

Australian Freshwater Invertebrates

An interactive guide with colour digital imagery to assist in the identification of aquatic invertebrates.



How to identify bugs

Aim

The aim of this tutorial is to address the most common issues we have come across when teaching new staff in bioassessment.

Notes before beginning

- This tutorial can be your entry into either major group level identifications (i.e. sorting) or family level identifications.
- It is assumed that you will be using the online guide to the Identification and Ecology of Australian Freshwater Invertebrates (Hawking *et al.* 2006+) at www.mdfrc.org.au/bugguide however, you can still work through the tutorial using other resources.
- Macroinvertebrates are usually preserved in 70% ethanol. Preservation in 70% ethanol will cause some features to change so be careful of live animal features listed in couplets that will not be observable when dead. [See example >>](#)
- Whenever you identify a taxon that you have not had previously, it is good practice to make taxonomic notes i.e. key reference, couplet number and list the features in that couplet that you actually saw. This is not just copying the couplet word for word, as not all features can be seen every time you identify an animal. Also, add in the bits that were difficult or of particular note so that when your identification is verified, and if it is incorrect, you can track down where you went wrong and learn from the mistake. Taxonomic verification does not always occur so close to identification that you can remember exactly what you were thinking at the time. [See example >>](#)
- It is also beneficial to take images of each new taxon you identify. These should at least be dorsal and ventral images of the whole animal. If the equipment is available then also take a few images of the most defining features. Ideally these images are taken via a digital camera mounted on a microscope, however, many general use digital cameras have a macro function or an optical zoom function that can take reasonable images of macroinvertebrates.
- Your taxonomic notes, digital images and site information can be combined into a voucher sheet for each taxon, creating a voucher file for each project undertaken. The creation of a voucher file enhances learning and is a good record for QA/QC purposes. [See example >>](#)

Equipment list

This list is not absolute but having this equipment will make identifications easier.

- Stereo microscope: 10X magnification in eyepieces and capability for 1 to 10X magnification in the objective lens - giving a total magnification of 10 to 100X; both incident (above) and transmitted (below) lighting with variable controls
- Squeeze bottle of 70% ethanol
- Several petri dishes of 60mm diameter in glass or plastic. At the very least a translucent flat tray but not too large
- Fine forceps: at least 1 long pair (Dumont 55) and 1 extra fine pair (INOX 5)

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Start identification

1. Place the animal to be identified into a petri dish or other small tray (not the channelled sorting tray as it is too difficult to light the animal correctly).
2. Cover animal with enough liquid (water or 70% ethanol) so that the incident light does not cause glaring bright patches on the animal (as this makes it difficult to see the key features) but not so much liquid that the animal floats away every time you let go.
3. Good lighting is imperative, keep the incident light on full unless the view becomes too shiny e.g. with adult beetles. The transmitted light is useful for discrimination of setae and antennae. Some dark beetles will also require side lighting to see the grooves in hard dark surfaces of the elytra.
4. For identification of major groups (sorting), the key generally includes characters of the whole animal in dorsal or ventral view. Do NOT pull anything off or out until absolutely necessary, the less damage done to the animal the better.
5. Dichotomous key couplets have a negative and positive answer for each feature on each side of the couplet. Features are usually listed in order of discrimination (or ease of visibility). [See example >>](#)
6. Read the first feature from each side of the couplet then look at the animal. Do NOT try to digest the whole couplet before looking at the animal as some couplets are long and wordy, especially as you progress down the level of taxonomy. The first feature may be so glaringly obvious that it negates the need to view all the others, however it is always good practice to scan the animal for the other features just in case you got the first one wrong. ALWAYS look at the opposing couplet before viewing the animal as sometimes it is easier to see what is not there.
7. Be sure the animal is well focussed at all times and that the particular part of the animal is in focus and being viewed from the correct angle e.g. trichoptera antennae should be viewed from above to estimate the length in relation to the front margin of the head.
8. You MUST interact with the microscope and animal. Zoom in and out to find the best perspective of the feature in relation to the rest of the animal; constantly focus up and down to find the best view of the feature; turn the animal around to get view from different angles; alter the transmitted light to enhance some features. What you need to do when, will come with practice.
9. Become familiar with the taxonomic terms, it will make life so much easier. In the beginning take the time to look up unknown terms in the [glossary](#) of the online bug guide. Do not spend the next few years calling the frontoclypeus the "triangular thingy"!
10. [Terminology images](#) from the online bug guide will also help to you know where on the animal to look for a particular feature. Sometimes the descriptive image is a disembodied part.
11. When using the online [identification keys](#); enlarge the descriptive images to see the key features more clearly; key parts are labelled (noted in the text); use images AND text TOGETHER; look where the arrows are pointing. If the key feature is hard to see on the descriptive image then it is going to be hard to view the key feature down the microscope. That is the whole point of the digital images - everything looks obvious on a 2-D line diagram.
12. Use the distributions (listed as each taxonomic level is identified) as a guide, but not an absolute. If your animal comes from Victoria and you are struggling with the features listed in a couplet that has one family only occurring in northern Queensland, then it is most likely to be the other family.
13. If your animal is small and you just can't see the features, consider that your animal is not at the usual life cycle stage that allows identification. Taxonomic keys are created on the features of final instar larvae or nymphs and mature adults. Immature animals or pupae may not have the same features and therefore cannot be identified correctly. This will need to be confirmed by someone with experience.
14. If your animal just does not fit any key couplets, then consider that you have a terrestrial animal. This will need to be confirmed by someone with experience or by referring to some terrestrial books.

Identification and Ecology of

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List of Resources

- [Ready reference guide to the major groups >>](#)
- [Common taxonomic errors >>](#)
- [Top 10 must know terms >>](#)
- [How do I know if I have an immature animal? >>](#)
- [How do I recognize a pupa? >>](#)
- [How do I know if I have a terrestrial animal? >>](#)

References

Hawking, J.H., Smith, L.M., Le Busque, K. (2006) *Identification and Ecology of Australian Freshwater Invertebrates*. <http://www.mdfrc.org.au/bugguide>, Version March 2007