Stem central, with a distinct ring, sometimes clothed with scales. Gills attached to the stem. Spores white.

Growing on the ground or on stumps. But for the presence of a ring, this genus agrees with *Tricholoma*, *Clitocybe* and *Collybia*.

40 species. Cosmopolitan. All species edible.
 2 species recorded in Sri Lanka.

- (1) *A. asparta* (Berk.) Petch .. P : 53
 (2) *A. omphnera* (B. & Br.) Sacc. .. P : 53

One more species described and recorded under the genus *Aeruginospora* Hohnel as

- (3) *A. singularis* Hohnel .. P : 53

PLATE IX

Fig. 22 — A — *Amanita hemibapha* (x0.5) a — entire, b — L.S., c — gills.

B — *Amanita vaginata* (x0.5) a — entire, b — L.S.

Fig. 23 — A — *Armillaria omphnera* (x0.5) — a — clump, b — L.S.

B — *Aeruginospora singularis* (x1) a — entire, — L.S.

Fig. 24 — A — *Armillariella mellea* (x1) a — clump, b — entire, c — L.S.

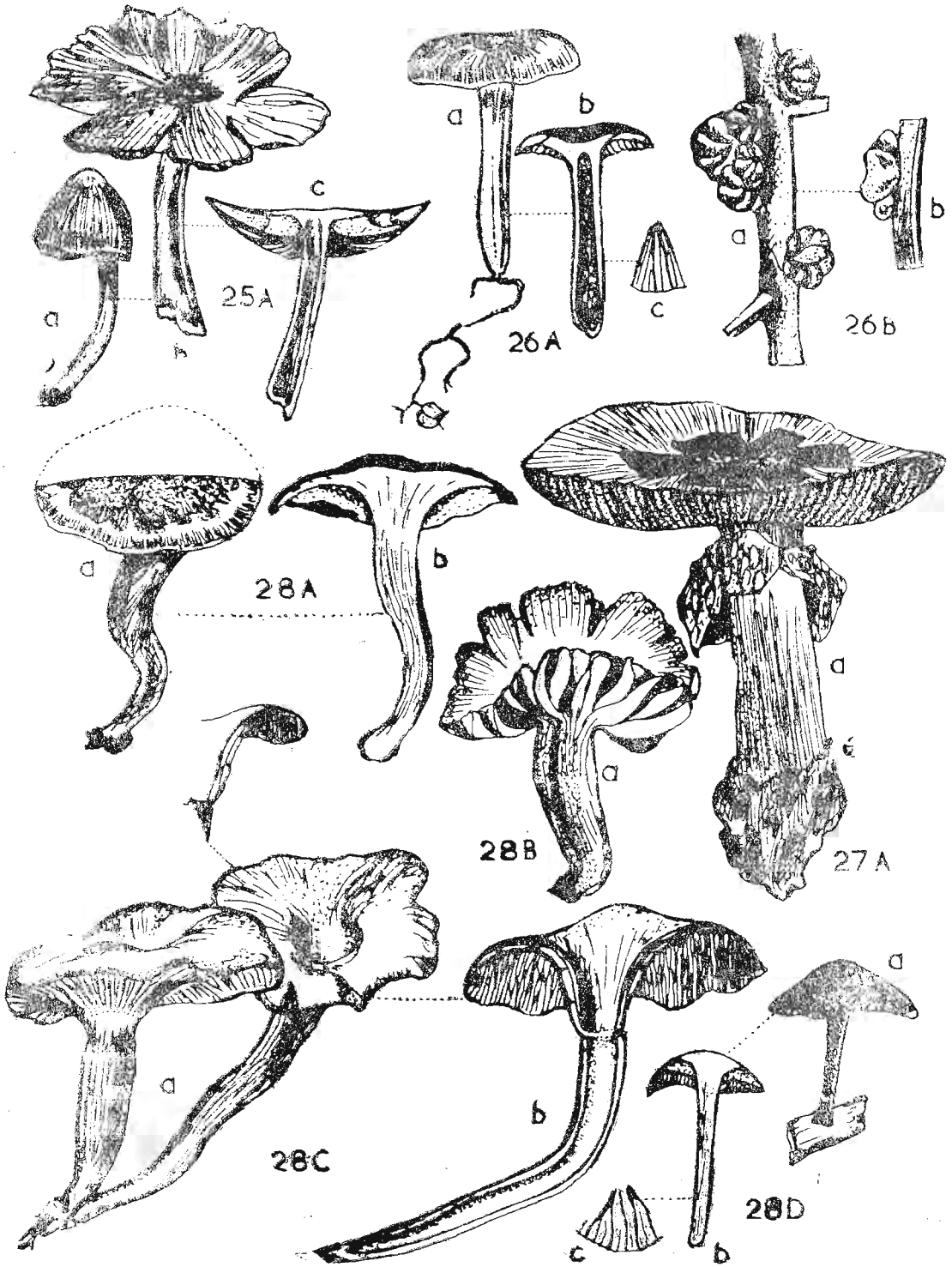


PLATE X — Figs. 25 — 28

4. *Armillariella* (Karst.) Karst. (Fig. 24)

This genus is based on *Armillarea mellea* (Fr.) Kummer (Ainsworth 1963).

The cap is very variable, usually brownish, squamulose or smooth, even, or when old slightly striate on the margin. Gills close to distant, moderately thick, decurrent, sometimes adnate white or whitish becoming sordid with age. Stipe somewhat fibrous — fleshy to fleshy, annulate, brownish toward the base. Spore - Print usually pale ochraceous, or pure white; spores often thin to moderately thick - walled ellipsoid hyaline, non-amyloid. Basidia 4 spored Cystidia frequently present on the edge of the gill (cheilocystidia).

6 species. The genus includes important tree - destroying fungi. Almost always grow on wood. All species are edible. *A. mellea* (Vahl.) Karst, (the 'honey agaric' or the 'boot lace' fungus) is the cause of serious root rots in trees and other plants. It can travel long distances through the soil with the use of its black, boot lace-like, rhizomorphs.

1 species recorded in Sri Lanka.

A. mellea (Vahl.) Karst.
= *Armillarea mellea* (Fr.) Kummer .. P : 53

5. *Arrenhiza* Fr.

Membranaceous fungi, very slender, with a hymenium below, striate with sparse slender, slightly elevated, simple veins in place of lamellae. Spore-print white.

5 species widespread.

1 species recorded in Sri Lanka.

A. minuta Petch .. P : 53

6. *Bolbitius* Fr. (Fig. 25)

Cap characteristically viscid, plicate — sulcate, striate, fragile; cuticle is cellular. Gills splitting after disintegration of tissue following spore release, finally gills dissolve into mucus but not dripping as in *Coprinus*; free or adnexed, membranaceous, soft, salmon colour or rusty, stipe central, white or whitish. Spore-print dull brown. Spores smooth, with germ pores, and develop evenly over the surface of the gills. Cystidia present on the margin of gills.

PLATE X

Fig. 25 — A — *Bolbitius fissus* (x1) a — young, b — entire, c — L.S.

Fig. 26 — A — *Cantharellus stolonifer* (x1) a — clump, lower surface, b — clump, upper surface.

Fig. 27 — A — *Clarbienda* (*Chitoniella*) *trachodes* (x0.5) a — entire.

Fig. 28 — A — *Clyrocybes* p. (x1) a — entire, b — L.S.

B — *Clyrocybe corrugate* (x1) a — entire.

C — *Clyrocybe hyalodes* (x1) a — entire, b — L.S.

D — *Clyrocybe myochroa* (x1) a — entire, — L.S., c — gills.

Growing on dung, soil and on rotting trunks of wood.

20 species, cosmopolitan.

1 species recorded in Sri Lanka.

B. fissus B & Br.

.. P : 53

7. ***Boletus* Dill. ex Fr. (Fig. 20).

Cap is fleshy, putrescent, reddish brown and rounded, flesh pale yellow, tubes greenish yellow. Flesh and tubes become greenish blue to blue when exposed to the air. Chemists are interested in the genus for the reason that flesh of many species turns vivid colours when exposed to the atmosphere. Stem central, stout, and fleshy. Many species possess a very distinct raised net work, all over the stem, whilst others have it present only in part or have minute often brightly coloured dots replacing it. Tubes are not firmly fixed to the cap, thus easily separating from the cap and from one another.

50 species cosmopolitan. Many species form mycorrhiza with forest trees. Some are edible, few poisonous.

For long all the boleti were classified in the Genus *Boletus* but now several genera, at least 18, are recognised. The separation of these genera is based on differences in colour of the spore-print and differences of the anatomy of the tubes, cap and stipe. *Boletus* species are disposed into several genera such as *Suillus*; *Leccinum*; *Phlebopus* singer (Heim); *Strobilomyces*; *Ixocomus*; *Xerocomus*; *Phaeogroporus* Singer; *Gyroporus*; *Tylophilus*; *Porphyrellus*.

5. species recorded in Sri Lanka.

- | | |
|-------------------------------------|-----------|
| (1) <i>B. luteus</i> L. ex Fr. | .. P : 47 |
| (2)* <i>B. portentosus</i> B. & Br. | .. P : 47 |
| (3) <i>B. rubescens</i> Petch | .. P : 47 |
| (4) <i>B. sylvestris</i> Petch | .. P : 47 |
| (5) <i>B. xylophilus</i> Petch | .. P : 47 |

* *Boletus portentosus* (B. & Br.) is now referred to as *Phaeogyroporus*. *Portentosus* (Berk & Br.) Mc Nabb (Zoberi 1972).

** See addendum for recently recorded genere

8. *Campanella* P. Henn.

Pileus membranaceous; hymenium sub-reticulate beneath, with veins or anastomosing ribs in the place of lamellae; spores colourless, sub-globose; basidia sub-clavate. Akin to *Marasmius* and *Arrhenia*.

1 species recorded in Sri Lanka.

(1) *C. purpureobrunnea* Petch.

.. P : 53

9. *Cantharellus* Adans ex Fr. (Fig. 26).

Hymenophore confluent with the stem, descending unchanged into the trama cap regular, eccentric or variously lobed, fleshy or membranaceous; gills thick, fleshy, waxy, fold-like, somewhat branched, obtuse at the edge, more or less decurrent; stem central, lateral or absent; spores white. Growing on the ground. Species of *Cantharellus*, eg. *C. cibarius* is considered a mycorrhiza forming fungus. (Trappe 1962a).

70 species, widespread. Some species are edible. 6 species recorded in Sri Lanka.

- | | |
|----------------------------------|-----------|
| (1) <i>C. decurrentis</i> Petch | .. P : 53 |
| (2) <i>C. furfuraceus</i> Petch | .. P : 53 |
| (3) <i>C. humilis</i> B. & Br. | .. P : 53 |
| (4) <i>C. inequalis</i> B. & Br. | .. P : 53 |
| (5) <i>C. Pellucidus</i> Petch | .. P : 53 |
| (6) <i>C. rabidus</i> B. & Br. | .. P : 53 |

10. *Clarkiella* OKUNTZE. (Fig. 27).
= *Chitoniella* P. Henn. (Ainsworth 1963)

Cap fleshy, regular; stem central, hollow thin; volva membranaceous, sheathing; gills free; spores purple-brown.

Growing on the ground. Agrees in structure with *Amanita*, and *Volvariella*, but has purple-brown spores.

1 species in tropical asia.

1 species recorded in Sri Lanka under the name *Chitoniella* as

- | | |
|---------------------------------------|-----------|
| (1) <i>C. trachodes</i> (Berk.) Petch | .. P : 53 |
|---------------------------------------|-----------|

11. *Claudopus* (W. G. Smith) Gill.

Cap eccentric, lateral or resupinate. Stem is very short or entirely absent. The cap often rests upon its back and is attached by a point when young, but it becomes turned backward with age. Spores pinkish. This genus resembles *Pleurotus* and *Crepidotus* in all respects except the colour of the spores. Growing on wood or on the ground.

20 species, north temperate. Several species are considered edible, but these must be harvested before the onset of autodigestion. They appear as weeds in mushroom cultivation. *C. quadrifidus* produces an antibiotic called quadrifidin.

3 species recorded in Sri Lanka.

- | | |
|--|------------|
| (1) <i>C. fuscolamellatus</i> Petch | .. P : 54 |
| (2) <i>C. proteus</i> (Kalchbr.) Sacc. | .. P : 54 |
| (3) <i>C. repens</i> Petch | ... P : 54 |

12. *Clitocybe* (Fr.) Kummer. (Fig. 28).

= *Aeruginospora* Hohnel.

Cap normally symmetrical generally fleshy at the centre and becoming thin towards the edge, flexible or tough, plane or depressed, margin involute. Stem central, confluent and homogenous with flesh of cap, somewhat elastic with a spongy stuffing, frequently becoming hollow, externally fibrous. Gills decurrent or rarely adnate with an acute edge. Growing on the ground, frequently in groups.

50 species; cosmopolitan. Most species are edible. Many species are mycorrhiza forming (Trappe 1962a).

12 species recorded in Sri Lanka.

- | | |
|--|-----------|
| (1) <i>C. anomologa</i> (B. & Br.) Petch | .. P : 54 |
| (2) <i>C. conspurcata</i> (B. & Br.) Sacc. | .. P : 54 |
| (3) <i>C. corrugata</i> Petch | .. P : 54 |
| (4) <i>C. epia</i> (B. & Br.) Sacc. | .. P : 54 |

- | | |
|---|----------|
| (5) <i>C. flavescens</i> Petch | .. P: 54 |
| (6) <i>C. hyalodes</i> (B. & Br.) Sacc. | .. P: 54 |
| (7) <i>C. metria</i> (B. & Br.) Sacc. | .. P: 54 |
| (8) <i>C. myochroa</i> (B. & Br.) Sacc. | .. P: 54 |
| (9) <i>C. nigra</i> Petch. | .. P: 54 |
| (10) <i>C. pyraces</i> (B. & Br.) Sacc. | .. P: 54 |
| (11) <i>C. scotodes</i> (B. & Br.) Petch. | .. P: 54 |
| (12) <i>C. sordida</i> Petch. | .. P: 54 |

13. *Clitopilus* (Fr.) Kummer. (Fig. 29)

Cap fleshy, regular or eccentric, usually depressed or umbilicate, with the margin at first involute. Stem fleshy or fibrous, not polished and cartilagenous externally, central, expanded upward into the flesh of the pileus. Gills more or less decurrent, salmon colour. Spores pink. Closely resembles *Eccilia*. Agrees in structure with *Clitocybe* but spores are pink.

Growing on the ground, often strong smelling. Some of the best edible kinds are in this genus; a few are unpleasant raw; none poisonous. 30 species, N. temperate. Some species are mycorrhiza forming. (Trappe 1962a).

4 species recorded in Sri Lanka.

- | | |
|--|----------|
| (1) <i>C. apalus</i> (B. & Br.) Petch. | .. P: 54 |
| (2) <i>C. peri</i> (B. & Br.) Petch. | .. P: 54 |
| (3) <i>C. subgilvus</i> (B. & Br.) Sacc. | .. P: 54 |
| (4) <i>C. tephras</i> (B. & Br.) Sacc. | .. P: 54 |

14. *Collybia* (Fr.) Kummer. (Fig. 30).

Pileus fleshy membranaceous regular, margin incurved or involute when young; stem different in substance from the pileus but confluent with it, hollow, central, cartilaginous often with rooting bases (pseudo & rhizae). Gills soft, membranaceous free or attached to the stem. Spore print white, vary in size from a small coin to 5" across.

Growing on the ground, wood, leaves and decaying fungi.

200 species, cosmopolitan. None of the species are poisonous. Many of them are strong in odour.

12 species recorded in Sri Lanka.

- | | |
|---|----------|
| (1) <i>C. albuminosa</i> (Berk) Petch | .. P: 54 |
| (2) <i>C. chryso-ropha</i> (B. & Br.) Sacc. | .. P: 54 |
| (3) <i>C. clara</i> (B. & Br.) Sacc. | .. P: 54 |
| (4) <i>C. crocobapha</i> (B. & Br.) Petch | .. P: 54 |
| (5) <i>C. cubistes</i> (B. & Br.) Petch | .. P: 54 |
| (6) <i>C. diminuta</i> (B. & Br.) Sacc. | .. P: 54 |
| (7) <i>C. dryophila</i> (Bull. ex. Fr.) Quel. | .. P: 54 |
| (8) <i>C. endochorda</i> (B. & Br.) Sacc. | .. P: 54 |
| (9) <i>C. multicolor</i> Petch | .. P: 54 |
| (10) <i>C. radicata</i> Petch | .. P: 54 |
| (11) <i>C. rufipicta</i> (B. & Br.) Sacc. | .. P: 54 |
| (12) <i>C. verticolor</i> (B. & Br.) Sacc. | .. P: 54 |

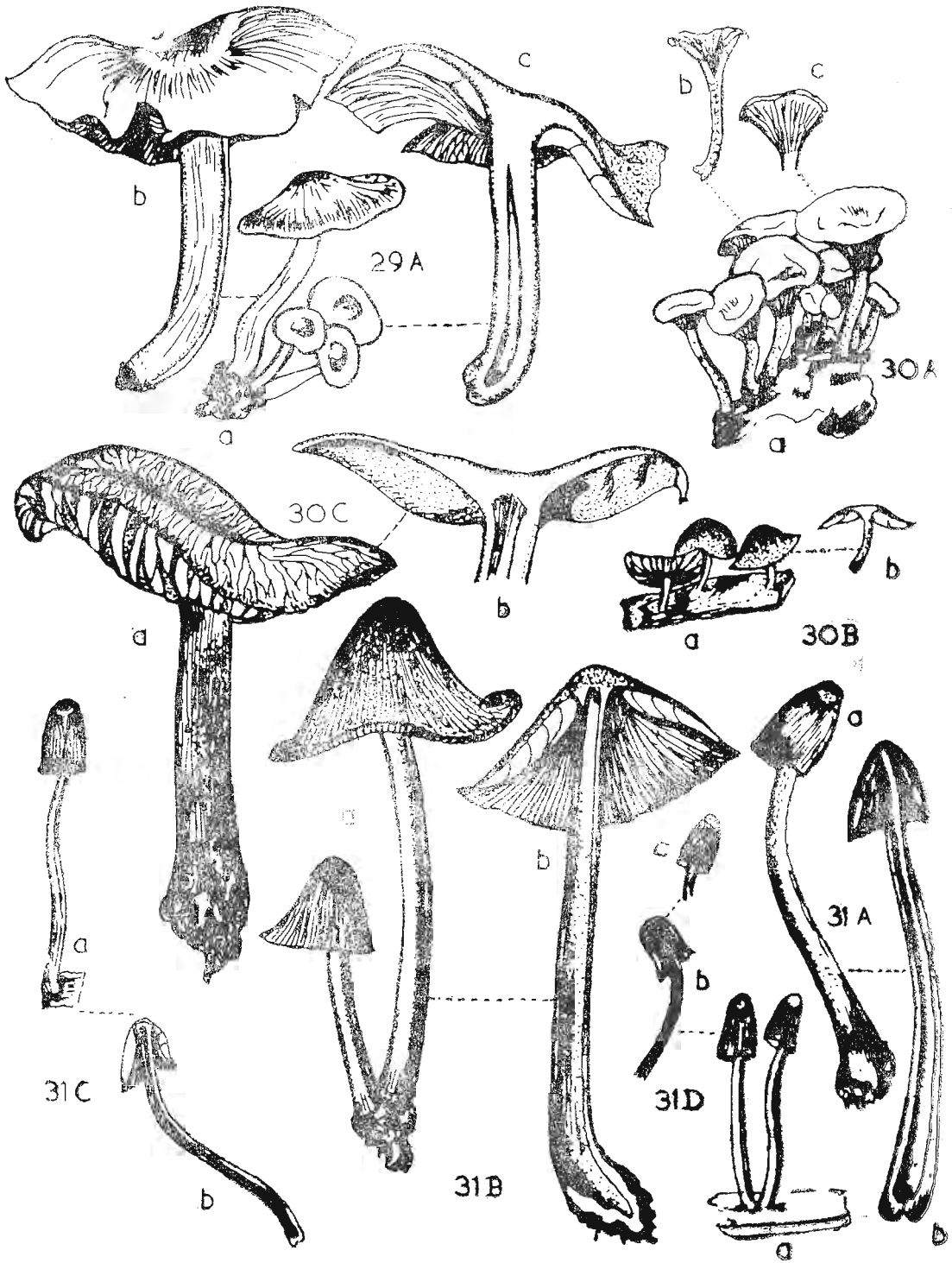


PLATE XI — Figs. 29 — 31

15. *Coprinus* (Pers ex. Fr.) Gray. (Fig. 31).

Pileus fleshy or membranaceous, usually, grooved or striate, at first cylindrical or conical or ovate, and usually floccose or scurfy with the margin originally straight and adpressed to the stem; stem central with or without a ring or volva; gills free or adnate or attached to a collar, with maturation of spores blackening and autodigesting from below upwards. The black fluid resulting from autodigestion may be used in writing. Spores black. The extreme closeness of the gills and their entire deliquescence into inky drops separate it from all other genera.

Majority grow on richly manured ground or dung. Some on rotten wood and other materials.

200 species, all species edible.

11 species recorded in Sri Lanka.

(1) <i>C. castaneus</i> B. Br.	.. P: 55
(2) <i>C. fibrillosus</i> B. & Br.	.. P: 55
(3) <i>C. fimbriatus</i> B. & Br.	.. P: 55
(4) <i>C. macropus</i> B. & Br.	.. P: 55
(5) <i>C. macrorhizus</i> (Pers. ex Fr.) Rea	.. P: 55
(6) <i>C. microsporus</i> B. & Br.	.. P: 55
(7) <i>C. pachyterus</i> B. & Br.	.. P: 55
(8) <i>C. pallidus</i> B. & Br.	.. P: 55
(9) <i>C. plicatilis</i> (Fr.) Fr.	.. P: 55
(10) <i>C. setulosus</i> B. & Br.	.. P: 55
(11) <i>C. tomentosus</i> Fr.	.. P: 55

16. *Crepidotus* Kummer. (Fig. 32).

Pileus fleshy, lateral or resupinate, becoming reflexed as it enlarges; stem lateral or none; gills more or less decurrent or radiating from a central point; spores, rust-colour. Pileus which in most species white or yellowish, is often stained by the spores and then it has a rusty stained or squalid appearance.

Growing especially on old stumps and often in decayed wood in damp shaded places.

The genus corresponds in shape and habit to the smaller species of *Pleurotus* and to that of *Claudopus* but they are distinguished from both by the rust colour of the spores. 40 species, cosmopolitan.

12 species recorded in Sri Lanka.

(1) <i>C. citrinus</i> Petch	.. P: 55
(2) <i>C. epicrocinus</i> (B. & Br.) Sacc.	.. P: 55
(3) <i>C. flavomarginatus</i> (B. & Br.) Sacc.	.. P: 55
(4) <i>C. grumosopilosus</i> (B. & Br.) Sacc.	.. P: 55

PLATE XI Fig. 29 — *Clitopilus* sp. (x1) a — clump, b — undersurface of cap; c — L.S.

Fig. 30 — A — *Collybia Crocobapha* (x0.5) a — clump, b — entire, c — L.S.
 B — *Collybia diminuta* (x1) a — clump, b — L.S.
 C — *Collybia endochorda* (x0.75) a — entire, b — L.S.

Fig. 31 — A — *Coprinus castaneus* (x1) a — entire, b — L.S.
 B — *Coprinus macropus* (x1) a — entire, b — L.S.
 C — *Coprinus pallidus* (x1) a — entire, b — L.S.
 D — *Coprinus setulosus* (x1) a — entire, b — L.S., c — cap.

- | | |
|---|-----------|
| (5) <i>C. hepaticum</i> (Berk) Sacc. | .. P : 55 |
| (6) <i>C. melleus</i> (B. & Br.) Petch | .. P : 55 |
| (7) <i>C. pezizula</i> (B. & Br.) Sacc. | .. P : 55 |
| (8) <i>C. phaeophyllus</i> (Berk) Sacc. | .. P : 55 |
| (9) <i>C. reversus</i> (B. & Br.) Sacc. | .. P : 55 |
| (10) <i>C. truncatus</i> Petch | .. P : 55 |
| (11) <i>C. velutinus</i> Petch | .. P : 55 |

17. *Ecclia* (Fr.) Kummer. (Fig. 33).

Pileus fleshy or sub-membranaceous, imbricate or depressed with the margin at first incurved; stem cartilagenous, central, expanded upward into the pileus; gills truly decurrent; spore print pink.

Corresponds in structure with *Omphalina* of the white spored form and *Tubaria* of the brown spored forms.

35 species, North American.

1 species recorded in Sri Lanka.

- | | |
|---|-----------|
| (1) <i>E. hyalodepas</i> (B. & Br.) Sacc. | .. P : 55 |
|---|-----------|

18. *Entoloma* (Fr.) Kummer. (Fig. 34).

Pileus rather fleshy; margin incurved when young; stem fleshy or fibrous, central, continuous with the flesh of the pileus; gills sinuate, adnexed, often separate from the stem, at first white then usually pink; spores rosy.

Growing on the ground. Some species of this genus are mycorrhiza forming (Trappe 1962a) some are edible.

Corresponds in structure with *Tricholoma*, *Hebeloma* and *Hypholoma* but has pink spores

120 species. North temperate.

13 species recorded in Sri Lanka.

- | | |
|--|-----------|
| (1) <i>E. argilophyllum</i> (B. & Br.) Sacc. | .. P : 55 |
| (2) <i>E. amethysteum</i> Petch | .. P : 55 |
| (3) <i>E. brunneum</i> Petch | .. P : 55 |
| (4) <i>E. crassipes</i> Petch | .. P : 55 |
| (5) <i>E. infundibuliforme</i> Petch | .. P : 55 |
| (6) <i>E. iodnephes</i> (B. & Br.) Sacc. | .. P : 55 |
| (7) <i>E. mazophorum</i> (B. & Br.) Sacc. | .. P : 55 |
| (8) <i>E. microcarpum</i> (B. & Br.) Sacc. | .. P : 55 |
| (9) <i>E. pallidogilvum</i> (B. & Br.) Sacc. | .. P : 55 |
| (10) <i>E. purpureum</i> Petch. | .. P : 55 |
| (11) <i>E. retroflexum</i> (B. & Br.) Sacc. | .. P : 55 |
| (12) <i>E. sericum</i> (Bull. ex. Fr.) Quel. | .. P : 55 |
| (13) <i>E. stylophorum</i> (B. & Br.) Sacc. | .. P : 55 |

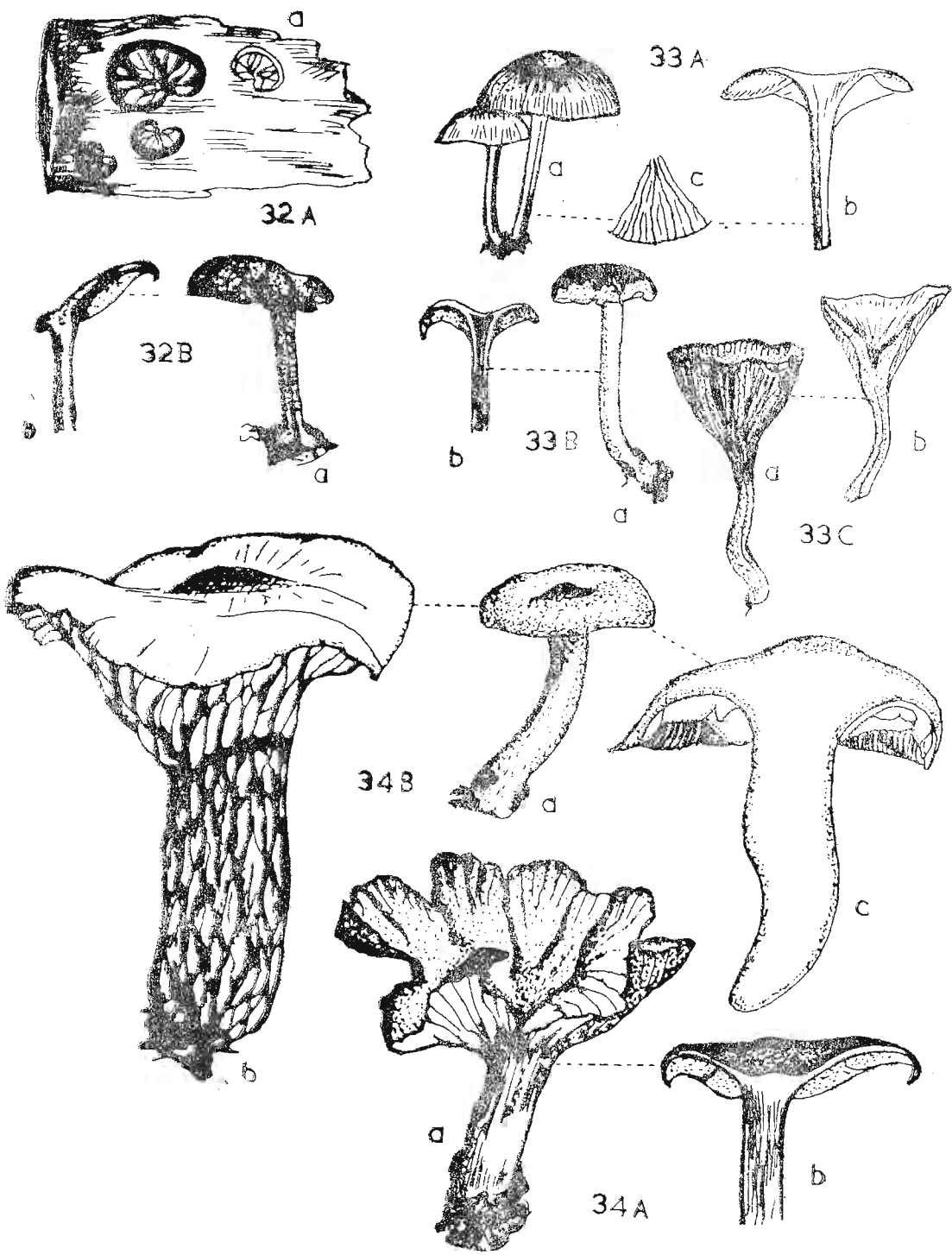


PLATE XII — Figs. 32—34

19. *Filoboletus* P. Henn.

Pileus truly poroid, the pores forming a rather deep or very shallow layer; cap is convex; spore-print white spores hyaline, smooth, ellipsoid, amyloid. Stipe central or slightly eccentric, sub-glabrous to pruinose or floccose. Grow on dead wood, more rarely on other plant debris.

4 species, tropical.

species recorded in Sri Lanka.

F. manipularis (Berk.) Singer . . . P.

20. *Flammula* (Fr.) Kummer. (Fig. 35)

Pileus fleshy, margin at first turned inward (involute); gills decurrent or adnate with a tooth, usually at first whitish clay colour or yellowish then coloured by the spores; stem central fleshy-fibrous, veil fibrillose, not forming a distinct ring; spores mostly pure rust, some brownish rust, others tawny ochraceous.

Growing on the ground or on wood.

Closely allied to *Pholiota*

120 species widespread. Some species are edible.

7 species recorded in Sri Lanka.

- | | |
|---|----------|
| (1) <i>F. alutiphylla</i> (B. & Br.) Sacc. | .. P: 56 |
| (2) <i>F. crocias</i> (B. & Br.) Sacc. | .. P: 56 |
| (3) <i>F. dilepis</i> (B. & Br.) Sacc. | .. P: 56 |
| (4) <i>F. goniospora</i> (B. & Br.) Sacc. | .. P: 56 |
| (5) <i>F. holocrocina</i> (Berk.) Sacc. | .. P: 56 |
| (6) <i>F. oxylepis</i> (B. & Br.) Saac. | .. P: 56 |
| (7) <i>F. rufipunctata</i> (B. & Br.) Sacc. | .. P: 56 |

21. *Galerina* Earle (Fig. 36).

= *Galera* Fr. Kummer (Ainsworth 1963).

Pileus thin membranaceous, conical, campanulate, or oval, with a striate margin, margin at first straight then adpressed to the stem; gills adnate or adnexed, not decurrent; stem central, somewhat cartilagenous, continuous with the pileus, but differing in texture; spores brown.

Growing on the ground or on mosses. Mostly slender, small and fragile.

Most closely related to *Naucoria*, differing in the thin cap having the edge straight and pressed to the stem when young; and *Tubaria* differing in gills being not decurrent. Agrees in structure with *Nolanea* and *Psathyrella* but spores are brown.

75 species, cosmopolitan. Edible.

PLATE XII

Fig. 32 — A — *Crepidotus reversus* (X1) a — habit.
B — *Crepidotus hepatizon* (x1) a — entire, b — L.S.

Fig. 33 — A — *Eccilia hyalodepas* var (x1) a — entire, L.S., c — gills.
B — *Eccilia hyalodepas* var (x1) a — entire, b — L.S.
C — *Eccilia hyalodepas* (x1) a — entire, b — L.S.

Fig. 34 — A — *Entoloma amethysteum* (x0.75), a — entire, b — L.S.
B — *Entoloma Crassipes* (x0.75) a — young, b — entire, c — L.S.

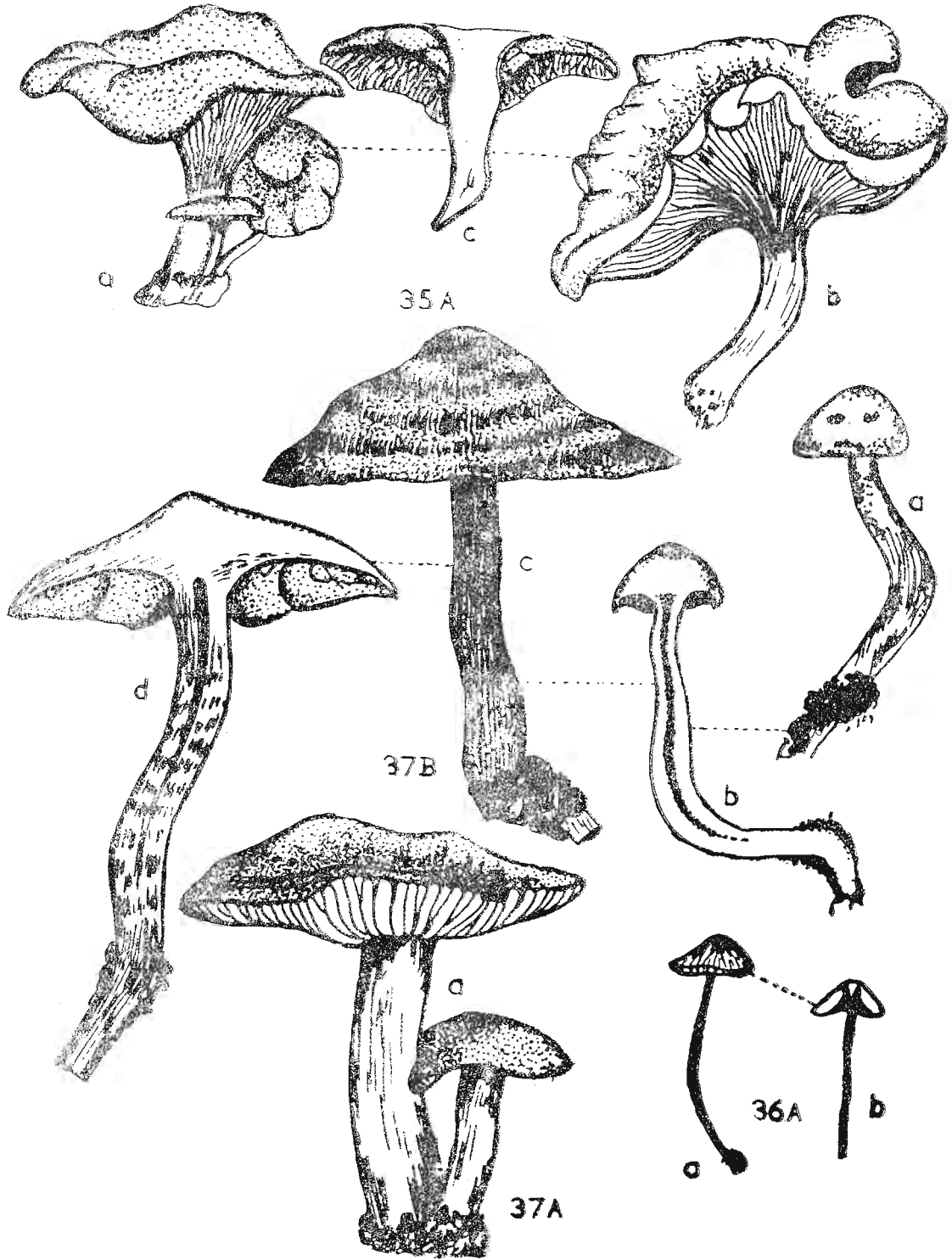


PLATE XIII — Figs. 35 — 37

2 species, recorded and described under the genus *Galera* as

- (1) *G. glaucopurpurea* (B. & Br.) Sacc. .. P : 56
 (2) *G. zeylanica* Petch ... P : 56

22. *Hebeloma* Fr. Kummer. (Fig. 37).

Pileus smooth, somewhat viscid with margin at first incurved ; stem central, fibrous or fleshy, flesh of stem continuous with that of the pileus ; gills attached, notched at the stem, edge inclined to be pale ; spores clay coloured.

Growing on the ground in clusters. Many of the species are strong in smell. None of the species have been regarded as edible, some have been regarded as poisonous.

Agrees in structure with *Tricholoma*, *Entoloma* and *Hypholoma* but spores are brown.

70 species, especially North temperate.

2 species recorded in Sri Lanka.

- (1) *H. siennicolor* Petch .. P : 56
 (2) *H. trachysporum* Petch .. P : 56

23. *Hygrophorous* Fr. (Fig. 38)

Pileus regular, or undulated and wavy, often viscid and moist ; flesh of the pileus continuous with that of the stem and descending as a trama into the gills ; stem central, fleshy ; gills more or less decurrent, waxy often thick and forked, edge always thin, sharp often branched ; spores white.

Growing on the ground very rarely on wood. Many species are brightly coloured. Most are edible, probably none are poisonous.

The genus is distinguished by a feature peculiar to itself viz. by the hymenial stratum of the gills changing into a waxy mass (in a ripe fruit body) which is at length removable from the trama.

Hygrophorous agrees in structure with *Paxillus*, but differs in the spore colour. Differs from *Russula* in not being vesiculose and from *Cantharellus* in the sharp edged gills.

175 species, widespread.

19 species recorded in Sri Lanka.

- (1) *H. alliciens* B. & Br. .. P : 56
 (2) *H. alwisii* B. & Br. .. P : 56
 (3) *H. apalus* B. & Br. .. P : 56
 (4) *H. caesius* B. & Br. .. P : 56
 (5) *H. cinerascens* B. & Br. .. P : 56
 (6) *H. dimorphus* (B. & Br.) Petch. .. P : 56

PLATE XIII

Fig. 35 -- A -- *Flammula rufipunctata* (x1) a -- young, b -- entire, c -- L.S.

Fig. 36 -- A -- *Galera zeylanica* (x1) a -- entire, b -- L.S.

Fig. 37 -- A -- *Hebeloma siennicolor* (x1) a -- entire.

B -- *Hebeloma trachysporum* (x1) a -- young, b -- L.S. ; c -- entire, d -- L.S.

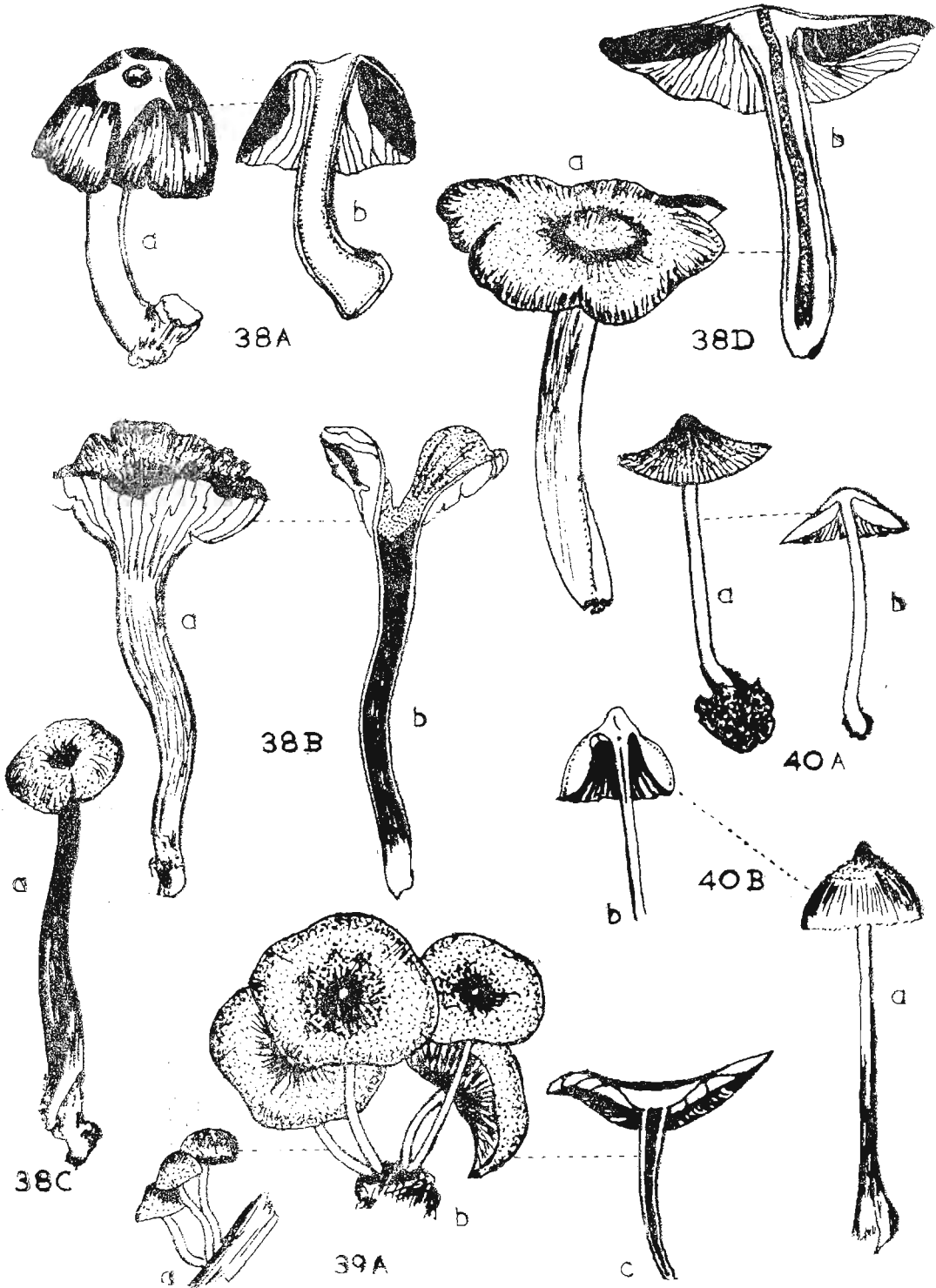


PLATE XIV — Figs. 38 — 40

(7) <i>H. diversicolor</i> Petch.	.. P : 56
(8) <i>H. elegans</i> B. & Br.	.. P : 56
(9) <i>H. erinaceus</i> Pat.	.. P : 56
(10) <i>H. firmus</i> B. & Br.	.. P : 56
(11) <i>H. miniatus</i> (Fr.) Fr.	.. P : 56
(12) <i>H. multicolor</i> B. & Br.	.. P : 56
(13) <i>H. mutabilis</i> Petch.	.. P : 56
(14) <i>H. nivosus</i> B. & Br.	.. P : 56
(15) <i>H. pygmaeus</i> B. & Br.	.. P : 56
(16) <i>H. roseostriatus</i> B. & Br.	.. P : 56
(17) <i>H. rufus</i> Petch.	.. P : 56
(18) <i>H. similis</i> Petch	.. P : 56
(19) <i>H. tricolor</i> B. & Br.	.. P : 56

24. *Hypholoma* (Fr.) Kummer. (Fig. 39)

Pileus more or less fleshy, margin at first incurved, ; stem central fibrous or fleshy, similar in substance to that of the pileus with which it is continuous ; ring or annulus is represented by a circle of fine dark coloured hairs or fibrils on the stem ; similar fibrils belonging to the veil adhere to the margin of the pileus ; gills attached to the stem, sometimes with a notch at the juncture (emarginate), occasionally separating and then appearing to be free ; spores brownish purple, sometimes intense purple almost black.

Growing on wood, more rarely on the ground. Generally caespitose. Vary in shades of yellow, red, orange, brick-colour and brown.

Agrees in structure with *Tricholoma*, *Entoloma* and *Hebeloma*. Not poisonous.

80 species, temperate.

1 species recorded in Sri Lanka.

H. janus (B. & Br.) Petch .. P : 56

25. *Inocybe* (Fr.) Fr. (Fig. 40)

Pileus fleshy, universal veil somewhat fibrillose, concrete with the cuticle of the pileus, often free at the margin, in the form of a cortina : stem scaly, fleshy, fibrillose or smooth, gills, sinuate or adnate or decurrent, at first pale then changing colour ; spores brownish - rust colour.

Growing on the ground. They are mostly strong smelling. None are edible, some are poisonous.

The genus is intermediate between *Hebeloma* and *Cortinarius*, differing from the former in the usually non-viscid, nature from the latter in the absence of a typical cortina and in the colour of the spores.

150 species widespread
2 Species record in Sri Lanka.

PLATE XIV

Figs. 38 — A — *Hygrophorus caeius* (x1) a — entire, b — L.S.
B — *Hygrophorus firmus* (x1) a — entire, b — L.S.
C — *Hygrophorus laetus* (x1) a — entire.
D — *Hygrophorus tricolor* (x1) a — entire, b — L.S.

Fig. 39 — A — *Hypholoma fascicularis* (x1) a — young clump, b — mature clump.
c — L.S.

Fig. 40 — A — *Inocybe cutifracta* (x1) a — entire, b — L.S.
B — *Inocybe unbenata* (x1) a — entire, b — L.S.

- (1) *I. cutifracts* Petch .. P : 57
 (2) *I. umbonata* Petch .. P : 57

26. *Laccaria* Berk & Br.

Pileus fleshy rufous red colour, carnation or brick red when moist, ochraceous when dry, almost membranaceous; hygrophanous, cuticle separating into measily squammules or somewhat silky, stem central, externally fibrous; gills flesh colour, adnate with a decurrent tooth; spores white.

Growing on the ground, and wood. Smell sometimes of garlic. Edible.

10 species cosmopolitan.

5 species recorded in Sri Lanka.

- (1) *L. laccata* (Scop. ex Fr.) Cooke .. P : 57
 (2) *L. porphyrodes* (B. & Br.) Cooke .. P : 57
 (3) *L. spodophora* (B. & Br.) Cooke .. P : 57
 (4) *L. sublaccata* (B. & Br.) Cooke .. P : 57
 (5) *L. vinosofusca* (B. & Br.) Cooke .. P : 57

27. *Lentinus* Fr. (Fig. 41)

Pileus fleshy coriaceous, pliant, tough and hard when old, persistent; stem may or may not be present; when present hard, firm, and central or lateral or eccentric continuous with the flesh of the pileus; gills becoming dry tough, simple, unequal, thin, margin, acute, toothed more or less decurrent; spores white.

Growing on wood. Edible. (Distinguished from other coriaceous genera by its serrated and torn gills).

10 species widespread, especially tropical.

9 species recorded in Sri Lanka.

- (1) *L. connatus* Berk. .. P : 57
 (2) *L. eximius* B. & Br. .. P : 57
 (3) *L. giganteus* Berk. .. P : 57
 (4) *L. hookerianus* Berk. .. P : 57
 (5) *L. lecomtei* Fr. .. P : 57
 (6) *L. percomis* B. & Br. .. P : 57
 (7) *L. sajor-czju* (Fr.) Fr. .. P : 57
 (8) *L. similis* B. & Br. .. P : 57
 (9) *L. subnudus* Berk.

28. *Lepiota* (Pers. ex Fr.) S. F. Gray. (Fig. 42)
 = *Hiatala* (Fr.) Mont (Answorth 1963).

Pileus fleshy, umbonate, generally scaly from the breaking up of the cuticle and the adherence of the concrete veil; stem central, hollow or stuffed, flesh distinct from that of the pileus, detaches easily from the cap; ring first attached to the cuticle of the pileus, often movable, sometimes evanescent; gills usually white, in some species yellow tinted, in others dingy red when ageing, free, often very distant from the stem, often attached to a collar. Sporeprint-white. Often cream in colour, spores hyaline ellipsoid or oval with complex walls; pseudoamyloid or rarely amyloid. Growing mostly in grassy places. Few species in this genus known to be poisonous *L. morgani* distinguished by the white gills becoming green. Some species of this genus are mycorrhiza forming.

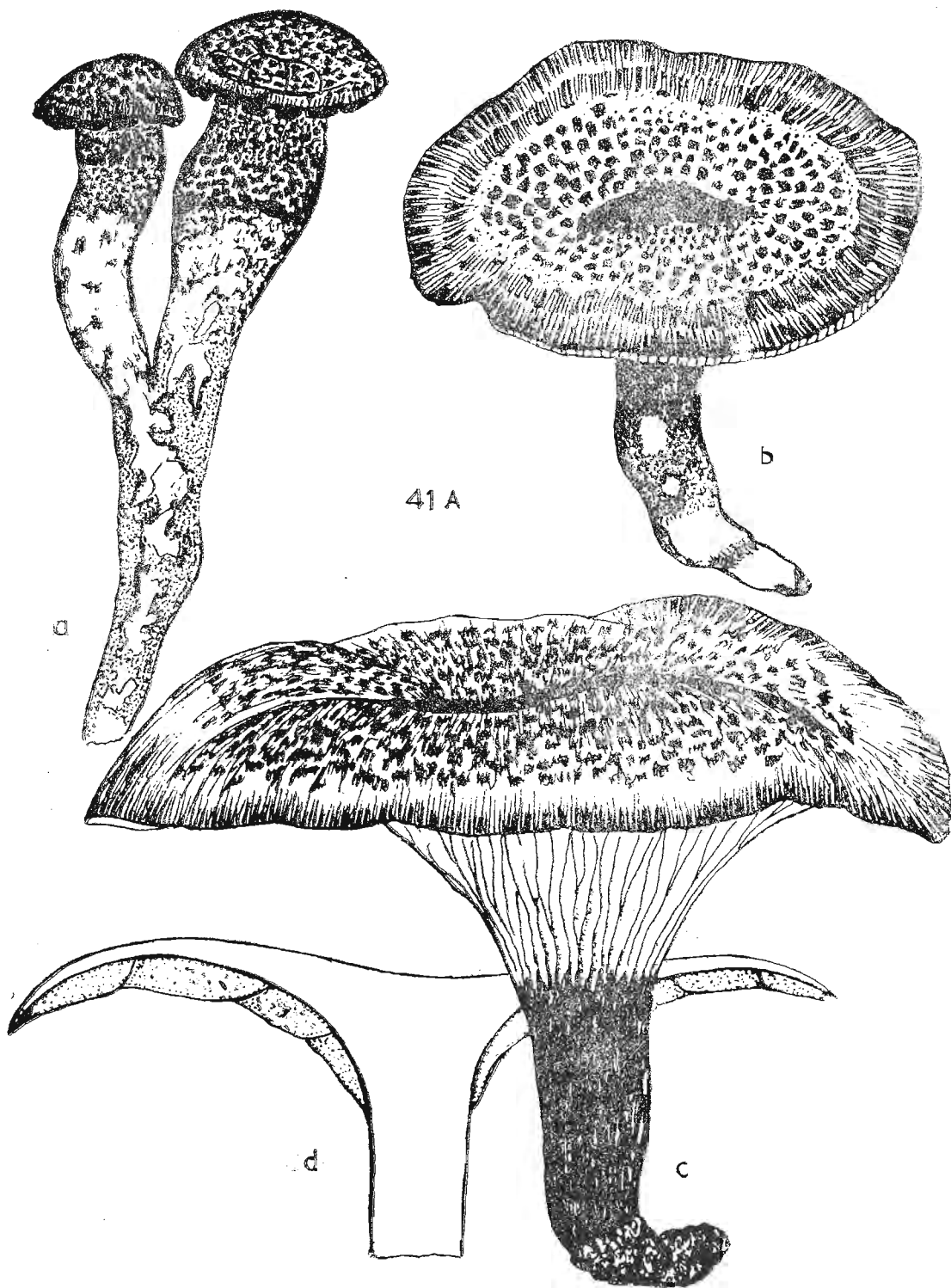


PLATE XV -- Fig. 41

Fig. 41 — A — *Lentinus giganteus* a — early ttaga (x0.5), b — young fruiting body (x0.75), c — nature of body (x0.5), d — L.S.

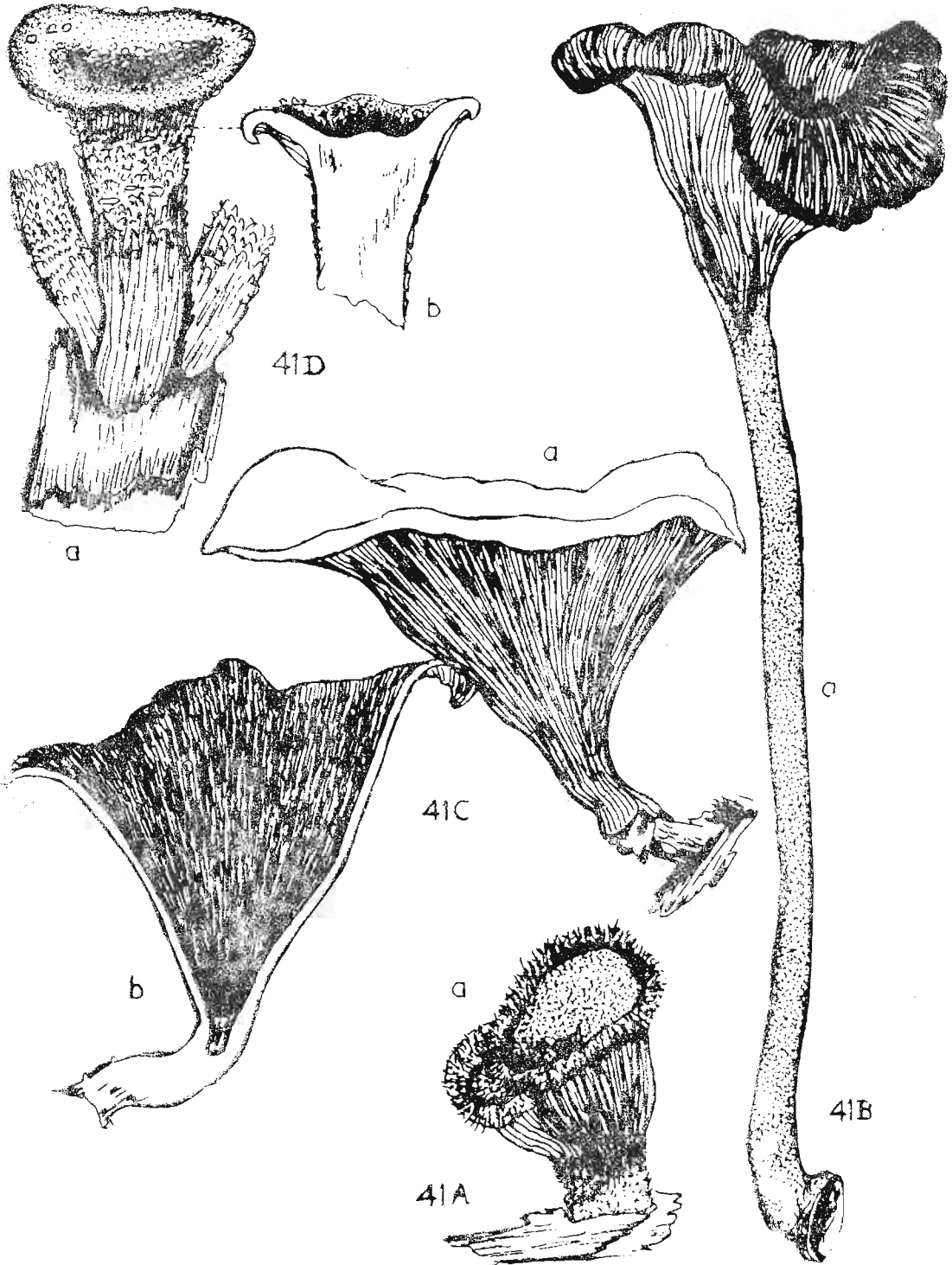


PLATE XVI — Fig. 41

Fig. 41 — B— *Lentinus lecontei* (x1) a — entire.
 C — *Lentinus sajor-caju* (x1) a — entire, b — L.S.
 E — *Lentinus velatus* (x1) a — entire, b — L.S.

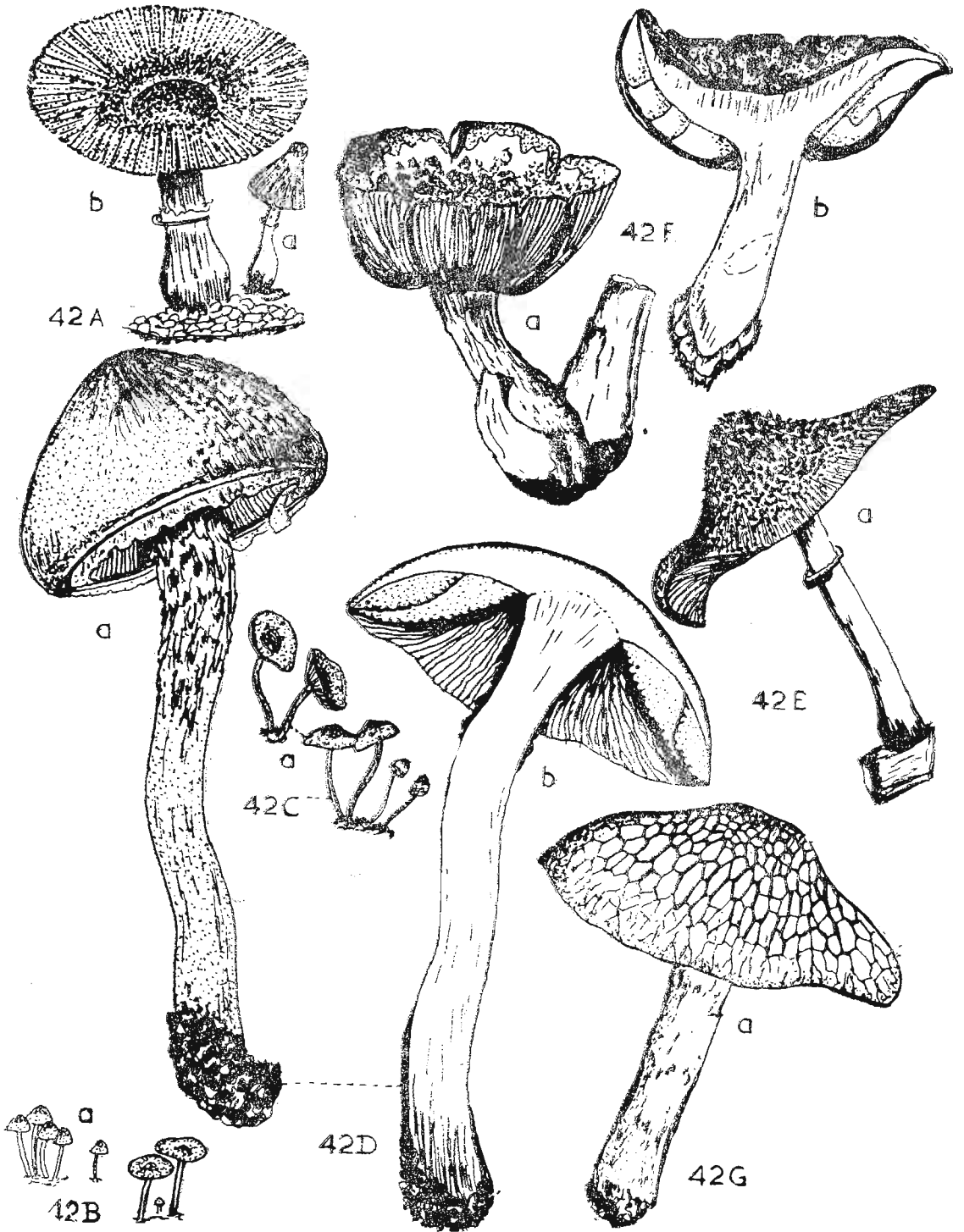


PLATE XVII — Fig. 42.

Closely allied to *Amanita* and *Amanitopsis* from which it is chiefly distinguished by the absence of a volva.

150 species widespread.

52 species recorded in Sri Lanka.

(1) <i>L. alborussea</i> (B. & Br.) Sacc.	..	P: 57
(2) <i>L. alopochroa</i> (B. & Br.) Sacc.	..	P: 57
(3) <i>L. anthomyces</i> (B. & Br.) Sacc.	..	P: 57
(4) <i>L. aulacergates</i> (B. & Br.) Sacc.	..	P: 57
(5) <i>L. biornata</i> (B. & Br.) Sacc.	..	P: 57
(6) <i>L. carphophylla</i> (B. & Br.) Sacc.	..	P: 57
(7) <i>L. cepaestipes</i> (Sow. ex Fr.) Quel	..	P: 57
(8) <i>L. ceramogenes</i> (B. & Br.) Sacc.	..	P: 57
(9) <i>L. citrophylla</i> (B. & Br.) Sacc.	..	P: 57
(10) <i>L. columbicolor</i> (B. & Br.) Sacc.	..	P: 57
(11) <i>L. continua</i> (Berk.) Sacc.	..	P: 58
(12) <i>L. dolichaula</i> (B. & Br.) Sacc.	..	P: 58
(13) <i>L. earochroa</i> (B. & Br.) Sacc.	..	P: 58
(14) <i>L. epicharis</i> (B. & Br.) Sacc.	..	P: 58
(15) <i>L. eriphaea</i> (B. & Br.) Sacc.	..	P: 58
(16) <i>L. erythrogramma</i> (B. & Br.) Sacc.	..	P: 58
(17) <i>L. erythrosticta</i> (B. & Br.) Sacc.	..	P: 58
(18) <i>L. euconiata</i> (B. & Br.) Sacc.	..	P: 58
(19) <i>L. flagellata</i> (B. & Br.) Sacc.	..	P: 58
(20) <i>L. flavidorufa</i> (B. & Br.) Sacc.	..	P: 58
(21) <i>L. holospilota</i> (B. & Br.) Sacc.	..	P: 58
(22) <i>L. leontoderes</i> (B. & Br.) Sacc.	..	P: 58
(23) <i>L. lepidophora</i> (B. & Br.) Sacc.	..	P: 58
(24) <i>L. leprica</i> (B. & Br.) Sacc.	..	P: 58
(25) <i>L. lignyodes</i> (B. & Br.) Sacc.	..	P: 58
(26) <i>L. manicata</i> (B. & Br.) Sacc.	..	P: 58
(27) <i>L. metabola</i> (B. & Br.) Sacc.	..	P: 58
(28) <i>L. metulispora</i> (B. Br.) Sacc.	..	P: 58
(29) <i>L. micropholis</i> (B. & Br.) Sacc.	..	P: 58
(30) <i>L. microspila</i> (Berk.) Sacc.	..	P: 58
(31) <i>L. myxodictyon</i> (B. & Br.) Sacc.	..	P: 58
(32) <i>L. oenocephala</i> (B. & Br.) Sacc.	..	P: 58
(33) <i>L. oenopoda</i> (B. & Br.) Sacc.	..	P: 58
(34) <i>L. opshaemata</i> (B. & Br.) Sacc.	..	P: 58
(35) <i>L. pardaota</i> (B. & Br.) Sacc.	..	P: 59
(36) <i>L. paroena</i> (B. & Br.) Sacc.	..	P: 59
(37) <i>L. phlyotaenodes</i> (B. & Br.) Sacc.	..	P: 59
(38) <i>L. plumbicolor</i> (B. & Br.) Sacc.	..	P: 59
(39) <i>L. polygloma</i> (B. & Br.) Sacc.	..	P: 59
(40) <i>L. pselliophora</i> (B. & Br.) Sacc.	..	P: 59

- (41) *L. pungens* (B. & Br.) Sacc. .. P: 59
 (42) *L. pyrocephala* (B. & Br.) Sacc. .. P: 59
 (43) *L. pyrhaes* (B. & Br.) Sacc. .. P: 59
 (44) *L. revelata* (B. & Br.) Sacc. .. P: 59
 (45) *L. rhyparophora* (B. & Br.) Sacc. .. P: 59
 (46) *L. spodolepsis* (B. & Br.) Sacc. .. P: 59
 (47) *L. spongodes* (B. & Br.) Sacc. .. P: 59
 (48) *L. thrombophora* (B. & Br.) Sacc. .. P: 59
 (49) *L. viridiflava* Petch .. P: 59
 (50) *L. viriditincta* (B. & Br.) Sacc. .. P: 59
 (51) *L. zeylanica* (Berk.) Sacc. .. P: 59

One more species recorded and described under the genus *Hiatula* as

- (52) *H. flosculus* B. & Br. .. P 56

29. *Leptonia* (Fr.) Kummer. (Fig. 43)

Pileus thin, umbilicate or with darker disc, cuticle fibrillose or separating into darker scales, margin at first incurved; stem central, cartilaginous, tubular, polished somewhat shining; gills at first adnexed but readily separating from their attachment to the stem; spores pink.

Growing on the ground. Species are small, elegant, brightly coloured, and abound in rainy weather.

40 species widespread.

4 species recorded in Sri Lanka.

- (1) *L. gnaphalodes* (B. & Br.) Sacc. .. P: 59
 (2) *L. gnophodes* (B. & Br.) Sacc. .. P: 59
 (3) *L. incana* (Fr.) Gill. var. *polychoraa* (B. & Br.) Sacc. .. P: 59
 (4) *L. serrulata* (Fr.) Quel. .. P: 59

30. *Leucocoprinus* Pat. (Fig. 44)

Marginal part of the cap usually splits at maturity, and is sometimes covered with sphaerocysts; gills thin, soft, free and often form a collarium round the stipe; spore print pure white to yellowish; spores with more or less distinct germ pore, cystidia numerous in gill margins. Stipe often subfilamentous and long and usually with a movable annulus; Volva absent. Growing on shaded soil or on lawns and on various other substrata.

Few species tropical. One yellow species reported to be very poisonous.

1 species recorded in Sri Lanka.

- L. licmophorus* (B. & Br.) Petch .. P: 59

31. *Marasmius* Fr. (Fig. 45)

Pileus thin tough and pliant emmbranaceous or coriaceous; stem sometimes shiny, often dark coloured, string or thick hair-like, cartilagenous or horny, continuous with the pileus but of different texture; gills pliant rather tough, somewhat distant, variously attached

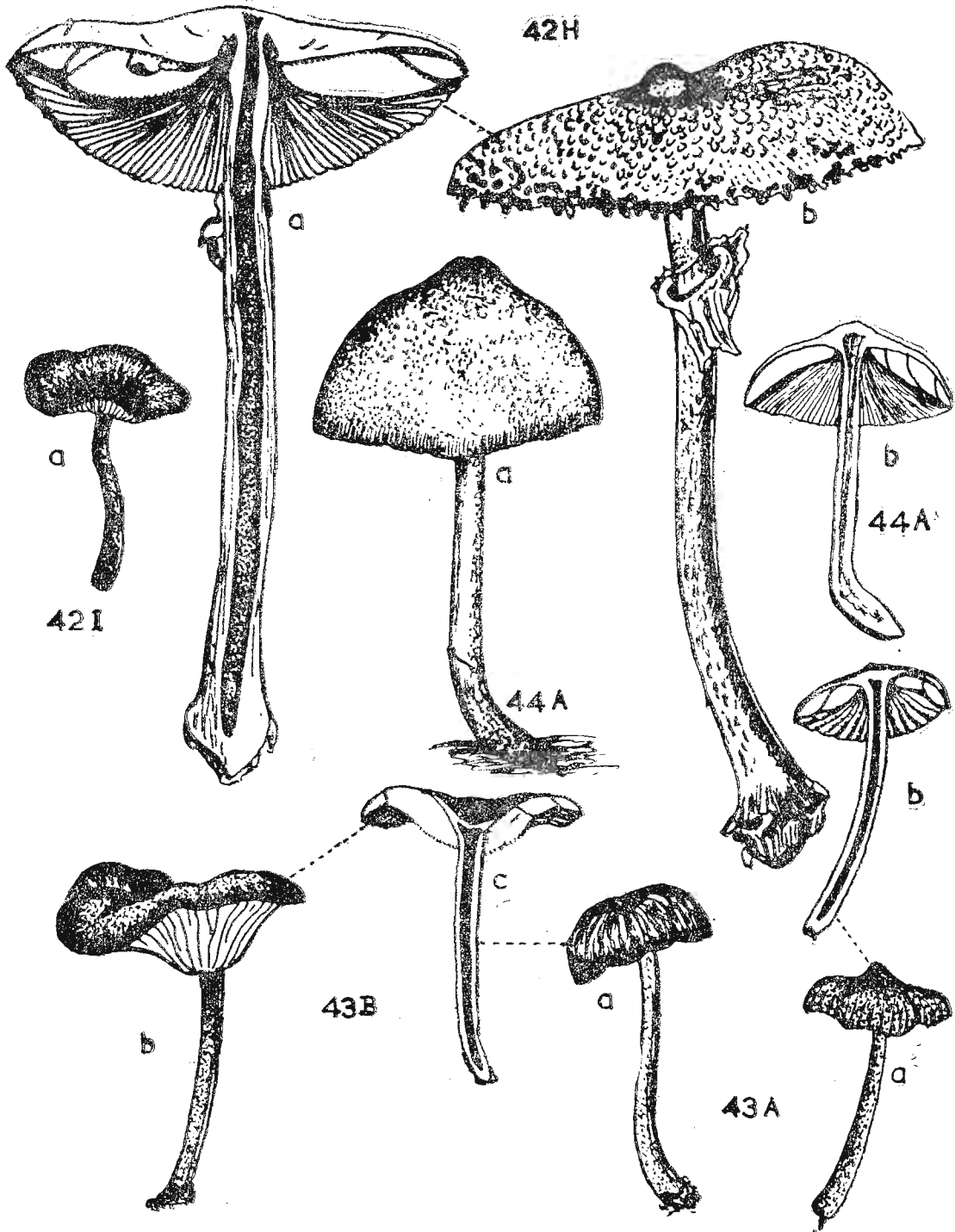


PLATE XVIII — Figs. 42 — 44

or free with an acute entire edge; spore-print white, spores hyaline thin walled, smooth, inamyloid. Cheilocystidia cystidia present. Not putrescent, but drying up with lack of moisture, reviving and assuming the original form with the advent of rain. This character distinguishes *Marasmius* from all other genera of Agaricaceae. Smells of garlic or onions.

Growing on the ground, but generally on wood or leaves, some species edible. Some species parasitic on economic plants of the tropics such as tea, coffee, rubber, and sugar cane. *M. pulcher* (B. & Br.) Petch in the common thread blight of tea and other plants. *M. stenophyllum* Mont. is the cause of root-rot of banana.

150 species cosmopolitan.

39 species recorded in Sri Lanka.

- | | |
|---|-----------|
| (1) <i>M. actinophorus</i> B. & Br. | |
| (2) <i>M. atrorubens</i> (Berk.) Sacc. | |
| (3) <i>M. calvus</i> B. & Br. | |
| (4) <i>M. campanella</i> Holterm. | |
| (5) <i>M. campanella</i> var. <i>rufescens</i> (B. & Br.) Petch | P : 59 |
| (6) <i>M. caryotae</i> (Berk.) Petch | .. P : 60 |
| (7) <i>M. confertus</i> B. & Br. | .. P : 60 |
| (8) <i>M. congregatus</i> Mont. | .. P : 60 |
| (9) <i>M. coniatus</i> B. & Br. | .. P : 60 |
| (10) <i>M. corticigena</i> B. & Br. | .. P : 60 |
| (11) <i>M. erispatus</i> B. & Br. | .. P : 60 |
| (12) <i>M. epochnous</i> B. & Br. | .. P : 60 |
| (13) <i>M. equicrinus</i> Muell. | .. P : 60 |
| (14) <i>M. florideus</i> B. & Br. | .. P : 60 |
| (15) <i>M. fulviceps</i> Berk. | .. P : 60 |
| (16) <i>M. galericula</i> Ces. | .. P : 60 |
| (17) <i>M. haematocephalus</i> Mont. | .. P : 60 |
| (18) <i>M. helvolus</i> Berk var <i>brunneolus</i> B. & Br. | P : 60 |
| (19) <i>M. hirtellus</i> B. & Br. | .. P : 60 |
| (20) <i>M. hypo chroides</i> B. & Br. | .. P : 60 |
| (21) <i>M. inustus</i> (B. & Br.) Petch | .. P : 60 |
| (22) <i>M. leuco phaeus</i> (B. & Br.) Petch | .. P : 60 |
| (23) <i>M. levellianus</i> (Berk.) Pat. | .. P : 60 |
| (24) <i>M. multijugus</i> (B. & Br.) Petch | .. P : 60 |
| (25) <i>M. mutabilis</i> B. & Br. | .. P : 60 |
| (26) <i>M. nephelodes</i> (B. & Br.) Petch. | .. P : 60 |
| (27) <i>M. nivosus</i> Berk. | .. P : 60 |
| (28) <i>M. pallidorubens</i> (B. & Br.) Petch | .. P : 60 |
| (29) <i>M. proximus</i> B. & Br. | .. P : 60 |
| (30) <i>M. pulcher</i> (B. & Br.) Petch. | .. P : 60 |
| (31) <i>M. radians</i> B. & Br. | .. P : 60 |
| (32) <i>M. rigidichroda</i> Petch. | .. P : 60 |
| (33) <i>M. rivulosus</i> B. & Br. | .. P : 60 |
| (34) <i>M. rotalis</i> B. & Br. | .. P : 60 |

PLATE XVIII

Fig. 42 — H — *Lepiota dolichaulus* (x0.75) a — entire, b — L.S.
I — *Lepiota spodolepis* (x1) a — entire.

Fig. 43 — A — *Leptonia incana* (x1) a — entire, b — L.S.
B — *Leptonia serrulata* (x1) a — young, b — entire, mature, c — L.S.

Fig. 44 — A — *Leucocorinus* sp. a — entire; b — L.S.

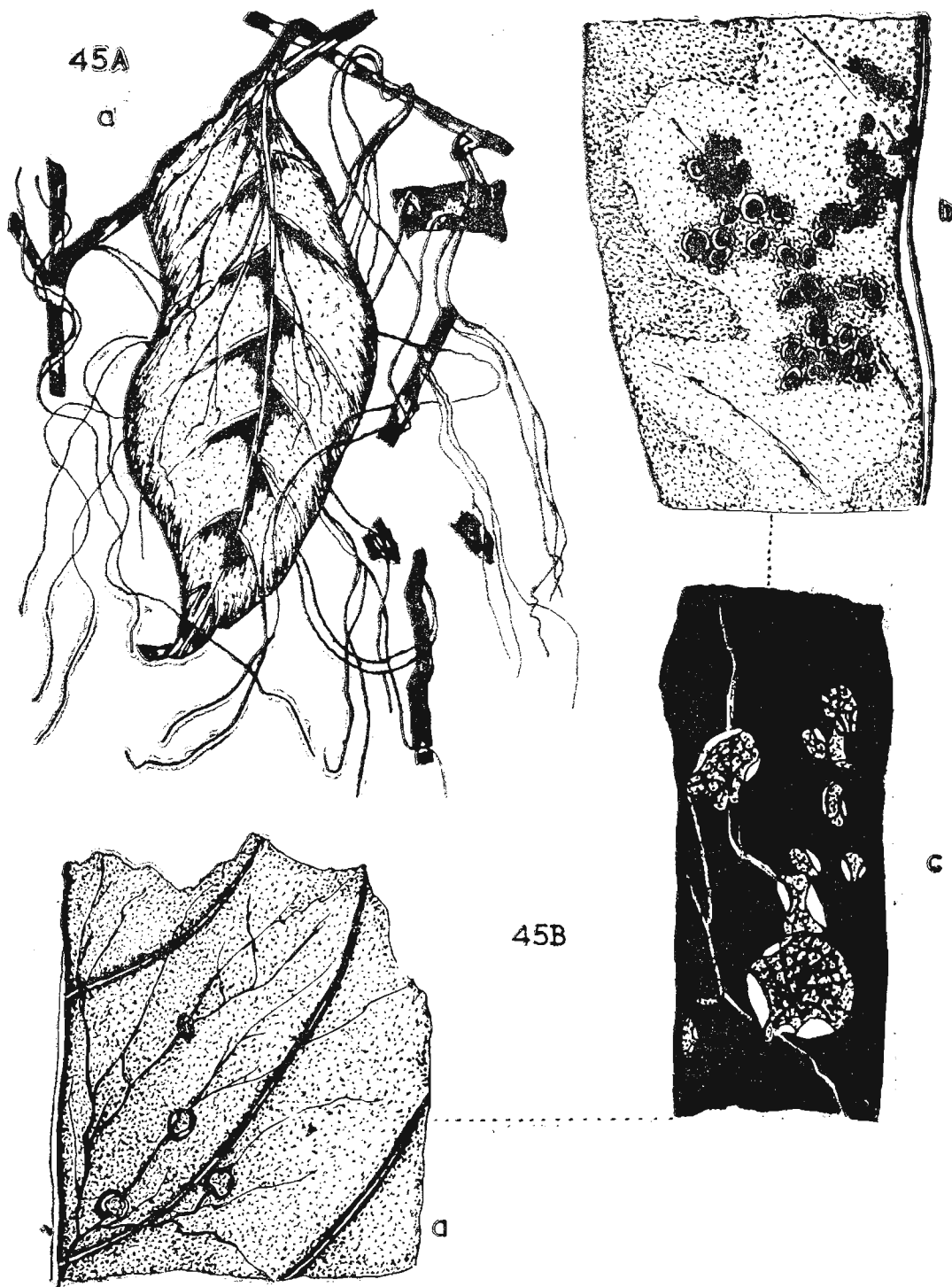


PLATE XIX — Fig. 45.

Fig. 45 — A — *Marasmius equicrinus* (x1) a — entire.
B — *Marasmius* Sp. (x1) a — entire.

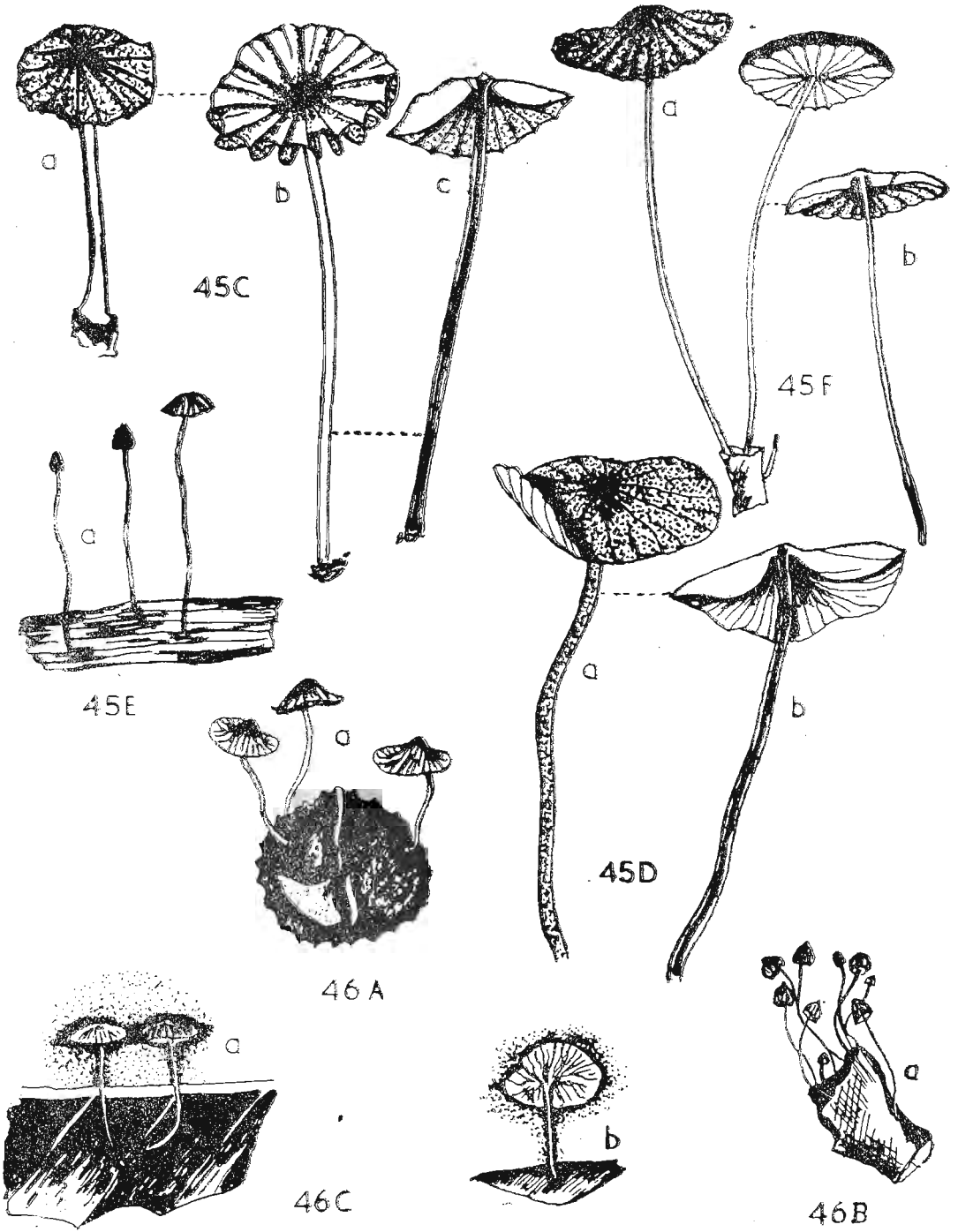


PLATE XX — Figs. 45 & 46.

- (35) *M. semipellucidus* B. & Br. .. P: 60
 (36) *M. stenophyllus* Mont. .. P: 60
 (37) *M. stypinus* B. & Br. .. P: 60
 (38) *M. sub cinereus* B. & Br. .. P: 60
 (39) *M. thwaitesii* B. & Br. .. P: 60

32. *Mycena* (Pers. ex Fr.) S. F. Gray. (Fig. 46)

Pileus thin, membranaceous, campanulate and umbonate, smooth, margins usually streaked with longitudinal lines (striae), margin straight at first and never incurved; stem cartilaginous, hollow, slender; gills never decurrent, but variously attached; spores white

Growing on branches, twigs, heaps of leaves, sometimes on the ground. Most of the species are small, some minute, some are fragile and fugative, others firmer and more persistent. Probably no poisonous species occur in the genus but on account of their small size and cartilaginous nature, the vast majority are worthless.

150 species, cosmopolitan.

23 species recorded in Sri Lanka.

- (1) *M. aculeifera* Petch .. P: 60
 (2) *M. acicula* (Fr.) Quel. .. P: 61
 (3) *M. aetites* (Fr.) Quel. .. P: 61
 (4) *M. auricolor* (B. & Br.) Petch .. P: 61
 (5) *M. citrinella* (Pers. ex Fr.) Quel. .. P: 61
 (6) *M. clavulifera* (B. & Br.) Sacc. .. P: 61
 (7) *M. dendro phila* Petch .. P: 61
 (8) *M. farinosa* Petch .. P: 61
 (9) *M. filipes* (Fr.) Quel. .. P: 61
 (10) *M. grisea* Petch .. P: 61
 (11) *M. haematera* (B. & Br.) Sacc. .. P: 61
 (12) *M. heliscus* (B. & Br.) Sacc. .. P: 61
 (13) *M. illuminans* P. Henn. .. P: 61
 (14) *M. longiseta* Hohnel. .. P: 61
 (15) *M. melanatoma* (B. & Br.) Sacc. .. P: 61

PLATE XX — XXI Fig. 45 — C — *Marasmius caryotae* (x1) a & b — entire, c — L.S.
 D — *Marasmius hypochroides* (x1) a — entire, b — L.S.
 E — *Marasmius thwaitesii* (x1) a — entire.
 F — *Marasmius umbraculum* (x1) a — entire, b — L.S.

Fig. 46 — A — *Mycena grisea* (x1) — a — entire.
 B — *Mycena heliscus* (x1) a — entire.
 C — *Mycena rorida* (x1) a — entire.

Fig. 47 — A — *Naucoria helicoes* (x1) — a & b — young, c — entire. d — L.S.

Fig. 48 — A — *Nolania fulvolanata* (x1) a — entire, b — L.S.

Fig. 49 — A — *Omphalina anthiidae* (x1) a & b — entire, c — L.S.
 B — *Omphalina holochlora* (x1) a — entire, b — L.S.
 C — *Omphalina salmonicolor* (x1) a — entire, b — L.S.

Fig. 50 — A — *Oudemansiella magisterium* (x0.5) a — entire, b — L.S.

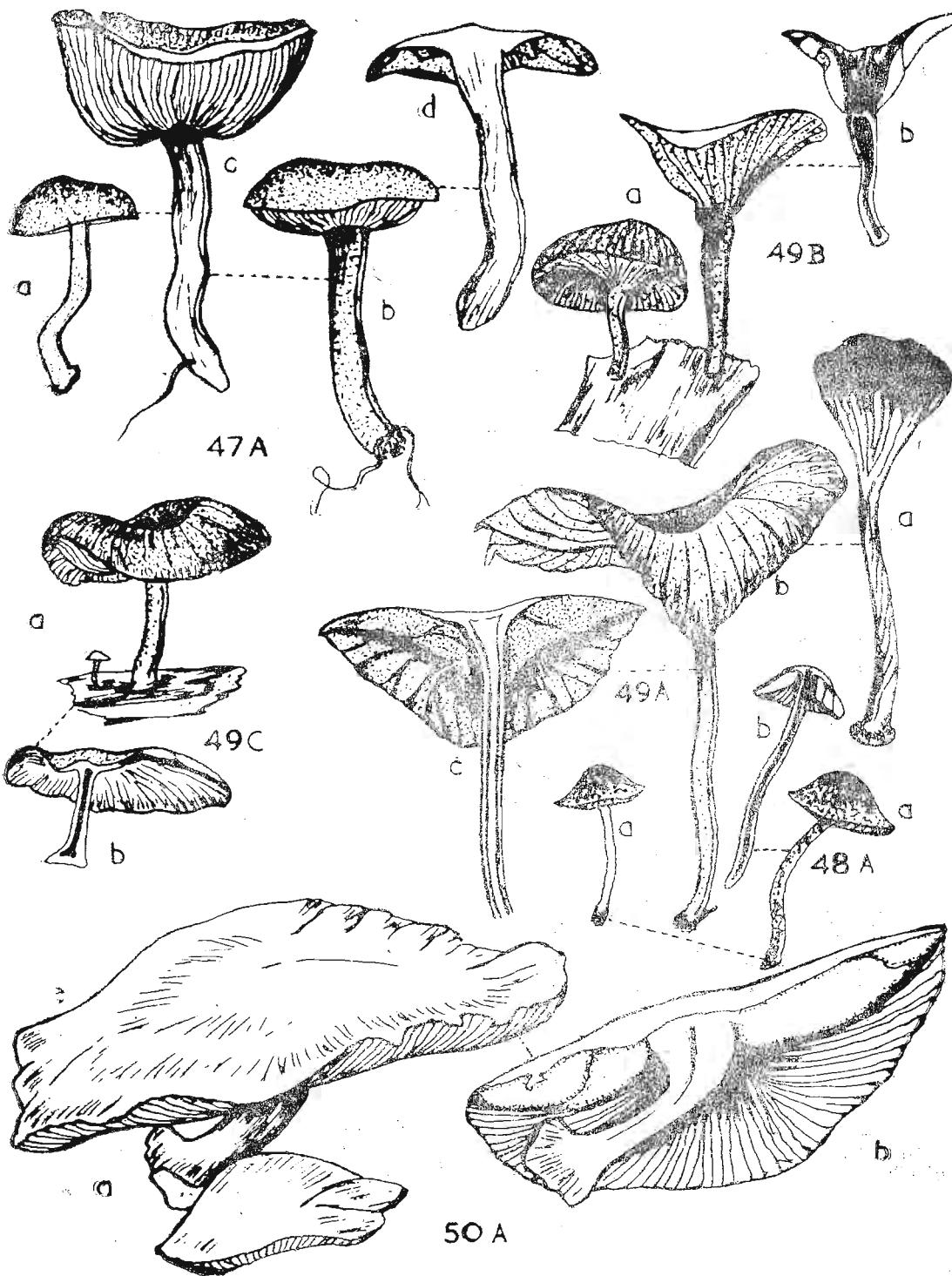


PLATE XXI -- Figs. 47 -- 50

- | | | |
|--|----|-------|
| (16) <i>M. miniata</i> Petch | .. | P: 61 |
| (17) <i>M. myoderma</i> (B. & Br.) Sacc. | .. | P: 61 |
| (18) <i>M. paediscula</i> (B. & Br.) Sacc. | .. | P: 61 |
| (19) <i>M. perone</i> (B. & Br.) Sacc. | .. | P: 61 |
| (20) <i>M. rorida</i> (Fr.) Quel. | .. | P: 61 |
| (21) <i>M. silenus</i> (B. & Br.) Sacc. | .. | P: 61 |
| (22) <i>M. stylobates</i> (Fr.) Quel. | .. | P: 61 |
| (23) <i>M. tenerrima</i> (Berk.) Quel. | .. | P: 61 |

33. *Naucoria* (Fr.) Kummer. (Fig. 47).

Pileus, some shade of yellow, more or less fleshy, conical or convex becoming flat, margin at first incurved; stem cartilaginous, central, hollow or stuffed; gills free or adnate not decurrent, vein fugaceous or absent, sometimes attached in minute flakes to the edge of the young pileus; spores various shades of brown.

Growing on the ground, or on wood. Species usually small in size and brown in colour.

Agrees in structure with *Collybia Leptonia* and *Psilocybe*, but has brown spores.

100 species cosmopolitan.

16 species recorded in Sri Lanka.

- | | | |
|--|----|-------|
| (1) <i>N. abjecton</i> (B. & Br.) Sacc. | .. | P: 61 |
| (2) <i>N. cerodes</i> (Fr.) Quel. | .. | P: 61 |
| (3) <i>N. fulvo-alba</i> (B. & Br.) Sacc. | .. | P: 61 |
| (4) <i>N. gnaphalopoda</i> (B. & Br.) Sacc. | .. | P: 61 |
| (5) <i>N. heliacaes</i> (B. & Br.) Sacc. | .. | P: 61 |
| (6) <i>N. lonchophora</i> (B. & Br.) Sacc. | .. | P: 61 |
| (7) <i>N. microphues</i> (B. & Br.) Sacc. | .. | P: 61 |
| (8) <i>N. micro pyramis</i> (B. & Br.) Massee | .. | P: 61 |
| (9) <i>N. ochra</i> (B. & Br.) Sacc. | .. | P: 61 |
| (10) <i>N. pediades</i> (Fr.) Quel var major
(B. & Br.) Sacc. | .. | P: 61 |
| (11) <i>N. pelidna</i> (B. & Br.) Sacc. | .. | P: 61 |
| (12) <i>N. phaedropis</i> (B. & Br.) Sacc. | .. | P: 61 |
| (13) <i>N. pygmaea</i> (Bull. ex Fr.) Gill. | .. | P: 61 |
| (14) <i>N. semiorbicularis</i> (Bull. ex Fr.) Quel. | .. | P: 61 |
| (15) <i>N. siennophylla</i> (B. & Br.) Sacc. | .. | P: 62 |
| (16) <i>N. sobria</i> (Fr.) Gill. | .. | P: 62 |

34. *Nolanea* (Fr.) Kummer. (Fig. 48).

Pileus fleshy or somewhat membranaceous, bell shaped, somewhat papillate, striate, margin straight at first and adpressed to the stem and not involute; stem central, cartilagenous, tubed, the tube more rarely stuffed with; gills adnexed fixed, never decurrent; spores pink.

Growing on the ground, small slender plants.

Agrees in structure with *Galerina* and *Psathyrella* but has pink spores.

75 species north temperate.

4 species recorded in Sri Lanka.

- | | |
|--|----------|
| (1) <i>N. apiculate</i> Petch | .. P: 62 |
| (2) <i>N. elaphines</i> (B. & Br.) Sacc. | .. P: 62 |
| (3) <i>N. fulvolanata</i> (B. & Br.) Sacc. | .. P: 62 |
| (4) <i>N. lasia</i> (B. & Br.) Sacc. | .. P: 62 |

35. *Omphalina* Quel. (Fig. 49)

.. *Omphalia* (Fr.). Kummer (Ainsworth 1963)

Pileus usually thin usually umbilicate at first, then funnel shaped often hygrophanous, margin incurved or straight; stem central, cartilagenous, polished, tubular, often stuffed when young, flesh continuous with that of the pileus but differing in character; gills decurrent from the start, sometimes branched; spores white.

Growing on the ground. Mostly small, and edible. None are poisonous.

100 species widespread.

11 species recorded and described under the name *Omphalia* as

- | | |
|---|----------|
| (1) <i>O. anthidepas</i> (B. & Br.) Sacc. | .. P: 62 |
| (2) <i>O. cirrhocephala</i> (B. & Br.) Sacc. | .. P: 62 |
| (3) <i>O. cylindraceo—complanata</i> (P. Henn) Hohnel | .. P: 62 |
| (4) <i>O. delicia</i> (B. & Br.) Sacc. | .. P: 62 |
| (5) <i>O. holochlora</i> (B. Br.) Sacc. | .. P: 62 |
| (6) <i>O. lychnodes</i> (B. & Br.) Sacc. | .. P: 62 |
| (7) <i>O. micromeles</i> (B. & Br.) Sacc. | .. P: 62 |
| (8) <i>O. salmonicolor</i> (B. & Br.) Sacc. | .. P: 62 |
| (9) <i>O. straminea</i> Petch | .. P: 62 |
| (10) <i>O. umbellifera</i> (Fr.) Quel. | .. P: 62 |
| (11) <i>O. viridicarnea</i> (B. & Br.) Sacc. | .. P: 62 |

36. *Oudemansiella* Speg. (Fig. 50)

Veil hardly manifest; the central stipe and hemispherical pileus fleshy, not oiguescent gills membranaceous, entire, broken with longitudinal lines, with opposite tips at first, connate with those of the lateral lamella, finally free.

2 species recorded in Sri Lanka.

- | | |
|--|----------|
| (1) <i>O. apalosarsa</i> (B. & Br.) Hohnel | .. P: 62 |
| (2) <i>O. subaurantiaca</i> (B. & Br.) Petch | .. P: 62 |

37. *Panaeolus* Fr.) Quel. (Fig. 51)

Pileus fleshy, conical, not expanding, margin exceeding the gills, viscid when moist, shining when dry; stem polished; gills ascending in a conical manner, state-grey, mottled with black spores.

Growing on the ground in rich earth and on dung. *Panaeolus*, in its entirety, has a precise looking membership, as in the gills were cut from cardboard and fixed by machinery. Most species, edible.

10 species, cosmopolitan.

3 species recorded in Sri Lanka.

- | | |
|---|----------|
| (1) <i>P. campanulatus</i> (Fr.) Quel | .. P: 62 |
| (2) <i>P. cyanescens</i> (B. & Br.) Sacc. | .. P: 62 |
| (3) <i>P. rubricaulis</i> Petch | .. P: 62 |

38. *Panus* Fr. (Fig. 52)

Whole fungus between leathery and fleshy, tough, not woody, texture fibrous; stem present or absent, when present, eccentric or lateral or central; gills tough, becoming leathery, edge acute and unbroken; spores white.

Growing on wood. Active destroyers of wood. Context very tough on drying but reviving and becoming chanoic leather like on remoistering.

Closely allied to *Lentinus* but differs principally in the gills being somewhat soft at first and not having the edges serrate. Many species give out light (luminiscent).

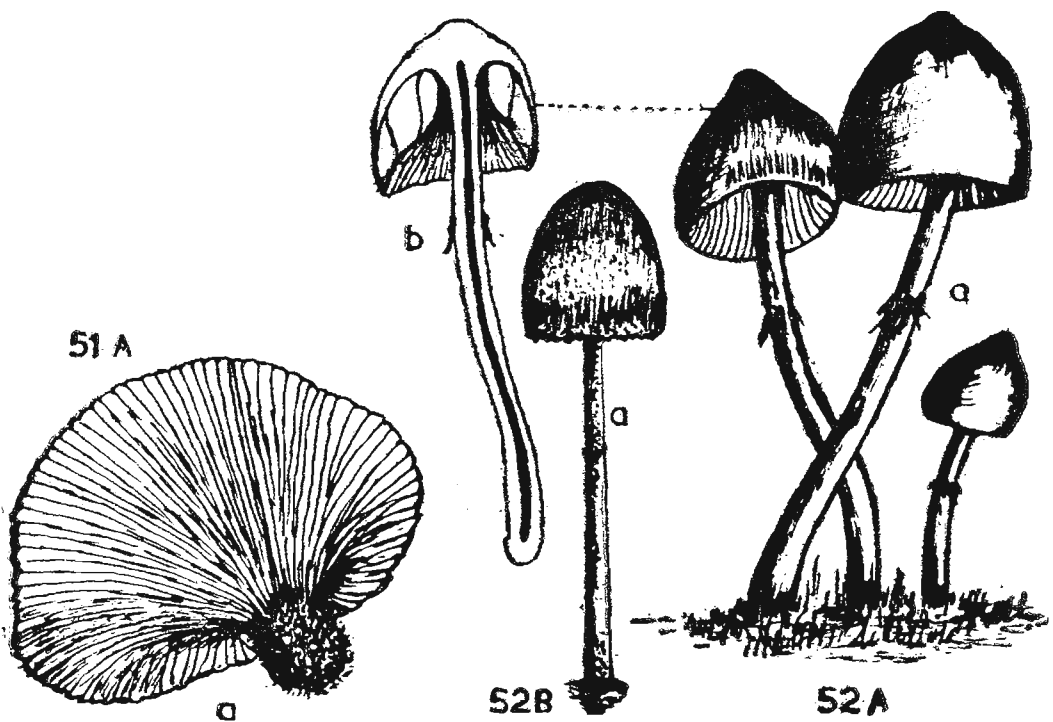


PLATE XXII — Figs. 51 & 52.

Fig. 51 — A — *Panus* S.P. (x1) a — entire.

Fig. 52 — A — *Panaeolus* sp. (x1) a — entire, b — L.S.

20 species mostly in tropics.

3 species recorded in Sri Lanka.

- | | |
|--------------------------------------|-----------|
| (1) <i>P. crassiusculus</i> B. & Br. | .. P : 62 |
| (2) <i>P. glandulosus</i> B. & Br. | .. P : 62 |
| (3) <i>P. melanophyllus</i> Fr. | .. P : 62 |

39. *Paxillus* Fr. (Fig. 53)

Pileus fleshy with the margin at first involute, then continually and gradually unfolding and expanding symmetrical or eccentric; stem central, eccentric or wanting, confluent with the pileus; gills membranaceous, soft, somewhat branched, frequently anastomosing behind distinct from the hymenophore and easily separable from it, decurrent, edge entire, sharp the anastomosing tendency of the gills can be so marked that the hymenium may consist of large angular tubes. Spores dingy white or brown.

10 species, cosmopolitan. Some species of this genus are micorhiza forming.

2 species recorded in Sri Lanka.

- | | |
|--------------------------------|-----------|
| (1) <i>P. lateritius</i> Petch | .. P : 62 |
| (2) <i>P. russloides</i> Petch | .. P : 62 |

40. *Phlebophora* Lev.

= based on a deformed *Tricholoma* (Ainsworth 1963).

Fungi sub-gelatinous, flesh coloured, membranaceous, shallowly hypocateriform, centrally stipitate, covered beneath with a hymenium; spores hyaline.

1 species recorded in Sri Lanka.

- | | |
|-------------------------|-----------|
| <i>P. hyalina</i> Perch | .. P : 62 |
|-------------------------|-----------|

41. *Pholiota* (Fr.) Kummer. (Fig. 54)

Pileus more or less fleshy, viscid or dry, scaly or naked; stem central provided with a spreading persistent membranaceous ring; flesh of stem continuous with that of the pileus; gills adnate with or without a decurrent tooth, at first pale and tawny then usually becoming rust-coloured; spores sepia-brown, bright yellowish, brown or light red.

Growing on the ground or on wood. Some of the species are large and bright coloured. Distinguished from all other genera of the brown spored series by the possession of a distinct ring. Some species cause a heart-rot of wood. None are known to be poisonous.

100 species, especially temperate.

3 species recorded in Sri Lanka.

- | | |
|---|-----------|
| (1) <i>P. badia</i> Petch | .. P : 62 |
| (2) <i>P. dasypepla</i> (Berk) Cooke | .. P : 62 |
| (3) <i>P. micromeres</i> (B. & Br.) Sacc. | .. P : 62 |

42. *Pleurotus* (Fr.) Kummer. (Fig. 55)

= Anom. cons. *vide* Ainsworth 1963

Pileus fleshy or sub-membranaceous, but never woody, usually eccentric sometimes dimidiate or resupinate; stem eccentric, lateral or wanting, flesh confluent and homogenous

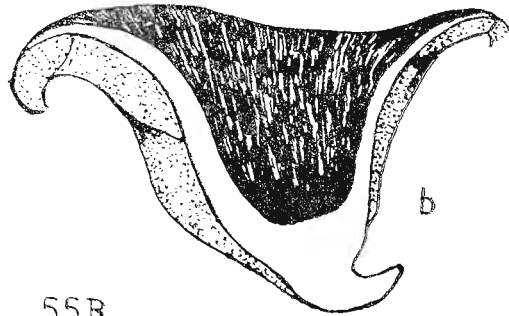
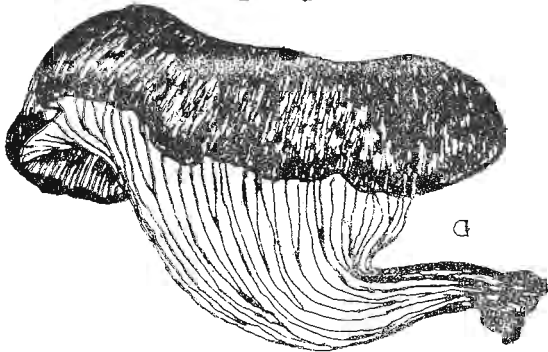
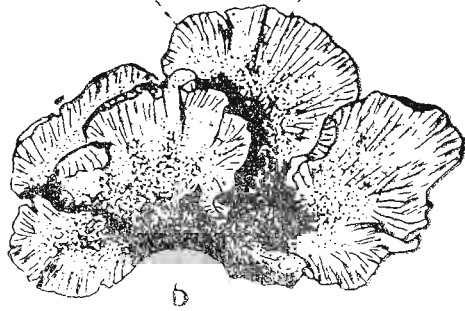
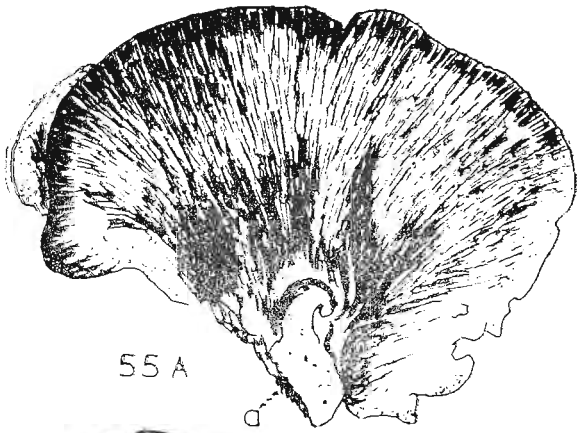
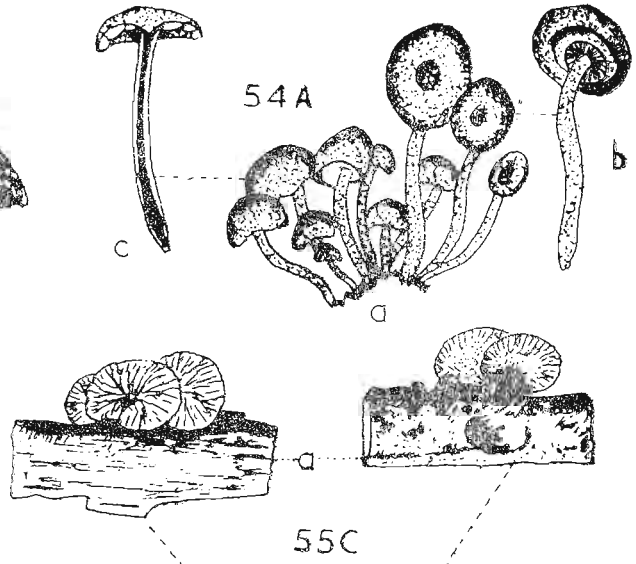
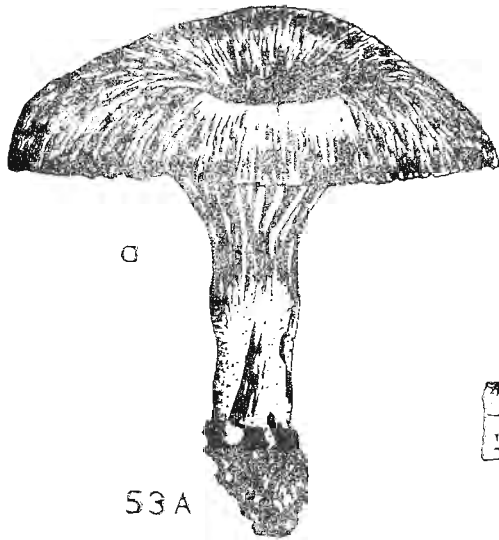


PLATE XXIII — Figs. 53 — 55

with the pileus ; gills edge acute, generally decurrent, in some with a well marked tooth, rarely simple adnate ; spore-print white.

Growing on wood, dead or alive ; a few species appear on the ground. This genus contain some of the most valuable edible mushroom.

100 species cosmopolitan.

11 species recorded in Sri Lanka.

(1) <i>P. angustatus</i> (B. & Br.) Sacc.	.. P : 63
(2) <i>P. flabellatus</i> (B. & Br.) Sacc.	.. P : 63
(3) <i>P. galeiformis</i> (B. & Br.) Sacc.	.. P : 63
(4) <i>P. gelatinosus</i> Petch	.. P : 63
(5) <i>P. polychromus</i> (B. & Br.) Sacc.	.. P : 63
(6) <i>P. pseudo barbatus</i> Petch	.. P : 63
(7) <i>P. reticulatus</i> Petch	.. P : 63
(8) <i>P. semisupinus</i> (B. & Br.) Sacc.	.. P : 63
(9) <i>P. subbarbatus</i> (Berk. & Curt.) Sacc.	.. P : 63
(10) <i>P. testudo</i> (Berk.) Sacc.	.. P : 63
(11) <i>P. versiformis</i> (Berk.) Sacc.	.. P : 63

43. *Pluteus* Fr. (Fig. 56)

Pileus fleshy ; stem central fleshy to fibrous, distinct from the pileus ; gills free from the stem, rounded behind, at first cohering, white, then coloured by the spores ; spores pink.

Growing on or near trunks of tree.

Resembling *Volvariella* in all respects but the volva. Several species are edible.

100 species widespread.

18 species recorded in Sri Lanka.

(1) <i>P. aglaeotheles</i> (B. & Br.) Sacc.
(2) <i>P. albo lineatus</i> (B. & Br.) Sacc.
(3) <i>P. balanatus</i> (B. & Br.) Sacc.
(4) <i>P. brunneopictus</i> (B. & Br.) Sacc.
(5) <i>P. chrysaegis</i> (B. & Br.) Sacc.
(6) <i>P. conizatus</i> (B. & Br.) Sacc.
(7) <i>P. escharites</i> (B. & Br.) Sacc.
(8) <i>P. eugraptus</i> (B. & Br.) Sacc.
(9) <i>P. flavipes</i> Petch
(10) <i>P. flavomarginatus</i> Petch
(11) <i>P. fusconigricans</i> (B. & Br.) Sacc.
(12) <i>P. glyphidatus</i> (B. & Br.) Sacc.
(13) <i>P. grandineus</i> (B. & Br.) Sacc.

PLATE XXIII

Fig. 53 — *Pezizus lateritius* (x0.75) a — entire.

Fig. 54 — A — *Pholiota micromeres* (x1) a — clump, b — entire, c — L.S.

Fig. 55 — A — *Pleurotus flabellatus* (x1) a — entire.
 B — *Pleurotus reticulatus* (x1) a — entire, b — L.S.
 C — *Pleurotus testudo* (x1) a — habit, b — entire.



PLATE XXIV — Figs. 56 — 61.

- (14) *P. marmoratus* (B. & Br.) Sacc.
 (15) *P. pelinus* (B. & Br.) Sacc.
 (16) *P. pulvinus* (B. & Br.) Sacc.
 (17) *P. spilopus* (B. & Br.) Sacc.
 (18) *P. stigmatophorus* (B. & Br.) Sacc.

44. *Psathyrella* (Fr.) Quel. (Fig. 57)

= *Psathyra* Fr. Kummer (Ainsworth 1963)

Pileus often brown, campanulate conical or vesiculose, membranaceous striate, margin straight, at first pressed to the stem and not extending beyond the gills; stem central, confluent with the pileus; gills narrow, wedgo shaped, adnate or free, blacing, not variegated; veil sometimes forming a ring but soon disappearing; spores black.

Growing on rich ground. Many species, small, and have a very short life span. All species are edible.

50 species cosmopolitan.

7 species recorded in Sri Lanka.

- | | |
|--|----------|
| (1) <i>P. achnoa</i> (B. & Br.) Sacc. | .. P: 64 |
| (2) <i>P. disseminata</i> (Pers ex Fr.) Quel | .. P: 64 |
| (3) <i>P. furfurella</i> (B. & Br.) Sacc. | .. P: 64 |
| (4) <i>P. hiascenns</i> (Fr.) Quel. | .. P: 64 |
| (5) <i>P. leptomeres</i> (B. & Br.) Sacc. | .. P: 64 |
| (6) <i>P. leptosceles</i> (B. & Br.) Sacc. | .. P: 64 |
| (7) <i>P. tiarella</i> (B. & Br.) Sacc. | .. P: 64 |

10 more species recorded and described under the genus *Psathyra* as

- | | |
|--|----------|
| (1) <i>P. amaura</i> (B. & Br.) Sacc. | .. P: 64 |
| (2) <i>P. asceua</i> (B. & Br.) Sacc. | .. P: 64 |
| (3) <i>P. efflorescens</i> (B. & Br.) Sacc. | .. P: 64 |
| (4) <i>P. ochreata</i> (B. & Br.) Sacc. | .. P: 64 |
| (5) <i>P. porphyrella</i> (B. & Br.) Sacc. | .. P: 64 |
| (6) <i>P. reticulata</i> Petch | .. P: 64 |
| (7) <i>P. rufescens</i> Petch | .. P: 64 |
| (8) <i>P. spadiceogrisea</i> (Schaeff ex Fr.) Quel | .. P: 64 |
| (9) <i>P. trechispora</i> Petch | .. P: 64 |
| (10) <i>P. tytha</i> (B. & Br.) Sacc. | .. P: 64 |

PLATE XXIV

- Fig. 56 — A — *Pluteus pulvinus* (x1) a — entire, b — L.S.
 B — *Pluteus spilopus* (x1) a — entire, b — L.S.
- Fig. 57 — A — *Psathyrella achnoa* (x1) a — entire, b — L.S.
 B — *Psathyrella etenodes* (x1) a — entire, b — L.S.
- Fig. 58 — A — *Psilocybe cernua* (x1) a — entire, b — L.S.
- Fig. 59 — A — *Russula purpureonigra* (x1) a — entire, b — L.S.
- Fig. 60 — A — *Schizophyllum commune* (x1) a — entire, b — L.S. c — section in detail.
- Fig. 61 — A — *Stropharia rostrata* (x1) a — entire.

45. *Psilocybe* (Fr.) Kummer. (Fig. 58)

Pileus fleshy, smooth, margin at first incurved; stem central somewhat cartilagenous, rigid or tough, tubular hollow or stuffed, often rooting, gills becoming brownish or purple; spores purple, purple-brown or slate colour.

Growing on the ground or on wood.

Psilocybe is analogous in form to *Collybia*, *Loptonia* and *Naucoria* which are distinguished by their spore colours.

25 species temperate.

1 species recorded in Sri Lanka.

P. cernua (Fr.) Quel.

.. P : 65

46. *Rhacophyllum* Berk.

Position uncertain, possibly near *Secotium* (Ainsworth 1963).

Pileus very thin, slender lamellae divided into oblong-obtuse flexuose fragments.

1 species, Asia, Africa.

1 species recorded in Sri Lanka.

R. lilacinus B. & Br.

.. P : 65

47. *Russula* (Pers. ex Fr.) S. F. Gray. (Fig. 59)

Colour of the pileus varies greatly and there are numerous species with shades varying from red to violet; pileus fleshy usually becoming more or less depressed, flesh descending into the gills forming a vesiculose trama; stem central, smooth, stout, rigid, brittle, spongy within; gills rigid, fragile, edge thin and acute; spores white or slightly yellowish.

Growing on the ground, rarely on wood. All species are edible. Certain species are concerned in the formation of mycorrhiza.

Russulae are readily distinguished by the stout, short, brittle stem and the fragility of the pileus and gills.

150 species cosmopolitan.

3 species recorded in Sri Lanka.

(1) *R. fuscogrisea* Petch

.. P : 65

(2) *R. periglypta* B. & Br.

.. P : 65

(3) *R. purpureonigra* Petch.

.. P : 65

48. *Schizophyllum* Fr. (Fig. 60)

Pileus fan shaped thin coriaceous resupinate; stem lateral or none; gills coriaceous fan-wise branched, united above the tomentose pellicle, bifid, split longitudinally at the edge, the two lips of the split edge of the gills commonly revolute; spores white.

Growing on wood. Active destroyers of wood, weak parasites often attacking economic plants and fruit trees. All species edible. Local inhabitants of Indonesia, Madagascar, and Africa have the habit of chewing fruit bodies of *Schizophyllum* (Zoberi 1972). It has also been reported that it causes a disease called basidioneuromycosis in man. (Zoberi 1972).

5 species, widespread.

1 species recorded in Sri Lanka.

.. P: 65

S. commune Fr.

49. *Stropharia* (Fr.) Quel. (Fig. 51)

Pileus fleshy, sometimes provided with a pellicle and may be scaly and viscid or dry; stem central, fleshy, annulate, flesh of stem and pileus continuous; gills more or less adnate, at first whitish or pale clay-brownish; spores purple.

Growing on the ground, dung or on wood. Species small. Many species edible.

Separated from all the genera of the purple-spored series but *Agaricus*, by the presence of a distinct ring and from *Agaricus* the continuity of flesh in stem and pileus and by the gills not being free.

70 species, temperate.

2 species recorded in Sri Lanka.

(1) *S. pseudobullacea* Petch.

.. P: 65

(2) *S. rostrata* Petch

.. P: 65

50. *Tricholoma* (Fr.) Kummer. (Fig. 62)

Pileus generally fleshy, viscid or non-viscid, smooth or ornamented with delicate fibrils. Stipe central, usually stout, fleshy-fibrous, continuous with that of the pileus. Gills are distinctly emarginate, sinuate, sometimes with a slight decurrent tooth, spore-printing white, spores smooth, hyaline, this walled, inamyloid.

140 species, widespread, mostly in warm temperate and sub-tropical zones, very few species truly tropical, grow on ground in woodlands. Some species are edible. *T. matsuke* is economically the most important. A number of species such as *T. saponaceum* have anti-biotic properties.

6 species recorded in Sri Lanka.

(1) *T. charisterum* (B. & Br.) Sacc.

.. P: 65

(2) *T. crassum* (Berk.) Sacc.

.. P: 65

(3) *T. rhacophorum* (B. & Br.) Sacc.

.. P: 65

(4) *T. rubro-cyaneum* (B. & Br.) Sacc.

.. P: 65

(5) *T. spongiosum* Petch

.. P: 65

(6) *T. theiochromum* (B. & Br.) Sacc.

.. P: 65

51. *Trogia* Fr. (Fig. 63)

Pileus spongy, coriaceous, soft, flaccid, dimidiate, sessile or sub-stipitate, reviving when wet; gills fold-like, edge longitudinally channelled; pileus and gills variegated with bluish or greenish blue stains. Plant rolls up irregularly when dry and so protect the gills, spores white.

3 species; Tropical. Not edible.

1 species recorded in Sri Lanka.

T. infundibuliformis B. & Br.

= *T. bicolor* B. & Br.

.. P: 65

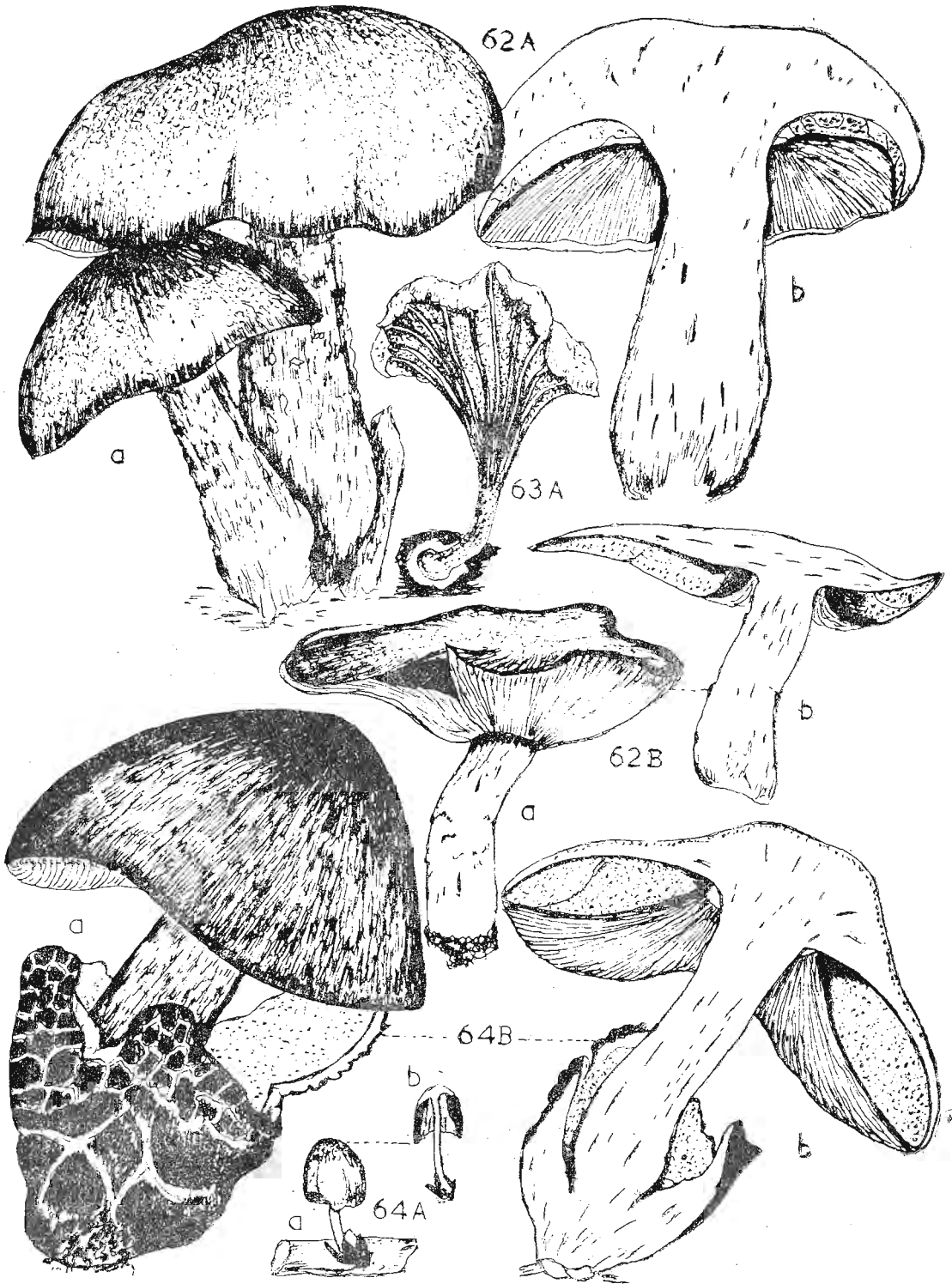


PLATE XXV — Figs 62 — 64.

52. *Tubaria* (W. G. Smith) Gill

Pileus fleshy or somewhat membranaceous, often clothed with universal floccose veil, sometimes umbilicate or depressed, margin striate, incurved; stem central, somewhat decurrent, or broadly adnate; spores rust colour or brownish rust colour.

Growing on the ground or on wood. Species are small.

15 species; Temperate.

1 species recorded in Sri Lanka.

T. crobulus (Fr.) Karst.

.. P: 65

53. *Volvariella* Speg (Fig. 64)

= *Volvaria* Fr. Kummer (Answorth 1963)

Pileus fleshy, circular, with a central stipe, white or pigmented; volva cup shaped, persistent no annulus. Gills always free, hymenophoral trama inverse. Spore-print brownish-pink; spores smooth, thick walled non-amyloid; cystidia usually present.

Growing in shady places on the ground, on decaying palm logs and other vegetation refuse. The young and healthy fruit bodies of some species are well known table delicacy in many parts of the world. *V. volvacea* (Bull ex Fr.) Singer and *V. diplasia* (Berk & Br.) Sacc., called the 'straw' or 'paddy straw' mushrooms are commercially grown in Burma China, India, Indonesia, Madagascar, Nigeria, Phillipines and Sri Lanka.

100 species cosmopolitan.

5 species recorded and described and the genus *Volvaria*.

- | | |
|---|----------|
| (1) <i>V. diplasia</i> (B. & Br.) Sacc. | .. P: 65 |
| (2) <i>V. glandiformis</i> (B. & Br.) Sacc. | .. P: 65 |
| (3) <i>V. microcoelia</i> (B. & Br.) Sacc. | .. P: 65 |
| (4) <i>V. pseudovolvacea</i> (B. & Br.) Sacc. | .. P: 65 |
| (5) <i>V. terastia</i> (B. & Br.) Sacc. | .. P: 65 |

Fig. 62 — A — *Tricholoma pachymeres* (x0.75) a — entire, b — L.S.

B — *Tricholoma rachophorum* (x1) a — entire, b — L.S.

Fig. 63 — A — *Trogia infundibuliformis* (x1) a — entire.

Fig. 64 — A — *Volvariella glandiformis* (x1) a — entire, B — L.S.

B — *Volvariella terastia* (x1) a — entire, b — L.S.

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GLOSSARY

- Acute — Sharp, applied to gills having sharp edges
- Adnate — Gills joined to the stem their entire width (See Plate VI, Fig. 17E)
- Adnexed — Gills which just reach the stem. (See Fig. 17 N. Plate VI)
- Adpressed — Pressed in close contact but not adherent
- Anastomosing — Branching so as to form a net work
- Annulate — Having a ring
- Annulus — The ring on the stem formed by the separation of the veil from the margin of the cap. (See Plate I, IFd.)
- Appendiculate — Hanging in small fragments
- Arid — Dry
- Caespitose — Growing in tufts or clumps
- Campanulate — Bell-shaped. (See Plate V, Fig. 13. D. I)
- Cap — The pileus; expanded umbrella-like receptacle of the mushroom (See Plate I Fig. I.F.b.)
- Carnose — Fleishy
- Cartilagenous — Firm and tough
- Confluent — Blended into one.
- Context — Substance
- Coriaceous — Of a leathery texture
- Decurrent — Gills that run down the stem. (See Plats VI. Fig. 17, 0)
- Deliquescent — Becoming liquid when mature
- Dimidiate — Gills which reach half-way to the stem; also of pileus when it is semi-circular in outline or nearly so.
- Distant — Of gills which have a wide distance between them.
- Eccentric — Attached off centre. (See Plate V. Fig. 16B)
- Emarginate — Notched at the end; of gills with a sudden scoop, as if scooped out at the point of attachment to the stem. (See Plate VI. Fig. 17 I)
- Ferruginous — Rust-red or the colour of the iron rust
- Flesh — Inner substance of the fungal body as distinguished from the cortical and hymenial layers.
- Fleshy — Succulent; composed of juicy cellular tissue
- Flexuose — Wavy
- Floccose — Covered with coarse wooly hairs
- Free — Gills that do not touch the stem. (See Plate VI Fig. 17, L.)
- Fugacious — Fading or falling early

Fuscous	— Brown tinged with grey
Glabrous	— naked ; not covered with hair
Gregarious	— Numerous individuals near each other but not in tufts
Heterogeneous	— Of a structure which is different from adjacent ones
Homogeneous	— Similar in structure
Hygrophanous	— of a watery appearance when moist and opaque when dry
Hymenophore	— The structure bearing the hymenium ; in agarics the under surface of the pileus to which the gills are attached
Hypocrateriform	— Having the shape of a cylindrical cup, the margin of which turns outward
Infundibuliform	— Funnel shaped. (See Plate V. Fig. 13 G)
Involute	— rolled inward. (See Plate V, Fig. 15 A)
Lamella	— A gill or gills on which the hymenium is extended. (See Plate I. Fig. I, F.C.)
Lateral	— Stem attached at one side of the cap. (See Plate V. Fig. 16, B)
Membranaceous	— Thin, rather soft and pliable
Obtuse	— Rounded.
Ochraceous	— Brownish - yellow
Recurved	— curved upward and inward
Resupinate	— Fungi spread over the matrix without any stem and with the hymenium upwards
Scurfy	— Bran-like particles on the surface
Seceding	— Gills that at first are attached to the stem but separate from it later
Serrate	— Having marginal teeth shaped like saw teeth. (See Plate VI. Fig. 17, tH)
Sinuate	— Gills having a sudded wave or sinns in its edge near the stem (See Plate VI, Fig. 17 G.)
Squamulose	— Covered with small scales
Striate	— marked with tiny streaks, furrows or lines.
Stuffed	— of a stem filled with material of a different texture from its walls
Tawny	— The colour of tanned leather
Tomentose	— Densely pubescent with matted wool
Trama	— the tissue between the hymenium in gills. (See Plate II, Fig. 4A, 4B)
Umbilicate	— With a small central depression. (See Plate V. Fig. 13F)
Umbrate	— Having a raised protion in the centre of the cap. (See Plate V. Fig. 13 J)
Vesiculose	— All the cells are circular in outline whatever direction the gill is cut. (Plate III ; Fig 10A)

- Veil or Velum — The partial or margin veil, a special envelope, extending from the margin of the pileus to the stem enclosing the gills; universal veil, a special envelope enclosing the entire plant in the young state, ultimately ruptured by the expanding pileus
- Viscid — moist and sticky, glutinous adhesive; covered, with a shining liquid which adheres to the fingers when touched
- Volva — universal veil ruptured at the apex, leaving a cup shaped structure at the base of the stem. (See Plate Fig. I. F.E.)

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<i>Inocybe</i> (Fr.) Fr. ...	25	36	XIV
<i>Laccaria</i> Berk. & Br. ...	26		
<i>Lentinus</i> Fr. ...	27	39, 40	XV, XVI
<i>Lepoita</i> (Pers. ex Fr.) S. F. Gray ...	28	41, 44	XVII, XVIII
<i>Leptonia</i> (Fr.) Kummer ...	29	44	XVIII
<i>Leucocoprinus</i> Pat. ...	30	44	XVIII
<i>Marasmius</i> Fr. ...	31	46, 47	XIX, XX
<i>Mycena</i> (Pers. ex Fr.) S. F. Gray ...	32	47	XX
<i>Naucoria</i> (Fr.) Kummer ...	33	49	XXI
<i>Nolanea</i> (Fr.) Kummer ...	34	49	XXI
<i>Omphalia</i> (Fr.) Kummer. See <i>Omphalina</i> Quel ...			
<i>Omphalina</i> Quel. ...	35	40	XXI
<i>Oudemansiella</i> Speg. ...	36	49	XXI
<i>Panaeolus</i> (Fr.) Quel ...	37	52	XXII
<i>Panus</i> Fr. ...	38	52	XXII
<i>Paxillus</i> Fr. ...	39	54	XXIII
<i>Phlebophora</i> Lev. ...	40		
<i>Pholiota</i> (Fr.) Kummer ...	41	54	XXIII
<i>Pleurotus</i> (Fr.) Kummer ...	42	54	XXIII
<i>Pluteus</i> Fr. ...	43	56	XXIV
<i>Psalliota</i> (Fr.) Kummer. See <i>Agaricus</i> L. ex Fr. ...			
<i>Psathyra</i> Fr. Kummer. See <i>Psathyrella</i> (Fr.) Quel ...			
<i>Psathyrella</i> (Fr.) Quel ...	44	56	XXIV
<i>Psilocybe</i> (Fr.) Kummer ...	45	56	XXIV
<i>Rhacophyllus</i> Berk. ...	46		
<i>Russula</i> (Pers. ex Fr.) ...	47	56	XXIV
<i>Schizophyllum</i> Fr. ...	48	56	XXIV
<i>Stropharia</i> (Fr.) Quel. ...	49	56	XXIV
<i>Tricholoma</i> (Fr.) Kummer ...	50	60	XXV
<i>Trogia</i> Fr. ...	51	60	XXV
<i>Tubaria</i> (W. G. Smit) Gill. ...	52		
<i>Volvaria</i> (Fr.) Kummer. See <i>Volvariella</i> Speg. ...			
<i>Volvariella</i> Speg. ...	53	60	XXV

ADDENDUM

Results of a recent survey of the mycorrhizal fungi of the tropical forests of Sri-Lanka were made available after the final manuscript had been prepared. Simple key to the genera and the species as identified by the Royal Botanical Gardens Kew are given below.

Veil dry and floccose to almost powdery, typically leaving an annular-zone on the	...	...	...	...	<i>Pulveroboletus</i>
stipe.	...	...	...	...	<i>Boletus</i>
Not as above	...	...	...	...	(including <i>Xeroconus</i>)

Pulveroboletus Murrill

A single species recorded from Sri-Lanka

P. reveneleii (Berk & Curt) Murr

Kottawa forest : de Alwis 1978.

Boletus

4 species have been reported as *Boletus* sp and two unidentified species have been reported as *Xeroconus* sp.

Boletus (Austroboletus) mucosus Cornex

Kottawa : de Alwis 1978

3 unidentified species of *Boletus*

Kottawa : de Alwis 1978.

2 unidentified species of *Xeroconus*

Kottawa : de Alwis 1978

Literature cited

de Alwis, D. P. 1978 : Mycorrhiza of the tropical forests. M. Sc. thesis, in preparation.