



UPPER RIVER TORRENS  
LANDCARE GROUP

# Data Sheet

# Freshwater

# Macroinvertebrates

*Macroinvertebrates are small aquatic animals without backbones that can be easily seen with the naked eye. Those that can not be easily seen with the naked eye are called microinvertebrates.*

- This sheet is an introduction to the many aquatic macroinvertebrates likely to be found in a healthy riparian system with particular reference to the Mount Lofty Ranges. They include worms, molluscs, crustaceans and insects - a complex community of filterers, shredders, chewers, scrapers, swamps and ponds support a varying range of species at different stages of development throughout the year. By indicating where they live we are stressing the importance of having a variety of micro-habitats (see also Bird Species and Frog Data Sheets).
- This sheet also introduces you to the option of closely observing the health of your riparian system by monitoring macroinvertebrate life.

**Protect their habitats with appropriate fencing. Avoid any practices which might pollute your catchment.**

## Pollutants

- Pollutants include domestic waste, animal wastes (eg: from paddocks, dairies, horse stables/training yards), other farming activities, fertiliser and pesticides from horticultural enterprises and small industry wastes.... all contributing to the development of toxins, bacteria, viruses and other organisms. They are not simply moved as run-off. They can also seep into the ground and effect groundwater.
- Pollutants are also high levels of nitrogen and phosphorous from fertilisers and decomposing organic material - which can activate excessive algal growth. The death and decay of these algae can cause serious problems.
- Pollutants can be naturally occurring things in the wrong place. They can include naturally occurring turbidity and salinity, both of which can be concentrated by poor catchment practices.

## Pollutants and macroinvertebrates

The variety and numbers of freshwater macroinvertebrates can be indicator of water quality over the period of time they have lived in it.

Many of these are illustrated on the centre pages. Their whole lives are spent in a water environment (see diagram opposite). Fish, tortoises, frogs, many birds and reptiles rely on macroinvertebrate life as a food source.

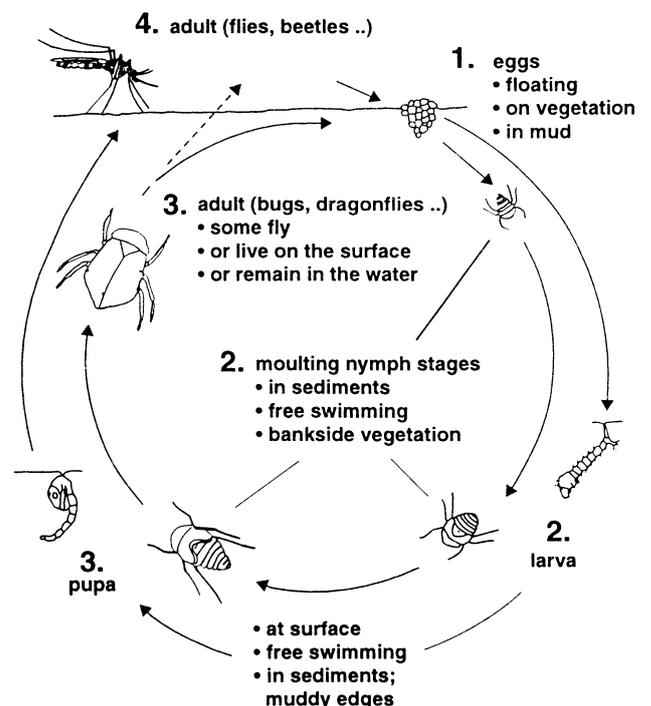
Two examples from the organisation formerly known as **WATERWATCH S.A.** will show the clear relationship between pollution and macroinvertebrates.

1. Downstream of a sewage treatment works discharge, where organic and nutrient enrichment is occurring, there will tend to be large numbers of very few animals such as segmented worms, snails and bloodworms. Animals such as mayflies are unlikely to be present if they are they will be very rare.

2. A toxic chemical entering the water in winter may only effect very sensitive animals like mayflies and stoneflies, but not others. However, if it entered the water in summer when there is little or no flow, all the animals would be effected in some way. Reactions vary: Local species of mayfly larvae don't like water with lots of sediment or organic/toxic pollutants. Sponges are sensitive to the chemical nature of their environment and are rare in silty or muddy sites. Leeches prefer stony, vegetated areas of slow flowing water.

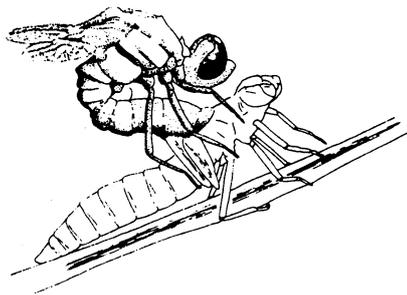
Dragonflies and damselflies are quite tolerant of salinity. The maggots of a species of hoverfly are commonly found in sewage ponds and stagnant water.

## Typical macroinvertebrate life cycles

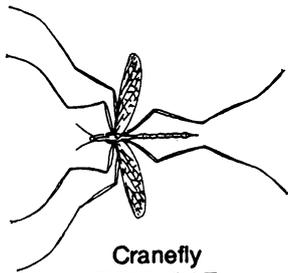


# Freshwater Macroinvertebrates -

Though the Yabby, Dragonfly and Water spider are noticeable



Emerging dragonfly



Cranefly  
TIPULIDAE



Marchfly larva  
TABANIDAE



Biting midge  
CERATOPOGONIDAE

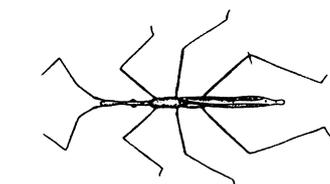


True midge  
CHIRONOMIDAE



Damselfly nymph  
COENAGRIONIDAE

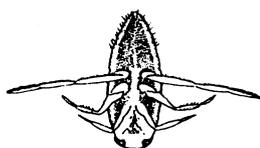
From the macroinvertebrate surface to



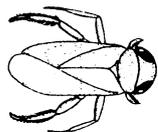
Common name: Water measurer  
Family name: HYDROMETRIDAE



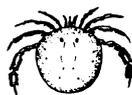
Fisher spider  
PISAUROIDAE



Back swimmer  
NOTONECTIDAE



Water boatman  
CORIXIDAE



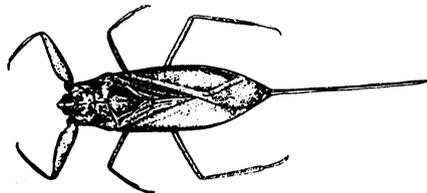
Water mite  
Order ACARINA



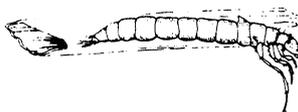
Mosquito larva



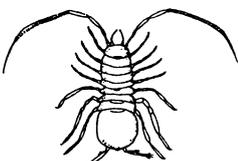
Scud  
Order AMPHIPODA



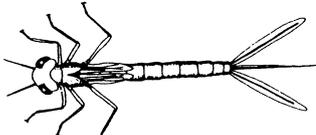
Water scorpion  
NEPIDAE



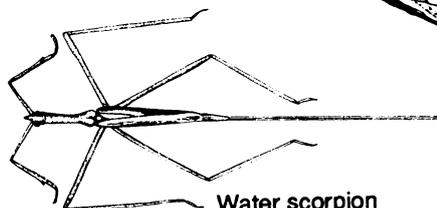
Caddisfly larva  
LEPTOCERIDAE



Isopod  
JANIRIDAE



Damselfly nymph  
COENAGRIONIDAE

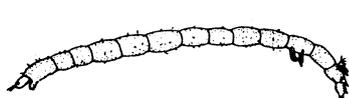


Water scorpion  
NEPIDAE

Beneath the surface

On the surface

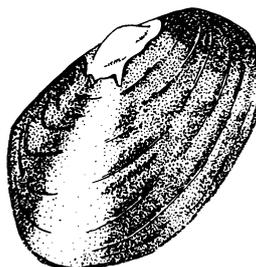
Among the litter and



Midge larva  
CHIRONOMIDAE



Biting midge larva  
CERATOPOGONIDAE



Freshwater mussel  
HYDRIIDAE



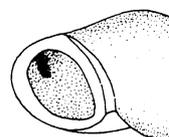
Hydra  
HYDRIDAE



Freshwater sphaeriid  
SPHAERIIDAE



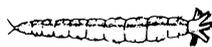
Bladder snail  
PHYSIDAE



Freshwater hydrophilid  
HYDROPHILIDAE



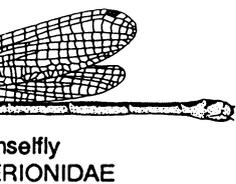
Freshwater worm  
TUBIFICIDAE



Cranefly larva  
TIPULIDAE

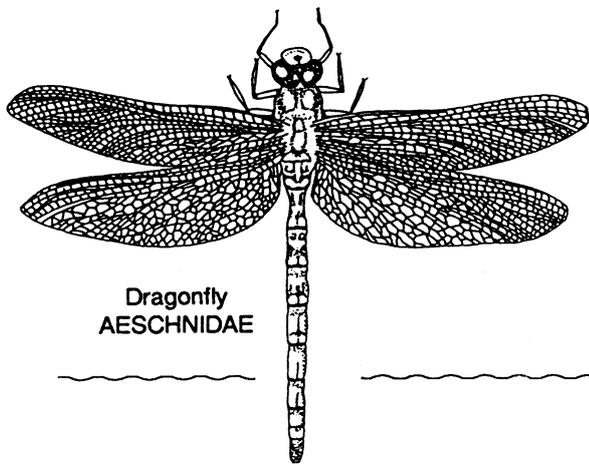
# Where they're commonly found

able "large," most macroinvertebrates are tiny to very small:



Damselfly nymph  
ZYGOPTERA

Margins and  
to the air



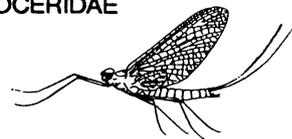
Dragonfly  
AESCHNIDAE



Caddisfly  
LEPTOCERIDAE



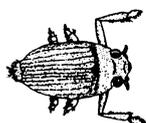
Mosquito  
CULICIDAE



Mayfly  
LEPTOPHLEBIIDAE



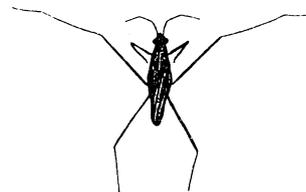
surface



Whirligig beetle  
GYRINIDAE



Springtail  
Order COLLEMBOLA

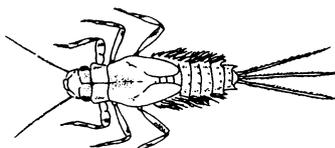


Pond skater  
GERRIDAE

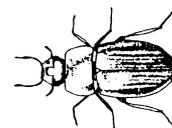
the surface



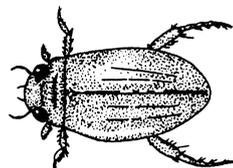
Mosquito  
pupa



Mayfly nymph  
LEPTOPHLEBIIDAE



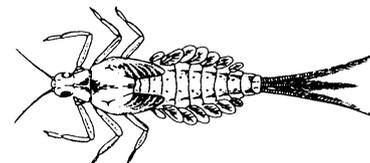
Water scavenger beetle  
HYDROPHILIDAE



Water tiger  
DYTISCIDAE

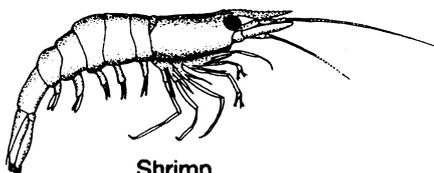


Water flea  
DAPHNIIDAE



Mayfly nymph  
BAETIDAE

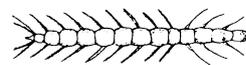
the rocks,  
sediments



Shrimp  
ATYIDAE



Leech  
RICHARDSONIANIDAE



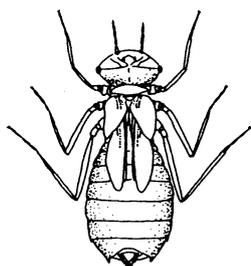
Whirligig larva  
GYRINIDAE



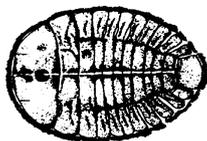
Water penny nymph  
PSEPHENIDAE



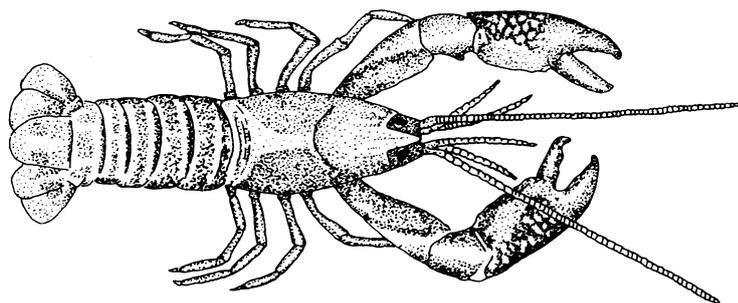
Flatworm  
ORDER TRICLADIDA



Dragonfly nymph  
CORDULIIDAE



Water penny  
PSEPHENIDAE



Yabby  
PARASTACIDAE

Water snail  
GASTROPODA

## Habitats and invertebrates★

The most important energy source in a riparian zone is from plant material... leaves, branches, logs... which fall into the water. The very pivot of this food web are the invertebrate animals which eat this material or feed on bacteria and fungi, the agents of decay. (Refer: Katsantoni, G. in the Field Guide)

Aquatic plants, including algae, absorb nutrients from the sediments and water, making them available to the invertebrates. They also vary the physical structure of the zone by increasing the area of substrate on which algae and microscopic animals can grow. They also modify water flow, light availability and temperature around them.

Aquatic animals have no control over body temperature. The dappled light which is provided by native shrubs and trees beside the water or from the top of the banks can significantly regulate water temperatures with their shade. This reduces extreme variations in temperature. This is in sharp contrast to the total seasonal shade (and sudden total soft leaf drop) of exotic species. They have no place on our watercourses.

**Our Data Sheet: *Native sedges, rushes, reed and grasses* gives an introduction to a basic number of suitable semi-aquatic emergent plant species. See also our Data Sheet: *Basic Understorey & Canopy*.**

We recognise that there are natural fluctuations in the salinity of our hills streams and local invertebrates have adapted to this. They are tolerant of increases in salinity during summer. However our abuse of a catchment could upset the balance leading to increased winter salinity of the water... many species' eggs would not be tolerant of this (from levels upwards of 3-5 000 ppm). Along with naturally occurring freshwaters are naturally occurring saline waters (e.g. obviously Lake Eyre, The Coorong). It follows that fresh water is not necessarily the best water. Our monitoring should take this into account.

## Hazards to invertebrates★

- Overgrazing and tramping of stock across paddocks and banks leads to harmful loads of sediment (= turbidity) moving into the water with run-off
- Stock trampling the toe of the batter zone (water's edge) polluted this critical area by removing egg-laying and larval growth sites and the protection of vegetation cover
- Overuse/incorrect use of fertilisers, herbicides and pesticides literally releases poison into their 'homes'
- Clearing logs and branches from watercourses is equivalent to wiping out a housing estate. (Common sense demands removal of huge fallen trees which are destabilising banks.)

## Highlights for invertebrates★

- fencing around their home-space
- a well-vegetated and managed catchment
- native sedges, rushes, reed, shrubs and trees buffering the riparian zone
- snags, branches and litter through the watercourse
- pools, gravel, rock crevices, scour holes - the natural diversity of a dynamic watercourse

(\* Both macro and microinvertebrates)

### ***Did you know that:***

- Many of the 'water beetles' fly between suitable sites. Some can bite when handled.
- The red colour of some aquatic worms and midge larvae (bloodworms) is due to respiratory pigments (haemoglobins) which helps them handle low oxygen levels in contaminated water.
- Some species (eg dragonflies) spend years as nymphs before flying and breeding.
- Many studies of invertebrates are incomplete and are difficult to undertake but the fact that little is known of some of them should encourage our observation and data collection.

*REMEMBER: We generally take the natural regulating factors in our environment for granted and it is not until these intricately balanced systems break down that we need expensive remedies. If, like the whirligig beetle, we see not just the surface of things but at the same time beneath as well, we'll have a more complete understanding of our environment.*

## Monitoring

### **For water quality & long term data collection:**

Details of how to do this effectively and efficiently are best referenced from the WATERWATCH DOCUMENT.

EPA South Australia: <https://www.epa.sa.gov.au/>

For specialist biological and chemical tests contact Australian Water Quality Centre (AWQC): <https://www.awqc.com.au/>.

## Sampling

### **For interests sake:**

'TOOLS OF THE TRADE' are straightforward:

- Aquarium nets or home made stocking nets. Triangular or square for sweeping sediments or beneath lifted stones. Circular for near vegetation or open water.
- Your hand... to upturn rocks, branches etc...
- 2 containers to hold the sample. Separate aggressive dragonfly nymphs and water tiger larvae from the rest
- White ice cream container; white dish to examine animals
- A magnifier, handheld 8x or microscope
- Macroinvertebrate illustrations
- Recording form

## **Data ID & Collection Apps:**

BDBSA Collect (DEW): <https://biocollect.ala.org.au/>

iNaturalist: <https://www.inaturalist.org/>

South Australian Museum Field Guide to South Australian Fauna.

## **Resources**

Aquatic Macroinvertebrates ID Key (2003). Factsheet. Adelaide and Mount Lofty Ranges Natural Resources Management Board. NRM Education.

## **Acknowledgements**

Chris Watts for initial advice on species, Phil Suter for editing final draft and S.A. species information, Chris Bayly for Waterwatch (S.A.) information, Jason Carter for original illustrations and illustrations redrawn after R. Altmann in W.D. Williams (1980) Australian Freshwater Life, Drafting Unit/Water Resources Group (Department of Environment & Water) for production of this data sheet.