NIWA
Taihoro Nukurangi

Benthic Macroinvertebrates

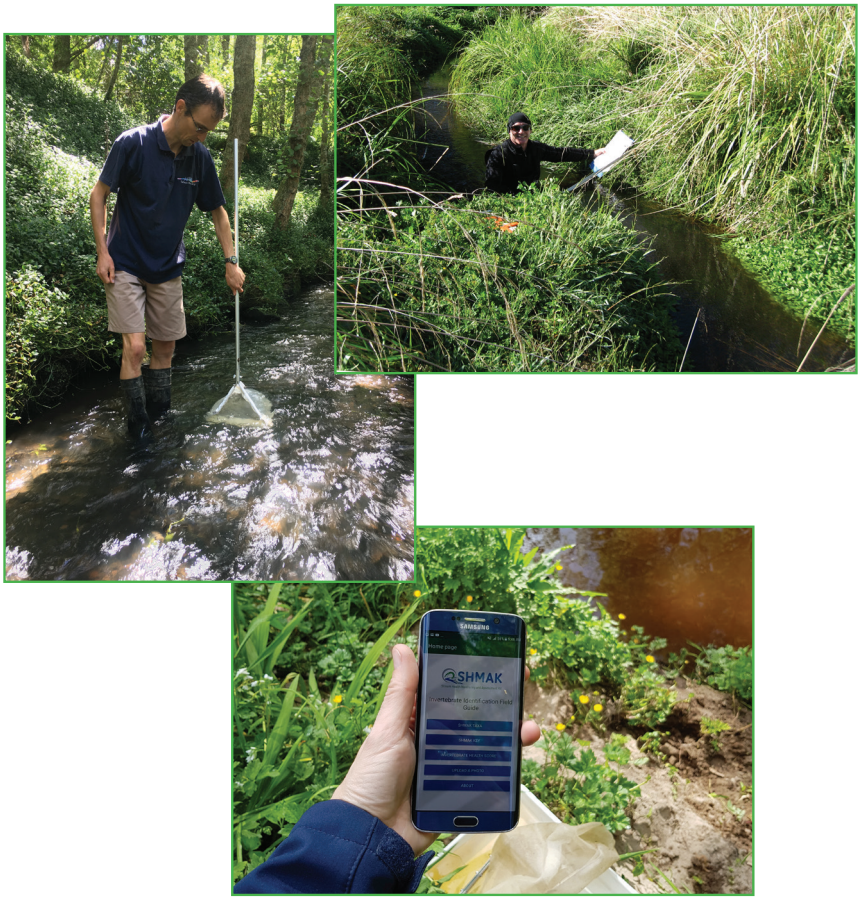
Field Identification Guide

Field Identification Guide

Stream Health Monitoring and Assessment Kit

Benthic Macroinvertebrate

Field Identification Guide

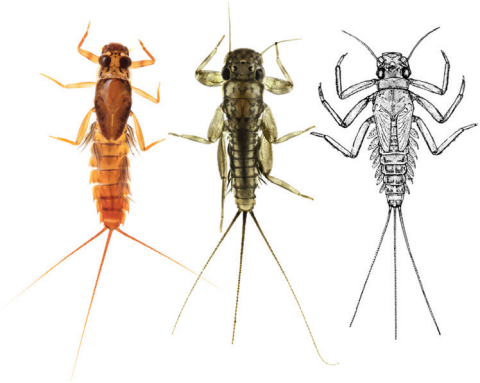


Field guide prepared by: Brian Smith, Richard Storey and Amanda Valois (NIWA).

Photos by Bryce McQuillan. Line drawings kindly supplied by Laurence Clark and Michael Winterbourn (with permission of the New Zealand Entomological Society).

SHMAK Macroinvertebrate Guide

Mayflies
Flat mayfly

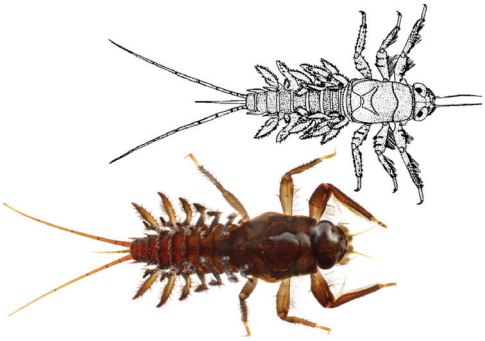


Phylum: Arthropoda
Class: Insecta **Order:** Ephemeroptera
Family: Lephtophlebiidae **Genus:** *Deleatidium*
Max size: 15 mm (excluding tails) **Score:** 8

Features to look for: Distinctive flattened bodies, gills along abdomen beat in unison; three long, hair-like tail filaments (may be broken); crawl fast and swim with an undulating movement.

Where found: Underside of stones, on woody debris or in leaf packs in cool, clean streams of high water quality.

Mayflies
Spiny-gilled mayfly

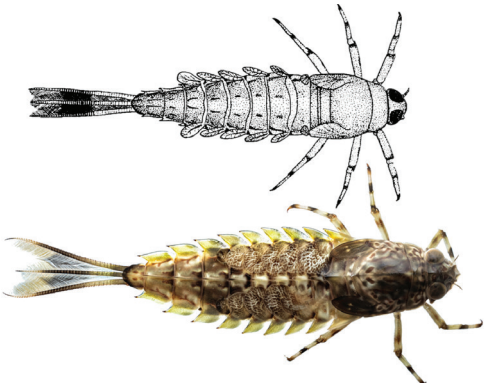


Phylum: Arthropoda
Class: Insecta **Order:** Ephemeroptera
Family: Coloburiscidae **Genus:** *Coloburiscus*
Max size: 20 mm **Score:** 9

Features to look for: Large, chunky, dark orange-brown; spiny cactus-like gills on top of abdomen; front and mid legs very hairy; middle tail very short; distinctive galloping-horse swimming style.

Where found: Between rocks and gravels in fast-flowing areas of cool, clean streams with high water quality.

Mayflies
Swimming mayfly

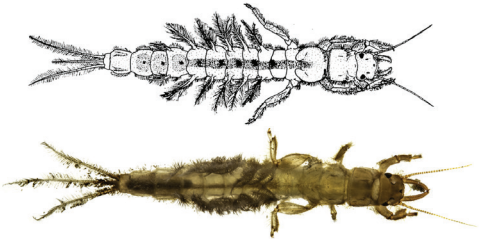


Phylum: Arthropoda **Class**: Insecta
Order: Ephemeroptera
Families: Rallidentidae, Nesameletidae, Oniscigasteridae
Genera: *Rallidens, Nesameletus, Oniscigaster*
Max size: 10–20 mm (excluding tails) **Score**: 9

Features to look for: Torpedo-like body form; hair-fringed tail filaments enable them to swim fast; some species have a black band across the tail.

Where found: Common in pools and slow to medium flow areas in high-quality streams with stony bottoms.

Mayflies
Tusked mayfly

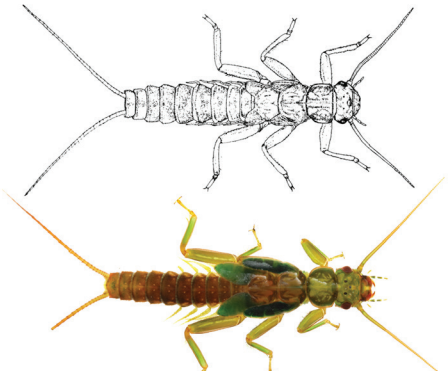


Phylum: Arthropoda
Class: Insecta **Order**: Ephemeroptera
Family: Ichthybotidae **Genus**: *Ichthybotus*
Max size: 25 mm **Score**: 8

Features to look for: Large with obvious "tusks" that extend in front of the head; feather-like gills held over the abdomen; tail filaments fringed with fine hairs.

Where found: In soft sediment in the slow-flowing margins of cool, clean streams.

Stoneflies
Green stonefly

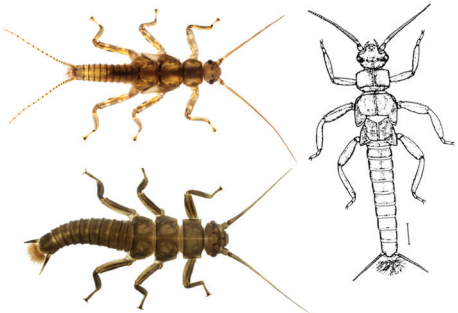


Phylum: Arthropoda
Class: Insecta **Order**: Plecoptera
Family: Eustheniidae **Genus**: *Stenoperla*
Max size: 35 mm (excluding tails) **Score**: 10

Features to look for: New Zealand's largest stonefly; large ones have green bodies with green, blue-green, or purple wing pads; tentacle-like gills along sides of abdomen; very active and can crawl fast.

Where found: Among gravels in clean, cold streams of high water quality.

Stoneflies
Other stonefly

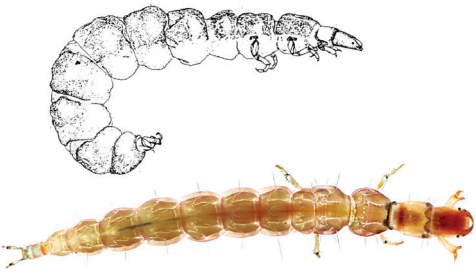


Phylum: Arthropoda
Class: Insecta **Order**: Plecoptera
Max size: 20 mm (excluding tails) **Score**: 5

Features to look for: two tail filaments; gills, if present, are between the tails either as three thin tubes or as a tuft of fine white or reddish filaments; some species "wag" their abdomen from side to side while others pulse the gill tuft.

Where found: A variety of habitats including leaf packs, submerged wood and under stones. Mostly in cool, clean, stony streams of high water quality.

Caddisflies
Free-living caddisfly



Phylum: Arthropoda **Class**: Insecta
Order: Trichoptera **Family**: Hydrobiosidae
Max size: 17 mm **Score**: 6

Features to look for: Long and slim; caseless; usually with a patterned pale or dark-coloured head; pincer-like front legs held beside head; slender abdomens can be transparent, whitish, green, or purplish, active crawlers and swimmers.

Where found: Common among gravels and rocks in medium to high quality stony streams.

Caddisflies
Net-spinning caddisfly

Phylum: Arthropoda **Class**: Insecta
Order: Trichoptera **Family**: Hydropsychidae
Max size: 18 mm **Score**: 6

Features to look for: Caseless; three plates behind the orange to dark-brown-black head; gill-tufts under the cream, greenish- or orange-brown abdomen. Crawl actively or swim by rapidly swinging their head and tail from side to side.

Where found: Mostly among stones and submerged wood; abundant in medium- to fast-flowing areas of medium to high quality streams.

Caddisflies
Messy-net caddisfly

Phylum: Arthropoda **Class**: Insecta
Order: Trichoptera **Family**: Polycentropodidae
Genera: *Polyplectropus, Plectrocnemia*
Max size: 20 mm **Score**: 9

Features to look for: Caseless; large, yellowish, speckled bulbous head and a semi-transparent pinkish abdomen; front legs are simple pointed i.e., do not form pincer-like claws.

Where found: Common in areas of slow flow in medium to high quality streams and rivers where they construct messy nets to trap drifting food items.

Caddisflies
Stick-cased caddisfly

Phylum: Arthropoda
Class: Insecta **Order**: Trichoptera
Genus: *Triplectides*
Max size: 21 mm **Score**: 6

Features to look for: Case made of short stick fragments or shaggy collection of small twigs or plant fragments; well camouflaged but obvious once they move; long, striped legs often stick out of the case.

Where found: Usually on leaves, sticks and logs in slow-flowing areas of medium to high quality streams.

Caddisflies
Stony-cased caddisfly

Phylum: Arthropoda **Class**: Insecta
Order: Trichoptera **Family**: Conoesucidae
Genus: *Pycnocentrodes*
Max size: 20 mm **Score**: 6

Features to look for: Short or long portable cases made from small stones and sand grains.

Where found: Among gravel and cobbles on the stream bed in moderate- to fast-flowing streams of medium to high quality.

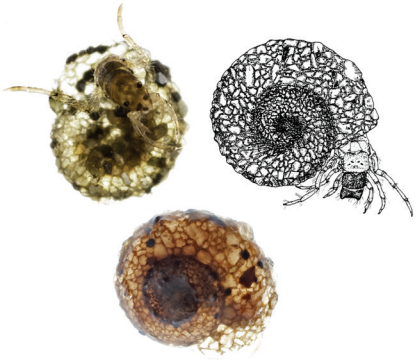
Caddisflies
Smooth-cased caddisfly

Phylum: Arthropoda **Class**: Insecta
Order: Trichoptera **Family**: Conoesucidae
Genera: *Beraeoptera, Confluens, Olinga*
Max size: 12 mm **Score**: 9

Features to look for: Smooth, orange-brown case with no sticks or stones attached.

Where found: Mostly in clean streams of high water quality; in moss, under stones, or in leaf packs.

Caddisflies
Spiral-cased caddisfly



Phylum: Arthropoda **Class**: Insecta
Order: Trichoptera **Family**: Helicopsychidae
Genus: *Helicopsyche*
Max size: 7 mm wide **Score**: 10

Features to look for: Small; flattened, snail-like spiral case made of small sand grains.

Where found: Under rocks or in hollows and crevices in rock surfaces where they may be very abundant; clean bush-covered and pastoral streams.

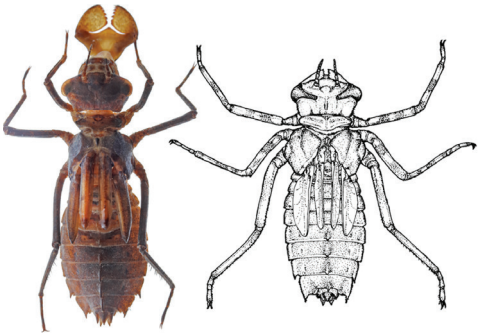
Caddisflies
Micro-caddisfly

Phylum: Arthropoda **Class**: Insecta
Order: Trichoptera **Family**: Hydroptilidae
Genera: *Oxyethira, Paroxythira*
Max size: 6 mm (including case) **Score**: 3

Features to look for: Small; semi-transparent case shaped like an axe-head (*Oxyethira*) or a purse (*Paroxyethira*).

Where found: *Oxyethira* are found on algae in streams and occasionally lakes; *Paroxyethira* are often associated with algae growing on plants in slow-flowing streams, ponds or lakes.

Other insects
Dragonfly

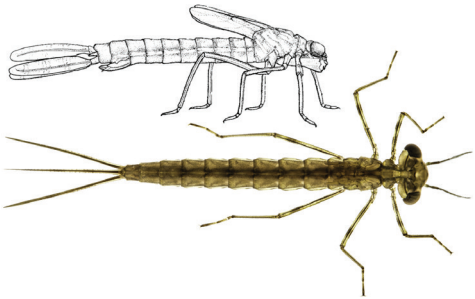


Phylum: Arthropoda **Class**: Insecta
Order: Odonata **Suborder**: Anisoptera
Genus: *Antipodochlora*
Max size: 20 mm **Score**: 6

Features to look for: Large and wide-bodied with long, spider-like legs; the stream-dwelling species has a distinct ridge of spines along the abdomen, may hide among debris but can propel themselves by squirting water from rear end.

Where found: In small pastoral or forested streams of high water quality; other species only in lakes or ponds.

Other insects
Damselfly



Phylum: Arthropoda **Class**: Insecta
Order: Odonata **Suborder**: Zygoptera
Families: Coenagrionidae, Lestidae
Max size: 20 mm **Score**: 5

Features to look for: Sandy or green-coloured; three leaf-like tails (gills); crawl slowly but can also swim by wriggling their slender bodies from side to side.

Where found: Hiding among vegetation in ponds and margins of slow-flowing streams.

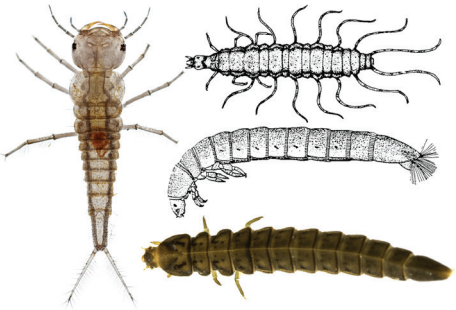
Other insects
Beetle (adult)

Phylum: Arthropoda
Class: Insecta **Order**: Coleoptera
Max size: 10 mm **Score**: 6

Features to look for: Typical beetle-like appearance; lake and pond dwellers are active swimmers whereas stream-dwellers often crawl along stream bed.

Where found: Streams, slow-flowing margins of large rivers, lakes, ponds and wetlands with good or poor water quality.

Other insects
Beetle (larva)

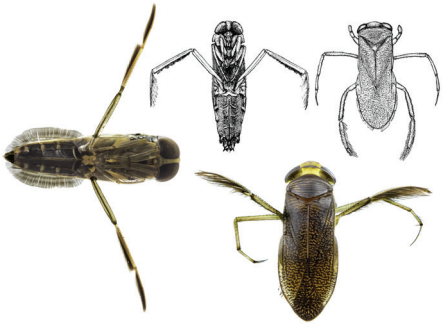


Phylum: Arthropoda
Class: Insecta **Order**: Coleoptera
Max size: 10 mm **Score**: 6

Features to look for: Wide range of body types – some are very slender and dark with thin pale bands; others have large jaws, or two tail filaments or tentacle-like abdominal gills.

Where found: Streams, slow-flowing margins of large rivers, lakes, ponds and wetlands with good or poor water quality.

Other insects
Water boatman & backswimmer

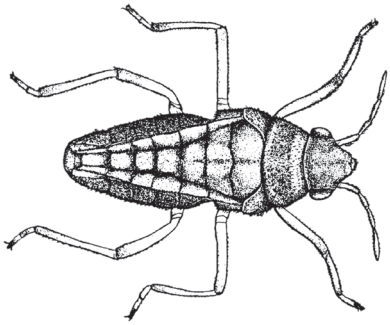


Phylum: Arthropoda
Class: Insecta **Order**: Hemiptera
Families: Corixidae, Notonectidae
Genera: *Sigara*, *Diaprepocoris*, *Anisops*
Max size: 6 mm **Score**: 5

Features to look for: Backswimmers swim upside down; light coloured on one side, dark on the other. Water boatmen are flattened, swim upright; mottled black and golden-yellow. Both have large eyes and oar-like legs for swimming.

Where found: Common in ponds, lakes and margins of slow-flowing streams.

Other insects
Water treader

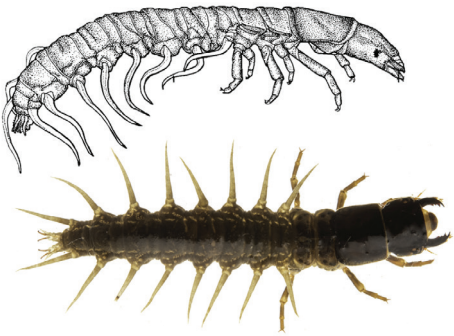


Phylum: Arthropoda
Class: Insecta **Order**: Hemiptera
Families: Mesoveliidae, Veliidae
Max size: 3 mm **Score**: 5

Features to look for: Very small, fast-moving, dark-brown or black.

Where found: On the surface of still water or at the margin of streams, particularly among floating or emergent vegetation where they scavenge for dead or dying invertebrates.

Other insects
Dobsonfly



Phylum: Arthropoda **Class**: Insecta
Order: Megaloptera **Family**: Corydalidae
Genus: *Archichauliodes*
Max size: 38 mm **Score**: 7

Features to look for: Large, dark, with a shiny blackish head and thorax; eight leg-like gills along the abdomen making it look like a centipede; powerful jaws can give a painful bite; crawl actively and swim with an undulating movement.

Where found: Common in gravel or leaf-packs in stony-bottom streams of medium to high quality.

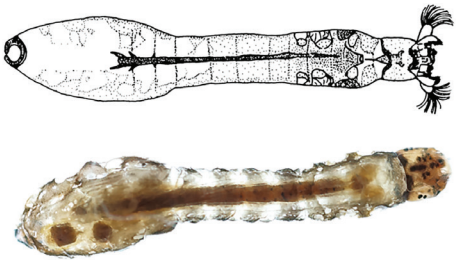
True flies
Cranefly

Phylum: Arthropoda **Class**: Insecta
Order: Diptera **Family**: Tipulidae
Max size: 40 mm **Score**: 5

Features to look for: Long and thin; light green to greyish-brown, some covered with golden hairs; actively twist and turn when disturbed; head is often retracted into body; some have ridges on the body that aid movement; tail end may have lobes (sometimes hairy).

Where found: Decaying logs and plant material, seepages and fast-flowing stony streams of low to high water quality.

True flies
Sandfly

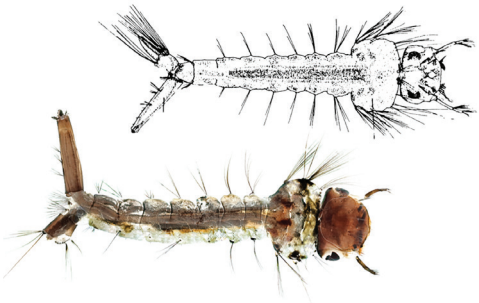


Phylum: Arthropoda
Class: Insecta **Order**: Diptera
Family: Simuliidae **Genus**: *Austrosimulium*
Max size: 5 mm **Score**: 3

Features to look for: Slender body with tail end swollen into a bulb; fan-shaped mouthparts resembling antennae on a well-developed head capsule; quickly attach to surfaces and stand upright.

Where found: Widespread, from degraded lowland waterways to pristine forest streams; on trailing vegetation or the top of rocks in running water.

True flies
Mosquito



Phylum: Arthropoda **Class**: Insecta
Order: Diptera **Family**: Culicidae
Max size: 4 mm **Score**: 3

Features to look for: Distinctive swollen segment behind the head and a breathing tube attached to the rear end; larvae swim with a wriggling motion; comma-shaped pupae swim with a tumbling motion at the water surface.

Where found: Still water or the margins of slow-flowing streams; can reach very high numbers in stagnant ponds and drains.

True flies
Midge

Phylum: Arthropoda **Class**: Insecta
Order: Diptera **Family**: Chironomidae
Max size: 20 mm **Score**: 2

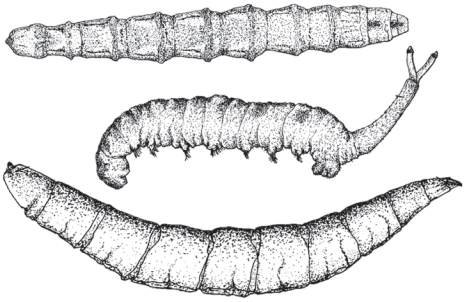
Features to look for: Long and slim with a distinct head; various colours including semi-transparent, white, green, orange, or red; can move by rapidly flicking from side to side.

Where found: Often in large numbers, in nutrient-rich waterways, on the tops of rocks; can also be abundant on submerged plants or in silt/mud in low-oxygen waters.

True flies
Other fly larva

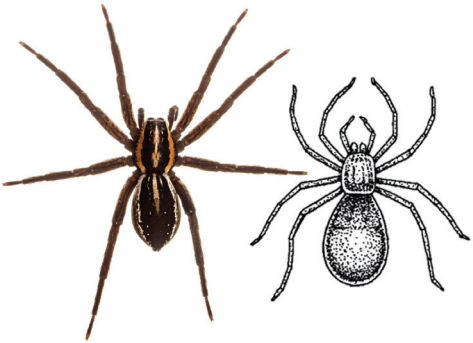
Phylum: Arthropoda
Class: Insecta **Order**: Diptera
Max size: 17 mm **Score**: 3

Features to look for: Various species; many species have maggot-like larvae with no visible head, some with pointed rear end while others have either a long tube (siphon), hairs or small lobes (for breathing); all are legless but some have creeping welts to aid in movement.



Where found: Various aquatic habitats from low to high quality streams.

Arachnids
Dolomedes spider

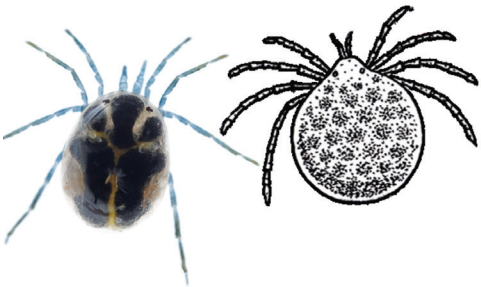


Phylum: Arthropoda
Class: Arachnida **Order**: Aranea
Family: Arachnida **Genus**: *Dolomedes*
Max size: Leg span 75 mm **Score**: 5

Features to look for: Large, fast-moving; body pale brown or greyish, with white stripes on abdomen and sides covered with short, velvety hairs that trap air when submerged; legs splayed outwards when resting.

Where found: Along the margins of medium to high quality streams; can run across or dive below the water surface.

Arachnids
Mite

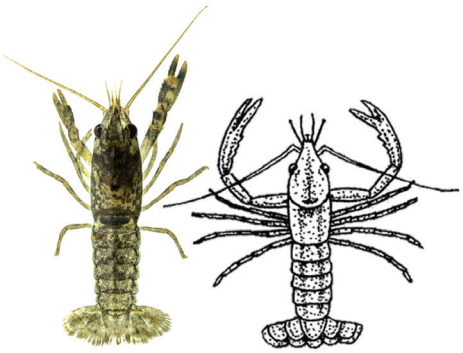


Phylum: Arthropoda
Class: Arachnida **Subclass**: Acari
Max size: 3 mm **Score**: 5

Features to look for: Very small, eight-legged, spider-like; usually have round bodies and can crawl or swim fast; some are brightly coloured.

Where found: In a range of water qualities in streams, lakes and ponds where they can be very abundant; parasitic species can be found attached to other freshwater invertebrates.

Crustaceans
Crayfish

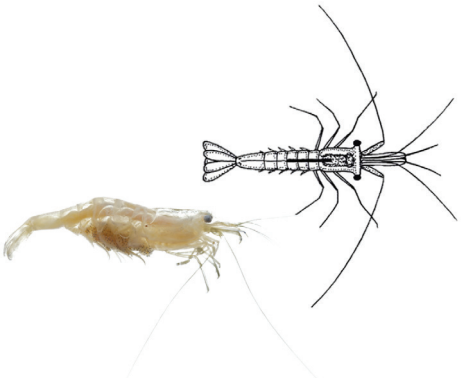


Phylum: Arthropoda
Order: Decapoda **Family**: Parastacidae
Genus: *Paranephrops*
Max size: 120 mm **Score**: 5

Features to look for: Lobster-like, with eight walking legs and two large claws (pincers); can walk slowly or shoot quickly backwards with a tail flick.

Where found: Lake and stream beds; under gravel or submerged wood, in muddy bottoms or among aquatic plants.

Crustaceans
Shrimp



Phylum: Arthropoda
Order: Decapoda **Family**: Atyidae
Genus: *Paratya*
Max size: 25 mm **Score**: 5

Features to look for: Semi-transparent body, 10 walking legs, very long antennae, lack claws (pincers).

Where found: Mostly coastal lowland and bush-clad streams with access to the sea.

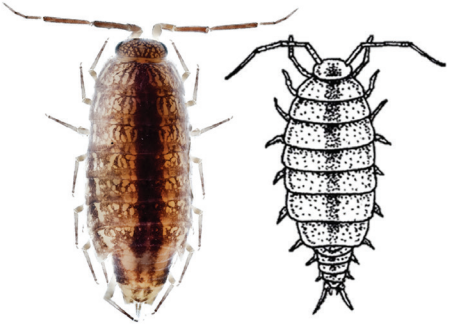
Crustaceans
Amphipod

Phylum: Arthropoda
Order: Amphipoda
Max size: 13 mm **Score**: 5

Features to look for: Like "sand hoppers", are laterally (sideways) compressed; white and eyeless, mottled or darkly coloured; can move fast either by crawling or swimming on their sides.

Where found: Can be abundant in slow-flowing, soft-bottom streams with aquatic plants of low to medium water quality.

Crustaceans
Isopod

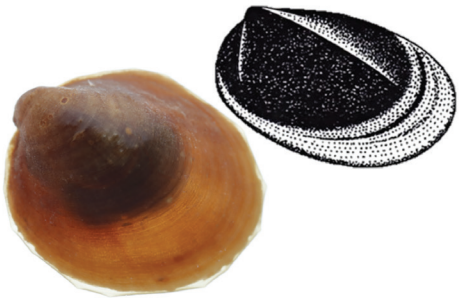


Phylum: Arthropoda
Order: Isopoda
Max size: 10 mm **Score**: 5

Features to look for: Resemble woodlice (slaters) with flattened body; mottled grey or brown patterning; normally crawl but some species can swim fast.

Where found: Semi-aquatic species in bankside vegetation of slow-flowing bush-clad streams; other species are found in lowland coastal streams; estuarine isopods may enter tidally influenced streams.

Molluscs
Limpet

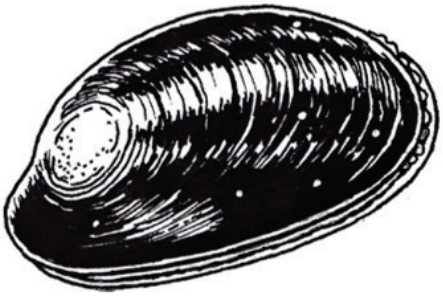


Phylum: Mollusca **Class**: Gastropoda
Families: Latiidae, Planorbidae
Genera: *Latia, Ferrissia*
Max size: *Latia* 12 mm, *Ferrissia* 6 mm **Score**: 7

Features to look for: *Latia* has a robust brown to black shell, the smaller ***Ferrissia*** has a thin and fragile semi-transparent to yellow-brown shell; *Latia* releases a glow-in-the-dark slime when disturbed.

Where found: *Latia* (North Island only) prefers larger stones in fast-flowing streams; Ferrisia is often found on aquatic plants in slow-flowing streams.

Molluscs
Mussel/Kakahi



Phylum: Mollusca **Class**: Gastropoda
Family: Sphaeriidae
Max size: 4 mm **Score**: 3

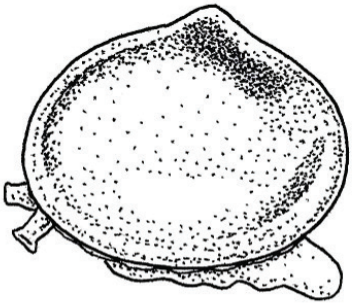
Features to look for: Large, oval bivalves with thick, dark shells as adults; juveniles usually have brown-yellow to greenish shells.

Where found: Common in lakes and under the banks of slow-flowing, soft-bottom streams; larvae attach themselves to native fish as part of their development and dispersal.

Molluscs
Fingernail clam

Phylum: Mollusca
Class: Gastropoda **Family**: Sphaeriidae
Max size: 4 mm **Score**: 3

Features to look for: Small, semi-transparent to whitish or discoloured, resembling miniature clams.

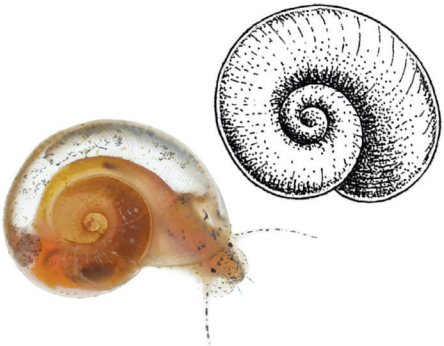


Where found: Common on the beds of lakes, ponds, wetlands and silty, slow-flowing streams of low to medium water quality.

Molluscs
Flat spiral snail

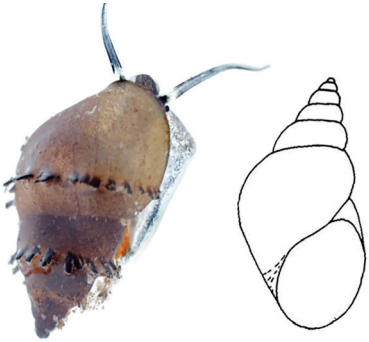
Phylum: Mollusca **Class**: Gastropoda
Family: Planorbidae **Genus**: *Gyraulus*
Max size: 4 mm **Score**: 3

Features to look for: The semi-transparent to yellow-brown shell is thin and coiled flatly (in a plane) .



Where found: Common in slow-flowing, unshaded streams with algae or found attached to aquatic plants in streams of low to medium water quality.

Molluscs
Mud snail

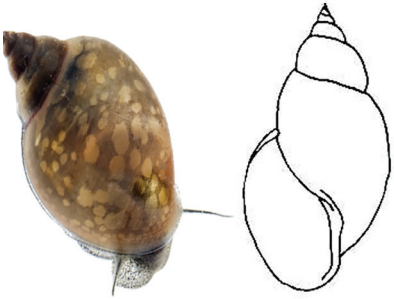


Phylum: Mollusca **Class**: Gastropoda
Family: Tateidae **Genus** *Potamopyrgus*
Max size: 12 mm **Score**: 4

Features to look for: Black or light brown; shell may have small spines; shell opens on the right side when oriented as in drawing; an operculum (protective disc) covers the shell opening when the animal withdraws.

Where found: Lakes, ponds, streams; can be very abundant in nutrient-rich waters.

Mollusc
Left-hand snail



Phylum: Mollusca
Class: Gastropoda **Genus**: *Physa*
Max size: 12 mm **Score**: 3

Features to look for: Light to dark brown, mottled and semi-transparent shell; no operculum covering the shell opening when the snail withdraws; shell opens on the left side when oriented as in drawing.

Where found: Mostly on stones in nutrient rich waters water bodies; capable of breathing air allowing them to live in low-oxygen waters.

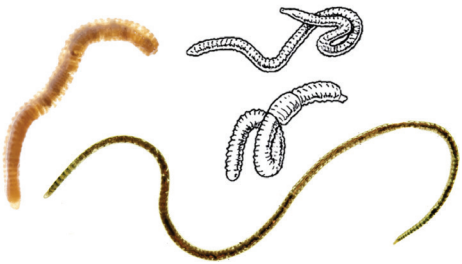
Worms
Leech

Phylum: Annelida
Class: Clitellata **Subclass**: Hirudinea
Max size: 150 mm **Score**: 3

Features to look for: Segmented body with a suction disc at the rear end; moves by "looping" (like a caterpillar), most are small (6–15 mm), pale and almost leaf-shaped when contracted; one species is large with yellow and black longitudinal stripes.

Where found: Common in ponds, lakes and slow-flowing, weedy streams.

Worms
Segmented worm



Phylum: Annelida
Class: Clitellata **Subclass**: Oligochaeta
Max size: 60 mm **Score**: 1

Features to look for: Worm-like appearance, range in sizes from tiny threads to more typical "earthworm" size and features; white, red or brownish; move by extending and contracting the body.

Where found: Mud or silt on the bed of lakes, ponds, wetlands and streams; may be very abundant in degraded lowland streams.

Worms
Flatworm

Phylum: Platyhelminthes
Order: Tricladida
Max size: 10 mm **Score**: 3

Features to look for: Small, grey-brown and flat; generally have "eyes" and sometimes "ears" that give the body an arrow shape; very soft and flexible; move by gliding.

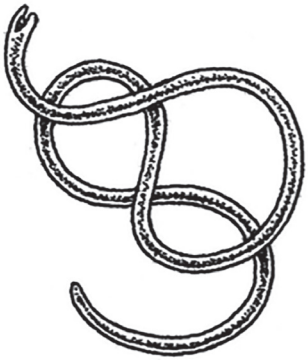
Where found: Various aquatic environments from low to high water quality.

Worms
Horsehair worm

Class: Nematomorpha
Family: Chordodidae
Max size: 200 mm **Score**: 6

Features to look for: Long and very thin (hair-like), brown-black, unsegmented, firm, smooth body; often tie themselves in knots, hence also known as Gordian worms.

Where found: Larvae are internal parasites of arthropods; adults in a range of damp environments including puddles, lakes and streams.



NIWA
Taihoro Nukurangi

Super-quick
macroinvertebrate community health-check

Most animals have six legs (legs may be hidden inside a straight or curved case). Some may look like centipedes. Some have two or three hair-like tails. Some move fast and/or swim.	**Health: good**
A mix of "healthy" and "unhealthy" stream animals, including some with six or more legs.	**Health: fair**
Most animals have no legs (may be worm-like or have a shell like a snail or clam) and no hair-like tails. Most move slowly.	**Health: poor**

SHMAK Macroinvertebrate Key

This key helps you identify your macroinvertebrate by asking you a series of questions about its body parts and movement. Each question is numbered in a box at the top left corner.

To use the key, start at question 1. Your answer to each question takes you to another question, making a path towards the correct identification. If you think you made a mistake you can go back. The box at the top right of each question tells you how to get back one step.

At the end of each path is the name of one or a few macroinvertebrates in blue font. To confirm your identification or make your final selection, look up the name(s) in the next section of this guidebook, where you will find longer descriptions with photos and drawings.

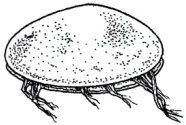
Have fun!

Small animals

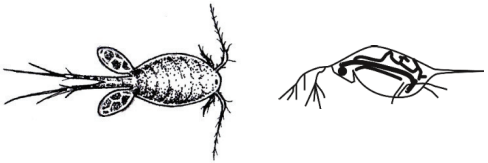
If your animal is <2 mm long, see if it matches one of these. If not, it may be the young of another animal in this key

mite

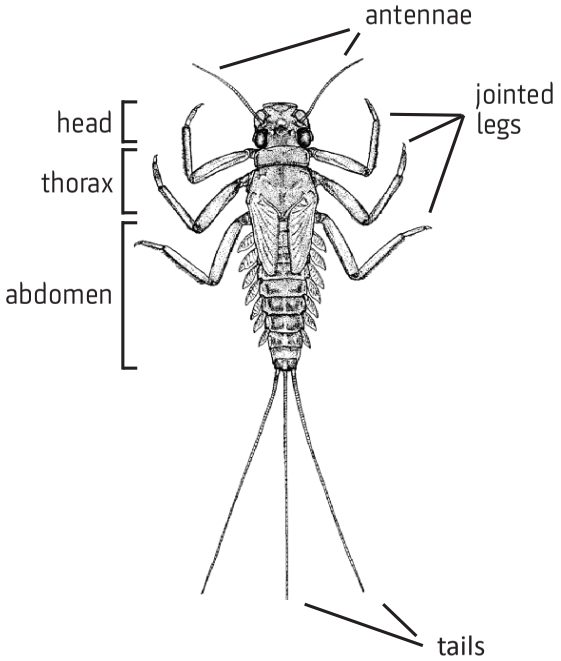
seed shrimp



water flea



Body parts of a freshwater insect



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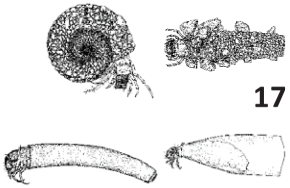
1

Has a shell
Molluscs **2**

Has a portable case (straight, curved, or coiled and stony)
Caddisflies



17

No shell or case (may have hard exoskeleton like a crab or beetle) **4**

2 **Back to 1**

Single shell **3**

Double shell **Mussel (kakahi)**
Fingernail clam

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3 **Back to 2**

Shell with opening on right side

Mud snail

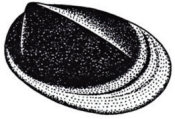
Shell with opening on left side

Left-hand snail

Shell with flat spiral

Flat spiral snail

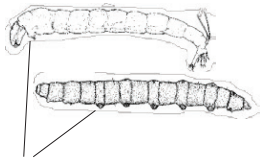
Shell without spiral



Limpet

4 **Back to 1**

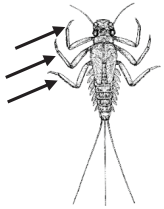
No jointed legs (may have fleshy prolegs behind head or along abdomen)



fleshy prolegs

5

Six or more jointed legs. Look closely, some may be hard to see.



9

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5 **Back to 4**

Has tails or obvious head **True flies**	**6**
No tails or obvious head	**8**

6 **Back to 5**

Head not obvious	**7**
Has obvious head	**Sandfly** **Mosquito** **Midge** **Other fly larva**

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7 **Back to 6**

Thrashing movement	**Cranefly**
Slow or crawling movement	**Other fly larva**

8 **Back to 5**

Has a sucker at each end of body	**Leech**
No suckers. Has obvious ‘eyes’ and ‘ears’ 	**Flat worm**
No suckers, eyes or ears. Body segmented	**Segmented worm**
No suckers, ears or eyes. Body very long, not segmented	**Horsehair worm**

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9 | **Back to 4**

More than six legs	**10**
Has six legs **Insects**	**11**
Has six legs and leg-like gills. Looks like a centipede	**Dobsonfly**

10 | **Back to 9**

Has eight legs. Spider-like. **Arachnids**	**Dolomedes spider** **Mite**
More than eight legs **Crustaceans**	**Crayfish (koura)** **Shrimp** **Amphipod** **Isopod**

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11 **Back to 9**

Three tails (may break off, or middle tail may be short)	**12**
Two tails	**Green stonefly** **Other stonefly** **Beetle larva**
No tails	**13**

12 **Back to 11**

Tails leaf-like. No gills along abdomen	**Damselfly**
Tails like long hairs or filaments. Gills along abdomen **Mayflies**	**Flat mayfly** **Swimming mayfly** **Spiny mayfly** **Tusked mayfly**

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13 **Back to 11**

Can't see body segments	**Adult beetle** **Water boatman/ back swimmer** **Water treader**
Can see body segments	**14**

14 **Back to 13**

Has visible hooks at tail end of body **Caddisflies**	 **15**
No visible hooks at tail end of body	**16**

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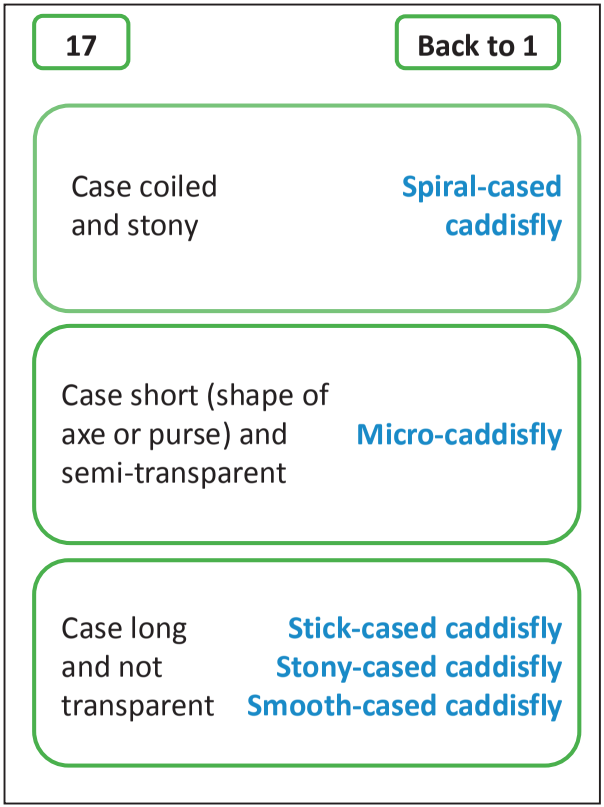
15 **Back to 14**

Has hairy gills under abdomen	**Net-spinning caddisfly**
No gills. Front legs are pincers	**Free-living caddisfly**
No gills or pincers	**Messy-net caddisfly**

16 **Back to 14**

Has short stubby wing ‘buds’	**Dragonfly**
No wings or wing ‘buds’	**Beetle larva**


17
Back to 1
Case coiled and stony
Spiral-cased caddisfly
Case short (shape of axe or purse) and semi-transparent
Micro-caddisfly
Case long and not transparent
Stick-cased caddisfly
Stony-cased caddisfly
Smooth-cased caddisfly