

Identification and Ecology of

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. The content focuses on invertebrates from fresh and inland saline surface waters of mainland Australia and Tasmania, in particular taxa utilised in routine biomonitoring. General information is given for each of the major aquatic invertebrate groups. Then successively more specific information is provided to genus level (not all groups). Taxonomic keys are provided to family level for the groups utilised in biomonitoring then to subfamily level or genus level for some families. Detailed information and key references are not included for the following major groups; Aphanoneura, Bryozoa, Gastrotrichia, Nematoda, Nematomorpha, Nemertea, Protozoa, Rotifera and Tardigrada. 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 level have not been assigned taxonomic status in this Guide.

Citation

This online resource is a compilation of taxonomic resources published by the various taxonomists working on invertebrates with aquatic life stages. Any information used from the description pages should be cited using the page name and referring to Hawking, Smith and LeBusque as editors.

Example: Micronecta In: Hawking JH, Smith LM and LeBusque K (editors) (2013) Identification and Ecology of Australian Freshwater Invertebrates. Murray-Darling Freshwater Research Centre. <http://www.mdfrc.org.au/bugguide> Accessed [insert date viewed]

To reference a key used for identification, the original key reference (noted at the top of couplet one) must be used and can be found in [Information Sources](#).

Example: "Note: Key from Tinerella 2013" should be cited as Tinerella PP (2013) Taxonomic revision and systematics of continental Australian pygmy water boatmen (Hemiptera: Heteroptera: Corixoidea) *Zootaxa* 3623: 1-121

Example: "Note: Key from Horwitz et al. 1995, Lowry & Yerman 2002, Serov 2002" should be cited as Key to malacostracan orders In: Hawking JH, Smith LM and LeBusque K (editors) (2013) Identification and Ecology of Australian Freshwater Invertebrates. <http://www.mdfrc.org.au/bugguide>. Accessed [insert date viewed] After: Horwitz et al. 1995, Lowry & Yerman 2002, Serov 2002 [then each citation should be included separately in your reference list]

When no key reference is noted in couplet one or if multiple sections of the online guide have been used then cite:

Hawking JH, Smith LM, LeBusque K (editors) (2013) Identification and Ecology

Security Issues

Your internet security settings may 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.

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.

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 Merrit, 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.

