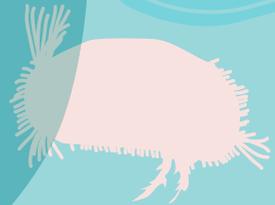




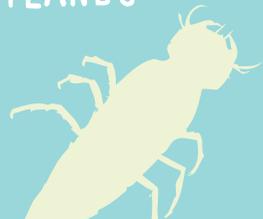
Field guide to the

Aquatic Macroinvertebrates

of the South Coast of Western Australia:



WALPOLE TO ESPERANCE RIVERS AND WETLANDS





ACKNOWLEDGEMENTS

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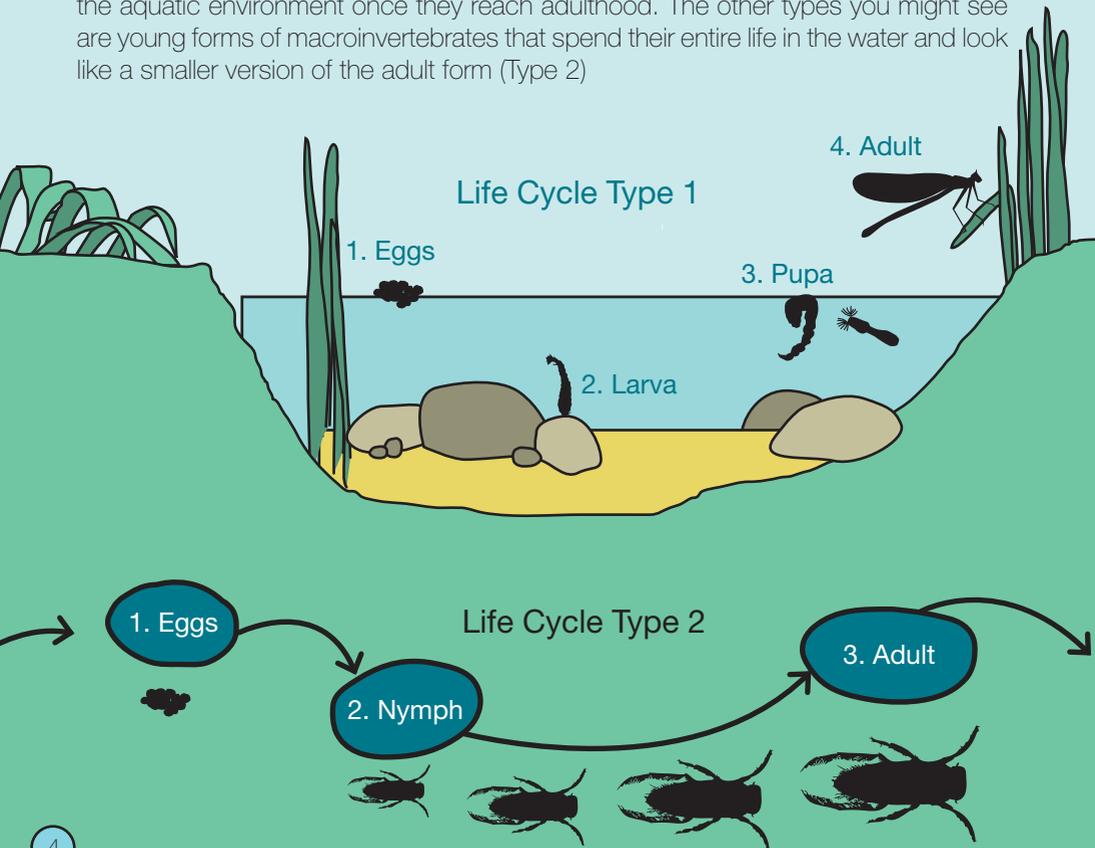
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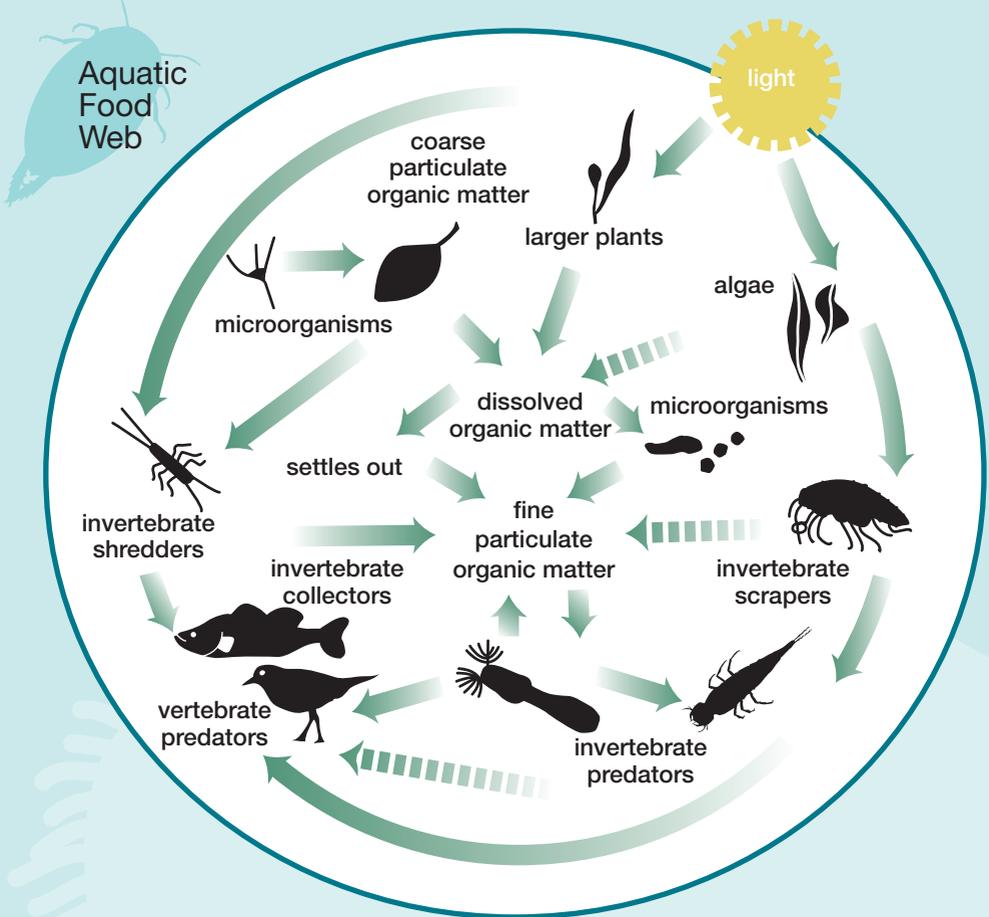
WHAT ARE MACROINVERTEBRATES AND WHY ARE THEY IMPORTANT?

Aquatic macroinvertebrates (sometimes called water bugs) are animals without a backbone that live in or on the surface of a waterway that can be seen in good light with the naked eye.

Some can be large, for example the freshwater crayfish, while others, such as aquatic mites, copepods and water fleas are much smaller and harder to see. Many groups of macroinvertebrates go through a **larval phase** that bears little visual resemblance to their adult form (Type 1). Many of the macroinvertebrates you will see in rivers and wetlands are in larval stages of flies, mosquitos and dragonflies, which live outside of the aquatic environment once they reach adulthood. The other types you might see are young forms of macroinvertebrates that spend their entire life in the water and look like a smaller version of the adult form (Type 2)



Although they can be very small, macroinvertebrates are an important group of animals. Some **shred** plant matter into smaller pieces which **filter feeders** and **detritivores** collect, while others **graze** on algae growing on the sand and rocks. Then there are the **predators** which feed on the **shredders** and **grazers**. These macroinvertebrates then provide food for larger animals like birds, crayfish, fish and turtles that also live in waterways.



Macroinvertebrates can tell us a lot about the water in which they live. Some groups are very hardy while others are more **sensitive** and only occur in healthy waterways. A waterway with many different groups may indicate a **healthier environment** than one with fewer groups. It is possible to learn more about how healthy the environment is by looking at what types of macroinvertebrate live in a particular waterway. To be able to do this, we must be able to identify the variety of macroinvertebrates that live in the waterway.

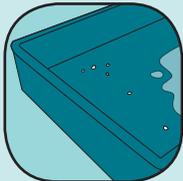
HOW TO COLLECT MACROINVERTEBRATES



1. Take a net with a fine mesh to a shallow and safe part of the waterway. Run your net under plants, along rocks and logs or kick up the dirt on the streambed and trawl it through this water. Try not to get too much dirt and mud into the net.



2. Gather your macroinvertebrates consistently by ensuring that each time you make a collection, you either do it for the same amount of time, or for the same distance.



3. Tip your collection through a sieve (if you have one) and wash clear water through your sample to get rid of as much of the dirt as possible. If you don't have a sieve, put your sample into a shallow tray or a flat container.



4. You can then pick out individual macroinvertebrates and place them into ice cube trays or other small containers to get a better view.



5. If available, use a magnifying glass to take a closer look. When finished return the animals to where you collected them.



HOW TO IDENTIFY MACROINVERTEBRATES

Scientists use a 'dichotomous key' to identify and separate animals into broad groups and in some cases **species**, based on a variety of distinguishing physical features.

This field guide, based broadly on a dichotomous key methodology, will allow you to identify broad groups of macroinvertebrates living in waterways between Esperance on the south-east coast of WA to Walpole in the west.

There are many types of waterways in this region. Some flow all year round while others only contain water after rainfall. Some rivers are quite salty, whereas others are very fresh. There are rivers flowing through towns and farming areas, as well as those which flow through natural bush. Rivers belonging to the Eastern South Coast bioregion receive less rainfall and are generally more salty compared to those belonging to the Western South Coast bioregion.

The use of land by humans can degrade habitat and introduce pollution in the form of increasing salinity, nutrients, sedimentation, pesticides and other toxic chemicals.

These differences among waterways can influence the health of the water environment. There are more types of macroinvertebrates in the naturally fresher Western South Coast bioregion and more saline tolerant species in the Eastern South Coast bioregion.

By using this key, you can identify the animals living in the water and find out how healthy our waterways are.



HOW TO USE THE MACROINVERTEBRATES KEY

Using the key is easy following the steps described below:

1. Choose an animal from your sample.
Make sure it is the biggest of that animal and that it has not been damaged by collection.
2. Begin with the key to the major groups (on the page opposite).
You will be given two or three options. These options describe differences in appearance or features of your animal. Choose which option best fits your animal.
3. Once you have decided which major group your animal belongs to, go to the section for that group.
Each group is colour coded.
4. Go through the list until you find the best description.

Once you have 'keyed-out' your animal continue to the page dedicated to your macroinvertebrate. If you have made the right choices the photos and descriptions should look like and describe your animal.

Don't worry if you went wrong - try again or you can look through the photos and you may find a photo that looks similar. Sometimes you may find 'drop-ins' (aphids, land beetles, ants and flies) which will not 'key-out'.

If the key doesn't work, flick through to the photos as you may have a 'drop-in' or a pupa or larva of an aquatic group; if this is the case you may be able to work backwards through the key.

HAPPY BUGGING!



go to page

LEGS?*



3 pairs?

INSECTA!

13



4 pairs?

SPIDERS & MITES!

40



5+ pairs?

CRUSTACEA!

23

OR NO LEGS?



shell?

MOLLUSCA!

32

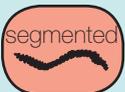
OR NO SHELL?



Body NOT segmented?

UNSEGMENTED WORMS!

35



Body segmented without head?

SEGMENTED WORMS!

38



Body segmented with head or other structures?

INSECTA!

13

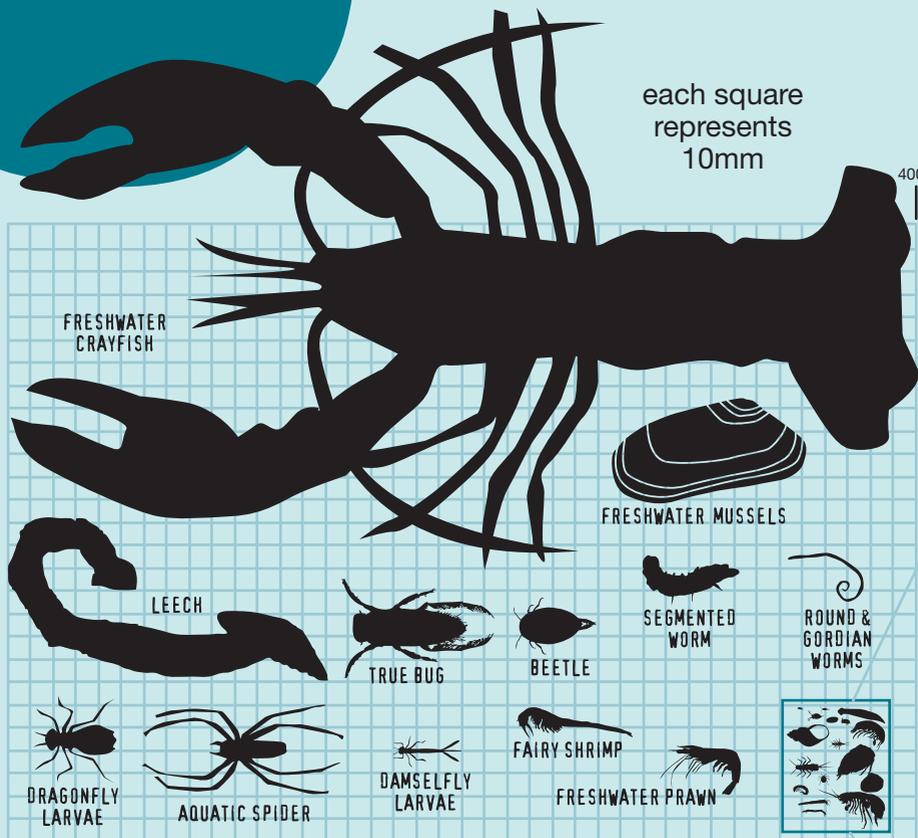
*WARNING some macroinvertebrates may have legs that are so tiny they are hard to see or they could be hidden inside a shell eg. seed shrimp (ostracod) on page 24.

SCALE

APPROXIMATE MAXIMUM SIZES

each square
represents
10mm

400mm



FRESHWATER
CRAYFISH

FRESHWATER MUSSELS

LEECH

TRUE BUG

BETLE

SEGMENTED
WORM

ROUND &
GORDIAN
WORMS

DRAGONFLY
LARVAE

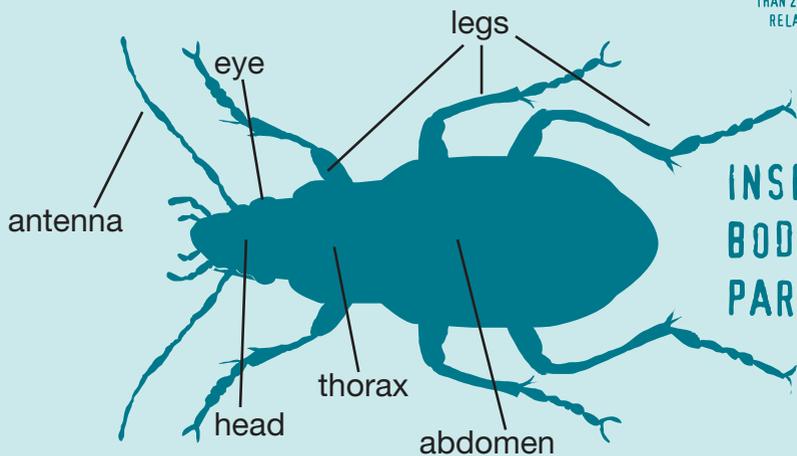
AQUATIC SPIDER

DAMSELFLY
LARVAE

FAIRY SHRIMP

FRESHWATER PRAWN

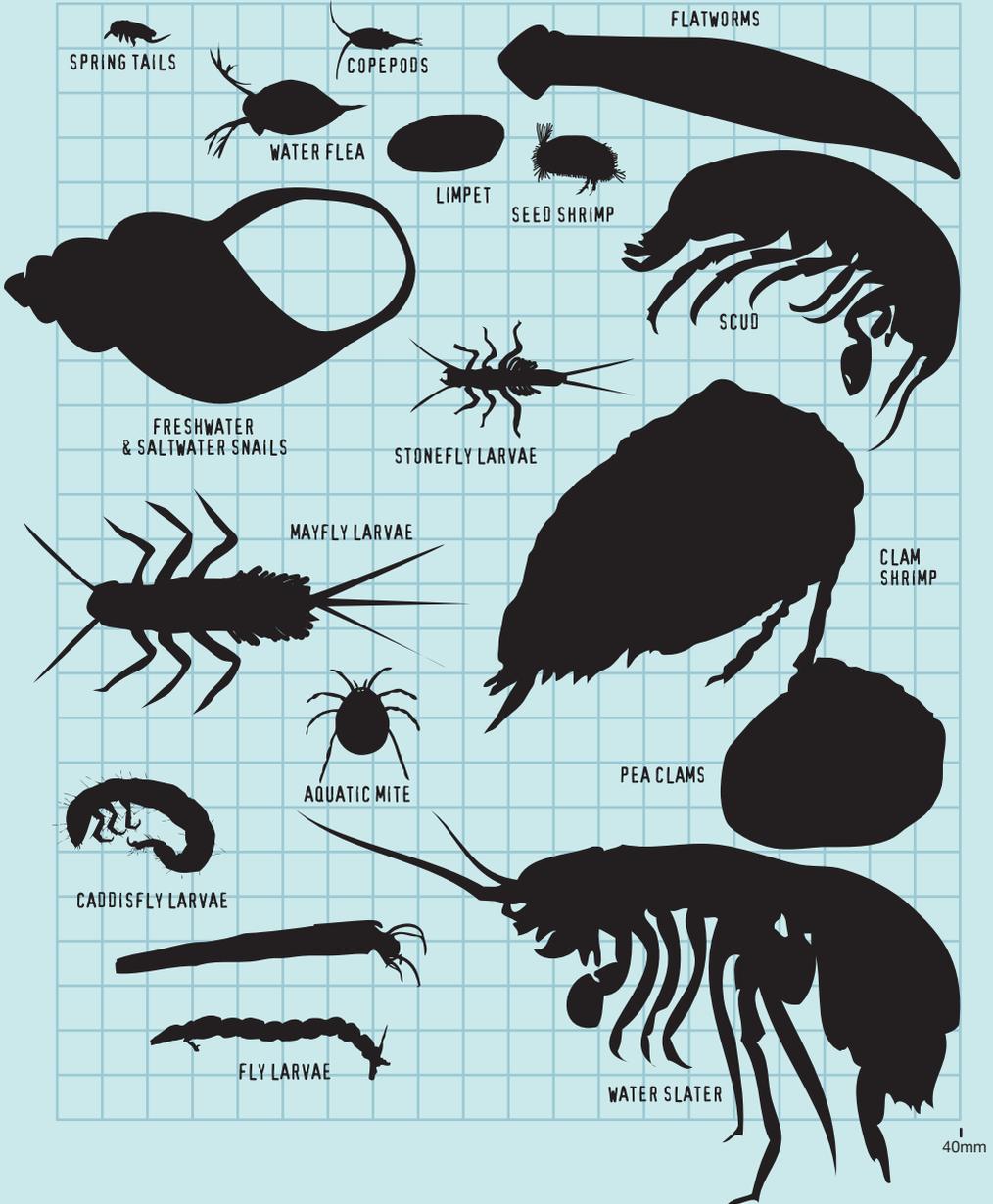
MACROINVERTEBRATES
THAT ARE SMALLER
THAN 20MM SEEN IN
RELATIVE SIZE



INSECT BODY PARTS

MACROINVERTEBRATES THAT ARE SMALLER THAN 20MM

each square represents 2mm





Who am I?

Go down the list until you find the best description...

go to page

I look like a beetle that lives in the water BEETLE

13

I have piercing mouth parts (a sucking spike/triangle) TRUE BUG

15

I am the size of a pinhead and live on the water surface SPRING TAIL

16

I am worm-like with a head or structures, but I have no legs FLY LARVAE

17

I live in a case (of twigs, sand or tiny silk purse/cylinder) CADDISFLY LARVAE

18

I am grub-like with hook/s on the end of my curved body CADDISFLY LARVAE

18

I am grub-like, with no hook/s on the end of a straight body BEETLE LARVAE

13

I am fragile with two long thin tails and a slim body STONEFLY LARVAE

20

I am fragile with three long thin tails and a slim body MAYFLY LARVAE

21

I am fragile with three long flat wide tails and a slim body DAMSELFLY LARVAE

22

I have a short wide body with a flattened end with small triangular spikes DRAGONFLY LARVAE

19

BEETLES

Coleoptera



water scavenger beetle



diving beetle

PHYLUM	Arthropoda
CLASS	Insecta
ORDER	Coleoptera
FAMILY	Dytiscidae, Hydrophilidae, Gyrinidae (and many more)
COMMON NAME	Aquatic beetles and larvae

Description

Look similar to land beetles. Adults have three pairs of legs with long swimming hairs. Most can fly and have wings under a hardened cover (elytra). The long thin larvae look very different from their adult form, with three pairs of well developed legs, a hard (sclerotised) head and a soft body.

Natural History

Beetles are the world's most diverse group of insects with numerous groups (families), making them very difficult to identify. **Diving beetles** (Dytiscidae) are the most common and diverse and are voracious predators of other macroinvertebrates. **Water scavenger beetles** (Hydrophilidae) do not swim but crawl and feed on plants and detritus, while **whirligig beetles** (Gyrinidae) are scavengers and group together on the water surface spinning in circles – hence their name.

Indicators of river health

The more groups (families and species) of beetles collected in a waterway, the healthier the environment. Beetles are more useful as indicators of waterway health when studied at species level. Some beetle groups only live in highly oxygenated unpolluted pristine waterways (**riffle beetle**, *Elmidae*); whereas others are more tolerant of degradation and can be found commonly in farm dams and other altered environments (**diving beetles**). Some species are very tolerant of pollution, in this case only one or two species may be found.



TRUE BUGS

Hemiptera



waterboatmen



backswimmer

PHYLUM	Arthropoda
CLASS	Insecta
ORDER	Hemiptera
FAMILY	Corixidae, Notonectidae, Hydrometridae (and many more)
COMMON NAME	True Bug

Description

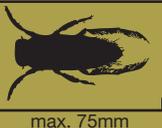
True Bugs have three pairs of legs — some with long swimming hairs, all have piercing and sucking mouthparts, some swim on their backs (**backswimmer**, Notonectidae) and some walk upon the water (**water measurer**, Hydrometridae). Nymphs or juveniles look very similar to their adult form.

Natural History

True bugs are diverse and have numerous groups (families), making it difficult to identify species. **Waterboatmen** (Corixidae) are common and look similar to beetles when whizzing through the water. Their mouth parts resemble a short, blunt triangle. They are omnivorous and feed on other insects and plant matter. **Backswimmers** (Notonectidae) swim upside down and hunt for other macroinvertebrates. **Water measurers** (Hydrometridae), **water scorpions**, **water treaders** and **water striders** have long legs to walk on the water used for stalking prey. Tiny water striders sometimes jump and walk on the water surface. They have hard bodies and are usually black.

Indicators of river health

True bugs are generally not as sensitive to degraded or polluted waterways, especially for surface dwellers which do not penetrate the water. True bugs are found in greater numbers where the water is slow flowing and there is plenty of vegetation.



SPRING TAILS

Collembola

top: Hypogasturidae

middle: Isotomidae

bottom: Sminthuridae



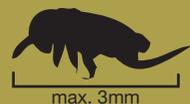
PHYLUM	Arthropoda
CLASS	Entognatha (formerly Insecta)
ORDER	Collembola
FAMILY	Sminthuridae, Hypogasturidae, Isotomidae
COMMON NAME	Springtail

Description & Natural History

Springtails are tiny animals (up to 3mm) which live on the water surface. Previously described as insects, these animals now have their own classification (Collembola). Springtails derive their name from the forked spring under their abdomen which can propel them upwards to 30cm. Sminthuridae are the only fully aquatic family group of springtails. They graze on diatoms on the water surface and are eaten by other aquatic macroinvertebrates.

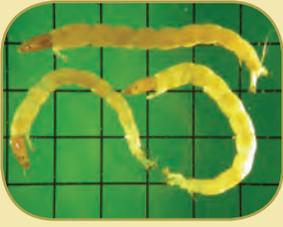
Indicators of river health

Springtails are tolerant of pollution and degradation and found in large numbers around plants in still aquatic environments.



FLY LARVAE

Diptera



midge larvae



mosquito larvae

PHYLUM	Arthropoda
CLASS	Insecta
ORDER	Diptera
FAMILY	Culicidae, Chironomidae, Tipulidae (and many more)
COMMON NAME	Fly larvae

Description

Fly larvae are a diverse group and vary greatly in body structure. The **mosquito larvae** (Culicidae) have large fleshy heads and some have breathing siphons on their tails. They can be identified by the way they dart through the water. **Midge larvae** (Chironomidae) are long and fleshy with small hard heads, variable in colour and can be identified by the way they coil and uncoil in the water. **Biting midge larvae** (Ceratopogonidae) are white, slender and swim in a snake-like manner. A **crane fly larva** (Tipulidae) is a fleshy maggot with a retractable head and fleshy protrusions at its other end. It can be identified by the way it 'slugs' along like a grub.

Natural History

Fly larvae are diverse, so it can be difficult to identify particular species. Most **mosquito larvae** filter feed on micro algae suspended in the water. The feeding habits of the highly variable midge larvae range from predation, parasitisation and wood-boring to algal and bacterial grazers. Crane fly larvae are thought to be predators.

Indicators of river health

Some fly larvae are tolerant of poor water quality and pollution. This is especially the case for mosquitoes and other maggot type larvae, such as **rat-tailed maggots** (Syrphidae). Some varieties of non-biting midges are also very tolerant of organic pollution (**bloodworms**, *Chironomus*), whereas, others including crane fly larvae, are less tolerant and can indicate a healthy waterway.

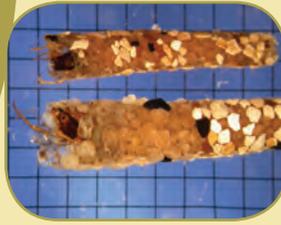


max. 20mm

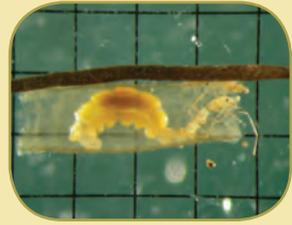


CADDISFLY LARVAE

Trichoptera



common stick caddis



microcaddis

PHYLUM	Arthropoda
CLASS	Insecta
ORDER	Trichoptera
FAMILY	Leptoceridae, Ecnomidae, Hydroptilidae (and many more)
COMMON NAME	Caddisfly larvae

Description

Caddisfly larvae can be split into two groups; those that make and live in cases made of sand, detritus, sticks or silk purses; and those that are free-living or caseless. All have three pairs of legs, with a sclerotised (hardened) head and fleshy body.

Natural History

The **common stick caddis** (Leptoceridae) build a variety of sand and stick cases. Some are predators while others are omnivores and plant shredders. The **free-living Ecnomidae** larvae range from detritivores to predators, while the tiny **microcaddis** (Hydroptilidae) creates its own silk purse and cylinder. Most are thought to eat algae.

Indicators of river health

The more types of caddisfly larvae collected, the healthier the environment. Many caddisfly larvae are sensitive to polluted and saline waterways. However, some species are tolerant of degraded water quality, especially species of **stick caddis** (Leptoceridae). The **Stick caddis larvae** (*Symphitoneuria wheeleri*) are naturally tolerant and occur in still saline waters on the South Coast of WA. This species makes a rough sand/detritus tubular case (see photo above).





dragonfly larvae

DRAGONFLY LARVAE

Epiproctophora/Anisoptera

PHYLUM	Arthropoda
CLASS	Insecta
ORDER	Epiproctophora/Anisoptera
FAMILY	Hemicorduliidae, Gomphidae (and many more)
COMMON NAME	Dragonfly larvae

Description

Dragonfly larvae are a diverse stout-bodied group of insects. All have three pairs of legs, large eyes and mouthparts that can 'strike out' at prey. Some types can grow up to 40mm in length.

Natural History

Found in slow-moving still waters, dragonfly larvae are camouflaged to hunt their prey. Some remain as larvae for weeks before changing into flying adults; while others spend years in the larval stage.

Indicators of river health

Dragonfly larvae occur in many different aquatic environments and are tolerant of some pollution and degradation. As some species are less tolerant than others, they are more useful as indicators when studied at species level.



STONEFLY LARVAE

Plecoptera



stonefly larvae

PHYLUM	Arthropoda
CLASS	Insecta
ORDER	Plecoptera
FAMILY	Gripopterygidae
COMMON NAME	Stonefly larvae

Description

Stonefly larvae have flattened long, soft bodies with three pairs of legs and small wingpads on their backs. They have long antennae and two long tails at the end of their abdomen, between which are small fluffy gills. The larvae range from 4 – 9mm in length.

Natural History

The omnivorous Gripopterygidae family is the most common in Australia and the only one found in southern WA.

Indicators of river health

Stonefly larvae are very sensitive to water quality. They are intolerant of pollution, environmental degradation and salinity and are used as indicators of a very healthy freshwater environment.



MAYFLY LARVAE

Ephemeroptera



mayfly larvae

PHYLUM	Arthropoda
CLASS	Insecta
ORDER	Ephemeroptera
FAMILY	Caenidae, Baetidae and Leptophlebiidae
COMMON NAME	Mayfly larvae

Description

Mayfly larvae have three pairs of legs and three long, thin tails at the end of the abdomen, with gills on top, or along the side. They have well-developed jointed legs and developing wing-pads on their backs. The larvae are fragile, so it is easy to damage their gills and tails during collection.

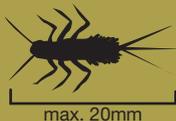
Natural History

Mayfly larvae live in freshwater and transform into winged, flying adults which only live for a few hours or days, during which time they do not eat. Three families of mayfly live on the South Coast:

- The species *Tasmanocoenis tillyardi* (Caenidae) feed on detritus
- *Cloeon* spp (Baetidae) are algae grazers
- Leptophlebiidae mayflies are detritivores. There are currently nine known species living in south-west WA.

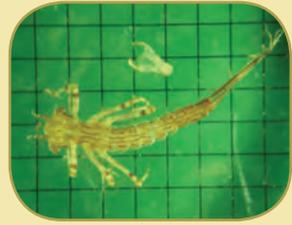
Indicators of river health

Mayfly larvae are indicators of a healthy waterway and are sensitive to pollution, salinity and degradation. Caenidae are the least environmentally sensitive of the mayflies.



DAMSELFLY LARVAE

Zygoptera



damselfly larvae

PHYLUM	Arthropoda
CLASS	Insecta
ORDER	Zygoptera
FAMILY	Lestidae, Coenagrionidae (and many more)
COMMON NAME	Damselfly larvae

Description

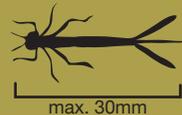
Damselfly larvae have long, thin and soft bodies with three pairs of legs; small wing buds on their backs and striking mouthparts. They have large eyes and three, flat leaf-like gills at the end of their abdomen.

Natural History

Damselfly larvae usually live around water plants and are found in slow-moving, still waters. Like their common dragonfly relative, they are predators of other macroinvertebrates.

Indicators of river health

Damselfly larvae occur in many different aquatic environments and are tolerant of some pollution and degradation. As some species are less tolerant than others, they are more useful as indicators when studied at species level.



Who am I?

Go down the list until you find the best description...

go to page

I am small with many legs and enclosed
in a mussel-like shell (rare).....CLAM SHRIMP

24

I am very small with many legs and enclosed
in a mussel-like tiny (less than 2mm) shell (common) SEED SHRIMP

24

I am small with a soft body, lots of feathery legs
and a long thin tail (pink or cream) FAIRY SHRIMPS

25

I am extremely small (2-3mm) and teardrop in shape.....COPEPODS

26

I am extremely small (2-4mm) and round in shape..... WATER FLEAS

27

I look like a small prawn without claws/nippers FRESHWATER PRAWN

28

I look like a small lobster with large claws/nippers .. FRESHWATER CRAYFISH

29

I am small and white with lots of legs, an arched body
and flattened on both sides.....SCUDS

30

I am small and grey/brown with lots of legs,
body flattened from above or from both sides WATER SLATERS

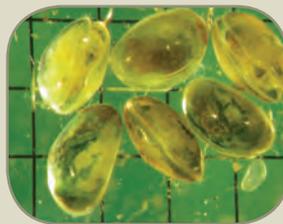
31

CLAM SHRIMP & SEED SHRIMPS

Conchostraca and Ostracoda



clam shrimp



seed shrimp

PHYLUM	Arthropoda Crustacea
ORDER	Conchostraca, Ostracoda
FAMILY	Many
COMMON NAME	Clam shrimp (Conchostraca) and seed shrimp (Ostracoda)

Description

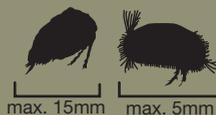
Clam and **seed shrimps** are similar in appearance, with numerous small legs enclosed in small double-valved shell-like cases. Clam shrimps often have growth ridges on their shell valves. The smaller common seed shrimps are more variable in size and shape; sometimes with raised spines, hairs and pits that can be used to identify them to species.

Natural History

The rarer and larger clam shrimp is found in temporary water sources including gnamma holes. The clam and seed shrimp are both filter feeding herbivores/detritivores; with eggs tolerant to drying out. The more common seed shrimp is found in both still and flowing waters.

Indicators of river health

The clam and seed shrimp are generally tolerant of some water degradation and pollution.



FAIRY SHRIMP

Anostraca



fairy shrimp



male head of a fairy shrimp

PHYLUM	Arthropoda Crustacea
ORDER	Anostraca
FAMILY	Artemiidae, Parartemiidae (and many more)
COMMON NAME	Fairy shrimp

Description

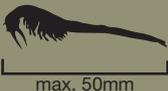
Fairy shrimp are soft-bodied with many feathery legs which propel them through water upside-down. Saline species are generally pink, smaller and found in large numbers, while the freshwater species are usually cream and larger.

Natural History

Fairy shrimps typically inhabit temporary waters from fresh to hypersaline. The *Artemia* (Artemiidae) are thought to have been introduced into Australia and now live in many temporary saline lakes. They have drought tolerant eggs which hatch when placed in water. The endemic *Parartemia*, of which there are many types in south-west WA, only live in saline lakes. All fairy shrimps are filter feeders.

Indicators of river health

Waterways containing endemic species such as *Parartemia* would be considered a healthy saline environment. However, this would require identification to species level by a scientist examining a male shrimp's head structure (see photo above).

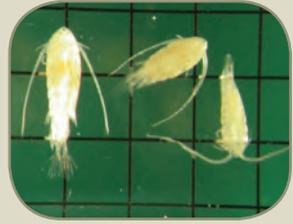


COPEPODS

Copepoda



cyclopoida



calanoida

PHYLUM	Arthropoda Crustacea
SUB-CLASS	Copepoda
ORDER	Harpacticoida, Cyclopoida, Calanoida
COMMON NAME	Copepods

Description

The **copepods** are extremely small, ranging from 2 – 4mm. Close-up, they resemble upside-down water droplets. Their physical size and antennae length help identify the three different types:

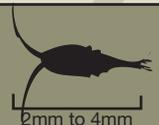
- Harpacticoid are the smallest and have tiny antennae;
- Cyclopoida are slightly larger with middle sized antennae; and
- the largest Calanoida, have the longest antennae.

Natural History

Longer antennae propel Cyclopoid and Calanoid copepods through the water, whereas Harpacticoids wriggle their bodies over surfaces. Most copepods are herbivores/detritivores feeding on algae and bacteria. Sometimes egg sacs can be seen attached to females.

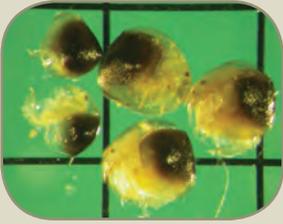
Indicators of river health

Copepods can be common in still water habitats such as wetlands and lakes. They form an important part of the food web and therefore can indicate a healthy waterway. A big increase in copepod numbers may indicate degradation of the environment.



WATER FLEA

Cladocera



water fleas



water fleas (lying on back)

PHYLUM	Arthropoda Crustacea
ORDER	Cladocera
FAMILY	Daphniidae (and many more)
COMMON NAME	Water flea

Description

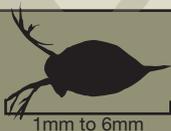
Water fleas are minute, oval-shaped animals with beak-like shaped heads and range in size from 1 – 6mm. They are called water fleas because their jerky swimming style resembles the movement of fleas. Water fleas range in colour and can be transparent, white, green or brown.

Natural History

Water fleas feed on detritus, bacteria and algae. Their eggs are resistant to extreme conditions and can hatch after many dry years. They reproduce rapidly and females can often be seen with eggs inside their shell-like case.

Indicators of river health

Water fleas can be common in still water habitats such as wetlands and lakes. They form an important part of the food web and can therefore indicate a healthy waterway. A big increase in water flea numbers may indicate the degradation of a water environment.



1mm to 6mm



FRESHWATER PRAWN

Decapoda



freshwater prawn

PHYLUM	Arthropoda Crustacea
ORDER	Decapoda
FAMILY	Palaemonidae
COMMON NAME	Freshwater prawn

Description

Freshwater prawns are similar to a small prawn, they are usually translucent without pincers (claws).

Natural History

Freshwater prawns are scavengers and feed on decaying plants and animals.

Indicators of river health

Freshwater prawns are an important part of the food web and can therefore indicate a healthy waterway. They are tolerant to some degradation and pollution.



FRESHWATER CRAYFISH

Decapoda



koonac

PHYLUM	Arthropoda Crustacea
ORDER	Decapoda
FAMILY	Parastacidae
COMMON NAME	Freshwater crayfish

Description

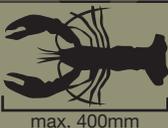
Freshwater crayfish are the largest of the macroinvertebrates. This animal's body is encased in a hard exoskeleton and has a tail in the shape of a fan. They have five pairs of legs, the first set of which are enlarged with big pincers (claws).

Natural History

Crayfish live in a wide range of habitats and are omnivores, eating rotting vegetation and small animals. There are a number of native endemic species, including the **marron**, **koonac** and **gilgie** and the introduced interstate **yabbie**. Many crayfish burrow in the sediment seen along or nearby river banks.

Indicators of river health

Finding native varieties of freshwater crayfish is a good indicator of a healthy waterway. Some species are more tolerant of salinity and degradation than others.



max. 400mm



SCUDS

Amphipoda



scuds

PHYLUM	Arthropoda Crustacea
ORDER	Amphipoda
FAMILY	Ceinidae, Perthidae (and more)
COMMON NAME	Scuds

Description

Scuds are usually white and small with many legs. Their bodies are flattened from the sides and when resting, appear curved.

Natural History

Amphipods or **scuds** are omnivores, usually feeding on decaying plant matter and when possible, animals. Young scuds resemble their adult form. Females carry their eggs in a marsupium or brood pouch located underneath the thorax and hatch the eggs when they moulting.

Indicators of river health

Some types of scuds are more tolerant of waterway degradation than others.



WATER SLATER

Isopoda



water slaters

PHYLUM	Arthropoda Crustacea
ORDER	Isopoda
FAMILY	Many
COMMON NAME	Water slater

Description

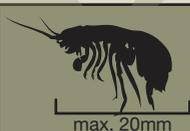
The body of most **water slater** species is flattened from the top, similar to their common relative, the **garden slater**. However, some are flattened on the side (see photo above) and appear very similar to **scuds** (see previous page). Water slaters are usually mid to dark brown and larger than scuds.

Natural History

Most water slaters are detritivores and shred leaves and organic matter. Some types can be parasitic on fish, some are more tolerant of saltwater.

Indicators of river health

Generally water slaters are tolerant of waterway degradation.



Who am I?

Go down the list until you find the best description...

go to page

I have a single shell...

that is snail shaped, coiled like a spiral,
and I live in freshwater..... FRESHWATER SNAIL

33

that is snail shaped, coiled like a spiral,
and I live in saltwater..... SALTWATER SNAIL

33

that is dome-shaped, but not coiled like a spiral... FRESHWATER LIMPET

33

OR...

I have a double shell (bivalves)...

that is small, thin, transparent or pale,
and shaped like a clam PEA CLAMS

34

that is large, thick, dark,
and shaped like a mussel..... FRESHWATER MUSSELS

34



FRESHWATER & SALTWATER SNAILS & LIMPETS

Gastropoda



freshwater snails



saltwater snails

PHYLUM	Mollusca
CLASS	Gastropoda
FAMILY	Many freshwater and Pomatiopsidae (saltwater snail)
COMMON NAME	Freshwater snails, saltwater snails, freshwater limpets

Description

Aquatic snails live in a single whole shell, the shape of which can vary from the typical land snail shape with an elevated spire, to a flattened spiralled shell or a simple dome limpet shaped shell. **Saltwater snails** have an elevated spiral shell, sometimes with a blunt tip.

Natural History

Freshwater snails are often found in shallow slow-moving or still water amongst submerged vegetation. Most are herbivores, grazing on the algal slime covering plants and rocks. There are many types and therefore a variety of habitat preferences. For example, the **freshwater limpet** (*Ferrissia* spp.) lives in multi-flow strength streams and grazes on the surface slime which it glides over. Saltwater snails are found on the edges of saline lakes.

Indicators of river health

Some freshwater snails can tolerate small amounts of salinity, while others can be found in degraded waterways, including farm dams and altered waterways. Other sensitive species will only be found in unpolluted and undegraded waterways. Saltwater snails are very tolerant of saline waterways. Snails are better indicators of waterway health at the species level.

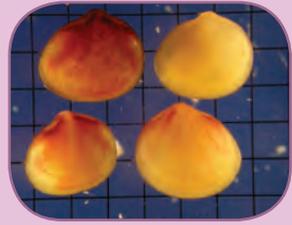


FRESHWATER MUSSELS & PEA CLAMS

Bivalvia



empty freshwater mussel shells



pea clams

PHYLUM	Mollusca
CLASS	Bivalvia
FAMILY	Hydriidae, Sphaeriidae
COMMON NAME	Freshwater mussels and pea clams

Description

Bivalves as their name suggests, are double valved with two hinged shells. The **freshwater mussel** *Westralunio carteri* (Hydriidae) has a thick dark shell and grow up to 85mm. The small (up to 10mm) **pea clams** are pale and semi-transparent. Neither types attach to rocks like marine mussels, but bury themselves in the sediment around the edges of rivers, lakes and wetlands.

Natural History

Both freshwater mussels and pea clams are filter feeders, feeding on microscopic algae, bacteria and other fine matter in the water. Young freshwater mussels parasitize on native fish. Once developed, they drop off and grow into the adult mussel form.

Indicators of river health

Both these types are filter feeders, which means they take up anything from the water column including pollution. Freshwater mussels are intolerant of increased salinity. Because they live in the sediment along the edges of waterways, it can be easy to miss them when collecting a macroinvertebrate sample. Finding freshwater mussels or pea clams would indicate a healthy waterway.



max. 85mm



max. 10mm

KEY

UNSEGMENTED WORMS!

Who am I?

Go down the list until you find the best description...

go to page

I am tiny, thin and have a round body ROUNDWORMS

36

I am long, thin and have a round body GORDIAN WORMS

36

I am long, thin and have a flat body FLATWORMS

37

I am long, squat and have a flat body with small tentacles
..... TEMNOCEPHALA

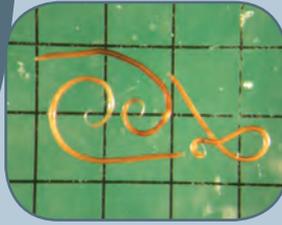
37

un-
segmented



ROUND & GORDIAN WORMS

Nematoda and Nematomorpha



round worm



gordian worm

PHYLUM	Nematoda and Nematomorpha
COMMON NAME	Round (Nematoda) and gordian worms (Nematomorpha)

Description

Round worms are very small pale worms without segments, often with one pointed end. The larger **gordian worms** can be light or dark and could be mistaken for coiled string or wire.

Natural History

The **round worm** is one of the world's most widely dispersed animals and can survive anywhere with sufficient water. When living in freshwater it can be free-living, parasitic on other freshwater animals, or a combination of the above. Young gordian worms parasitize insects and it's thought that the worm's host eventually dies and the adult form becomes free-living in the water.

Indicators of river health

Round and gordian worms occur in all aquatic environments. Round worms are tolerant of degradation, while the gordian variety is less so.

un-segmented



max. 50mm

FLATWORMS & TEMNOCEPHALA

Turbellarians and Temnocephalans



flatworm



temnocephala

PHYLUM	Platyhelminthes
CLASS	Turbellaria, Temnocephala
COMMON NAME	Flatworm and temnocephalan

Description

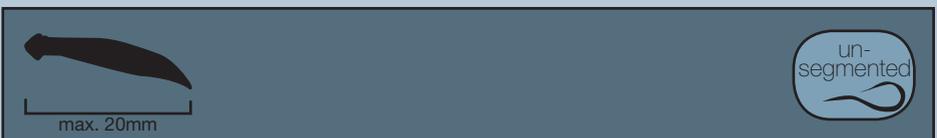
As their name suggests, **flatworms** are flat and thin and they glide slowly over surfaces. Larger types can swim through the water. The **temnocephalans** are small, flat and oval with tiny tentacles at one end and a suction disc at the other.

Natural History

Flatworms are omnivores and feed on prey by scavenging as they glide over rocks and wood. Temnocephalans are symbiotic with freshwater crayfish. They do not harm crayfish and use their tentacles to capture food.

Indicators of river health

Flatworms are fairly tolerant of waterway degradation, while temnocephalans are less tolerant and must live in waterways favourable to freshwater crayfish. If found in large numbers on crayfish, they may indicate deteriorating water quality.



KEY

SEGMENTED WORMS!

Who am I?

go to page

Go down the list until you find the best description...

I have many body segments
with a sucker on each end, and am usually dark.....LEECH

39

I have a many body segments
without suckers, and am usually pale.....SEGMENTED WORM

39

segmented



SEGMENTED WORM/LEECH

Oligochaeta and Hirudinea



freshwater segmented worms



leech

PHYLUM	Annelida
CLASS	Oligochaeta and Hirudinea
COMMON NAME	Freshwater segmented worm and leech

Description

Freshwater segmented worms are soft bodied. They have a variable number of body segments and look similar to **garden earthworms**. They can be cream, red or black; some have small gills and tiny hairs along their bodies. **Freshwater leeches** always have 32 segments with a single sucker on each end of their body.

Natural History

Freshwater segmented worms live in sediment rich in organic matter and consume the bacteria and algae living there; although some are known to be carnivores. Leeches are predators; some use their sharp jaws to extract blood from frogs, turtles and people. Others use their mouthparts to pierce and suck out the guts of their prey. Freshwater segmented worms and leeches live in a variety of waterways; from still, stagnant pools to flowing rivers.

Indicators of river health

Freshwater segmented worms can tolerate extremely degraded waterways and can indicate poor water health. Freshwater segmented worms and leeches can tolerate low water oxygen levels. Although they tolerate polluted waterways, they are also found in pristine environments. If freshwater oligochaetes are found in large numbers with other species indicative of poor water health, this may indicate a degraded waterway.

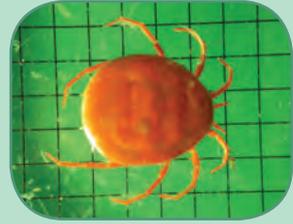


AQUATIC SPIDERS & MITES

Araneae and Acarina



aquatic spider



aquatic mite

PHYLUM	Arthropoda
CLASS	Arachnida
ORDER	Araneae and Acarina
FAMILY	Many types
COMMON NAME	Freshwater spider and mite

Description

Aquatic spiders are variable in size and have a distinct head, abdomen and eight legs. They look similar to land spiders; are often brown and are usually seen sitting on the water surface. **Aquatic mites** are tiny with a simple round body and eight legs. Colour, size and shape are variable, although this is difficult to see with the naked eye.

Natural History

Freshwater spiders are predators of insects, tadpoles and fish. They often ambush their prey from the surface using the fine hairs on their legs to feel ripples from any unsuspecting prey below. Juvenile freshwater mites are usually parasitic of aquatic insects. When mature, they continue to prey on insects and small crustaceans such as copepods and cladocera.

Indicators of river health

Most aquatic spiders live on the water surface and are not usually used as indicators of water health. Some aquatic mite families are extremely sensitive to water degradation and others are very tolerant. Aquatic mites are variable and need to be identified to family level (using a microscope) to be useful as environmental indicators.



max. 90mm



max. 5mm

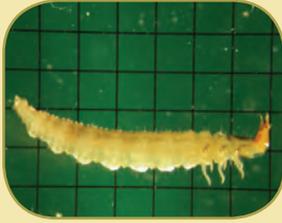




INSECTA!



diving beetle larvae



water scavenger beetle larvae



riffle beetle larvae



marsh beetle larvae



whirligig beetle larvae



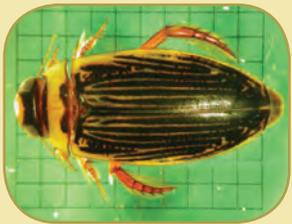
diving beetles



riffle beetle



scavenger beetle



diving beetle

INSECTA!



water scavenger beetle



whirligig beetle



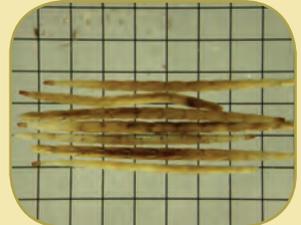
water strider



water strider



water strider



biting midge larvae



crane fly larvae

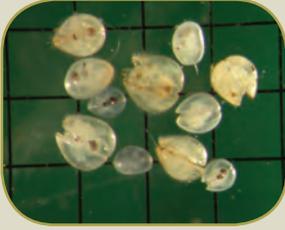


free living trichoptera



caddis fly stick larvae

CRUSTACEA!



ostracod



ostracod



copepod
(harpacticoida with eggs)



marron (native)

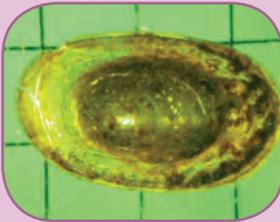


yabbie (feral)

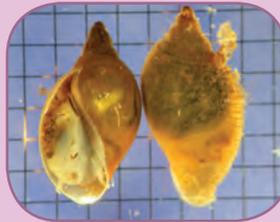


freshwater fairy shrimp

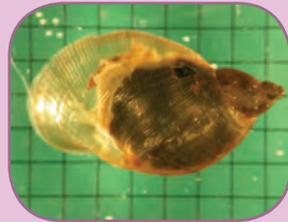
MOLLUSCA!



freshwater limpet



freshwater snail



freshwater snail

UNSEGMENTED WORMS!



unsegmented worm



unsegmented worm

SEGMENTED WORMS!



oligochaete worms



oligochaete worms



SPIDERS!



aquatic spider

MITES!



aquatic mites



aquatic mites



aquatic mite



aquatic mite



aquatic mite



aquatic mite



aquatic mite



aquatic mite



GLOSSARY

Abdomen	Last part of the body (see diagram on page 10)
Antenna	A pair of long, thin feelers attached to the head
Antennae	Plural of antenna
Aquatic	Relating to, or being in water
Benthic	Located on the bottom of a waterbody, such as a river or lake
Carnivore	Animals which eat other animals
Degradation	Deterioration of the environment through depletion of resources
Detritus	Rotting animal and plant matter
Detritivore	Animals that eat detritus
Diatoms	Microscopic, single-celled algae in a silica case
Endemic	An animal or plant native or restricted to a certain place
Feral	An animal or plant not naturally belonging to an environment
Filter feeder	An animal that filters particles from the water to eat
Free-living	Living independently, not as a parasite or attached to a substrate
Gnamma	A natural hole in a rock in which rainwater collects
Grazer	An animal that feeds on plant matter
Hypersaline	Extreme amounts of salt in water
Indicator	A thing (eg. an animal) that shows the state or level of something.
Larva	A juvenile form of an animal that looks unlike its adult form
Larvae	Plural of larva

Nymph	Juvenile insect that looks like its adult form with undeveloped wings
Omnivore	An animal that eats plant and animal matter
Organic matter	Decayed matter composed of organic compounds from the remains of plants and animals and their waste products in the environment
Organic pollution	Organic compounds resistant to environmental degradation through chemical, biological and photolytic processes
Parasite	An animal which lives on another animal — can be harmful
Parasitize	To live on another animal as a parasite
Plankton	Microscopic plants and animals living in water
Predator	An animal that hunts, kills and eats another animal
Pupa	The stage of an insect between larva and adult (cocoon)
Scavengers	Animals that feed on decaying organic matter
Sclerotise	The hardening of an insect's outer shell
Shredder	An animal that pulls apart organic matter (leaves) and eats it
Species	Lowest taxonomic level and the animals and plants in that level
Sp and Spp	Abbreviation of species singular (sp.) and plural (spp.)
Symbiotic	A long term relationship between two different species
Taxonomic	Naming and classification of plants and animals
Tolerant	Able to withstand changes
Waterway	A body of water, such as a river, lake or creek

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