



Collecting and preserving fungi specimens, a manual

Queensland Herbarium

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Introduction

Fungi are simple, filamentous organisms comprised of masses of thread-like hyphae which constitute the body (mycelium) of the fungus. Unlike plants, fungi do not contain chlorophyll and are therefore incapable of directly manufacturing their own organic compounds for energy. Most fungi are microscopic, but some (macrofungi) intermittently produce fruiting bodies (sporocarps) that are highly visible. These are commonly called “mushrooms” or “toadstools”. The fungi have been assigned to their own Kingdom, but mycologists often work alongside botanists in major herbaria, where macrofungi collections and associated data and information are housed. The methods of collection and study of fungi are somewhat similar to those used in botany, however there are many differences. The purpose of this manual is to assist amateur mycologists and others to make useful collections of fungi that meet herbarium standards and therefore contribute to the overall knowledge of our fungi flora.

Lichens are not included in this manual. For information on collecting lichens, please contact the Queensland Herbarium.

Fungi diversity in Australia

Fungi are found on every continent and in almost every habitat. They are commonly found in forest and rainforest but can also be located in open paddocks, garden beds, beaches and even in arid zones. Colours vary from extremely vivid and bright to drab, dull tones, or even fluorescent. Some may only be millimetres high and wide, while others can be measured in decimetres.

Fungi that are commonly known as “mushrooms” belong to a group referred to as the agarics, or gilled fungi. Other categories of macrofungi include boletes, cup fungi, club fungi, coralloids, gasteromycetes (puffballs, earthstars, phalloid fungi, bird’s nests), jellies, corticioids (paint fungi) and polypores. Australia also possesses a large diversity of another distinct group of macrofungi, the sequestrate fungi (truffles), which produce their sporocarps underground. These are not true “gourmet” truffles, but are often referred to as “truffle-like”. Australian sequestrate fungi are generally produced within the top 10 cm of the soil, or directly beneath the litter or humus and can often be detected close to the diggings of foraging mammals, some of which rely on these fungi as an essential food source.

There are many new species of fungi yet to be discovered, and the role of fungi in ecosystem function is as yet only fundamentally understood. High quality specimens and data are needed as materials for research to improve our understanding of this important group of organisms.

Why collect?

In Queensland, most areas are still poorly collected compared with vascular plants (Figure 1), and a significant proportion of specimens you collect will probably represent new discoveries or new records. Citizen scientists and amateur mycologists play an important role in finding and collecting fungi, and ultimately documenting Queensland’s fungi flora. These specimen collections form the basic biological materials for researchers to describe new species and study their relationships and evolution. New genetic techniques have increased the need for well-annotated and correctly identified specimens (the mycologist’s role) to be stored in herbaria, and collected in sufficient quantities to allow limited destructive sampling. These specimens need to be processed and stored so that the DNA is preserved for future study.

Herbarium collections and associated label data provide:

- reference material for accurate identification.
- basic biological material for taxonomists and other researchers to study.
- the core material upon which application of scientific names is based (Type specimens).
- a permanent record for a species at a particular time and location.
- reliable distribution maps and habitat information.
- vouchers for scientific research, including taxonomic, ecological and biochemical analyses and DNA sequences.
- information for production of fungal inventories for your local area.
- information for monitoring changes in composition and behaviour over time.
- reference material for recognition of those fungi species which are most appropriate for use in localised revegetation programs.
- data for monitoring programs which document the introduction and spread of invasive alien species.

People with an interest in fungi are encouraged to submit good quality collections accompanied by useful field notes, descriptions and photographs. Submitted specimens are assessed according to the amount and condition of material and the quality of associated notes and photographs. The Queensland Herbarium currently has a particular interest in corals, boletes, phalloides, bird's nests and Fungimap targets <http://fungimap.org.au/index.php/learn-about-fungi/fdu-online/targets>. These fungi are the subject of active research by Queensland Mycologists.

Remember, only quality specimens that meet the Herbarium standards are accepted, so it is especially important to take the time and effort to follow this guide when collecting specimens in the field.

The Queensland Herbarium fungi collections

The Queensland Herbarium (BRI) houses approximately 850,000 specimens of plants, algae and fungi but only 12,000 of these are macrofungi (Map 1). A *Census of Queensland macrofungi* is published annually <https://data.qld.gov.au/dataset/census-of-the-queensland-flora-2016>. This list includes named species known to occur in Queensland and those that are known but as yet undescribed. The latter may be recorded as phrase names with a standard format based on the collection e.g. *Pisolithus* sp. (Bribie Island J.Herbert BRIP8252). The Queensland Herbarium collection continues to grow through activities undertaken by staff and research associates, the Queensland Mycological Society (QMS), exchange of specimens with other herbaria, students undertaking research projects, and members of the public.

The specimen label information, including location and habitat, is available online through collective data delivery such as Australia's Virtual Herbarium (AVH) (<http://avh.chah.org.au>) or the Atlas of Living Australia (ALA) (<http://www.ala.org.au>).

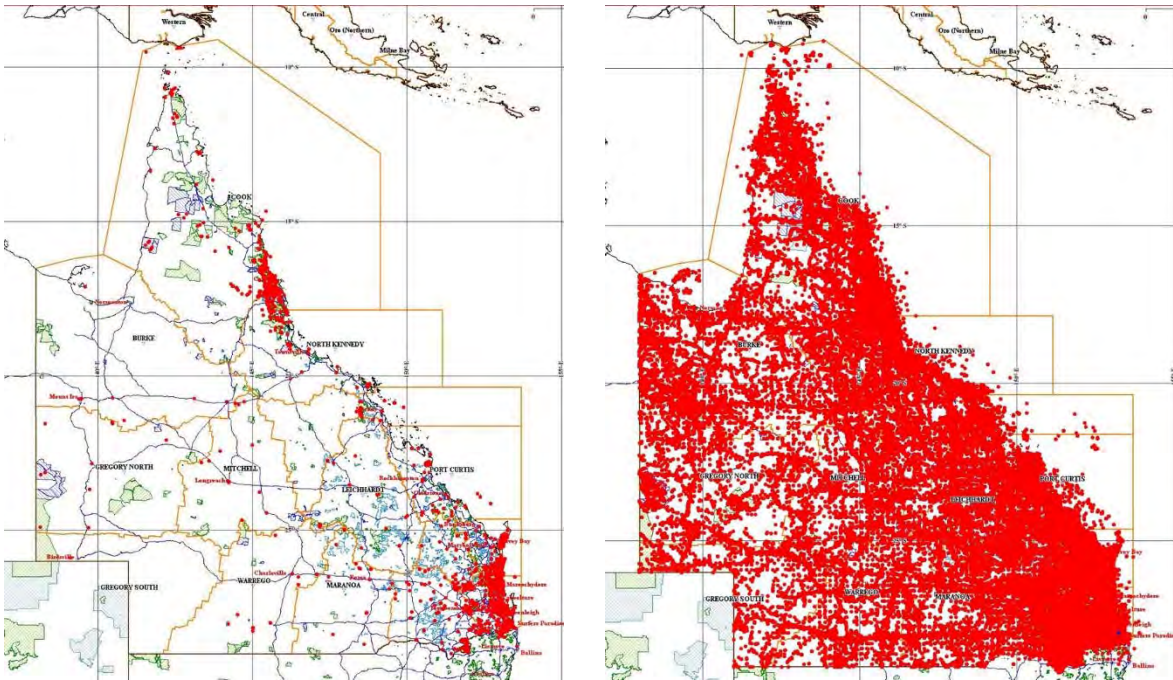


Figure 1 Total Queensland fungi collections (left) compared to total Queensland vascular plant collections (right) (Queensland Herbarium December 2016)

Before you collect

Permits and permission

In Queensland, native fungi are protected under the *Nature Conservation Act 1992* (as protected flora). A permit to take protected flora is required on crown land. Application forms for Scientific Research and Educational Purposes Permits are available here:

<http://www.ehp.qld.gov.au/licences-permits/plants-animals/research-education/index.html>.

These permits have stringent conditions, including notifying the local ranger of your intended visit. The Queensland Mycological Society Inc. (QMS) holds such a permit and members who wish to be added to the permit need to speak to the permit holder. The permit requires records to be kept of your collections, specimens to be submitted to Queensland Herbarium, and an annual report is to be sent to the relevant department. Note that additional permits may be required for collecting in State Forests or other areas managed by the Queensland National Parks and Wildlife Service: contact parkaccess@npsr.qld.gov.au for more information on these tenures. Permit information should be included with specimens, and the permit number added to labels.

Safety first

It is advisable to take personal protective equipment and safety items such as sunscreen, hat, long-sleeved shirt, long trousers, sturdy shoes, gloves (for seeking out fungi in the litter layer), insect repellent, first aid kit, water and food.

There is little to no risk of being poisoned by handling fungi. However, tasting is strongly discouraged for beginners – illness and death have occurred from eating fungi in Queensland. Skin or respiratory allergies/reactions may also occur, caused either by the fungus itself, or by bacteria or other organisms growing on the fungus. Washing hands after handling fungi is strongly recommended. Ticks can be a problem in many areas, Deet sprays or electronic tick deterrent devices have proven to be effective deterrents. Be alert for snakes, spiders and insects, especially in litter. First aid training for the treatment of bites and stings is recommended.

Safe travel procedures

Always let someone know where you will be working, and when you expect to return. For prolonged journeys, details of your intended route and destination, call-in schedule and expected time of return should be left with someone, preferably the relevant land managers, who can raise help if necessary. Check prevailing conditions in the park and take note of any track closures or other site specific warnings. Travel with someone and discuss safety issues and procedures before you leave. Be sure that the vehicle is suitable for the job, and functioning properly prior to leaving. All safety equipment such as satellite phones and recovery gear should also be checked prior to leaving.

When to collect

Most species have fruiting bodies (sporocarps) that survive from a couple of hours to several days, with some hard bracket fungi persisting for many years. In addition, fruiting can occur at any time of the year, depending on the species, and provided there is sufficient moisture and the temperatures are amenable. Characteristically, a 'peak' of activity is preceded by a couple of days or a few weeks of steady build-up in fungal productivity. The peak is generally in autumn in South-East Queensland, but flushes of fungal activity often occur following summer rains.

Standard Equipment for fungal fieldwork

- Camera and tripod
- Notebook, pens and/or pencils
- Hand lens
- Pocket knife
- Mirror (dental or automotive telescopic inspection mirrors have proven to be very effective)
- Small trowel for digging up fruit bodies
- Truffle rake (pictured below)
- Paint brush to dust off soil
- Scissors to cut grass and number tags (if not cut previously)
- GPS unit and/or maps/smart phone
- Ruler for providing scale in photos
- Tags for labelling collections. These may be QMS numbered tags with scale, or jewellers' tags
- Storage containers
- Esky with ice bricks to store specimens (not directly on the ice brick).



Figure 2 Fungi collecting tools (left) and truffle rake (right)

Making a collection

Selecting the fruiting bodies

- Look for fruit bodies in good condition (not over-mature, decayed, deliquesced, maggot infested, dried out, withered or badly eaten).
- Select fruit bodies representing a range of developmental stages (e.g. from buttons to mature specimens with fully open caps). The major part of the collection should be old enough to be fertile. If you have a microscope you can check for spores to ascertain fertility.
- A good specimen includes all parts of the fungus – cap, hymenium (spore bearing tissues), stipe, ring and volva where present. Include a little of the mycelium where possible.
- Ideally, all fruit bodies in your collection will come from the same log, trunk of the same tree or from the same patch of lawn around a single tree. Generally keep within a square metre – this will decrease the chance of a mixed collection.
- Never mix together collections from different sites.
- Where possible, collect enough material to make a duplicate collection. Herbaria regularly send duplicates to other institutions to allow specialists to work on particular genera.

Note: the Queensland Herbarium does not return specimens, once submitted the specimens become the property of Queensland Herbarium.

How many fruit bodies do I collect?

- Sufficient material should be collected to allow some destructive sampling for identification.
- The number of fruit bodies required will depend on their size: the smaller the species the more fruit bodies will be needed.
- A rough guide is to collect at least 20 fruit bodies of small fungi (such as *Marasmius* and *Mycena*), and 5–10 fruit bodies of medium sized fungi (such as *Russula* species). For very large fungi, a single fruit body may be sufficient, or in the case of huge species such as *Phlebopus marginatus*, a cross section of a single fruit body may be sufficient.

Ensure photographs are taken to capture any morphological variation, chemical reactions, textural details etc. Photographs should always be clearly linked to the specimens. (See Photography section below)



Figure 3 Examples of good fungi collections



Figure 4 Examples of inadequate collections

How to collect a fruit body

- Use a knife or trowel to dig out the basal portion of the stipe keeping it intact, with some of the mycelium and substrate attached. Be aware that some fungi have a large mass (sclerotium) underground – the *Laccocephalum* sp. below was collected without its sclerotium.
- Small gilled fungi (agarics), such as *Marasmius* and *Mycena*, often have a characteristic basal disk.
- For Ascomycetes, which can be very small, the substrate is often collected to allow examination of the means of attachment. The same applies to bird's nest fungi. These have an “emplacement” or foot, and the nature of this ‘foot’ can be crucial in correct identification. By way of example, *Trametes lactinea* is illustrated with a small amount of substrate to confirm the attachment (Figure 5).
- Fungi growing in soil are best dug out with a small trowel or pocket knife. Grasping a fungus by the stipe and attempting to pull it out of the ground will often result in a broken stipe and therefore the base of the fungus, which may prove to be a diagnostic character, is left behind.
- Fungi growing on wood can either be collected intact if growing on a branch small enough to allow this (trim off excess pieces of substrate), or it may be possible to cut or chisel away a thin slice of the substrate with the fungus intact using a good pocket knife.

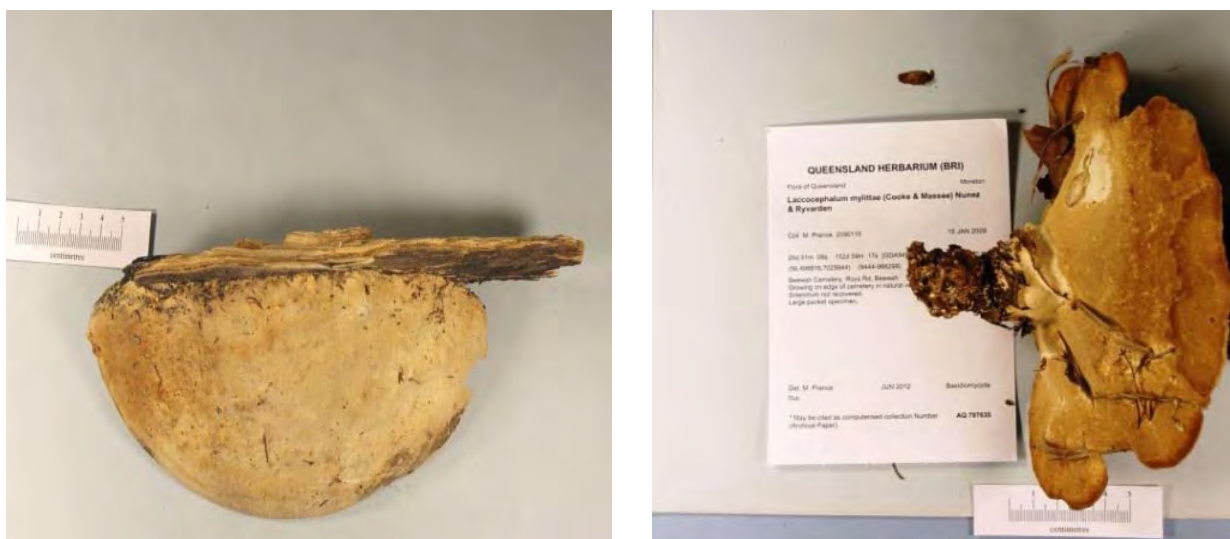


Figure 5 Examples of collections including the attachment points and a small amount of substrate. *Trametes lactinea* on the left and *Laccocephalum* sp. on the right (missing its sclerotium).

Storing specimens

- Do not store fresh fungi in plastic bags. However, they may be wrapped in waxed paper or aluminium foil for the journey from the field back to where the specimens will be processed.
- Clean compartmentalised tool boxes or fishing tackle boxes are suitable (see Figure 6). Alternatively, takeaway food containers, ice cream containers and sample jars may be used.
- It is important that fruit bodies from separate collections are not allowed to come into contact with each other, as cross contamination with spores is likely to occur. Therefore, when carrying tackle boxes, avoid turning them over.
- Avoid any mix-ups by labelling your specimens as soon as they are collected. As a minimum, the tag should have the date, the location, your collecting number and initials. This tag should stay with the specimen at all times.
- In warm conditions, or when more than an hour from home, an insulated bag or esky can be used to keep the specimens cool and slow deterioration in most cases. Some fungi will break down rapidly regardless of conditions, and others are so badly infested with insect larvae that, whilst it may not be evident when they are picked, they can transform into a writhing mass of maggots swimming in dark brown ooze by the time you get back home.
- Do not press fungi. Specimens are dried whole, as outlined in 'Drying Specimens'.



Figure 6 Example of fresh collections into a tackle box.

Field notes

Good field notes are as important as the fungus collection itself. Collections that are not fully documented have limited value. Your specimens will likely be used for research by future mycologists so they will need to have all the details of colour, substrate, habitat etc. This record is best provided in written form as photographs are often inadequate, and may fade or be lost.

Important note: always submit your field notes/ specimen label with the specimen. Trying to match them up later is time consuming and may result in your specimen being discarded.

- Do not be tempted to wait until you get home: take down as many notes as you can at the site of the collection.
- Some collectors like to use a structured collecting book or recording sheet that has the required data fields set out. Structured sheets are suggested for the beginner, see Appendix 1 for a sample record sheet.

The key pieces of information to record

Collector/s: surname and initials of the collector(s)

Field determination: the preliminary identification of the fungus (taxon)

Determiner: name and initials of the person identifying the specimen

Date: record both the date of collection and the date of determination

Collecting number: This is a unique number **you** create **yourself** and apply to your collections. One favoured system is to use your initials (no full stops) and follow with a unique sequential number. Numbers should always be attached to an individual collector. If there is more than one collector, please make sure you indicate which collector has assigned the collecting number.

Substrate: record the substrate or host species, e.g. growing on leaf litter.

Habitat: record the habitat and type of vegetation (e.g. open woodland, with *Eucalyptus* sp.)

Associated Species: record the plants that are growing nearby.

Permit number: record the permit number if collecting under a permit.

Location: Place name – town or suburb, street address, park or reserve, named landform (e.g. mountain or river), walking track – preferably described in relation to roads, road intersections or distances from the nearest named place. For example “Silver Plains Station Homestead, south of Stewart River and 28.5 km by road north of Running Creek Station, north east of Musgrave”. Vague locality descriptions such as Black Mountain (which one?), a large national park e.g. Bunya Mountains NP or a very long road are not sufficiently detailed by themselves. Aim to record enough information to allow a person to be able to find the site of your collection to within at least 50 m using your notes alone. If you cannot provide GPS latitude & longitude, these notes should have sufficient detail to allow the site to be located using a mapping program such as Google Earth.

Geocode: This is the latitude and longitude, easting or northing, or a map reference that will allow these co-ordinates to be determined. The Queensland Herbarium much prefer you to use Degrees, Minutes, Seconds as your format. If you don't have a GPS, there are many smart phone applications that can be used e.g. “Theodolite”, developed by Craig Hunter. This takes a photo with the GPS coordinates printed on the photo. One equivalent app for Android devices is “Geocam Free”. Google Earth can be set to the preferred units. Go to “Tools”, “Options” “3dView” and toggle “show lat long” to select the second option (see Figure 7). It is essential that you state which codec your device is using. Options are GDA94 (best), WGS84, AGD84 and AGD66. This can be found in a menu on your device.

Altitude: Please record altitude in metres above sea level only when using GPS.

Voucher Details: If the specimens are for the purposes of a particular project, research proposal, ongoing survey, etc., it is worthwhile recording this data with the specimens e.g. ‘This specimen is part of the Fraser Island Bolete project, 2008-2010’.

Don't forget to submit field notes/ specimen label with the actual specimen. It is often difficult and time consuming to match data and specimen at a later date.

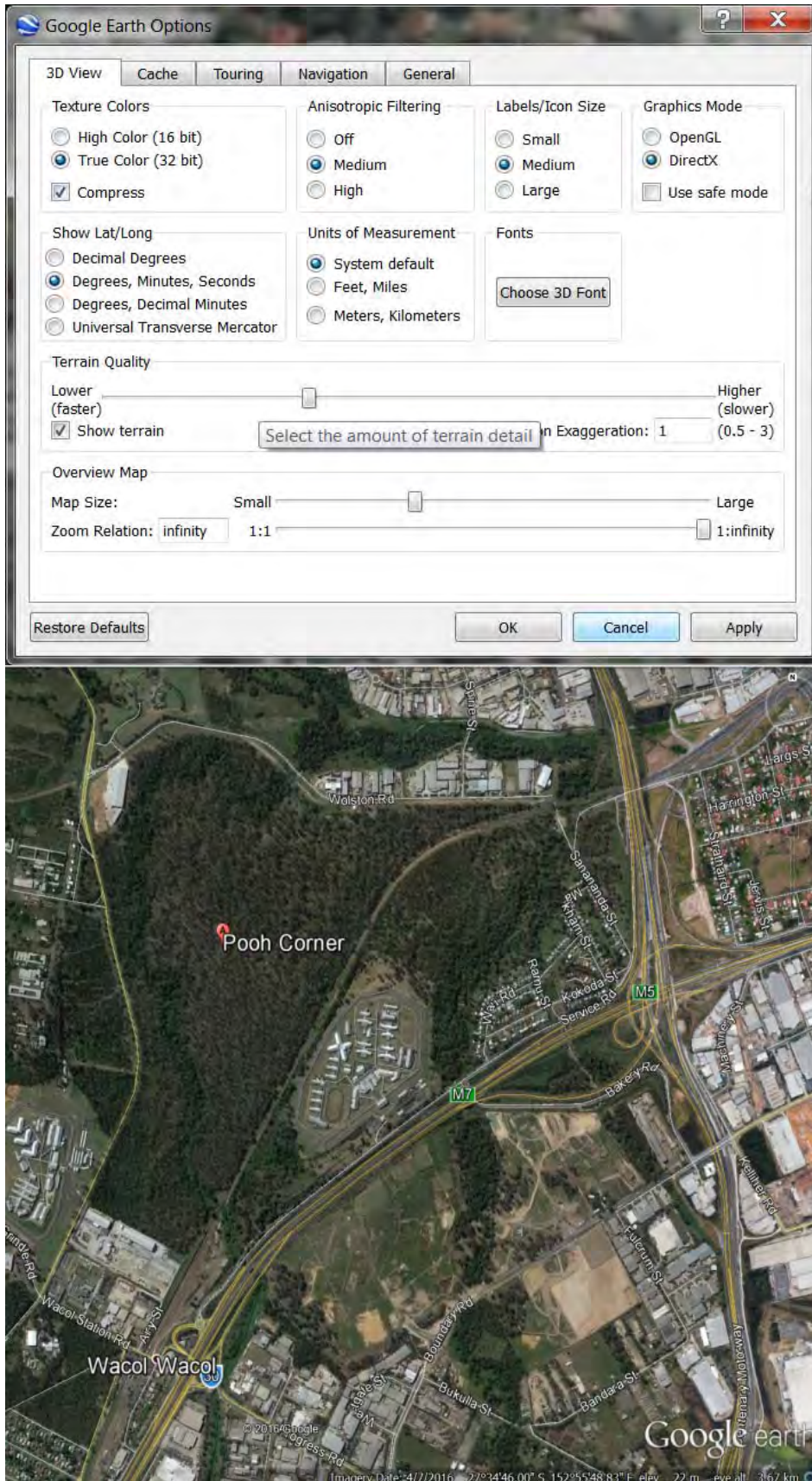


Figure 7 Setting the geocode units on Google Earth (above). The GPS data appears at the bottom of the screen to the right (below). This may need to be switched on by selecting "View" and "Status bar".

Photography

Photography is a very useful method for recording the appearance of fleshy fungi, especially colour, texture and other features that are lost on drying.

- Take an initial photo with the specimen *in situ*, without disturbing the surroundings, or “gardening”. Include a number tag and a scale. It is best to place the tag so that it can be cropped out of the image. If using jeweller’s tags, write the number on them with a felt pen. QMS number tags have been designed with a 3 cm scale, these are available to print from the website http://qldfungi.org.au/wp-content/uploads/2013/03/numbered_tags_01-40.pdf
- Take another photo with distractions removed, but try to maintain a natural look to the location.
- Do not shift the specimen to a different substrate, e.g. from soil onto a log, even though this may give a better photo, it will convey misleading information.
- The photographs should show all aspects of the fruit body: cap surface, margin, fertile surface, stipe, and any other unusual, distinctive or interesting features.
- If you are collecting several fruit bodies you can show all views by creating a “group” shot. Do this by laying some on their side, some upside down and leaving some *in situ*. This will allow the cap, gills and stipe to be visible in a single photo.
- A picture displaying the gill attachment can be obtained from a longitudinally sectioned cap.
- Natural backgrounds may not provide sufficient contrast to display the details of the specimen. A dull grey card often works well as a background.
- Lab shots can be taken later, at home or in the lab, utilising a “light box” (see Figure 8).

After downloading your photos, give the files meaningful names that will allow the images to be readily matched with the specimens. One option is to set your computer so that photos are automatically named Year, Month, Day, Collector initials - followed by a numerical sequence, for example, starting at 1 e.g. 170126MP001.

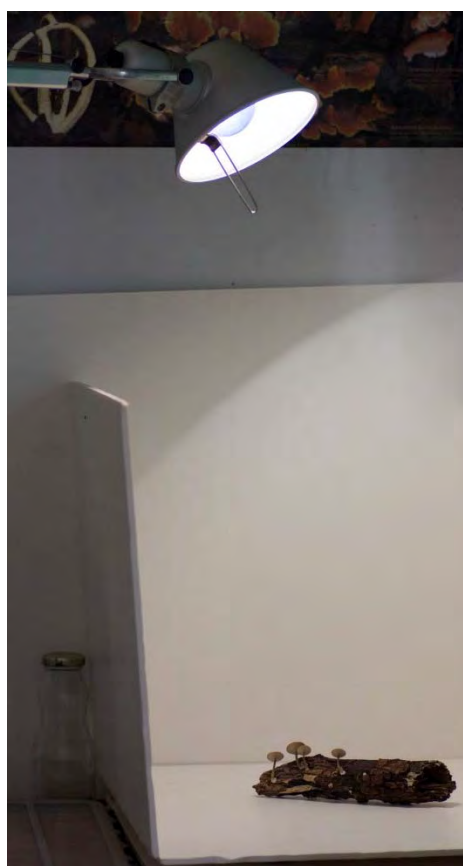


Figure 8 Field photo (above) and lab photo (below). DIY light box for lab photos (right)

Photographing boletes

Following these guidelines improves the chance of identification of boletes dramatically.

- Take a photo of the cap and stipe in good light.
- Take a photo of the pores before and after you scratch the surface to check for bruising reactions. Be careful when handling boletes as they may bruise easily.
- Smell the mushroom pore surface and report the odour.
- Cut the mushroom in half lengthwise and show a photo of the flesh profile. Do this as quickly and neatly as possible, taking particular care to be watching the flesh in the cap as you do it. Some boletes, for example, react very rapidly with an intense bluing reaction (see Figure 9). It has been found that some of these species actually have rich yellow flesh in the first instance, but after the bluing reaction has faded can appear to have whitish flesh.
- Describe any ornamentation on all parts of the fruiting body, and the texture of the stipe and cap.

Note: The scope of this document cannot cover all of the technical aspects of photography. There are training courses available on macro-photography, or search the internet for tips:

<http://digital-photography-school.com/macro-photography-for-beginners-part-1>

<http://www.cambridgeincolour.com/tutorials.htm>



Figure 9 Examples of bolete structure and staining after cutting

Making a spore print

A spore print is useful for establishing the colour of the spores, and can be used as a source of spores for microscopic examination. Prints can be obtained from gilled, pored, toothed and, with perseverance, coralloid fungi. It is not necessary to get a spore print from puffballs and earth stars as these fungi produce copious masses of spores.

- Place the fruit body on a piece of white paper with the fertile surface facing down. Some people use both white and black paper. You may need to separate the cap from the stipe or you may be able to stand the mushroom up in a glass and use paper with a hole cut for the stipe (see Figures 10-12). Spore prints can also be made directly onto glass microscope slides, although for storage purposes, those on paper are preferred.
- Note that polypores have their spores in tubes, so ensure the tubes are vertical so the spores drop. If the tubes are not perpendicular to the paper or slide, the spores may get stuck in the tubes.
- Place a small amount of wet tissue paper on the cap and cover the specimen with a container. Leave for a few hours or overnight (see Figure 10).

- Draw a circle around the specimen outline so light coloured spores can be located on the paper.
- Fold the paper in half with the spore print on the inside, label with the collector's initials, collection number and date and place on the dryer with the specimen.

Do not submit spore prints made on acetate. This can be handy for seeing the colour of the spores but is not useful in a herbarium. Record the spore colour and discard the acetate. Black paper will show up light coloured spores but does not assist with determining the fine differences in the lighter shades.

For microscopic examination, some spores are removed from the spore print, or 'master' slide, and placed on a working slide to allow easy investigation. It is then discarded. The master slide needs a cover slip to be taped over the spores and then the slide is encased in a slide mailer. Clearly label the slide and slide mailer with specimen details.



Figure 10 Making a spore print with stem intact (left), add wet tissue paper (middle) and cover (right)



Figure 11 Spore print on paper (left), on a glass slide (right)



Figure 12 Agaric *in situ* (left) and, as a specimen with spore print (right)

Writing a description

Many characters of the fresh fruit body are lost when specimens are dried. A detailed written description is a useful way of recording such information while you are still processing the specimens. The description should provide information on the size, shape, colour, texture, and surface features of all parts. Use language you are comfortable with. As you become more experienced, the technical terms will become more familiar. It is better to use accurate plain English than to get confused using an incorrect technical term. See Appendix 1 for a sample record sheet.

- Shape and size e.g. shape, diameter & height of pileus, length and diameter of stipe, and the radius measurement (distance it projects from the substrate) of a bracket polypore should be recorded. Take a range of measurements using the smallest and largest mature specimens.
- Note changes in shape as specimens mature (e.g. caps convex in young fruit bodies, becoming applanate in mature specimens).
- Note the presence of features such as scales, warts, fibrils, striations and pleats on the cap surface and whether the margin is even or undulate, entire or ragged with veil remnants. Examination with a hand lens will enable you to describe the indumentum (surface covering).
- A longitudinal section through the fruit body will allow you to describe the gill attachment and the colour and texture of the cap and stipe flesh, and any bruising reactions that may occur.
- Describe colour changes occurring as a result of handling, cutting, or drying out - both externally and internally and don't forget to describe the smell.
- Make note of the substrate, habitat and associated plant species.

Many collectors describe colours by referring to standard reference charts. If you are using a chart, please name the chart, name the colour, and add the colour / numeric code to your notes. Many collectors today use the Online Auction Colour chart available from the Fungimap bookstore <http://fungimap.org.au/index.php/bookshop>.

A detailed guide to writing descriptions is beyond the scope of this document, and is best learnt by attending a training workshop. Also see the 'References and Resources' below for hints and tips.

Drying specimens

Dry your fungi as soon as possible after photographs and descriptions are completed. Whilst it is good practise not to collect more specimens than you can process on the same day, in some circumstances delays are unavoidable. When you are unable to dry the specimens straight away, you can keep them in their containers in a refrigerator for up to 48 hours, provided that the container used doesn't cause the specimens to "sweat". This will only be successful if they were in good condition when collected. There are many types of fungi where this is not advisable, however, particularly with fleshy fungi like boletes or with agarics which auto-digest. With experience you will become familiar with which fungi are amenable to storage and which aren't.

Note: Never allow fresh fungi to become frozen!

- In order to dry your specimens you will need a source of airflow and warmth. Temperatures of 40 – 45 °C are ideal in the tropics where you need to cater for high humidity conditions. See Hosaka & Uno (2011).
- Food dehydrators (Figure 13) and clothes drying cabinets are good options. Alternatively, fungi can be placed on a rack in front of a heater with a fan (though not advisable for smaller specimens), or over ducted heating vents. Sometimes success can be achieved by placing specimens in a paper bag and pegging it on a clothes line in a dry sunny spot.

- Be aware that fruit bodies will shrink dramatically as they lose moisture and may fall between the bars of a rack. Prevent this by sitting them on fine mesh, in a sieve, in patty papers, or on waxed paper.
- Larger fruit bodies (stipe >5 mm diameter) should be sectioned into halves or quarters to facilitate drying.
- Excess dirt at the base of the stipe can be carefully removed with a small brush.
- Be careful to keep different collections separate and keep the identification tag (number) with the specimen at all times.
- Do not try to press fungi as you would press a plant.
- If using a food dehydrator, make sure you switch it off before removing the lid as the contents may fly up in the air.
- Don't leave your fungi drying in areas accessible to small children or pets.
- If drying stinkhorns it is advisable to remove the dryer to the garage or back deck. Otherwise, family members may take a sudden dislike to your hobby!
- The length of time it takes fungi to dry will depend on the type of fungus, the size, shape, thickness and type of the fruit bodies, drying temperature, humidity and the efficiency of your drying apparatus. It may be a matter of hours, overnight or several days.
- Fully dried specimens will be slightly crisp, brittle and the stipe may be stiff. If the material is still pliable, it is probably not fully dried. **Note:** partially dried specimens will eventually become mouldy and will be discarded if submitted to a herbarium.
- When removed from the dryer your specimens will reabsorb some atmospheric moisture. To minimise this, add some silica gel desiccant sachets to the zip-lock bag to absorb the moisture.

Sometimes a large specimen, like the sclerotium of a *Laccocephalum* species, should be left intact. To determine when it is dry enough, weigh it then put it back on the dryer for another hour or two and weigh it again. When it stops losing weight it is dry. Transferral of the specimen from the dryer to the scales needs to be performed quickly, as moisture in the air can be readily reabsorbed by many fungi.



Figure 13 Food dehydrator (left) with large fungi (top right) and ready for small fungi (bottom right). These can be bought for as little as \$40 – the only mandatory feature is some form of temperature regulator.

Storing dried specimens

Dried fungi can be stored in paper envelopes, paper bags, or zip-lock plastic bags. Check that the zip-lock bags are NOT biodegradable

- Ensure that all details are complete: Collector, collection date, collection number, genus & species if known, additional collectors, location, GPS coordinates, substrate, habitat and description notes.
- Ensure all components of the collection are together: specimen, spore print, notes, drawing and photographs. It is preferable to have the specimen & spore print in an inner bag, and the remainder of the paperwork in an outer bag. Paperwork must be protected from spore deposit for safety reasons.
- If sending glass microscope slides, please enclose in a labelled slide mailer.
- Herbarium specimens are vulnerable to attack by insects, particularly beetles and psocids (paper lice). The best method of control is to place the separate bags of dried specimens and paperwork in a large zip lock bag and seal (air tight). The Queensland Herbarium freezes specimens for 2 weeks at $-25\text{ }^{\circ}\text{C}$ to kill all insects and insect eggs. Remember to allow the specimens to reach room temperature before opening the bag after freezing.
- For long term storage, try to keep the specimens as dry as possible. In Queensland, specimens should be sealed in zip-lock bags with silica gel desiccant (sachets are easiest form to use).

Finally, clean all tools and implements you have used on your foray and in the processing of your specimens. Methylated spirits or 70% ethanol (if you have access) is recommended. Include your boots and camera tripod in your clean-up routine. This ensures safety as well as reducing cross contamination of specimens. Remember to wash your hands after handling fungi specimens.

Submitting data, photographs and specimens

Submit your specimens with your collecting information and descriptive notes presented as hard-copy printed or legibly written labels. Dried specimens can be sent to the herbarium by post, or submitted in person.

Note that:

- Each specimen must be bagged separately, with the specimen and spore print in an inner bag and notes in an outer bag.
- An assessment will be made on the specimen's suitability for incorporation. Don't be discouraged if in the initial stages some of your specimens are discarded. Please ask for feedback if you are unsure.
- If your specimen is accepted, the descriptive notes will be transcribed or imported into the Queensland Herbarium specimen label database, HERBRECS, to produce an herbarium label. If you have used archival quality (acid free) paper, please indicate this clearly. As storage space is limited, bulky paperwork is discouraged.
- Always ensure that the collection number attached to the specimen is the same as the data, and that any photographs and other items are also clearly linked.
- Include field notes/ specimen labels with the specimen. If you wish to submit your data electronically in a spreadsheet, or via a phone application, please contact us first.
- Photographic images should be printed as a 10 x 15 cm print and enclosed with the specimen documentation. Prior arrangements must be made before submitting electronic images – please contact us first.
- If you wish to submit fresh material, please make prior arrangements so that a trained staff member can assist you.
- Dried specimens may be submitted in person during office hours, or sent in the mail. Make sure to pack the dried specimens into a box with bubble wrap, foam or fresh crumpled newspaper to protect the specimens in the post. Address the package to:

The Mycologist
Queensland Herbarium
Brisbane Botanic Gardens, Mt Coot-tha
Mt Coot-tha Road
TOOWONG Q 4066

What happens to my specimens after they are submitted?

When your specimens arrive they will initially be checked to ensure they have been dried, and a date of arrival slip will be added to the bag. The bag will then go into the freezer for 2 weeks, unless further drying is required first. The submitters name and date of arrival of the specimens are then recorded. Once accepted, the following steps are involved in accessioning donated specimens:

Freezing: To ensure insects are not introduced, all paper, plant and fungal material entering the building must first be treated by freezing.

Processing: Specimens will be placed in packets made from archive quality cardboard, placed in trays, and then bagged again to prevent insect infestation. The photographs and notes are kept with the specimen. If a single collection is large, the collection may be split and a portion sent to

another herbarium as a duplicate – these are only sent if the specimen is named to species. The collector may nominate which herbaria will receive their duplicates.

Data entry: Each of your specimens will be given a unique AQ number (database number) and this will be stamped on the packet and recorded on the specimen label and in the database HERBRECS. Your specimen notes will be transcribed or imported into HERBRECS and a printed herbarium label will be placed inside the packet

Incorporation: Specimens are again frozen for another two weeks. They are then taken to the collection floor, sorted by genus and species, and shelved.

There may be a backlog of specimens awaiting processing. If there is some reason for haste e.g. an upcoming publication, please advise staff at the point of submission. It will still take approximately 3 months to process and up to a year before the data appears on Australia's Virtual Herbarium and the Atlas of Living Australia.

Note that the Queensland Herbarium does not offer an identification service for fungi. However, your specimens may be eventually be examined by local or international mycologists working on the taxonomy of a particular group. Specimens form an incredibly valuable resource for mycological research and are a temporal and spatial record of biodiversity within the state.

Final words of advice

As you are now aware, there is a fair bit of work involved in making a collection. It is easy to get carried away in the field and make more collections than you can have time to properly process. It is always better to have five well-documented collections than ten poorly documented collections, so don't exceed your limits! Be meticulous when it comes to record keeping. Labelling and cross-referencing the components of a collection are common problems in an herbarium. Always submit your field notes/ specimen label with the specimen unless other arrangements have been made. Specimens with insufficient data, missing information and label mismatches will be discarded.

References and Resources

Atlas of Living Australia website at <http://www.ala.org.au/>

Australia's Virtual Herbarium website at <http://avh.chah.org.au/>

Fuhrer, B. (1993). Fungus photography. *Victorian Naturalist* 110: 96–97.

Hosaka, K., & Uno, K. (2011). Assessment of the DNA Quality in Mushroom Specimens: Effect of Drying Temperature. *Bulletin of the National Museum of Nature and Science Ser. B*, 37(3): 101–111.

Kornerup, A. & Wanscher, J.H. (1978). *Methuen handbook of colour* (Methuen: London).

Largent, D.L. (1986). *How to identify mushrooms to genus 1: Macroscopic features*. Revised edition (Mad River Press: Eureka, California).

Leonard, P.L. (editor) (2010). *A guide to collecting and preserving fungal specimens for the Queensland Herbarium*. Queensland Government, Department of Environment and Resource Management, Brisbane.

Online Auction Color chart. <http://fungimap.org.au/index.php/bookshop>

Royal Botanic Garden Edinburgh (1969). *Flora of British fungi. Colour Identification Chart*. (HMSO: Edinburgh).

Scaled collecting tags by V. Ryan: <http://qldfungi.org.au/resources-2/collecting>

Appendix 1: Description sheet and illustration chart

Taxon: _____

Collectors: _____

Date: _____

Collecting number: _____

Permit number: _____

Determined by: _____

Determination Date: _____

Location: _____

State: Queensland, Australia _____

Latitude (S): _____

Longitude (E): _____

Datum/codec: _____

Altitude (m): _____

Substrate: _____

Habitat: _____

Associated Species: _____

Voucher details: _____

Description: _____

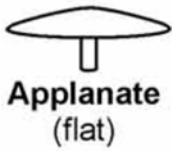
Collection sketch & description (cont.):

Name: _____

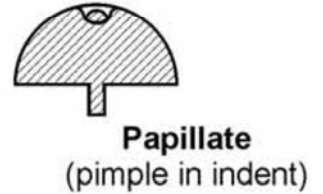
Date: _____

To aid description, see illustrations overleaf

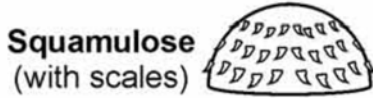
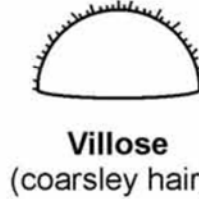
Pileus (Cap) Shape



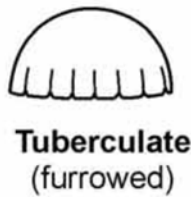
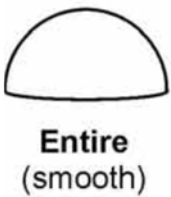
Pileus apex (top)



Pileus surface



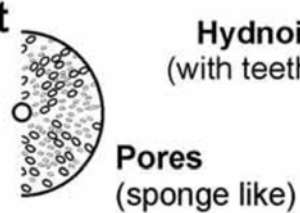
Pileus margin (cap edge)



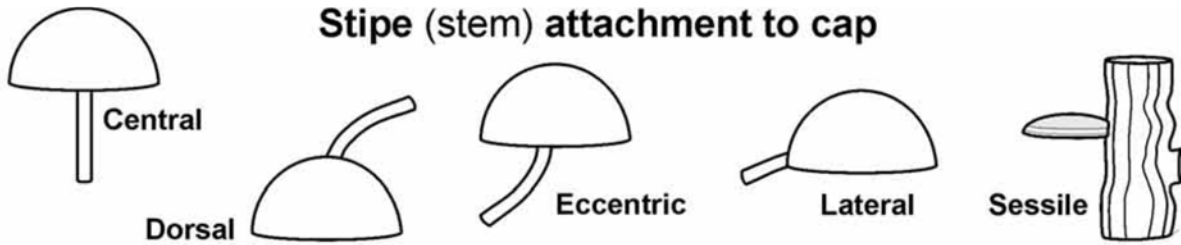
Lamellae (gills) attachment



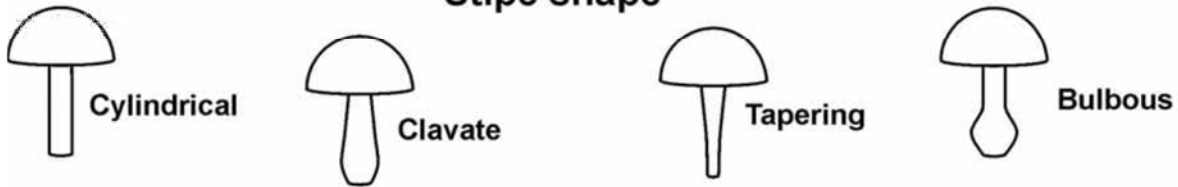
Lamellae arrangement



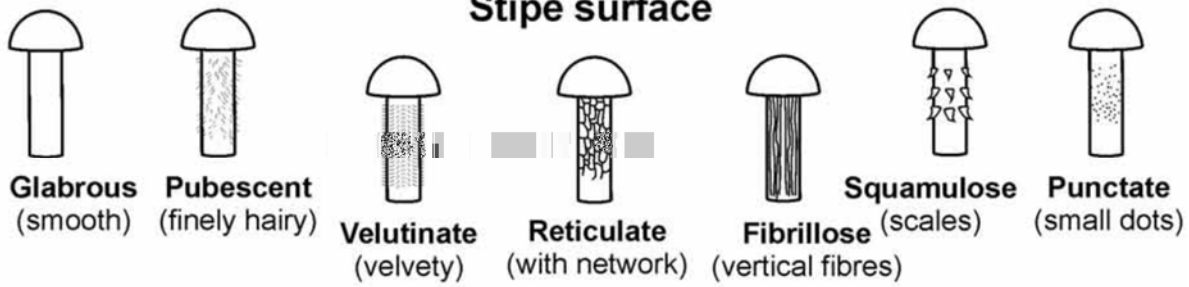
Stipe (stem) attachment to cap



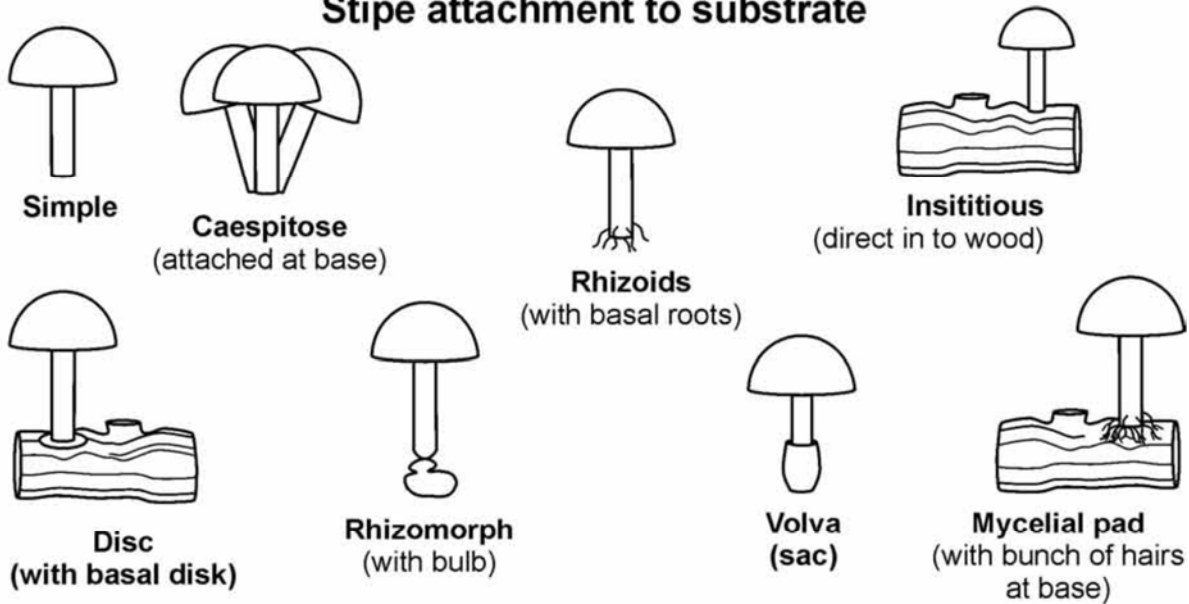
Stipe shape



Stipe surface



Stipe attachment to substrate



Annulus (ring)



Illustrations by Will Smith, Queensland Herbarium