

# Australian Freshwater Invertebrates

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



## How to use the online Bug Guide

This interactive guide to the *Identification and Ecology of Australian Freshwater Invertebrates* is designed to provide ecological and taxonomic information to enable community groups, students and scientists to readily identify inland aquatic invertebrates, this includes some invertebrates from saline waters. Ecological information is given for each of the major aquatic invertebrate groups. Then successively more specific information is provided to family level, where possible. Taxonomic keys are provided to family level for the groups utilised in biomonitoring and to subfamily level for the order Diptera (flies) and to genus level for the orders Decapoda (shrimps, prawns, crayfish, yabbies, crabs), Ephemeroptera (mayflies), Hemiptera (bugs), Odonata (dragonflies, damselflies) and Trichoptera (caddisflies), where possible.

## Security Issues

Educational institutions may find that the security settings on their computing network does not allow pop-up windows. These pop-ups are essential for glossary, information sources, terminology images and key image enlargements. If a security alert appears at the top of the screen, select the option that allows all images and pop up windows for this site. This should only be necessary once per session.

## To make an identification

- Click on **Start Identification** to begin identifying the specimen.
- Each key is dichotomous i.e. a series of couplets noting the presence or absence of particular diagnostic characters
- Colour digital images are provided to enhance identification
- Click on a thumbnail image within a key to view an enlarged image. The hover text for each image identifies the specimen.
- The guide then branches off to minor group, order, family, subfamily and generic keys (where possible).
- When an identification is reached at each taxonomic level, diagnostic and ecological information is given as well as juvenile, adult and habitat images (when available).
- At any time, click on **glossary** or **terminology images** for help with taxonomic and biological terms.

## Descriptive Features

A detailed taxonomic description of the features to identify that particular invertebrate at that particular taxonomic level i.e. group, order, family, genus. At any time, click on **glossary** for a list of word definitions or **terminology images** for labelled digital images.

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## Taxonomic Checklist

A list of names of the subsequent taxonomic groups within the current group i.e. at family level, a list of genera is given. The name given after a species name is the person who first described that species.

This is an example of the taxonomic levels for a common backswimmer bug.

| Taxonomic level | Scientific name | syntax  | common name  |
|-----------------|-----------------|---|--------------|
| Class           | Insecta         | ends in "a" and starts with an upper case letter  | insects      |
| Order           | Hemiptera       | ends in "a" and starts with an upper case letter  | bugs         |
| Family          | Notonectidae    | ends in "ae" and starts with an upper case letter | backswimmers |
| Genus           | <i>Anisops</i>  | italics and starts with an upper case letter      |              |
| Species         | <i>deanei</i>   | italics and starts with a lower case letter       |              |

The status of taxonomic levels above Order are reviewed or debated as knowledge is gained or refuted with the majority of groupings remaining constant. For this reason, major groups and minor groups above Order have not been assigned taxonomic status in this guide. Species validation relies on published description of the adult specimen. "Larva unknown" means a distinct adult specimen has been recorded but a larva has yet to be associated with it. "Undescribed genus" or "undescribed species" means a morphologically distinct larval specimen has been recorded but a described adult has yet to be associated with it.

## Distribution

The geographical region where specimens have been found is usually indicated by state but may also include, N = northern, S = southern, E = eastern, W = western. 'Australia wide' includes Tasmania.

## Ecology

When information is available, details of habitat, life history, habits and feeding ecology are given.

## Sensitivity Rating

A SIGNAL (Stream Invertebrate Grade Number) grade is given for group, order and family levels. This is an indication of the pollution tolerance or intolerance of invertebrates within that taxonomic group. A grade 10 indicates a high sensitivity to pollution. A diverse community of high grade taxa indicates a healthy ecosystem. A grade of 1 indicates a greater tolerance to pollution. A community with high numbers of a few low grade taxa indicates a degraded aquatic habitat. This information has been sourced from **Chessman, B. (2003) New Sensitivity grades for Australian River Macroinvertebrates *Marine and Freshwater Research* 54: 95-103**

## AUSRIVAS Taxacode

Each identified taxon has a distinct numeric code that can be used in the AUSRIVAS software for determination of O/E scores ([complete list](#))

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## Functional Feeding Groups

The functional feeding group (FFG) refers to the method by which each species of invertebrate obtains food. The relative abundance of macroinvertebrate functional feeding groups may reflect the in-stream processes of an aquatic habitat. Dominance of, or loss of a particular group may indicate a change in the ecological status of the stream or pool. The ideal 'healthy' aquatic habitat has representatives of each functional feeding group. In the absence of degradation of habitat or water quality, there will always be a natural dominance in relation to natural food sources e.g an abundance of leaf litter will be reflected by an abundance of shredders.

The types of FFG used in this guide.

| FFG                    | Trophic level              | Food  |
|------------------------|----------------------------|---|
| Shredders              | Herbivores or Detritivores | living or decomposing vascular plant tissue           |
| Filtering collectors   | Detritivores               | suspended decomposing fine particulate organic matter |
| Gathering collectors   | Detritivores               | deposited decomposing fine particulate organic matter |
| Scrapers               | Herbivores                 | biofilm i.e. periphyton, bacteria, fungi              |
| Predators (scavengers) | Carnivores                 | living (dead) animals                                 |
| Macrophyte piercers    | Herbivores                 | living vascular plant and algal fluids                |

adapted from Merritt, R.W. and Cummins, K.W. (editors) (1996) *An introduction to the aquatic insects of North America*. 3rd edn, Kendall-Hunt Publishing Co., USA

## Information Sources

An acknowledgement of the publication(s) from which information has been obtained. At any time, click on **information sources** for a complete list of reference details.

## Key to...

When available, the reference for a key to further identify a specimen to subsequent taxonomic levels is given. A list of references for the taxonomic status of aquatic invertebrate groups and the available identification keys are listed in Hawking, J.H. (2000) *A preliminary guide to keys and zoological information to identify invertebrates from Australian freshwaters*. Identification Guide No. 2 (2<sup>nd</sup> edn). Cooperative Research Centre for Freshwater Ecology: Albury. This publication is being updated and the revised edition will be online with a hyperlink from the homepage.

## Citation

Hawking, J.H., Smith, L.M., Le Busque, K. (2009) *Identification and Ecology of Australian Freshwater Invertebrates*. <http://www.mdfrc.org.au/bugguide>, Version January 2009, Accessed [insert date viewed]