



Collecting and preserving plant specimens, a manual

Second Edition

Queensland Herbarium

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Introduction

The Queensland Herbarium is the centre for research and information on Queensland ecosystems, plants, fungi and algae. The Herbarium, located in the Brisbane Botanic Gardens, Mt Coot-tha, houses more than 850,000 dried pressed specimens. We provide a plant identification and information service to the public. This manual has been written to assist in collecting quality specimens for identification, research and other purposes, and to anyone intending to contribute to the Queensland Herbarium's collection.

Why collect?

Herbarium specimens are used for a variety of purposes. They:

- allow and support accurate identification of plants, algae, lichens and fungi
- provide a permanent record for a species occurring at a particular time and place
- form the basis of reliable distribution, habit and habitat information
- document the introduction and spread of invasive plants over time
- are the reference point for the application of the scientific names
- provide the basic biological material and information for taxonomists, ecologists and other researchers
- serve as scientific vouchers for seed collections, toxicological cases, biochemical analyses and biodiscovery.

Voucher specimens

Some herbarium specimens are known as a 'voucher specimens'.

Voucher specimens serve as a basis of scientific study. Voucher specimens are collected from taxa that are the subject of research or investigation, generally resulting in a publication in a scientific journal or report. Their importance cannot be over-emphasized. If lodged in a recognised herbarium, they will endure in the collection for many years, and their identity can be checked and verified at any future time by linking it with the voucher reference in the publication. This means that research and survey data will remain useful many years after publication, even though names and classifications may change. The advent of genetic techniques in plant taxonomy has increased the need for well-annotated, correctly identified specimens to be stored as vouchers for published sequences, ensuring scientific accuracy and reducing the need to resample at a future time.

Other voucher specimens serve as a reference for verifying the identity of photographs.

Before you collect

Permits

Before going on to private land you must request permission from the owner to access and traverse their land.

Collecting specimens in Queensland National Parks and State forests is illegal unless you have a permit. Permits to collect for scientific purposes can be obtained from

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

Safety

Protective equipment

It is advisable to take personal protective equipment such as sunscreen, a hat, long-sleeved shirt and long trousers, sturdy shoes, a first-aid kit, water and food on any collecting trip. Make sure you have additional suitable equipment as required for the particular job. For example, gloves will be needed for handling prickly or plants with sap, and a hard hat for collecting material from trees (see list of equipment on next page).

Safe travel procedures

Always let someone know where you are, and when you expect to return. For prolonged journeys, details of your intended route and destination, call-in procedure and expected time of return should be left with someone who can raise help if necessary. If possible travel with someone and discuss safety issues before you leave. Make sure that the vehicle is suitable for the job, and functioning properly prior to leaving. Check all safety equipment such as satellite phones and recovery gear prior to leaving.

Commonly used equipment

For general collecting you may require

- day press that is light enough to carry around. This should include a few cardboard corrugates, and a few dozen sheets of newspaper.
- a field press with many more corrugates and more newspaper. This can be left at the campsite, accommodation, or in the vehicle.
- spare corrugates and newspaper and some sheets of foam for pressing bulky items
- secateurs to cut and trim specimens
- GPS for recording an accurate latitude and longitude. Alternatively, mark the position on a topographic map.
- a field notebook and pencil. This can be a pocket-sized notebook or a book of pre-printed specimen labels may be used.
- large and small plastic bags, to hold specimens temporarily
- small brown paper bags for collecting fruits, seeds, bryophytes and lichens
- a hand lens
- gloves, for handling prickly plant material, poisonous plants or plants with corrosive sap

- tie-on tags, often called jewellers tags (available at newsagents)
- felt tipped pens and pencils for numbering collection and writing notes
- a camera/phone for photographing the form of the plant, flower colour and its natural habitat. Plant photographs should be linked to a specimen voucher so that the identity of the photograph can be checked in the future.

In addition you may require

- a trowel for digging out herbaceous plants with underground structures. For example, *Haemodorum* species have bulbs 15–20 cm below the surface and *Murdannia* species have tubers that will be left behind if you pull plants from above.
- plastic bottles with preserving liquid, to preserve fleshy plants or delicate flowers. This usually consists of 70% alcohol. Note: alcohol cannot be sent through the mail.

For collecting specimens from trees you will need

- a throwing rope or a pole pruner
- a hard hat
- binoculars to help you locate the optimum material

Selecting the plant material

Select vigorous, typical specimens. Avoid insect-damaged plants. Choose individuals that show the variation in leaf, flower and fruit size. It may be important to show morphological variation, involving the collection of individuals of different sizes or ages. Collect at least two sets of specimens (duplicates) and number each set. Keep one set for your reference, and send the duplicate numbered set to the Herbarium for identification or as a voucher if required. The Queensland Herbarium does not return specimens.

A good specimen includes stems, leaves, flowers and fruits. Basal parts of grasses, sedges, ferns and bulbous plants are essential for identification. Underground parts e.g. tubers, rhizomes are important for some plant groups.

The plant material should be fertile i.e. in flower or fruit (both if possible), as these characteristics are often vital for identification. This might entail returning to the site when the plant is in flower/fruit. Spend time looking at a number of individuals, and choosing one with a number of flowers or more mature fruits.

Size of the specimen

A specimen should ideally be 25–40 cm long and up to 26 cm wide, allowing it to fit on a standard herbarium mounting sheet which measures 42 x 27 cm. This is also the approximate size of tabloid newspapers.

Plant parts that are too large for a single sheet may be cut into sections pressed on a series of sheets, for example a palm or cycad frond.

Long and narrow specimens such as grasses and sedges can be folded once, twice or even three times at the time of pressing. In this way a plant of up to 1.6 metres high may be pressed onto a single sheet.

For very small plants, a number of individuals may be placed on each sheet.

Features of the plant

When collecting from trees or large shrubs, distinctive or notable features should be recorded, for example branching habit, height and width of the plant and details of the bark.

You may need to collect more than one specimen to show the range of variation that is present, for example mature and immature parts, juvenile and adult leaves, coppice shoots.

If the plant is dioecious, with male and female flowers on different plants, collect a specimen from each sex and label the specimens A & B.

Handling plants during collection

For best results, specimens should be pressed within a few minutes of being removed from the plant. Many plants wilt and fade soon after collection. A day press is convenient for short trips taken from the vehicle.

If specimens cannot be pressed at the point of collection, for example if it is raining or on steep terrain, they may be stored in large plastic bags. The bags should be kept moist, and the specimens not jammed in too tightly. Make sure that each bag is correctly labelled, using one bag per collection site. However, **storing specimens in plastic bags is not recommended** because it is easy for specimens to become damaged or mixed and they are more likely to go mouldy.

Step-by-step plant collecting and pressing



Figure 1. Find a specimen that is representative of the existing population. Collect both flowers and fruit if available.



Figure 2. Use secateurs for a clean cut of the stem. Collect two specimens if you wish to retain one sample for yourself.



Figure 3. Every specimen and its duplicates should be tagged. Jeweller's tags are used by most botanists. Write your name or initials and a unique collection number on one side, and the date and site number on the other side. Use a pencil or waterproof pen.



Figure 4. Attach tags securely to each specimen.



Figure 5. Consider how the pressed specimen will appear. Its form at this time largely determines its ultimate appearance. Unnecessary twiggy shoots and excess material may be cut away.



Figure 6. Flatten out the specimen by closing the day-press and securely attaching the straps (in this case, Velcro straps).



Figure 7. Record the latitude and longitude of the site using a GPS unit. Alternatively, mark your position on a map, and record the grid reference.



Figure 8. Record site/habitat data (locality, soil/geology, vegetation type, associated species) and individual specimen data (habit, flower colour, abundance) in a notebook. All notes should be recorded at the collecting site and not at a later time.



Figure 9. Example of a mounted and labelled herbarium specimen. (*Hymenachne amplexicaulis*).

Data to be recorded in the field

Many botanists use a small notebook to record information about the specimens they collect, and the sites at which they collect them. Increasingly, apps are available to collect the data digitally.

The following information should be recorded before you leave the collection site:

1. A preliminary descriptive locality. This can be modified later after consulting maps, but the preliminary locality reminds you about which site it is.
2. GPS location. This can be recorded as latitude and longitude or AMG. Remember to also record the datum that you are using e.g. GDA94.
3. Habitat (site) data, including landform, slope, dominant plant species, structural formation, for example “open forest”, “open woodland”, or “shrubland”. Soil type and geology should be added if known. Record whether the collection site was a disturbed site such as a roadside, burnt area or grazed paddock. Regional ecosystem information may be recorded, but not as a replacement for actual observations on the site.
4. Information about the individual plants collected at the site, including: height, form, bark type and colour (for trees and large shrubs), leaf texture, presence of rhizomes, presence and colour of sap in cut stems, colour of new growth and flower colour. Flower colour often changes on drying. Also record the relative abundance of the species, particularly for threatened species or weeds.

Drying specimens

It is essential to dry the specimens fairly quickly, to prevent the onset of fungal attack. Fungus affected specimens are of limited value to a Herbarium.

If your field trip involves car travel, specimens placed in presses on the roof rack will dry within a few days if the humidity is low.

The damp papers and corrugates must be replaced daily for each specimen collected. In drier inland areas, every 2 or 3 days will suffice. After changing the papers and corrugates, the specimens should be again firmly packed in the press, otherwise they will not remain flat.

At the first paper change, adjust any undesirable features of the specimen, for example folded leaves, leaves all showing the same face, flowers obscured by leaves. Such adjustments will not be possible once the specimen has fully dried. Look for any evidence of insect attack, especially caterpillars in flowers, and remove any insects found.

Drying in the field

Placing the presses in the sun during the day appears to have little drying effect except for the topmost and bottommost specimens. However, the sun is invaluable for drying the damp papers and corrugates once they have been removed from the press.

Collapsible field driers are useful in remote areas. Typically these consist of an outer metal frame with a wire grid where the press sits on top with a gas burner below on a very low flame.

Drying when based in a powered building

A fan heater (set on the lowest heat) will assist drying, provided you ensure the air is directed towards the press and has free access through the gaps in the corrugates. Placing specimens near an air conditioning unit will also assist with the drying process.

Some specimens tend to fall apart during the drying process, with the leaves detaching from the stem. This especially applies to specimens of *Erythrina*, *Ficus*, Loranthaceae, and mangroves. Leaf detachment can be prevented by dipping the newly pressed specimen in very hot water for 15 seconds.

Alternatively, specimens can be placed in a large plastic bag with enough alcohol to thoroughly wet the foliage and stems. After 12–24 hours, remove the specimen and press between newspaper as previously described. Alcohol kills the plant tissues quickly and prevents leaf abscission. If you use alcohol then it is important to say so in the data you collect, as these specimens will no longer be useful for DNA studies.

If leaves detach, place them in a labelled paper packet and keep with the specimen.

Writing a final label to accompany the specimen

The data that accompanies a herbarium specimen is just as important as the specimen itself. Even a very good quality specimen is of no use to a Herbarium unless it has a written label with the information detailed below. Alternatively you may provide these data in an Excel spreadsheet – if you wish to do this, please contact the Queensland Herbarium for the current template.

Collector's name: [mandatory] the name(s) of the person/people who collected the specimen, preferably no more than 2 people. You don't need to include everyone who was on the trip.

Collector's number: [optional] A unique number, usually sequential, given by the collector

Date of collection: [mandatory].

Botanical name: [optional] If you are unsure of the identity it is still helpful to suggest a name, or at least a genus.

Locality: [mandatory] A written description of the precise collection locality is necessary, AS WELL AS a latitude and longitude reading. A GPS location alone is not sufficient. The locality description should be detailed enough to enable any person to revisit the approximate place of collection. On the other hand, the locality description should not be too verbose and should not include information better included under "Habitat". Commonly, the description includes distance and/or direction from a town or a well-known locality that is on a readily available map. It should be meaningful to someone not familiar with the local area.

Here are some examples of a **good** locality description:

W Claudie River, 10.3 km WNW of Lockhart River (GPS 12° 44' 38" S; 143° 15' 30" E)

Johnston Creek, 1 km N of Mt Etna, Grid Reference: 238951 (easting), 7436790 (northing); zone 56; Datum: GDA94 (WGS84).

Injune-Rolleston road, 86 km N of Injune, Grid Ref: 659470 (easting), 7222980 (northing); zone 55; Datum: GDA94.

23.4 km by road NNW of Proserpine P.O. on road to Dingo Beach

15.8 km S of Lake Cargellico on road to Rankins Springs