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A Photographic Guide to Freshwater Invertebrates of Taranaki's Rivers and Streams

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Note: Images courtesy of Mr SC Moore Landcare Research NZ Ltd.

Introduction

Turn over a few rocks in a shallow, fast flowing section of any stream and you will soon notice movement. Small, dark insect-like shapes scuttling for cover. You may well discover some of the surprisingly large members of the mayfly, stonefly, caddisfly or dobsonfly groups. These insects are in their larval (juvenile) stages and are just a few of more than 150 aquatic invertebrates widely distributed around the Region.

In addition to insects you may find crustaceans, snails, worms, and leeches particularly in weedy stream habitats. Collectively these creatures are known as "aquatic invertibrates" (animals without backbones).

Invertebrates are a vital part of the freshwater ecosystem. They include grazers, plant shredders, filterers, and predators. Many of them feed on plant matter (algae, leaf litter and aquatic "weeds") and in turn they provide the most important food source to almost all of the freshwater fish found in New Zealand. Without the invertebrates we would have none of the native eels, bullies or "whitebait" species, and no introduced trout, salmon or perch in our freshwater habitats.

Invertebrates can tell us a great deal about the "state of health" of our waterbodies. The presence of many invertebrate species usually indicates clean water, cool temperatures and generally natural conditions. A stream which lacks any invertebrate life has a major habitat problem, possibly because of recent pollution, or low flow conditions.

Each year the Taranaki Regional Council (TRC) monitors the condition of the freshwater invertebrate communities around Taranaki (1020 sites monitored in total to date). This work compliments chemical (water quality) and hydrological (water quantity) monitoring programmes, and together these programmes are significantly improving our understanding of the state of our freshwater resources, and monitoring the performance of consent holders.

This "Photographic Guide is designed to assist anyone interested in learning about stream life or the condition of their local waterbodies. The following pages introduce all of the major invertebrate groups using microscope images, and a brief description of the habitat preferences of each group. This guide may be useful in any part of the region. Particular emphasis is placed on those invertebrate groups which are recognised as useful indicators of water quality. All of the invertebrates shown in this guide are present in Taranaki.

Where to Look and How to Sample

This guide is designed for those without a great deal of freshwater biological experience or access to laboratory facilities. Even if you do not have equipment such as sampling nets, containers or microscopes, you can use this guide to identify as many invertebrate groups as possible and make some conclusion regarding the "state of health" of your chosen waterbody.

A single site can be used for a spot check, although most biological surveys involve a series of sites along a particular waterbody. Select sites with easy and safe access, and always seek permission to cross property. The widest range of stream invertebrates can be found in shallow (but permanently submerged), fast-flowing, stony-bedded reaches known as "riffles". Larger, more stable rocks usually support the most invertebrate types, although the rocks need to be small enough to be lifted or turned over.

Invertebrates can be picked or scraped off rocks and placed into a tray or transparent container. The more invertebrate types found, the more useful information you will gain relating to the "state of health" of the site. Be sure to look for the smaller species as well as the more obvious, larger species.

If you are interested in weedy streams, ponds, lakes or wetlands, you may find a wide range of invertebrates in permanently submerged vegetation. You will see the invertebrates more easily of you place a sample of vegetation into a tray or suitable viewing container. The invertebrate groups you find may differ to those found in stony habitats, but the general rule about rich communities reflecting "healthy" conditions can still apply. Many plant-associated invertebrates are described in this booklet.

The TRC uses a "kick-sampling" method where the streambed is disturbed by foot, and fine, organic matter (including the invertebrates) is swept into a hand-held net. A detailed description of the TRC sample collection and analysis methods can be obtained from the Technical Services Section Unit of the TRC.

Once you have obtained a collection of invertebrates from a site, use the following sections of this guide to identify each group (as far as possible) and to establish stream health.

Identifying the Major Invertebrate Groups

Published scientific identification keys require the use of a microscope to recognise the features of each group, and it is assumed that the observer has a good understanding of scientific terms. The following guide however is designed for those without these advantages, although a magnifying glass would make the task easier.

The first step is to sort your collected invertebrates into the major groups which are visually distinct. Try the following primary categories:

- Six-legged insect larvae - **pp 5-12**
- Eight (or more) legged crustaceans (shrimps, water fleas etc) - **pp 13-14**
- Molluscs (snails and bivalves) - **pp 15-16**
- Others (worms, legless insect larvae, leeches etc) - **pp 17-22**

Having separated your invertebrates into these primary visual categories, you may choose to refer to the corresponding photographic section of this guide. Further identification will be easy for many invertebrate groups however. Try the following secondary categories:

Six-legged insect larvae

- Those with three tail filaments and gills along the sides of the body (mayflies) - **pp 5-6**
- Those with two tails (stoneflies) - **pp 6-7**
- Those inhabiting a portable case (cased caddisflies) - **pp 7-9**
- Those with a soft grub-like body and two tailhooks (free-living caddisflies) - **pp 9-10**
- Those with a hard outer cover and biting mouthparts (beetles) - **pp 10-11**
- Those with pointed, sucking mouthparts (bugs) - **pp 11-12**
- Those with leg-like gills along the body (dobsonflies which resemble the centipedes at first glance) - **p 12**
- Those with extendable hinged lower jaws (damselflies and dragonflies) - **p 12**

Eight (or more) legged crustaceans

- The crayfish with distinct "pincers" - **p 13**
- The shrimps (similar to small crayfish, but lacking large pincers) - **p 13**
- Those resembling sand hoppers (amphipods) - **p 13**
- Those resembling wood lice (isopods) - **p 13**
- The water fleas (small, open-water swimmers) - **p 14**
- The seed-shaped ostracods - **p 14**
- Those resembling horseshoe crabs (notostracans) - **p 14**
- Estuarine crabs - **p 14**

Molluscs

- Dark, chunky pond snails - **p 15**
- Bubble-shaped fragile pond snails - **p 15**
- Large conical pond snails - **p 15**
- Flat-spiralled snails - **p 15**
- Estuarine snails - **p 16**
- Large freshwater mussels (bivalves) - **p 16**
- Small pea shells (bivalves) - **p 16**
- Freshwater limpets - **p 16**

Others

- Worms similar to small earthworms - **p 17**
- Wide, flexible flatworms - **p 17**
- Small, green or red coloured, worm-like midges (true flies) - **pp 18-19**
- Larger, cream coloured, worm-like craneflies - **pp 19-20**
- Other legless fly larvae including sandflies, mosquitos and maggot-like larvae - **pp 20-22**
- Aquatic caterpillar larvae, covered in tentacle-like gills - **p 23**
- Hydroids (like small sea anemones) - **p 23**
- Colonial tube-dwelling animals - **p 23**

This list of visually distinct, secondary identification categories is arranged in the same order as the following photographic section of this guide. You will find that matching your collected invertebrates with the photographs will be much quicker and easier if you have become familiar with the layout of the photographic section.

You will also find that invertebrate identification becomes much easier as you build up a bit of experience, so do persist!

Photographic Guide to the Freshwater Invertebrates

Once you have collected and visually separated as many invertebrate groups as possible, you should find that each group will resemble one of the invertebrate images in this section. Each photograph is accompanied by a caption giving the name and a typical full size of the invertebrate group.

Many people are interested in how these invertebrates reflect the state of health of their waterbody. The captions in this image section identify those groups which are useful indicators of water quality. If you find that a particular invertebrate group is abundant at a site, the water quality comments associated with that group are more likely to be relevant.

Some invertebrates cannot tolerate any form of pollution. These groups are often described as sensitive. Invertebrates which thrive in polluted habitats are described as tolerant.

The easiest way of summarising the sensitivity of each invertebrate group to water quality is by using a one-to-ten scoring system. Those invertebrates given a score of ten are the most sensitive groups and their presence in a sample indicates clean water. Those groups with a score of only one are the most tolerant groups and their abundance in a sample may indicate polluted water. The "preferred" habitat type, and the scores assigned to each group are given in the image captions. These are the scores used by the Taranaki Regional Council. They are similar to those used in the NZ "Macroinvertebrate Community Index" (Stark 1985) and the Otago Regional Council region. These scores apply to stony (hard-bedded) rivers and streams. A separate score for soft-bedded (weedy or silty) streams is shown in brackets (Stark and Maxted, 2007).

If you can identify a number of invertebrate groups (ten or more if possible) you can average the 1-10 scores for these groups to give an indication of the overall condition of the site. If the average score is five or more, the stream community is likely to be in a "healthy" condition. A stony stream community with an average score of three or less is likely to reflect a degraded (possibly polluted) habitat.

Remember that you have a better chance of correctly assessing stream health if you have collected a good number of invertebrate groups, and if your identifications are correct. Take enough time to match all of your invertebrate groups with the following photos.

Six-legged Insect Larvae (Mayflies)

Deleatidium is a moderately common mayfly in the region. It is presented in clean, stony, fast-flowing waters. Sensitivity score 8(6). Typical size of fully developed larvae 15mm (incl tail).

Zephlebia mayflies are often common in Taranaki, in good to high quality waters and common in high quality soft-bedded streams. Sensitivity score 7(9). Typical size 20mm.

Coloburiscus mayflies are very common in most clean, streams and rivers. They are the bulkiest of the mayflies. Sensitivity score 7(8). Typical size 18mm.

Mauiulus mayflies are small and delicate and can be difficult to collect intact. They are also relatively uncommon. Sensitivity score 5(4). Typical size 6mm.

Austroclima mayflies are another sensitive group and are often abundant in Taranaki. Sensitivity score 7(7). Typical size 15mm.

Nesameletus is the swimming mayfly found in high quality waters. A similar, but relatively rare, more spiny genus, is *Oniscigaster*. Sensitivity score 9(9). Typical size 16mm.

Six-legged Insect Larvae (Mayflies and Stoneflies)

Ameletopsis is generally a rare mayfly which is difficult to collect intact, but it is a good indicator of "clean" water. Sensitivity score 10(10). Typical size 10mm.

Zelandoperla can be recognised by the very long antennae, tails and hairy legs. Like all of the large stoneflies they prefer high quality waters. Sensitivity score 8(9). Typical size 18mm.

Ichthybotus is a very sensitive mayfly, usually only found in pristine, upper catchment streams. Sensitivity score 8(9). Typical size 12mm.

Megaleptoperla is another large stonefly moderately common in good quality waters. Sensitivity score 9(7). Typical size 18mm.

Stenoperla is the spectacular green stonefly found in clean, cool waters, seldom in large numbers. Sensitivity score 10(9). Typical size 30mm (including tail filaments).

Austroperla is a moderately common stonefly which is another indicator of clean, cool waters. Sensitivity score 9(8). Typical size 15mm.

Six-legged Insect Larvae (Stoneflies and Caddisflies)

Zelandobius is a smaller stonefly which is more widespread and not necessarily confined to clean waters. Sensitivity score 5(7). Typical size 10mm.

Beraeoptera is a smaller caddisfly with flared case, also usually confined to clean waters where it may be common. Sensitivity score 8(7). Typical size 5mm.

Acroperla stoneflies are distinguished by the pale markings on the legs and body. Another medium-tolerance group. Sensitivity score 5(5). Typical size 6mm.

Confluens is a dark-striped cased caddisfly which is not very common. Sensitivity score 5(7). Typical size 6mm.

Olinga is the largest New Zealand smooth-cased caddisfly and is only likely to be abundant in clean waters. Sensitivity score 9(8). Typical size 8mm.

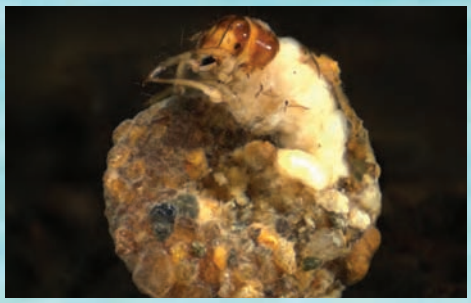
Pycnocentrodes is a widespread stony-cased caddis, found mostly in clean waters. This genus has a flatter head than *Pycnocentria*. Sensitivity score 5(4). Typical size 7mm.

Six-legged Insect Larvae (Caddisflies)

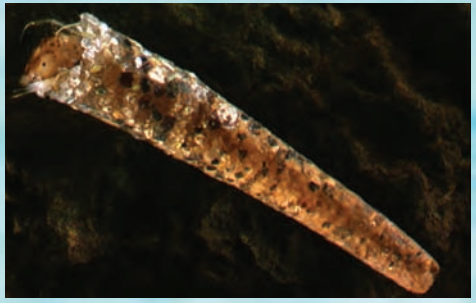
Pycnocentria caddis larvae make cases out of fine sand grains neatly arranged in tight spirals. Has rounder head than *Pycnocentrodes*. This group prefers clean waters. Sensitivity score 7(7). Typical size 9mm.

Oeconesid caddisflies make a chunky case out of coarse sand grains. Not very common. Sensitivity score 5(6). Typical size 15mm.

Hudsonema amabilis is a caddisfly with striped legs, which produces a very long case out of sand grains. It is an indicator of medium to good water quality. Sensitivity score 6(7). Typical size 10mm.



Helicopsyche caddis larvae make spiral cases out of sand grains, easily confused with gravel. This is a sensitive group found in clean waters. Sensitivity score 10(9). Typical size 2.5mm.



Oecetis caddis larvae make small, fragile cases out of very fine sand grains. Found in a wide range of water qualities. Sensitivity score 4(7). Typical size 8mm.

Triplectides caddis larvae live inside hollow pieces of stick and debris, and can be found in many slow-flowing streams with moderate water quality. Sensitivity score 5(6). Typical size 20mm.

Six-legged Insect Larvae (Caddisflies)

Hudsonema aliena is an uncommon caddisfly which makes a case out of spirally arranged rectangular plant fragments. Sensitivity score 6(7). Typical size 18mm.

Aoteapsyche is a free living caddis which builds a "fishing net" for food capture. Found in a wide range of water qualities. Sensitivity score 4(6). Typical size 9mm. (Note: very similar to *Orthopsyche* (score 9(8))).

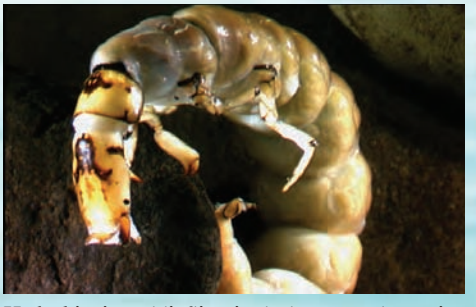
Oxyethira is the small "axehead" caddis in a transparent case, found amongst weeds and algae. This is a very tolerant group often abundant in degraded waters. Sensitivity score 2(1). Typical size 4mm.

Psilochorema caddis larvae are most common in clean waters, but may be found amongst plant debris. Sensitivity score 6(8). Typical size 11mm.

Paroxyethira is the "purse caddis" in a transparent case, often found attached to plants in slow-flowing waters. Sensitivity score 2(4). Typical size 5mm.

Hydrobiosella is free-living (no case) white-bodied caddis generally found in the upper clean streams. Sensitivity score 9(8). Typical size 8mm.

Six-legged Insect Larvae (Caddisflies and Beetles)



Hydrobiosis caddisflies include several species which are common in Taranaki. Some are found only in very clean water, others thrive in most water qualities. Sensitivity score 5(7). Typical size 10mm.

Polyplectropus caddis larvae are often found in abundance in small weedy streams with moderate to good water quality. Sensitivity score 6(8). Typical size 11mm.

Costachorema caddisflies include large green-bodied, dark-headed species usually found in clean flowing waters. Sensitivity score 7(7). Typical size 15mm.

Plectrocnemia caddis larvae are rare but are most likely to be found in clean flowing waters. Very similar to *polyplectropus* in appearance. Sensitivity score 8(8). Typical size 7mm.

Neurochorema is a less common caddis group, found in cleaner streams. Sensitivity score 6(6). Typical size 9mm.

Elmid larvae are very abundant beetles in stony streams. Found in moderate and clean waters. Sensitivity score 6(7). Typical size 6mm. The flat-tailed Ptilodactylids are similar but rarer beetles.

Six-legged Insect Larvae (Beetles and Bugs)

Scirtid beetles (long antennae) are not very common but tend to occur in clean waters. Sensitivity score 8(6). Typical size 6mm.

Hydrophilid beetles are quite uncommon but occasionally are found in moderate to clean waters. Sensitivity score 5(8). Typical size 8mm.

Hydraenid beetles (adults) are very small and dark but can be quite common in clean, stony streams. Sensitivity score 8(7). Typical size 2mm.

Berosus (larvae) is a distinctive type of hydrophilid beetle, only occasionally found in moderate to clean waters. Sensitivity score 5(-). Typical size 7mm.

Dytiscid beetles (adults) commonly inhabit weedy streams and ponds. They include some large swimming species. Sensitivity score 5(1). Typical size 5-10mm.

Microvelia is a small bug living on the surface of ponded waters. May also be found at edges of streams. Sensitivity score 3(5). Typical size 2mm.

Six-legged Insect Larvae (Miscellaneous)

The bug *Sigara* is the common "water boatman" found in near-stagnant waters. Sensitivity score 3(2). Typical size 6mm.

Xanthocnemis larvae are the most abundant damselflies in weedy streams and ponds. Fairly tolerant. Fragile pointed tail filaments. Sensitivity score 4(1). Typical size 16mm.

The bug *Anisops* is the "back swimmer" found in slow flowing or stagnant waters, sometimes amongst weedbeds. Sensitivity score 5(2). Typical size 6mm.

The slender *Austrolestes* damselfly larvae are also weed inhabitants with rounded tail filaments, but less common than *Xanthocnemis*. Sensitivity score 4(1). Typical size 27mm.

Archichauliodes is the dobsonfly also known as the "creeper" or "toe-biter". They inhabit most fast-flowing streams and are common in Taranaki. Sensitivity score 7(7). Typical size 30mm.

Procordulia dragonfly larvae are large and uncommon predators found in slow waters amongst vegetation. Sensitivity score 5(4). Typical size 27mm.

Eight (or more) legged Crustacea

Paranephrops (the freshwater crayfish) is the largest freshwater invertebrate in NZ. Found mainly amongst vegetation in streams and lakes of varying water quality. Sensitivity score 5(8). Typical size 80-120mm.

Paracalliope is a very common amphipod particulary in lowland areas. This group can tolerate moderate water qualities. Sensitivity score 5(6). Typical size 3mm.

Freshwater *(Paratya)* and estuarine shrimps prefer slow-flowing weedy streams, estuaries and lakes. They often tolerate nutrient enriched, or otherwise degraded waters. Sensitivity score 3(4). Typical size 15mm.

Paraleptamphopus includes some of the larger amphipod species, most frequently in lowland areas. Often lighter in colour than *Paracalliope*. Sensitivity score 5(6). Typical size 4mm.

Estuarine isopods are found within the salt water intrusion zones in the lowest reaches of rivers. Sensitivity score 5(5). Typical size 4mm.

Freshwater isopods are found in slow flowing and weedy lowland streams, usually low in numbers. Sensitivity score 5(5). Typical size 3mm.

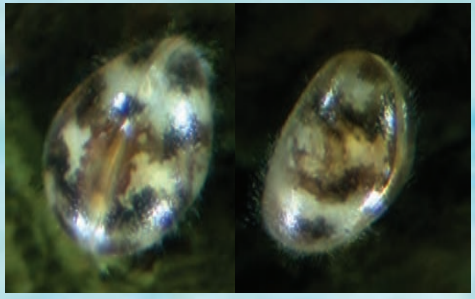
Eight (or more) legged Crustacea

Cladocerans (eg *Daphnia* ("water fleas")) are found in most lakes and ponds, usually in open water. Often in streams below oxidation pond discharges. Sensitivity score 5(1). Typical size 2mm.

Another Cladoceran, *Simocephalus*. Sensitivity score 5(1). Typical size 2mm.

Copepods are also very small open water swimmers, generally found in slow flowing or ponded waters. Sensitivity score 5(2). Typical size 1mm.

Notostracans (tadpole shrimps) are only found in isolated locations in New Zealand, typically in temporary streams or ponds. Their ability to tolerate stagnant, warm water results in the low sensitivity score of 3(-). Typical size 30mm.



Ostracods or "seed shrimps" look like seeds that swim. Often found in large numbers and thrive in organic muds. Sensitivity score 1(2). Typical size 2.5mm.

Helice mud crabs are abundant in muddy river estuaries, eg Waitara River. Sensitivity score 3(7). Typical size 35mm.

Molluscs (Snails and Bivalves)

Potamopyrgus is the widespread "pond snail" found in most freshwaters especially amongst weedbeds and streambed algae. This snail can tolerate various water quality conditions. Sensitivity score 4(2). Typical size 3.5mm.

Potamopyrgus can be found in the spiny form shown above, or the smooth form shown above left. The same sensitivity score and size apply. This snail has been found at altitudes in excess of 400m a.s.1. in Taranaki.

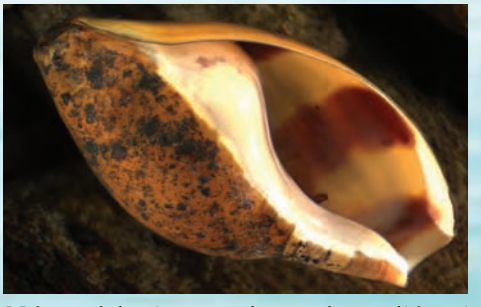
Physa is another common snail in slow flowing waters, and can be abundant in enriched or "polluted" waters. Sensitivity score 3(1). Typical size 8mm.

Physa also occurs in a range of shell shapes. This form is less common than the bubble-shaped form. Same score and size apply.

Lymnaeididae are large introduced snails found in some streams and ponds. The shell opening is opposite to that *Physa*. Quite tolerant. Sensitivity score 3(1). Typical size 12mm.

Gyraulus snails are often found amongst aquatic plants in near-stagnant waters. Tolerant. Sensitivity score 3(2). Typical size 2.5mm.

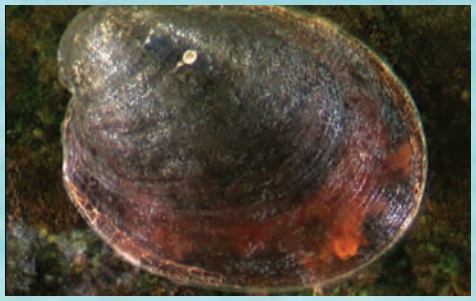
Molluscs (Snails and Bivalves) (continued)



Melanopsis is a large semi-estuarine snail found in stony bedded habitats within the salt water intrusion zone of lower rivers, eg Waitara River. Sensitivity score 3(2). Typical size 15mm.

Sphaeriid bivalves, also known as pea shells, can be found in abundance in soft sediments in both clean and nutrient-enriched waters. Sensitivity score 3(3). Typical size 4mm.

Amphibola is a largely marine snail group, but can be abundant in river estuaries where they live in freshwater for part of each day. Sensitivity score 3(-). Typical size 5mm.



The luminescent freshwater limpet *Latia* is relatively widespread in Taranaki. Sensitivity score 7(6). Typical size 6mm.

Hyridella is the large freshwater mussel found in sandy-muddy bedded streams and lakes. Present in some nutrient-enriched rivers. Sensitivity score 3(7). Typical size 50-100mm.

Ferrissia is a thin-shelled freshwater limpet usually found amongst weedbeds, often in nutrient enriched waters. Sensitivity score 3(2). Typical size 2mm.

Worm-like Groups

Oligochaete worms are found everywhere, from pristine streams, to the most polluted waterways. Their ability to thrive in many heavily polluted habitats gives them the sensitivity score of 1(4). Typical size 15mm.

Nematode worms occur in most waters, although they tend to be too fine to see without a microscope. Sensitivity score 3(3). Typical size 4mm.

Flatworms are also widespread and can thrive in some nutrient-enriched, stony or weedy habitats. *Cura* is most common. Sensitivity score 3(1). *Neppia* is found in higher water quality. Sensitivity score 6(-). Typical size 6mm.

Proboscis worms (Nemertea) tend to occur in lowland or enriched waters. Often surrounded by a mucous-like layer. Sensitivity score 3(2). Typical size 4mm.

Temnocephalus is a distinctive type of flatworm found in stony streambeds and sometimes attached to the pincers of freshwater crayfish. Sensitivity score 5(1). Typical size 2mm.

Paddle-worms are a largely semi-estuarine group found in slow flowing, muddy sites, eg Waitara Rivers. Sensitivity score 3(7). Typical size 30mm.

Worm-like Groups (continued)

Horse-hair worms *(Nematomorpha)* are almost long enough to resemble shoe laces and tend to be mistaken for plant matter. They usually occur in clean water streams. Sensitivity score 7(4). Typical length 200mm.

Maoridiamesa midges (note the dark collar) thrive in algae-covered, stony-bedded streams. Sensitivity score 3(5). Typical size 8mm.

Leeches *(Hirudinea)* are found in weedy habitats, and can tolerate moderate nutrient enrichment. They are not among the species capable of sucking blood from humans. Sensitivity score 3(1). Typical size 6mm.

Tanytarsus midges (note the double eye) also occur in most stony streams with some algal growth. Sensitivity score 3(5). Typical size 4mm.

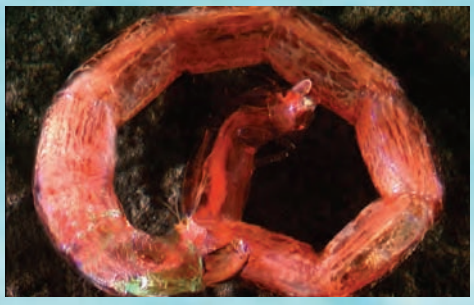
Orthoclad midges (note the green body) are found in almost all freshwaters including nutrient enriched streams. Sensitivity score 2(3). Typical size 5mm.

Tanypod midges (note the bullet-shaped head) includes some clean water species but also some quite tolerant species. Sensitivity score 5(7). Typical size 7mm.

Worm-like Groups (True flies)

Polypedilum (note the pale colour) is one of the less common midge groups, found in a range of water qualities. Sensitivity score 3(8). Typical size 5mm.

Nothodixa fly larvae are occasionally found in slow flowing, weedy streams. Typically U-shaped at rest. Sensitivity score 4(9). Typical size 5mm.



Chironomus midges (note the red colouration and tail gills) are specialists at living in low-oxygen, nutrient-enriched muds. Sensitivity score 1(3). Typical size 20mm.

Paradixa fly larvae also an occasional inhabitant of weedy or soft-bedded habitats. Sensitivity score 4(9). Typical size 5mm.

Harrisius fly larvae are rarely found in most streams but tend to occur in moderate to high quality waters amongst wood debris. Sensitivity score 6(5). Typical size 5mm.

Aphrophila craneflies are very common in moderate to pristine waters. Sensitivity score 5(6). Typical size 15mm.

Worm-like Groups (True flies)

Limonia craneflies are similar to *Aphrophila* but much less common. Sensitivity score 6(6). Typical size 10mm.

Eriopterini craneflies are found in moderate to high water quality conditions. Sensitivity score 5-9(6-8). Typical size 10mm.

Zelandotipula is a large cranefly often found in shaded, slow-flowing streams. Sensitivity score 6(4). Typical size 10mm.

Hexatomini craneflies are not very common in most waters, but can occur in a range of stream types. Sensitivity score 5(7). Typical size 8mm.

Paralimnophila craneflies tend to live in soft-bedded streams with moderate to good water quality. Sensitivity score 6(7). Typical size 10mm.

Ceratopogonid flies are most common in weedy habitats. Very thin and easily overlooked. Sensitivity score 3(6). Typical size 10mm.

Worm-like Groups (True flies)

Austrosimulium sandfly (or blackfly) larvae are found in almost all waterways. Sensitivity score 3(4). Typical size 5mm.

Syrphid fly larvae are the notorious "rat-tail maggots" which are specialists in grossly polluted conditions. They are an obvious indicator of an organic waste discharge. Sensitivity score 1(2). Typical size 12mm.

Empidid flies include many species with aquatic larvae, and are found in many grades of water quality. Sensitivity score 3(5). Typical size 4mm.

Muscid pupae are most common in streams with moderate enrichment, typically in lowland areas. Very similar in appearance to the anthomyid flies. Sensitivity score 3(2). Typical size 5mm.

Culex mosquito larvae inhabit ponds and other stagnant waters. Sensitivity score 3(1). Typical size 2.5mm.

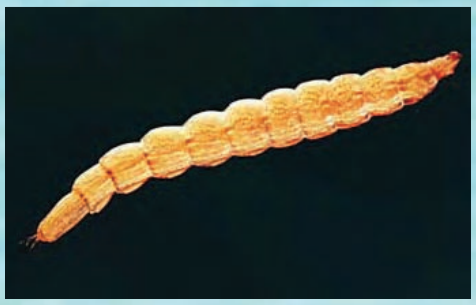
Muscidae flies are found in clean and degraded waters, but are most common in streams with moderate enrichment, particularly amongst algae. Sensitivity score 3(2). Typical size 15mm.

Worm-like Groups (True flies)

Pyschodid flies are usually found in highly enriched waters with low dissolved oxygen levels. Their abundance is a strong sign of pollution. Sensitivity score 1(6). Typical size 4mm.

Ephydrid flies are not usually abundant, but can be found in a wide range of habitats, (more frequently in moderately enriched waters). Sensitivity score4(1). Typical size 4mm.

Mischoderus tanyderid fly larvae are commonly found in Taranaki. They tend to occur in medium-quality waters. Sensitivity score 4(6). Typical size 20mm.



Stratiomyid flies may be present in grassy streams. Sensitivity score 5(4). Typical size 12mm.

Tabanid flies are large and distinctive but only rarely found in Taranaki streams. Sensitivity score 3(7). Typical size 20mm.

Sciomyzid flies are possibly the ugliest looking stream invertebrates. Found occasionally in slower flowing lowland streams. Sensitivity score 3(3). Typical size 12mm.

Miscellaneous Groups

Hygraula is the aquatic caterpillar, sometimes found in weedy slow-flowing habitats. Sensitivity score 4(1). Typical size 7mm.

The bryozoan *Paludicella* is a coral-like filter-feeding organism which forms tangled mat-like colonies sometimes several centimetres thick. Sensitivity score 5(4).

Mites in streams are usually too small to be easily recognised without a microscope, although some pond dwelling mites are quite large. Sensitivity score 5(5). Typical size 1mm.

Hydroids are the freshwater equivalent of the sea anemone. They are usually found in weedy habitats. Sensitivity score 3(2). Typical size 1.5mm.

Summary

Freshwater invertebrates are the small animal inhabitants of the beds (and sometimes the open water), in our streams, rivers, lakes, ponds and wetlands. Insect larvae make up the majority of most freshwater invertebrate communities.

The habitat preferences of many of these invertebrates are well known and therefore the study of invertebrate communities can provide information on water quality and physical habitat suitability. You can obtain some of this information by following these steps:

- choose a "riffle" habitat in streams, or a shallow "weedy" habitat in stagnant or slow flowing waters.
- if you are sampling a series of sites, ensure that the habitat types are as similar as possible.
- collect as many invertebrate groups as possible, from the under sides of stones, or grab samples of vegetation.
- use this guide to identify these groups as accurately as possible.
- use the appropriate 1-10 sensitivity scores (soft or hard-bedded) and habitat preference notes as a guide to the general "state of health" of the waterway.
- an average sensitivity score of six or more indicates a "healthy" community, while an average of three or less indicates a degraded community.

Further Information

Water quality conditions in Taranaki rivers and streams are indicated by average sensitivity scores as follows: 6 or above - high water quality (e.g. upper reaches of ring plain catchments); 4 to 6 - moderate water quality (e.g. mid to lower reaches of ring plain catchments, and some lowland streams); 3 or lower - degraded conditions (e.g. industrialised small catchments, polluted streams).

This Taranaki information has been supplied by Chris Fowles, TRC Scientific Officer, and is based upon more than 7000 site surveys undertaken in the region's rivers and streams (TRC, 2009).

For help with your invertebrate identification try your local Regional Council, University, Department of Conservation, Fish and Game Council or NIWA (National Institute of Water & Atmospheric Research) offices. They can also advise on sampling methods.

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