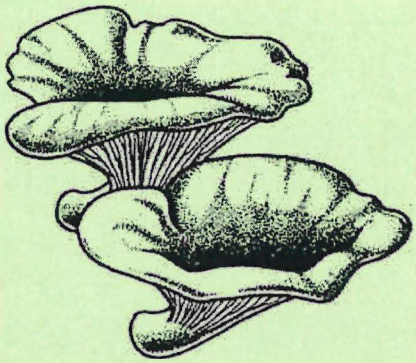

PUBF Fungi Kit

Perth Urban Bushland Fungi

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For

Fungi Workshop

Talbot Road Bushland July 11th 2004

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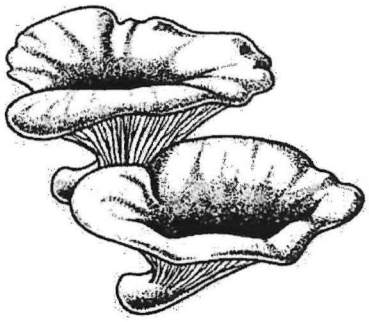

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Booklet written and produced by Neale L. Bougher

Photos by Neale L. Bougher

July 2004

Practical sessions demonstrated by Neale L. Bougher & Roz Hart
of the Perth Urban Bushland Fungi Project

Disclaimer

Information about fungi and their edibility and/or poisonous nature is provided only as a guide. The producers of this booklet and demonstrators of the associated practical sessions accept no responsibility for any consequences of people either correctly or wrongly identifying fungi or experiencing ill effects from using or eating fungi.

TIPS ABOUT IDENTIFYING AUSTRALIAN FUNGI

- **Colour and size of fungi vary** according to environmental conditions and are not *always* reliable characters for determining differences between species.

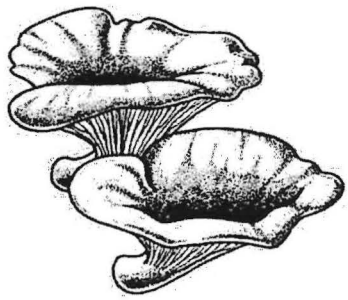
- **Shapes and forms of fungi vary** and may not always fall into discrete categories and may sometimes overlap the defined boundaries of genera and species.

- **Many Australian fungi are unique.** Only some Australian fungi are the same as those in overseas countries. Even fungi that closely resemble European or North American fungi are often different species.

- **Do not expect to be able to key out and/or put a name on every fungus.** Comprehensive, accurate descriptions are not available for most Australian fungi. Keys are not available for most groups. Also, many Australian fungi are yet to be discovered and named, and so there are no published data about those.

- **Field guides:** There are not many field guides about Australian fungi, and these all deal with only a small representation of our fungi. Field guides about overseas fungi are only of limited use because many Australian fungi are unique.

A list of some useful books, CD's and web sites is provided at the end of this booklet.



The difference between Ascomycetes and Basidiomycetes

The broadest category in determining the identity of the larger fungi is to decide whether a specimen is an Ascomycete or a Basidiomycete. Sexual reproduction in the Ascomycetes is by microscopic sacks or tubes called asci producing ascospores, and in Basidiomycetes it is by microscopic structures called basidia producing basidiospores. Each Ascomycete fruit body may have thousands of asci, e.g. lining the concave surface of a cup-shaped fruit body or coating the surface of a tongue-shaped fruit body. Each Basidiomycete fruit body may have thousands of basidia, e.g. lining the surface of the gills of a mushroom or occupying the inside of a puffball.

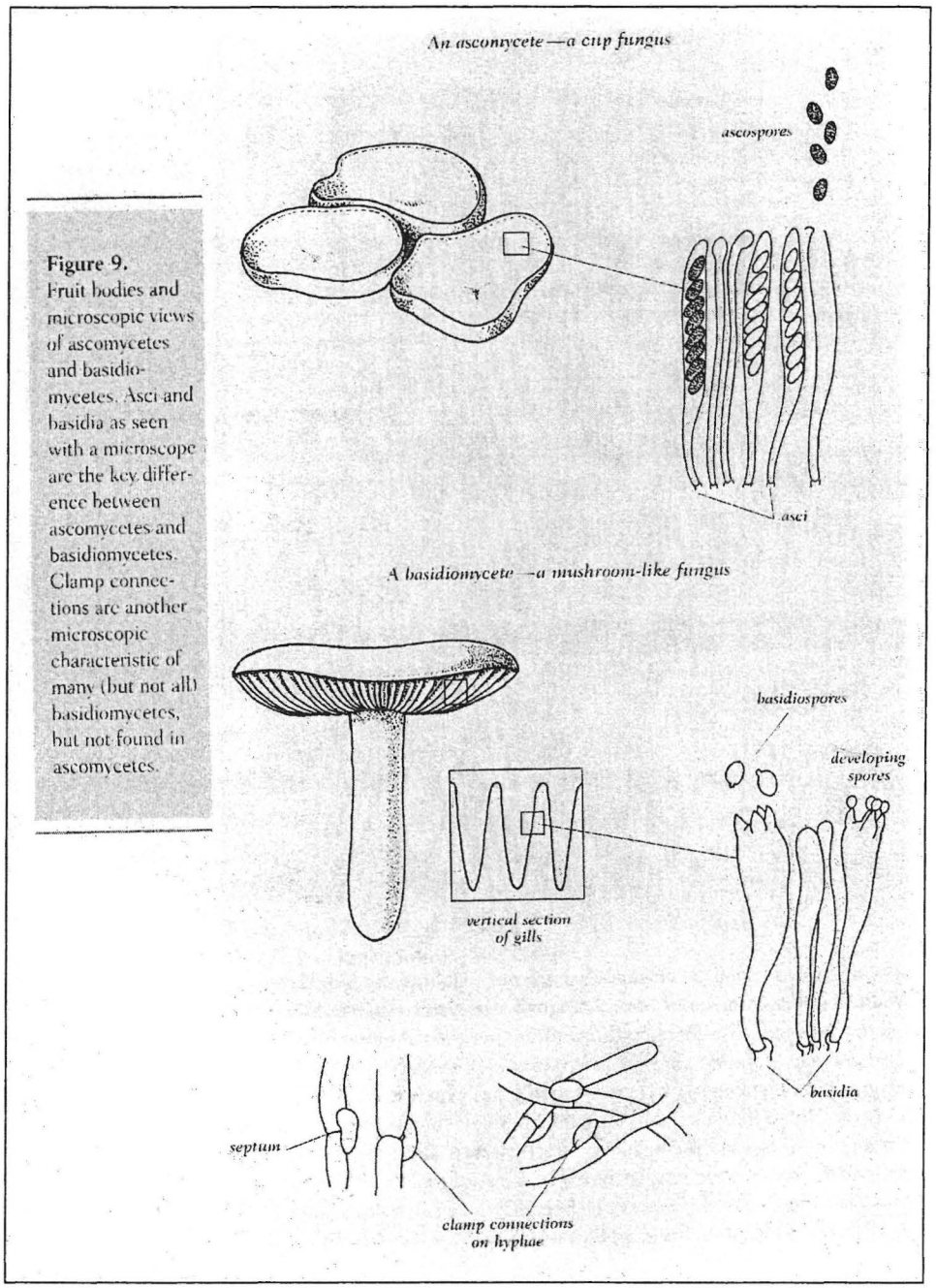
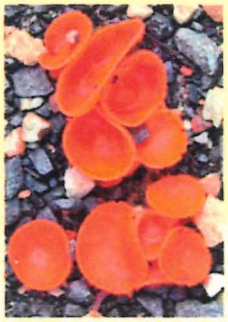


Figure 9. Fruit bodies and microscopic views of ascomycetes and basidiomycetes. Asci and basidia as seen with a microscope are the key difference between ascomycetes and basidiomycetes. Clamp connections are another microscopic characteristic of many (but not all) basidiomycetes, but not found in ascomycetes.

Extracted from the book Fungi of Southern Australia (Bougher and Syme 1998)

Some distinctive main types of fungi

Ascomycetes



Cup fungi



Morels



Earth Tongues



Truffles
(Ascomycetes)

Basidiomycetes



Jelly Fungi



Birds Nest Fungi



Earth Balls



Puffballs



Stinkhorns



Earth Stars



Gilled Mushrooms



Mushrooms with Pores
(Boletes)



Truffles
(Basidiomycetes)



Bracket Fungi
(Polypores)



Coral Fungi



Teeth Fungi



Skin Fungi
(Resupinate Fungi)

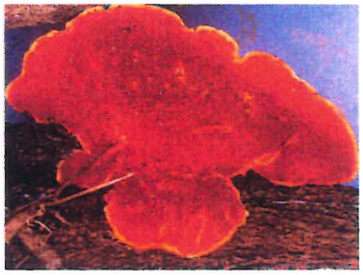
Some distinctive species of fungi to learn

Another way to learn about fungi is to simply focus on recognising a few distinctive species.

Ghost Fungus
Omphalotus nidiformis



Scarlet Bracket Fungus
Pycnoporus coccineus



Golden Wood Fungus
Gymnopilus allantopus (*austrosapineus*)



Pink-spored Volvaria
Volvariella speciosa



Curry Punk Fungus
Piptoporus australiensis



Punk Fungus
Laetiporus portentosus



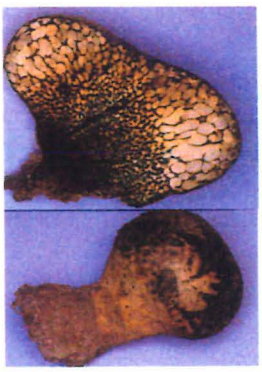
Magpie Fungus
Coprinus picaceus



Dog Poo Fungus



Pisolithus species



5 common Genera of gilled mushrooms



In learning how to identify fungi it is useful to at least recognise some of the more frequently encountered genera of fungi.

Amanita



- On ground
- Veil patches on cap and/ or ring on stem.
- Cup (volva) often at base of stem
- **Spore print** white to cream
- Gills usually free
- Spores smooth, sometimes blue in Melzers reagent (iodine)

Coprinus (Ink Caps)



- On ground, dung, wood or litter
- Mushrooms auto-digest, become inky
- **Spore print** black
- Gills usually attached
- Spores usually smooth, with a germ pore

Cortinarius



- On ground
- Cobweb-like veil on upper stem when young
- **Spore print** rusty or ochre brown
- Gills attached
- Spores ornamented

Mycena



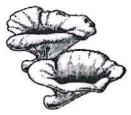
- On ground or wood or litter
- No veil patches on cap or ring on stem.
- **Spore print** white to cream
- Gills attached
- Typically small and slender
- Caps often conical or bell-shaped
- Spores smooth

Russula



- On ground
- No veil patches on cap or ring on stem.
- **Spore print** white to cream
- Gills attached
- Texture chalky, snaps
- Spores ornamented and blue in Melzers reagent (iodine)
- Closest relative = *Lactarius* which exudes latex when cut.

Photographing fungi



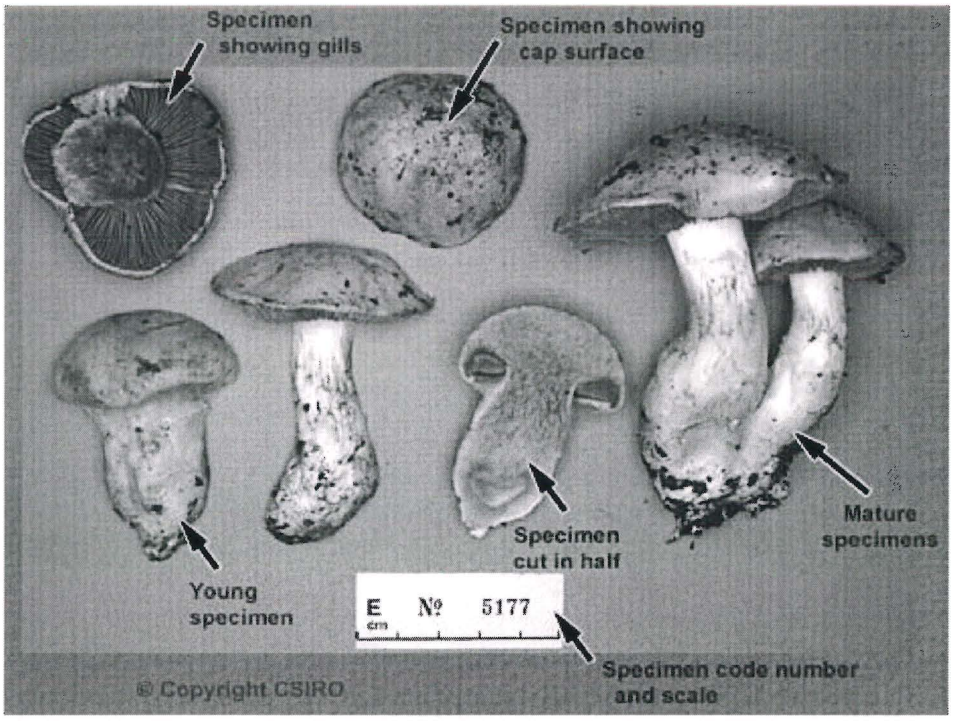
The best photos for scientific record are colour photographs showing young, mature, and old specimens, with a scale. It is also a good idea to include a unique collection reference number for the specimen in the photograph.

Photographs also may be taken in the field to show the habitat, and such photographs are also scientifically valuable.

In order to provide a clear visual record of the main features of fungi, a photographic system which enables good lighting and close-up focus is strongly recommended. A single lens reflex camera for either 35 mm film or digital media is recommended. The camera should have a close-up or macro lens, e.g. 50 mm macro lens capable of focusing on an area as small as about 70 x 50 mm, i.e. 1x or 0.5x magnification at the closest focus.

A lens aperture, preferably f16 or f22 or more, should be used to ensure an acceptable depth of focus. No filter should be used on the lens as natural colours are desirable.

Slide film is recommended over print film, as the colour saturation is often better. Digital imaging is fast taking over as the preferred method due to relatively low cost, improved resolution, speed, and compatibility with computers.



A *Cortinarius* species photographed in a manner to keep as a quality image record for permanent reference.

Image extracted from FungiBank at www.FungiBank.csiro.au

Guide for collecting, examining and preserving fungi



The following outline is a guide to collecting fungi in a well planned and ordered fashion so as to achieve a high standard of information. For example, data about fungi and their environment, particularly associated plants and soil, needs to be recorded at the time of collection as it is often impossible to retrieve such data at a later date. Morphological characteristics such as shapes, textures and colours are required for identifying fungi and these need to be recorded with fungi in their fresh condition . The value of the information may be greatly enhanced by preservation of fungal fruit bodies in a herbarium.

Main steps for collecting and initial processing of fungi

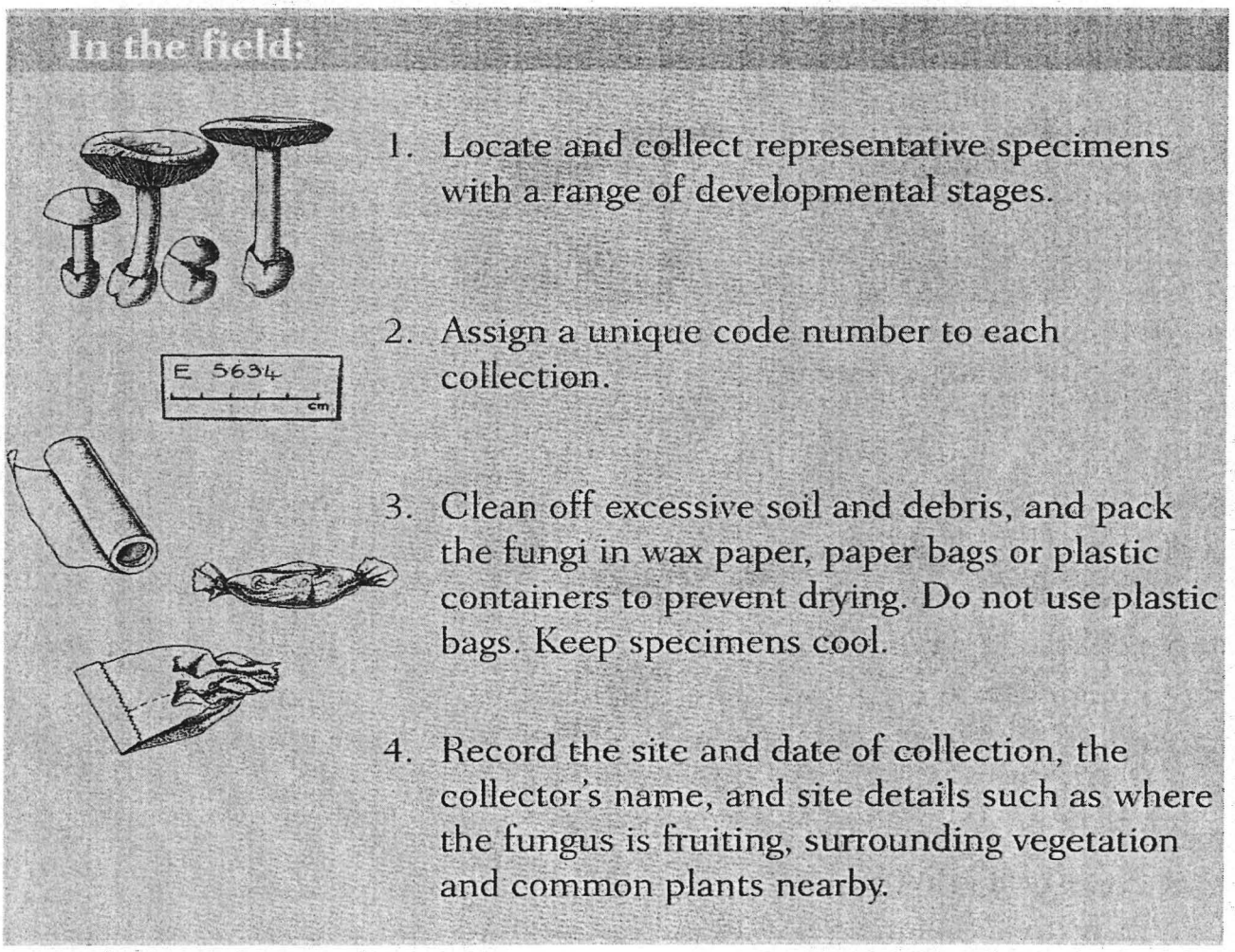


Image extracted from the book Fungi of Southern Australia (Bougher & Syme 1998).

Collecting a fungus

Extract the whole fruit body including the base of the stalk by using a small knife or other instrument to dig well under and into the soil and immediately place in a bag to prevent desiccation. A 'good collection' of a fungus consists of at least several fruit bodies of the same species, preferably young and mature specimens at different stages of development, collected at the same place and at the same time. Rotting or maggot-infested specimens should be discarded.

What to do with fungi you collect

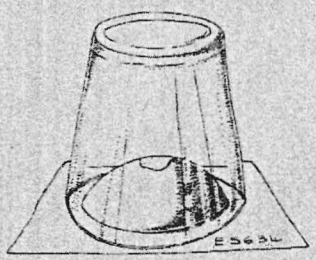
(Aside from eating them – not recommended unless you are certain of what you are doing)

In the laboratory:

5. Examine, draw, and record characteristics of the fungi such as shapes, textures and colours, giving particular attention to variations with age.

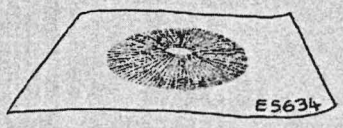


6. Take colour photographs showing young, mature, and old specimens, some in longitudinal section, on a standard background with a scale.



7. Set up a spore print on white paper (may need to do this first, e.g. if small specimens).

8. Before air-drying the specimens: cut one or two fruit bodies of mushroom-like fungi longitudinally; cut all truffle-like fungi in half.



9. After thorough drying is completed, package the specimens and spore prints in a labelled paper bag, envelope, or plastic zip-lock bag. Store them in a dry environment.

Image extracted from the book Fungi of Southern Australia (Bougher & Syme 1998).

Recording shapes, sizes, and colours

Morphological features such as shapes, textures and colours are useful for identifying fungi and these need to be recorded with fungi in their fresh condition.

Some of the main features are:
Cap and stem: size, shape, colour, surface texture and moisture.
Gills: size, shape, colour, how attached to the stem.
Partial veil: (ring or covering over gills): presence or absence, form.
Universal veil: (patches on cap or cup at base of stem): presence or absence, form.
Flesh: colour, texture, bruising.
Odour and taste:
Spore print colour:

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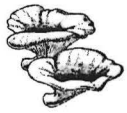
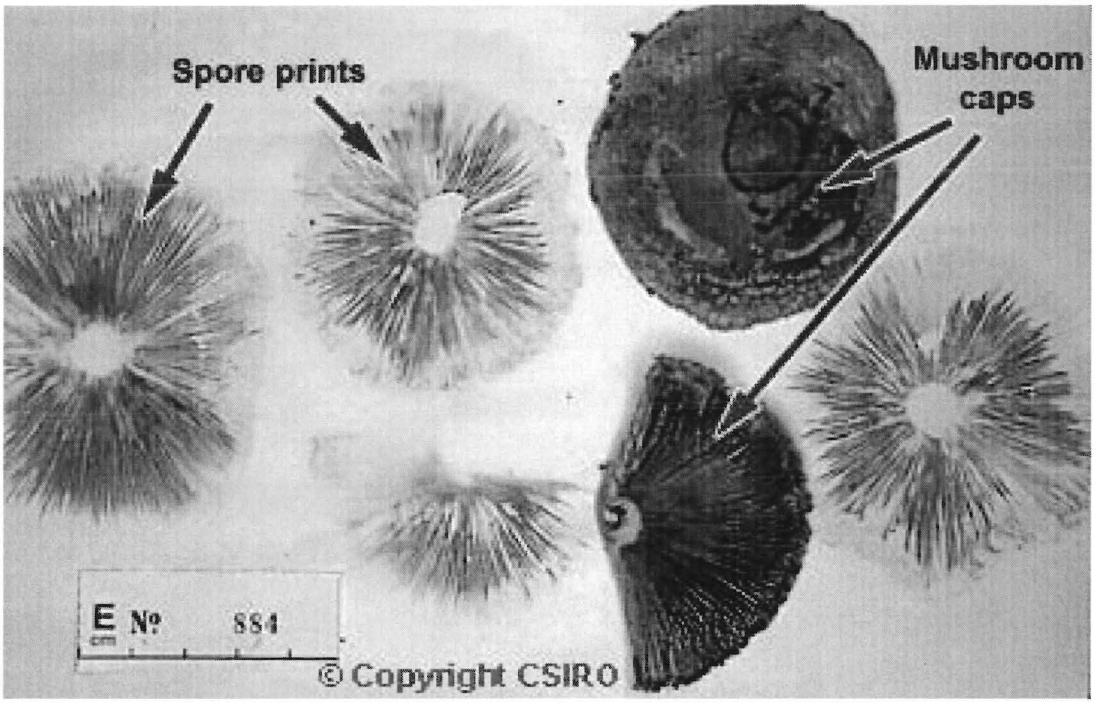


Making spore prints

A spore print can be made by placing a mushroom cap which is mature but not too old, with the stem removed and the spore-bearing gills facing down, onto white paper. It can be covered with paper or glass for protection against air movements and desiccation. A drop of water placed near the fungus may help to prevent drying out. After a period of one hour to overnight (depending on the size and condition of the specimen), the spores should have been deposited on the paper. They adhere to the paper by static electricity but can be easily brushed off and therefore require some protection. The colour of the deposit itself is useful for broad identification purposes, and the spores can be used later for microscopic examination. Spore print colour should be noted as soon as possible as they may change colour on drying, and may change further after lengthy periods of storage. Label the spore print paper with the name and/or code number of the fungal collection, allow the paper to dry out, then fold it in half with the spore deposit facing inwards. Store spore prints with the corresponding fruit bodies.

Spore prints can be made from many types of fungi such as mushrooms, brackets, corals and clubs. Truffle-like fungi generally do not produce spore prints.



Green spore prints of the fungus *Chlorophyllum molybdites*
(Image extracted from FungiBank at www.FungiBank.csiro.au)

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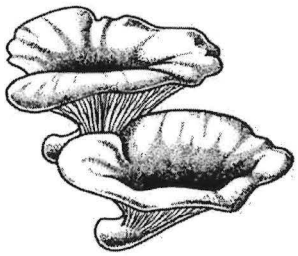
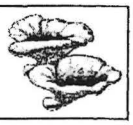


FUNGI DATA RECORDED BY: ..... DATE: .....



COLLECTION No. ..... FUNGUS NAME .....

Genus ..... species .....

Common Name .....

Collector .....

Site .....

Plant association and habit: .....

.....

.....

Main distinctive features: (do this last, after completing main description)

1 .....

2 .....

3 .....

4 .....

Cap: size, shape, colour, surface texture and moisture.

Gills: size, shape, colour, attachment, spacing, lamellules.

Stem: size, shape, colour, surface texture and moisture.

Partial veil: (ring or covering over gills): presence or absence, form.

PTO
Continued over page

Further notes and diagrams



Collection No. . . . . .

Universal veil: presence or absence, form.

Flesh: colour, texture, bruising.

Odour and taste:

Spore print colour:

Notes and diagrams

Identification/ relationships and notes

.....

.....

.....

.....

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This form was produced by Neale Bougher and distributed for use at urban bushland forays in Perth 2004

Data sheet for recording microscopic features of fungi

MICROSCOPIC DATA **RECORDED BY:** ..... **DATE:** .....



COLLECTION No. ..... **FUNGUS NAME** .....

SPORES

shape - face view:

shape - side view: symmetrical ☐ asymmetrical ☐

size - length: ☐ to ☐ µm

size - breadth: ☐ to ☐ µm

colour in KOH:

colour in Melzer's: amyloid (blue) ☐ dextrinoid (brown) ☐

hilar appendix:

apex:

wall ornamentation and thickness:

perisporium: present ☐ absent ☐

other notes:

BASIDIA

shape: sterigma number ☐

clamp connection at base? Yes ☐ No ☐ Not sure ☐

other notes (size, colour in KOH, in Melzers):

CYSTIDIA

present ☐ absent ☐ shape size ☐ X ☐ to ☐ X ☐ µm

colour in KOH colour in Melzer's (amyloid/dextrinoid)

PELLIS/PERIDIUM

structure

CLAMP CONNECTIONS

presence/absence, abundance and location

DIAGRAMS AND OTHER NOTES

This form was produced by Neale L. Bougher and distributed for use at urban bushland forays in Perth2004

Scale: ——————— µm

Preserving fungi for permanent herbarium specimens

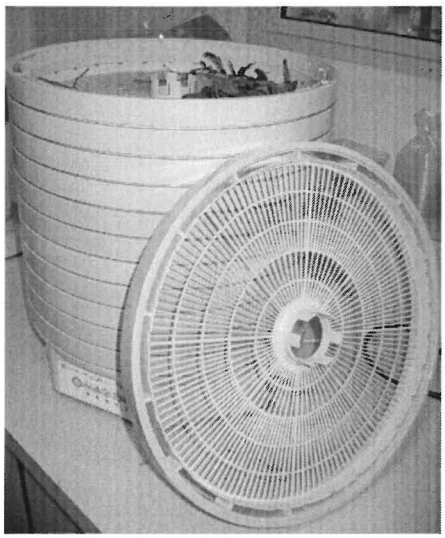
Air drying is the best method of preserving fungi. Air drying can best be achieved with commercially available electrical units designed for drying fruit or herbs. These have a heating element and blow warm air through a series of wire or plastic grid trays.

Tips about drying fungi specimens

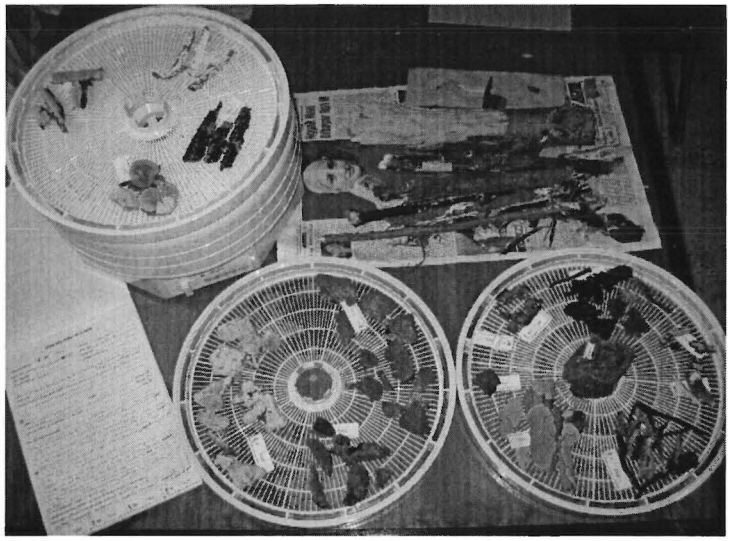
- It is important **not to cook specimens** by overheating them as this may destroy structures needed later for identification. 40 – 50°C is adequate.
- **Heating overnight is sufficient** for drying most fungi.
- Large and woody specimens **take longer**.
- It is best to **slice all specimens**, particularly large specimens to encourage thorough drying.

If a drier is not available it may be possible to air-dry small to medium sized fungi by:

- placing specimens on a wire mesh over an electric, gas or oil lamp
- placing specimens on a wire mesh over a radiator or a fan heater
- application of silica desiccating gel
- exposure to the sun (only in warm, low humidity weather).

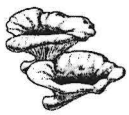


Air-drier suitable for drying fungi.



Fungi specimens ready for drying.

Air-dried fruit bodies often have little resemblance to the fresh fruit bodies. However, microscopic characters of the fungi that are useful for identification are preserved in the samples. Fruit bodies of air-dried fungi can be stored permanently for future reference. If at any time fungi are found to have rehydrated, the specimens can be removed from their packet and put on an air drier for an hour or until dry once again.



Books and other useful References

Some books and CD's about Australian fungi

Aberdeen, JEC. (1979). **Introduction to the Mushrooms, Toadstools and Larger Fungi of Queensland.** Queensland Naturalists Club, Brisbane.

Bougher, N.L., & Syme, K. (1998). **Fungi of Southern Australia.** University of Western Australia Press.

Cole, M, Fuhrer, B & Holland, A. (1984). **A Field Guide to the Common Genera of Gilled Fungi of Australia** (rev. ed.). Inkata Press, Melbourne & Sydney,

Fuhrer, B. A (2001). **Field Companion to Australian Fungi** (rev. ed.). Bloomings Books, Melbourne.

Fuhrer, B.A. and Robinson, R. (1992). **Rainforest fungi of Tasmania and south-east Australia.** (CSIRO, Melbourne.)

Fungimap (2001) **Compendium of fungimap target species.** Version 1.0 (CD-ROM).

Grgurinovic, C.A. (1997). **Larger fungi of South Australia.** (The Botanic Gardens of Adelaide and State Herbarium, Adelaide.)

Grgurinovic, C.A. (2003). **The genus Mycena in south-eastern Australia.** Fungal Diversity Res. Ser. 9. Fungal Diversity Press.

Griffiths, K. (1985). **A Field Guide to the Larger Fungi of the Darling Scarp & South West of Western Australia.** (Griffiths, Perth.)

Hood, I. (2003). **An Introduction to Fungi on Wood in Queensland.** (University of New England)

Macdonald, R. and Westerman, J. (1979). **A Field Guide to Fungi of South-eastern Australia.** (Thomas Nelson, Melbourne.)

McCann, I.R. (2003). **Australian fungi illustrated.** Macdown Productions, Vermont.

Robinson, R. (2003). **Fungi of south west forests.** Department of Conservation and Land Management, Kensington.

Shepherd, C.J. and Totterdell, C.J. (1988). **Mushrooms and Toadstools of Australia.** (Inkata Press, Melbourne.)

Willis, JH. (1963). **Victorian Toadstools and Mushrooms** (3rd. ed.). Field Naturalists Club of Victoria, Melbourne.

Wood, A. (1990). **Australian Mushrooms and Toadstools: How to identify them** (rev. ed.). New South Wales University Press, Sydney.

Young AM. (2000). **Common Australian Fungi.** New South Wales Univ. Press, Sydney. (revised edn; 1st ed 1982).

A helpful book series on how to identify and work with larger fungi

Largent, D.L. (1977a). **How to Identify Mushrooms to Genus I: Macroscopic features.** (Mad River Press Inc., Eureka.)

Largent D.L. (1977b). **How to Identify Mushrooms to Genus III: Microscopic Features.** (MRP Inc., Eureka.)

Largent D.L. and Baroni, T.J. (1988). **How to Identify Mushrooms to Genus VI: Modern Genera.** (MRP Inc., Eureka.)

Largent D.L. and Thiers, H.D. (1977). **How to Identify Mushrooms to Genus II: Field ID of Genera.** (MRP Inc., Eureka.)

Stuntz, D.E., (1977). **How to Identify Mushrooms to Genus IV: Keys to Families and Genera.** (MRP Inc., Eureka.)

A couple of easy-to-read books about fungi

Arora, D. (1986). **Mushrooms Demystified.** (Ten Speed Press: Berkeley.)

Kendrick, B. (1992). **The Fifth Kingdom.** (Focus Information Group Inc., Newburyport).

Growing edible fungi

Stamets, P. (1993). **Growing Gourmet and Medicinal Mushrooms.** (Ten Speed Press, Berkeley.)

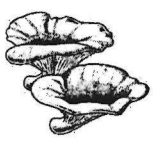
Some of the many useful websites about fungi

Fungimap – A project to map the locations of Australian fungi http://fungimap.rbg.vic.gov.au/

FungiBank – online resource of information about Australia's rich resource bank of native fungi for revegetation http://www.fungibank.csiro.au

Fun facts about fungi - http://www.herb.lsa.umich.edu/kidpage/factindx.htm

"The WWW Virtual Library: Mycology" http://biodiversity.uno.edu/~fungi/



Notes

