BugWise

Invertebrate Guide

A tool for studying Australian invertebrates

Environmental TRUST

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Introduction

The Invertebrate Guide was created by Matthew Bulbert and David Britton.

Illustrations were prepared by Andrew Howells.

Images on title page were provided by Matthew Bulbert.

An electronic version is available at www.australianmuseum.net.au/bugwise. This version has coloured pictures of groups.

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Scope of the document:

BugWise Invertebrate Guide has been prepared by Australian Museum staff working on invertebrate behaviour, taxonomy and ecology. It has been designed to help people who need to identify invertebrates. Unlike other guides of similar nature, extensive notes on behaviour and common misidentifications for each invertebrate group are also provided. An advantage of this added information is that it potentially allows identification of invertebrate groups without the need to collect them.

Invertebrate guide deals with common invertebrate groups found on land including some of the lesser encountered groups such as Webspinners and Stylops.

Each invertebrate group has been set out in the following format:

1) What do (e.g. Beetles) look like?
This lists attributes used to identify the group. Common headings allow easy comparisons to be made between groups. Scientific 'jargon' has been avoided, but where it has been used, definitions (in brackets) immediately follow.

2) Where are (e.g. Beetles) found?
This lists places where the group is likely to be found when searching for them. This might be places where most time is spent foraging for food or nesting.

3) What do (e.g. Beetles) do?
This lists behavioural traits generally associated with the group. Focus is on behavioural characteristics that can be used to identify members of the group with the naked eye. Unique traits are also included. ***We hope this section will inspire users to read more about invertebrates and encourage students to undertake behavioural studies since so little is known about most invertebrate species.*** Without natural history studies, effective conservation planning is difficult.

4) Atypical (e.g. Beetles)
Generally, this lists members within a group that do not share one of the major characteristics that define the group as a whole. Instead, the weight of minor characteristics provides clues to where it belongs. This section also highlights some groups that have characteristics that are key features used to identify other invertebrate groups.

5) What looks similar?
This lists invertebrates that might be mistaken as belonging to the group in question. Possible cause for misidentification and characteristics that are important for separating the groups are also provided.

If you wish to comment on this *Invertebrate guide,* please visit our site at www.australianmuseum.net.au/bugwise and either email us or post a comment on the forum.

Happy Hunting!
The BugWise Team

Ants (Order Hymenoptera, family Formicidae)

What do ants look like?

Size:
1 mm - 50 mm in length.
Body:
Elongate and constricted at 'waist'.
Abdomen swollen, sometimes greatly.
One or two knobs at waist. These knobs sometimes are reduced or flattened.
Appears hard.
Antennae:
Thread-like and distinctly elbowed.
Segment closest to body much longer (at least five times as long) than any of the remaining segments.
Eyes:
Range from large and well separated to small.
Nocturnal or litter dwelling species may have reduced eyes or no eyes at all.
Mouthparts:
For chewing or munching.
Held in front at rest.
Wings:
Two pairs if present.
Only reproductives have wings, which are sometimes lost after mating and before constructing the founder nest.
Both pairs membranous, clear and with few veins and cells.
At rest wings are held flat to the body and almost entirely overlapping.
Limbs:
Six slender legs.
Abdomen tip:
Cerci (tails) absent but some have a prominent stinger.

Where are ants found?

- They construct nests that are highly variable in structure and complexity. They can consist of simple chambers under rocks and other objects, through to extensive networks of chambers extending deep into the soil.
- Some have a nomadic lifestyle, often relocating temporary nests found amongst leaf litter.
- In the trees they tend to use and partly modify existing burrows and crevices, such as beetle holes. Some specialised ants construct nests by joining leaves with silk.

- Often found in and around houses.

What do ants do?

- They are highly social, that is, they form colonies where individuals share the responsibility of providing care for the young.
- They often have distinct castes such as queens and kings, workers and soldiers, which have different roles in the nest. Workers are generally unable to reproduce, with only queens laying eggs.
- Depending on the species they will forage in groups, or sometimes as individuals.
- When disturbed workers tend to runaway from danger. Soldiers often confront the disturbance and may react by biting, squirting acidic chemicals or stinging.
- They often move in a zigzag motion searching for food items. Some species of ants run in lines, often on paths.
- Adult ants feed on liquids but larvae will feed on processed solids. The majority of the liquid diet comes from sugar-rich secretions from plants, other invertebrates or from their larvae that accept plant and animal tissue, which is then regurgitated and presented in a liquefied form to the adults.
- Many ant communities form special partnerships with plants and other insects. The ants protect, tend or even feed their partners, in return they are supplied with sugar-rich secretions.
- They are important for dispersing seed and modifying soil and plant community structures.
- They are active during the day or night but some may have a preference for certain time periods.

Atypical ants

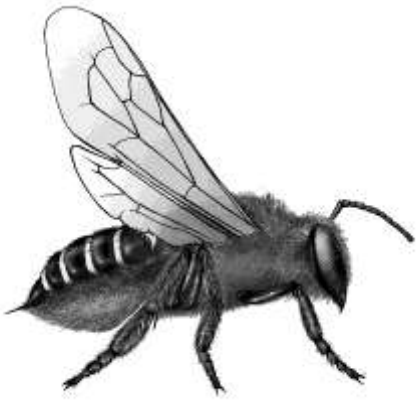
- Some groups of Australian ants such as *Tapinoma* and *Technomyrmex* do not have knobs at the waist. They are however very ant like and very unlikely to be mistaken with anything else.

What looks similar?

- A number of wasp families contain species that are excellent ant mimics. Good examples are the velvet ants (Order Hymenoptera, family Mutillidae) and the flower wasps (family Tiphiidae). Both families have wingless females that look like ants. Wasps can be separated from ants by the lack of knobs at the waist and no distinctly elbowed antenna with long first segments. However, some mimics are amazingly similar to ants and may appear to have these features. These can be very difficult to distinguish even for the experts, in this instance they maybe distinguished by the lack of particular gland structures and the presence of felt lines along the abdomen. Unfortunately these attributes can only be observed using a microscope.
- Some spiders look and behave like ants. On closer examination they maybe distinguished from ants by having only two major body regions and eight legs.
- Some true bugs are fantastic mimics of ants but generally they can be separated by sucking tube mouthparts, a lack of constriction at waist and no elbowed antennae. Some may have a pseudo-constriction at the waist, in this case they do not display the one or two knobs.

Bees (Order Hymenoptera, superfamily Apoidea)

What do bees look like?



Size:
2 mm - 39 mm in length.
Body:
Stout or elongate and constricted at the 'waist' (not always obvious).
Body has forked hairs.
Can appear hard or soft and fluffy.
Antennae:
Thread-like and distinctly elbowed. First segment much larger than the others.
Eyes:
Large to very large. Well separated in females and close together in males.
Mouthparts:
Used for cutting and lapping, held downwards at rest.
Wings:
Two pairs.
Both pairs are membranous and clear with few veins and cross-veins - but have visible cells.
Veins do not extend to wing margin.
Hindwing always shorter and narrower than forewing.
Fore- and hindwing coupled tightly by a row of minute hooks (hamuli).
At rest wings are held flat over the body, overlapping in some species.
Limbs:
Six legs.
Hindlegs are enlarged and have forked hairs.
Abdomen tip:
Cerci (tails) absent and they occasionally have a stinger.

Where are bees found?

- On plants especially around flowers.
- Holes, hollows or burrows in wood, soil, plant stems and rock crevices.
- Some species can be found in nests of unrelated bee species.

What do bees do?

- Most bees live alone in nests. However, some nest alongside each other in small to large groups occupying the nest similar to flats in an apartment block. A few bees are truly social, forming colonies where individuals share the

responsibility of providing care for the young. Social bees have a queen bee, reproductive males and a large number of sterile workers.

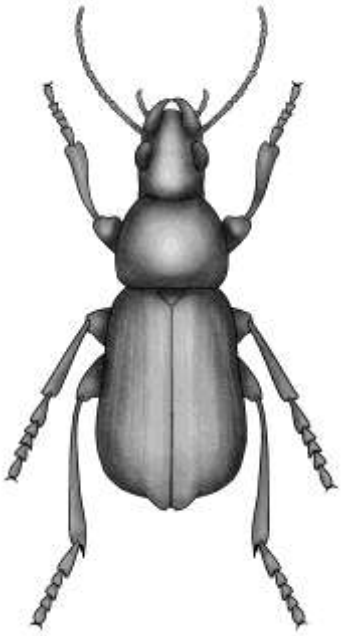
- When disturbed bees fly away, sting or swarm (rare). Most bees sting as a last resort, although true social bees can become aggressive and attack when their hive is threatened.
- They are strong fliers. Many bees are capable of flying long distances as well as hovering. They tend to buzz loudly when they fly.
- Bees hold their antennae in front when walking.
- The majority of bees are pollen or nectar feeders.
- They provide food for their young. Bees transfer pollen using special arrangements of hairs that form pollen baskets on their hindlegs and the underside of the abdomen. They may also ingest pollen and nectar, then regurgitate it once they are back at their nest.
- They are extremely important plant pollinators.
- They are mostly active during the day. Many species have been observed sleeping in groups at night.

What looks similar?

- Wasps are closely related to bees (in the same Order) and so share many common features. Wasps can be distinguished from bees by having one or more of the following: an obvious constriction at the waist; fewer hairs; hindlegs not enlarged to form baskets of hairs for carrying pollen; very few veins and cross-veins on the wings; and long antennae.
- Sawflies are closely related to bees (in the same Order) and so share many common features. Sawflies can be distinguished from bees as they have no constriction at the waist, lack enlarged hindlegs and forked hairs, have a saw-like spike extending from the abdomen; have more veins and cross-veins on the wings.

Beetles (Order Coleoptera) includes weevils

What do beetles look like?



Size:
- 0.4 mm - 80 mm in length.

Body:
- Greatly variable in shape.
- Pronotum (segment behind head) usually large.
- Generally appears hard.

Antennae:
- Form and length highly variable.

Eyes:
- Variable ranging from so large that they meet in the middle to no eyes at all.
- For most species are large and well separated.

Mouthparts:
- For chewing or munching.
- Held in front at rest.
- Some very small beetles have mouthparts forming a sucking tube, while weevils have mouthparts on the end of a nose.

Wings:
- One or two pairs if present, though most have two pairs.
- Forewings (elytra) hardened and rigid, cloudy and with no visible veins.
- Hindwings are membranous and clear.
- At rest, forewings are held flat over body, meeting at midline.
- Hindwings are usually folded and hidden.
- The wings generally cover the abdomen but some species of beetle have shortened wings.
- Some flightless species have the forewings fused together so it does not appear that there are any wings at all.

Limbs:
- Six legs.

Highly variable depending on the lifestyle of the beetle, for example some beetles have strong slender legs for running, while others such as dung beetles have spade-like legs for digging.

Abdomen tip:

Cerci (tails) absent.

Where are beetles found?

- Practically anywhere including marine environments.
- In houses amongst foodstuffs, furnishings and wooden objects.

What do beetles do?

- They are solitary or rarely form groups. They may be found in groups on localised food sources or when mating.
- A few beetles are external or internal parasites of other insects while some such as rove beetles are parasitoids.
- When disturbed they might remain still, run, fly, clamp down on surfaces, drop to ground, burrow, jump, make noise or spray chemicals.
- Beetle forewings are not used for flight - so they may be held in place, upright or out to the sides.
- They are strong fliers capable of covering long distances.
- Their feeding habits are very diverse.
- Many are experts at camouflage. Some have colours, patterns, structures or behavioural traits that allow them to blend in with their surroundings.
- Some look and behave like other insects such as ants, wasps and termites.
- They are active during the day or night.

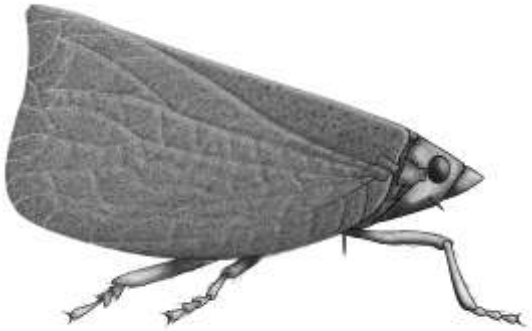
What looks similar?

- Cockroaches are often confused with beetles. They can be distinguished from beetles as their forewings overlap rather than meet. If the wings are absent, then cockroaches can be distinguished by the presence of cerci (tails) and a pronotum (segment behind head) that overhangs the body and the head.
- Some groups of True bugs look very much like beetles. All true bugs can be distinguished by their mouthparts, which are tube-like for sucking. Otherwise true bugs can be separated from beetles by their forewings, which tend to overlap and are partially see-through.
- Earwigs can be confused with rove beetles (family Staphylinidae). Rove beetles have small cloudy forewings with clear membranous hindwings folded underneath, similar to earwigs. But they lack the fully developed abdominal forceps as seen in earwigs.
- Flies can be confused with wood-boring beetles (family Lymexylidae). The forewings of these wood-boring beetles are sometimes reduced to tiny pads and the hindwings are fully exposed which gives them the appearance of having only one pair of wings. Flies have a reduced hindwing and a fully functional forewing.

Cicadas and hoppers (Order Hemiptera, suborder Auchenorrhyncha)

Includes plant, tree, leaf and froghoppers, and spittlebugs

What do cicadas and hoppers look like?



Plant hopper.

Size:
- 4 mm - 60 mm in length.
- Wingspan up to 140 mm.

Body:
- Generally widest at wing attachment (wide shoulders), abdomen tapered or column-like.
- Pronotum (segment behind head) maybe enlarged or modified.
- Head held rigid against pronotum hence little movement.
- Appears hard.

Antennae:
- Bristle-like, first segment is swollen and varies in length between species.
- Usually very small but can be as long as the body.

Eyes:
- Large and well separated.
- Often two or three ocelli (small simple lenses) between the eyes.

Mouthparts:
- For piercing and sucking, do not have visible palps (mouthparts that look like a chain of beads).
- A sharply pointed tube comes from the back of the head, thus the tube appears to originate from between the front legs; sometimes difficult to see.

Wings:
- Two pairs.
- Both pairs membranous and clear or partially see-through.
- Both have a moderate to numerous cross-veins that form square to rectangular cells.
- Hindwing shorter and wider than forewing.
- At rest wings held tent-like over body.

Limbs:
- Six legs slender with many spines.
- Hindleg of hoppers usually modified for jumping.

Abdomen tip:

Cerci (tails) absent.
Some fulgoroid leafhoppers have long tail filaments that are made from a waxy substance (particularly nymphs). These sometimes look like antennae and cause observers to think the abdomen tip is the head of the insect.

Where are cicadas and hoppers found?

- On plants and bark of trees.

What do cicadas and hoppers do?

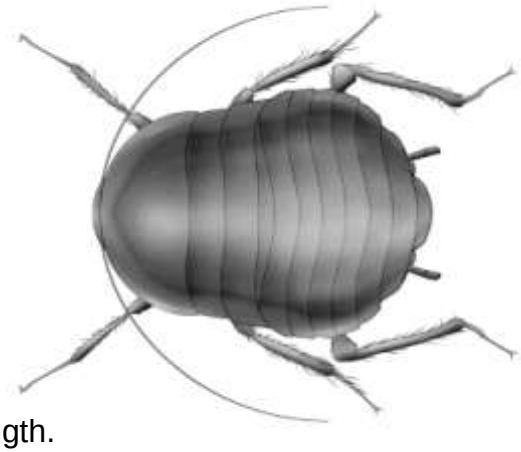
- They are solitary or live in groups.
- When disturbed they usually jump (hoppers only), fly away or move out of the line of sight; some may also make noise.
- They are generally strong fliers some capable of covering large distances.
- Primarily feed on sap.
- Some such as cicadas are sound producers.
- Many cicadas and hoppers are experts of camouflage. They may use colouration and patterning to blend in with their surroundings.
- Many hoppers have partnerships with ants where the hopper offers honeydew (a sugary excretion) to the ant and in return the ants provide protection.
- They are active day or night.

What looks similar?

- Moths can be confused with some leafhoppers in the families Flatidae and Ricaniidae due to their flight, wing pigment and tubular mouthparts. However moths have overlapping scales on at least the body, and their mouthparts are nearly always coiled or at least strongly curved in live and dead specimens. Leafhoppers lack scales and have straight tubular mouthparts.
- Beetles can be confused with some leafhoppers that have the wings covered by the rearward extension pronotum (segment behind head) for example Treehoppers (Family Membracidae). The functional wings are still visible under this extension.

Cockroaches (Order Blattodea)

What do cockroaches look like?



Size:
3 mm - 70 mm in length.

Body:
Oval, flattened as if pressed from above. Segment behind head shield-like, overhanging body and often covering base of head. Appears hard.

Antennae:
Thread-like, length variable.

Eyes:
Large and well separated. Cave-dwelling cockroaches may have reduced or no eyes.

Mouthparts:
For chewing or munching. Held downwards at rest.

Wings:
Two pairs if present. Forewings hardened and cloudy. Hindwing membranous, clear.
Both wings lack cross veins and are of similar size.
At rest, wings are held flat to body, with forewings overlapping, and hindwing hidden.

Limbs:
Six legs with many spines. Slender designed for running.

Abdomen tip:
Two cerci (tails) never longer than the body and have one or more segments.

Where are cockroaches found?

- They are adaptable to most environments.
- The majority of Australian natives are found amongst leaf litter, under bark and rocks, and within rotting logs and crevices.
- Others live in trees or underground in burrows or caves.
- Introduced species are often found in the house.

What do cockroaches do?

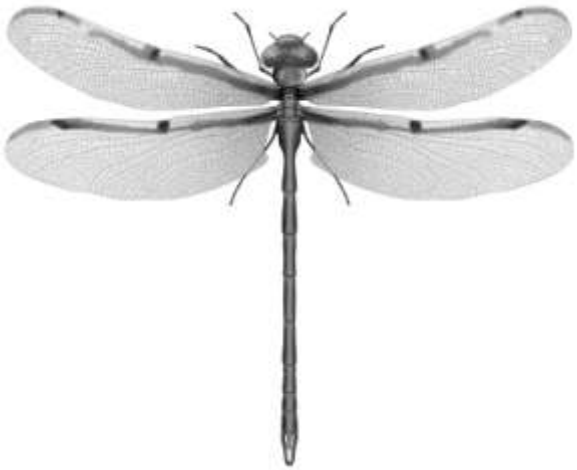
- They often group together sometimes in large numbers, but are usually solitary.
- When disturbed they runaway, usually undercover and fast; rarely fly.
- They are weak fliers, usually flying in short bursts.
- Introduced species feed on plant or animal debris; native species primarily feed on plant debris.
- Most are active at night, however some do openly bask in sunlight.

What looks similar?

- Beetles can be distinguished from cockroaches by their hardened forewings. These forewings, or rather elytra, never overlap but meet in the middle. Beetles also never possess cerci.

Dragonflies and Damselflies (Order Odonata)

What do dragonflies and damselflies look like?



Dragonfly.

Size:
- 20 mm - 150 mm in length.

Body:
- Widest at wing attachment (wide shoulders), abdomen column-like.
- Appears soft and fragile.

Antennae:
- Short and hair-like.

Eyes:
- Large and bulging.
- Well separated (damselflies) or nearly touching (dragonflies).

Mouthparts:
- for chewing or munching; held slightly forward at rest.

Wings:
- Two pairs.
- Both pairs are membranous, clear and similar in length. In dragonflies the hindwing is generally wider.
- Both pairs have numerous cross-veins forming many cells.
- At rest dragonflies hold their wings outstretched with all four wings visible. In contrast, damselflies hold their wings upright, above their body and usually pressed flat together.

Limbs:
- Six legs, short with strong bristles.
- Fore- and midlegs held out from body and bent at elbows.

Abdomen tip:
- Two short cerci (tails).
- Sometimes modified as claspers in males which are used to hold onto the female during mating.

Where are dragonflies and damselflies found?

- Males often found near water perched on vegetation, rocks or in the air.
- Females may be found away from water.

What do dragonflies and damselflies do?

- They are solitary, though it is not uncommon to see large numbers perched on structures like fences.
- When disturbed they fly away.
- Dragonflies are extremely strong fliers; capable of high speeds and flight in all directions. Damselflies are not so active.
- Some are perchers that tend to make short flights and return to a preferred perch, others are fliers that tend to spend the majority of their active periods on the wing.
- Males tend to be territorial.
- They are all predators that prey primarily on flying insects, taken from the air or as they land on vegetation.
- They are mostly active during the day, though some are primarily active around twilight and few are active at night.

What looks similar?

- Alderflies and dobsonflies can be distinguished by wings with fewer cells, which they hold tent-like over their body. They also have well-developed antennae and their abdomen is very soft. Alderflies or dobsonflies also tend to be weak fliers and active during the night.
- Lacewings can be distinguished by the forked veins along their wing margin. Lacewings also hold their wings tent-like over their body. Lacewings also have well-developed antennae and tend to be weak fliers.

Flies including mosquitoes (Order Diptera)

What do flies look like?

Size:
1 mm - 75 mm in length.
Body:
Highly variable from long and skinny to short and stout.
Appears soft or hard.
Antennae:
Generally short.
Variable in appearance for example some are thread-like, antler-like, feather-like, or hair-like with or without a swollen base.
Eyes:
Large and either well separated or touching; rarely small or absent.
Mouthparts:
Often absent, or reduced and non-functional.
Functional mouthparts are tube or spongelike adapted for lapping or sucking as well as abrading or piercing surfaces.
Held downward at rest.
Wings:
One pair of functional wings if present.
Forewings membranous, clear with few cross-veins forming long curving cells.
Hindwings replaced by club-like structures called halteres. The halteres are used for balance.
At rest wings are held in a variety of ways depending on the species.
Limbs:
Six legs, usually long and slender.
Abdomen tip:
Cerci (tails) absent.

Where are flies found?

- In most places on land and air, in both marine and freshwater environments.
- Inside galls.
- In the house often associated with food and waste.

What do flies do?

- They are solitary but they often group together around food sources and form swarms associated with mating behaviour.
- Some are external parasites.
- When disturbed they usually fly away, fly and land soon after, or fly away and return soon after. Some may run particularly parasitic flies.
- They are generally strong fliers with a rapid wing beat. Many are capable of hovering and most fly with a sharp weaving flight. Some such as crane flies and mosquitoes are much slower flapping fliers that float from side to side like a falling feather. They also buzz or whine in flight.
- They feed on liquid or soluble products such as water, animal and plant secretions, liquids from decomposition, sugars solubilised by salivary secretions, and bodily fluids such as blood.
- Some form galls (abnormal outgrowths of plant tissue).
- They are active any time, but some prefer day or night

What looks similar?

- Mayflies maybe confused with flies as they have small hindwings or they may only have one pair of wings. Mayflies maybe distinguished as they have two or three long tail filaments and a wing with numerous cross-veins forming many cells.
- Wasps, bees or sawflies, unlike flies, have two pairs of membranous wings. However these wings are usually attached with microscopic hooks so that they look like a single pair.
- Male scale insects have only one pair of functional wings, with the other pair reduced to haltere-like structures but not club-like. However forewings of male scale insects have only two or three veins in the wings without any cells, and often have a tail of waxy filaments. Flies never have this combination of characters.
- Stylops have a club-like forewing and fully functional membranous hindwing (reverse of Diptera).
- Some wood-boring beetles (Order Coleoptera, family Lymexylidae): forewings of these wood-boring beetles are reduced to tiny pads and the hindwings are fully exposed which gives them the appearance of possessing only one pair of wings, however it is the reverse of the pattern seen in flies.

Grasshoppers, Locusts, Crickets, Katydids (Order Orthoptera)

What do grasshoppers, locusts, crickets and katydids look like?

Grasshopper.

Size:

5 mm - 100 mm in length.

Body:

Variable from stick-like to bulbous but commonly widest at wing attachment (wide shoulders) with a tapering abdomen.

Pronotum (segment behind head) draped over sides to form large lateral lobes.

Body appears hard.

Antennae:

Thread-like and length is variable (can be longer than body).

Eyes:

Large, bulbous and well separated.

Some forms found in caves have very small eyes or none at all.

Mouthparts:

For chewing or munching and held downward at rest.

Wings:

One or two pairs if present.

Forewing hardened, leathery and partially see-through or cloudy.

Hindwing much larger than forewing, membranous, clear and folds like a fan.

Both wings have numerous cross-veins forming many cells.

Wings usually cover the abdomen but short wing species are common in some groups.

At rest the wings are held tent-like or flat over body, hindwings hidden.

Limbs:

Six legs that are usually slender with spines.

Hindlegs specialised for jumping shaped like a chicken drumstick.

Forelegs of some species (e.g. mole crickets) are spade-like and modified for digging.

Abdomen tip:

Two short cerci (tails).

Males have clasping organs while females of some groups have a long prominent spike known as an ovipositor (which is used for laying eggs).

Where are grasshoppers, locusts, crickets and katydids found?

- In the open, on vegetation, rocks or bare ground.
- Some are cave dwellers.
- Some are found in leaf litter, burrows or live entirely in the soil.
- Some are semi-aquatic and can be seen at the waters edge on aquatic plants or swimming in the water.

- Some live in groups with other insects, for example in ants nests.
- Crickets are often found in sheds and other damp regions around the house.

What do grasshoppers, locusts, crickets and katydids do?

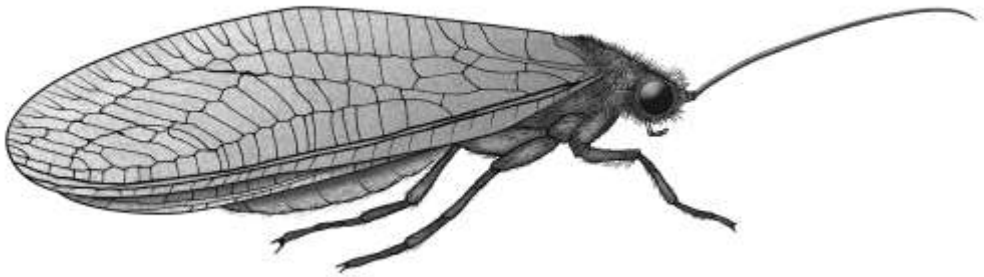
- They are normally solitary. Some grasshoppers and locusts form foraging swarms while crickets may be found in small groups.
- When disturbed they usually jump, run quickly under cover, or jump into flight usually landing soon after. Some remain still or burrow, while others may have threat displays including, flashing warning colours, or noise-making.
- Most fly in short bursts but some such as the locusts can fly for extended periods. Many usually make slapping, buzzing or whistling sounds as they fly.
- Many grasshoppers and katydids are experts at camouflage. They use behaviour or colouration patterns, and special body forms to help them blend in with their surroundings. For example, some look like twigs, leaves, rocks or bark. In some circumstances they may also look and behave like other insects.
- Some such as mole crickets are strong burrowers.
- Many, especially crickets, are sound producers. To create sound they use special structures along the base of their wings, sides of the abdomen or along their legs. Often these sounds are used to attract potential partners.
- Most are herbivores (plant feeders) and eat a variety of plant materials such as leaves, roots, flowers, pollen, nectar, seeds and fruits. Alternatively some will eat animal and plant debris, lichens and mosses, and a number are predators.
- Crickets and Katydids tend to be active at night while grasshoppers and locusts are primarily active during the day.

What looks similar?

- Stick insects can be confused with grasshoppers that look like sticks. Stick insects can be distinguished by their pronotum, which does not drape over the sides to form lobes. They also have tarsi (toes) with five segments and wings that are always shorter than their abdomen.

Lacewings (Order Neuroptera)

What do lacewings look like?



Size:
Wingspan 5 mm - 150 mm.
Body:
Column-like or widest at wing attachment (wide shoulders) and tapering past this point.
Body appears soft and fragile.
Antennae:
Thread-like or bead-like, and has many segments.
Sometimes variously thickened with a well-defined club.
Length highly variable.
Eyes:
Large, bulging and well separated.
Mouthparts:
For chewing or munching; long palps (mouthparts that look like a 'chain of beads').
Held downwards at rest.
Wings:
Two pairs.
Both pairs are membranous, clear and have numerous cross-veins forming many cells.
Both pairs have forked veins along wing margin.
Length, width and shape variable.
At rest wings held tent-like over body.
Limbs:
Six slender legs.
Abdomen tip:
Cerci (tails) absent.

Where are lacewings found?

- Just about anywhere.

What do lacewings do?

- They are solitary but they may group together or swarm during mating.
- When disturbed they usually fly away. Other possible responses include threat displays where they pretend to sting with their abdomen (they do not have stings), and emitting noxious-smelling chemicals.
- They are weak, flapping fliers.

- Those species of lacewing that feed as adults are generally predators, though some feed on honeydew or pollen.
- They are active during the night or day - some strongly attracted to light.

Atypical lacewings

- Dusty wings (family Coniopterygidae) are unlike other lacewings as their wings have few veins and they may not have forked veins along margin. Furthermore their bodies are covered with a waxy secretion. Otherwise other features of the order apply. They are small with a wingspan less than 15mm.
- Mantis flies (family Mantispidae) are lacewings despite their name. They are characterised by having raptorial forelegs similar to praying mantids. Furthermore they may even behave like a mantid, otherwise all the other features apply.
- Moth Lacewings (family Ithonidae) are characterised by wings hairy along veins and margins and appear moth like. Otherwise other features of the order apply.

What looks similar?

- Dragonflies and Damselflies that are preserved may be confused with lacewings. Dragonflies and Damselflies can be distinguished by having bristle-like antennae and wings that lack forked veins along margins.
- Stoneflies can be separated from lacewings by having a pair of cerci extending from abdomen tip and wings held flat to or wrapped around body.
- Caddisflies maybe confused with Moth Lacewings however caddisflies can be distinguished as their wings are entirely hairy and have little or no cross-veins.
- Alderflies and dobsonflies that are preserved may be confused with lacewings. Alderflies and dobsonflies however lack forked veins along wing margin and their hindwing has a large lobe at base.
- Praying mantids maybe confused with mantis flies. However praying mantids unlike mantis flies lack wings or if present are leathery, cloudy and held flat over their body. Furthermore they have a triangular head, and their hindwing folds away like a hand fan.
- Scorpion-flies are sometimes confused with lacewings. Scorpion-flies are generally separated from all other groups by a beak-like extension of their head, with the mouthparts located at its tip. However in some lacewings the head may also appear to be extended, though never to the extent of a scorpion-fly. In these circumstances scorpion-flies can be distinguished by lacking the forked veins along margins of their wings.
- Moths can be confused with moth lacewings. Moths can be distinguished as they have curled tubular mouthparts or mouthparts reduced or absent; their bodies are covered in easily removed scales rather than hair; and their wings lack numerous cross-veins.

Moths and Butterflies (Order Lepidoptera)

What do moths and butterflies look like?

Butterfly.

Size:

3 mm - 250 mm wingspan.

Body:

Long or stout.

Generally widest at wing attachment (wide shoulders), with abdomen tapered or column-like.

Body covered with scales and often hairy.

Appears soft or fragile.

Antennae:

Short to very long with many segments.

Butterflies and some day flying moths have club-like antennae with swollen tips.

Form for most moths highly variable.

Eyes:

Large, well separated and sometimes hairy.

Rarely reduced, ocelli (tiny single lens eyes) when present small, next to top of eye rather than top of head.

Mouthparts:

For sucking fluids.

A long feeding tube (probiscis) coiled under the head at rest.

Some have non-functional mouthparts, or no mouthparts at all.

Wings:

Two pairs if present.

Both pairs membranous - often patterned or textured and cloudy.

Have few cross-veins forming at most long rectangular or triangular cells.

Hindwing generally wider and rounder than the more elongate and angular forewing.

Wings have overlapping scales though in some species it is restricted to the veins.

At rest, wings are held in a variety of ways. These include upright and pressed together above the body (butterfly, some moths), upright but not pressed together (some skipper butterflies), tent-like above body (moths) or horizontally spread so the hindwing and often the abdomen are visible (moths, some skippers, sun-basking butterflies).

Limbs:

Six legs covered with overlapping scales.

Usually long and slender.

Abdomen tip:

Cerci (tails) absent.

Some males have tail-like claspers.

Where are moths and butterflies found?

- On plants usually around flowers.
- Rarely around ant hosts or insect prey (some carnivorous species).
- Around water such as puddles.
- In the air.
- In the house around areas such as the pantry or clothes cupboard.

What do moths and butterflies do?

- They are solitary or form large groups for mating, migration or roosting.
- When disturbed they fly away or drop to the ground. During the day, roosting moths may undertake short flights to escape potential predators.
- Most are strong fliers. Depending on the species they maybe capable of rapid flight, a loping flight or simply drift on air currents like a bird. Others have weak fluttering, often erratic flight.
- Adults feed on nectar from flowers though some do not feed, and rely on the stored reserves accumulated from their larval stages.
- Many are associated with particular plants, where they mate and lay eggs.
- Some are sound producers although most emit ultrasonic sounds.
- Many butterflies and moths (in particular) are experts of camouflage and deception. Many use colourations and patterning to blend in with their surroundings, or to deter predators.
- They are active during the day (all butterflies and few moths) night (moths) or twilight periods; many are attracted to light.

Atypical moths

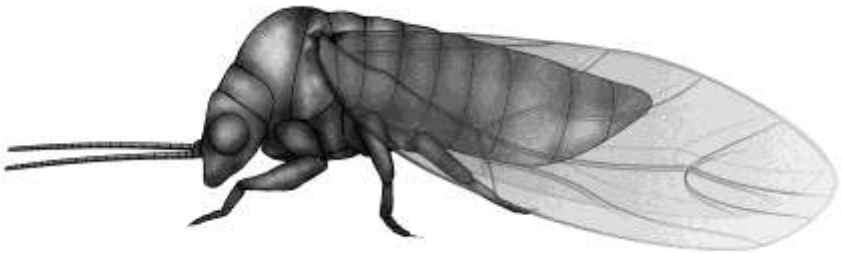
- Atypical moths are present throughout the Order Lepidoptera. Moths with reduced wings, or absent wings are found in several families. The case moths (Family Psychidae), looper moths (Family Geometridae), tiger moths (Family Arctiidae) and tussock moths (Family Lymantriidae) all have some species in which the female is flightless, having reduced or absent wings. They are still distinguished as moths as they have overlapping scales on their body.
- Reduction and absence of the proboscis (haustellum) is also common across many families, and some families are comprised totally of species that do not feed as adults. This may sometimes cause confusion with other insects, but the presence of scales and two pairs of wings are usually sufficient to identify the insect as either a moth or butterfly.

What looks similar?

- Some moth species may look like wasps. Some species of case moths (Family Psychidae), cup moths (Family Limacodidae), clearwing moths (Family Sesiidae), forester moths (Family Zygaenidae), and hawk moths (Family Sphingidae) have clear wings, with scaling restricted to veins and the body of the moth. This can sometimes give a wasp-like appearance (eg. Family Sesiidae), and may result in incorrect identifications. The scales on the body should still identify these insects as moths.
- Caddisflies may look remarkably like moths. They can be distinguished from moths by the combination of a lack of scales on the body, antennae longer than the body and their hair covered wings.

Psyllids, aphids, scale insects and whiteflies (Order Hemiptera, suborder Sternorrhyncha)

What do psyllids, aphids, scale insects, and whiteflies look like?



Psyllid.

Size:

1 mm - 40 mm in length.

Body:

Psyllids, whiteflies and male scale insects are generally widest at the wing attachment (wide shoulders), abdomen tapered or globular.

Aphids are blob-like.

Mealybugs look like a dome with segments.

Lerp insects (immature psyllids) and female scale insects are larvae-like but their waxy coating can come in a wide range of shapes.

Antennae:

Thread-like, length variable.

Eyes:

Large and widely separated.

Often absent in scale insects and other non-moving species.

Mouthparts:

For piercing and sucking, do not have visible palps (look like a chain of beads).

Very small tube, thorn-like in appearance and appearing to come from chest.

A small number of species have reduced mouthparts that maybe difficult to see, or retractable tubular mouthparts that are hidden in the head when not in use.

Wings:

One or two pairs if present.

Male scale insects have membranous forewings with only one or two veins, hindwing absent or greatly reduced.

Both pairs of whitefly wings are membranous, clear or partially see-through with one or two veins.

Both pairs of psyllid wings are membranous, often covered with white waxy scales.

At rest wings are held tent-like over body for all groups.

Limbs:

Six legs short and stocky.

Some female scale insects lack legs.

Abdomen tip:

Cerci (tails) absent.

Male scale insects may have a single spike or waxy filaments.

Where are psyllids, aphids, scale insects and whiteflies found?

- On the leaves or young stems of plants.
- In ant nests.
- In galls, which they create.

What do psyllids, aphids, scale insects and whiteflies do?

- Some are solitary but most form groups around a common food source.
- When disturbed they jump, run away, remain still or emit an chemical informing others of danger.
- Most lerp and female scale insects are fixed to a plant surface. They hide themselves under waxy or sugary secretions, which harden and form a protective shield. These shields are highly variable in shape, with dome-like to scallop-like shells.
- They are primarily sap feeders.
- Many, especially aphids and mealybugs are biocontrollers, tended by ants which drink the honeydew they exude.
- Some produce eggs but some such as aphids produce live young. Some do not mate and produce only female offspring.
- They are active during the day or night.

What looks similar?

- Psocids are easily confused with psyllids. Psocids maybe distinguished by their large bulging nose, long antennae, wing veins that form 'S-shaped' lines, long slender legs and they usually run or fly away when disturbed rather than jump.
- Flies can be confused with male scale insects as they both have only one pair of functional wings and another pair that are reduced to haltere-like structures. However, male scale insects have only two or three veins in their wings, the haltere-like structures are not club-like and they often have a tail of waxy filaments. Flies never have this combination of characters.

Sawflies (Order Hymenoptera, suborder Symphyta)

What do sawflies look like?

Size:
3 mm - 55 mm in length.
Body:
Stout, column-like to cigar-shaped, lack constriction at 'waist'.
Appears hard.
Antennae:
Short and varying in form from thread-like to feather-like.
Eyes:
Large and well separated.
Mouthparts:
For cutting and munching.
Held downwards at rest.
Wings:
Two pairs.
Both pairs are membranous and clear; veins form cells with at least one vein extending to margin of wing.
Hindwing always shorter and narrower than forewing.
Fore- and hindwing coupled tightly by a row of minute hooks (hamuli) along adjacent edges.
At rest wings held flat along body, and overlapping or resting above the body on special pads (cenchri).
Limbs:
Six legs, slender; hindlegs of some species have enlarged 'thighs' for jumping.
Abdomen tip:
Saw-like ovipositor (no sting) sometimes visible but often folded into a groove, much like a pocket knife.

Where are sawflies found?

- On vegetation.

What do sawflies do?

- They are solitary, though their larvae better known as spitfires can be found in large groups.
- When disturbed they fly away, jump, act aggressively like a wasp or in the case of their larvae dispense noxious secretions.

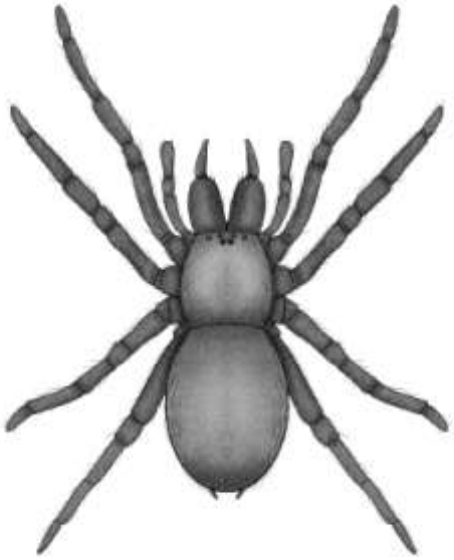
- They hold their antennae in front of body at rest.
- They are strong fliers and buzz loudly when they fly.
- Adult sawflies mostly feed on nectar and do not provide food for their young. Females of some species guard eggs and young larvae.
- They use their saw-like ovipositor to saw into vegetation such as leaves to deposit their eggs inside. The larvae feed on internal tissue of plants.
- Species of the sawfly family Orussidae are parasites of beetle larvae.
- They are active during the day.

What looks similar?

- Wasps are closely related to sawflies (in the same Order) and so share many common features. Wasps can be separated from sawflies as they have a distinct waist, and their wings have few veins or if they have complete cells then the veins never extend to the margin of the wing. They also tend to have a spike like ovipositor/sting and some have long antennae.
- Bees are closely related to sawflies (in the same Order) and so share many common features. Bees can be separated from sawflies by their hairy bodies, hindlegs with enlarged 'shins' forming baskets of hairs for carrying pollen. Bees also have a distinct 'waist' but as some bees are very hairy this 'waist' may be difficult to see.
- Ants are closely related to sawflies (in the same Order). Some species of parasitic sawflies (family Orussidae) are remarkably ant-like in appearance and behaviour. Their forewing is even patterned in a manner, which at rest gives the impression of a constricted 'waist'. In general the following features distinguish ants: constricted 'waist' with one or two knobs; antennal segment closest to body very long (5x as long at least) to any of the remaining segments; presence of certain glands (microscope and taxonomic expertise required). Sawflies never have all of the above.

Spiders (Order Araneae)

What do spiders look like?



Size:
Less than 1 mm - 180 mm in length.

Body:
Constriction between cephalothorax (front portion containing head) and the abdomen.
Abdomen without segments and is circular to cigar-shaped, some have spines and nodules.

Antennae:
Absent.

Eyes:
Most have eight simple eyes and size is variable. Two, four or six-eyed species exist, while some cave dwelling spiders have no eyes at all.

Mouthparts:
For paralysing prey (i.e. fangs), for mashing and chopping up prey and for slurping liquids
Mouthparts held in front or downwards at rest.

Wings:
Absent.

Limbs:
Eight legs.
Pedipalps (appendages between first legs and mouthparts) are leg-like, often with swollen tips in males.

Abdomen tip:
Cerci (tails) absent.
Spinnerets (silk distributing organs) originate under the abdomen and sometimes extend well past the tip.

Where are spiders found?

- On land in all habitats.
- In leaf litter and under rocks, logs and bark.
- Below soil level in burrows.
- On plants on any surface.
- Suspended in webs and retreats.

- Some are found on or below the surface of fresh water.
- Domestic areas such as corners of the house.

What do spiders do?

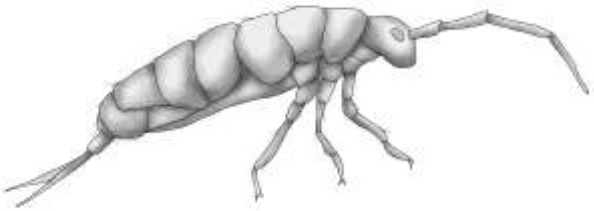
- They are usually solitary, but a few live together.
- When disturbed they run under cover or move out of line of sight, run to constructed retreats or burrows, jump, drop to ground on draglines, remain still faking death, rear up exposing fangs, or bite.
- Almost all are venomous. The venom is delivered via fangs (mouthparts with poison glands) and is used to paralyse or kill prey, but may be used defensively if threatened. Few are harmful to humans.
- They are all predators, feeding mostly on other invertebrates but have been known to snare small vertebrates such as birds. After injecting their venom, spiders liquefy a victim's tissues with digestive juices.
- They have many types of hunting strategies. For example, passive hunters capture prey in webs, active hunters hunt particular prey using specialised techniques.
- They produce silk. The silk is used for a variety of purposes such as web-building, packaging prey and eggs, making draglines, and triplines, and casting nets.
- Many spiders are experts at camouflage, which they use to capture prey or to hide from predators. These spiders may behave in a particular way or use colouration, patterning, or structural features to help them blend in with their surroundings. In special circumstances they may also look or act like other invertebrates including ants, termites, wasps and even other spiders.
- Some have bright conspicuous colours to warn potential predators that they taste bad or can bite.
- They are active during the day or night.

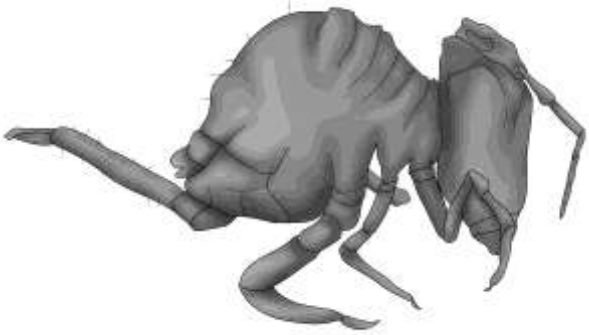
What looks similar?

- Harvestmen (class Arachnida, Order Opilionida) are sometimes mistaken for spiders. However, they do not have a narrow waist, they are generally smaller (body length less than 10 mm), their pedipalps are long and antennae-like, and their body has segments.
- Some of the spiders that mimic insects such as ants and wasps can be difficult to identify. On closer examination they can be distinguished from ants and wasps by having only two major body regions, and eight legs.
- Some tiny spiders look like mites, but can be distinguished from mites by their narrow waist.

Springtails (Order Collembola)

What do springtails look like?





Size:
Usually 1 mm - 3 mm in length, though some grow to 10 mm.

Body:
Globular or column-like.
Has a siphon tube just behind the rear legs. This tube is prominent in springtails that a reduced springing organ.
Appears soft.

Antennae:
Bead-like, or thread-like.
Rarely longer than body.

Eyes:
Absent or very small.

Mouthparts:
Enclosed within the folds of the head (difficult to see).

Wings:
Absent.

Limbs:
Six legs usually short and stumpy.

Abdomen tip:
Forked springing organ or anal spine (often folded under the abdomen).

Where are springtails found?

- Anywhere.
- Most are found in soil, among leaf litter, or around decomposing logs, dung or root zones.
- Often seen after heavy rain as a dark purple scum on the top of puddles.

What do springtails do?

- They often group together in large numbers.
- When disturbed they spring (jump) erratically, sometimes over large distances.
- Most springtails eat microflora such as bacteria and fungi, decaying plant and animal material or graze other plant related surfaces.
- A small number are predators, pollen-feeders, or plant feeders; some are also known to eat waste products from other insects or even their own.
- They are active during the day and night.

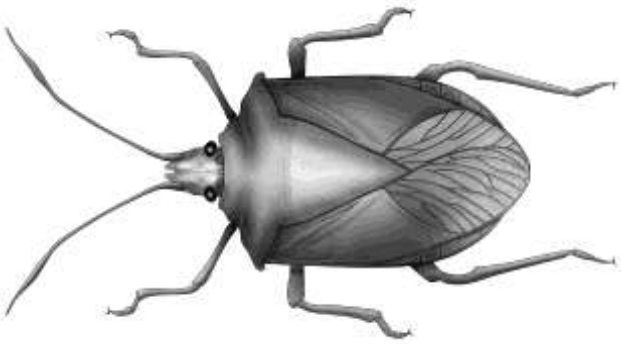
What looks similar?

- Springtails are very distinctive so are not generally confused with any other animal.

True bugs (Order Hemiptera, suborder Heteroptera)

True bugs include bugs such as plant bugs, stink bugs, water bugs and shield bugs.

What do true bugs look like?



Size:

Less than 1 mm - 75 mm in length.

Body:

Highly variable.
Commonly widest at wing attachment (wide shoulders) and oval-like but many other forms exist such as stick-like, spindle-shaped, dome-like, and shield-like.
Head mobile.
Appears hard.

Antennae:

Thread-like.
Length variable, never exceeding more than five segments.

Eyes:

Usually large and well separated.

Mouthparts:

For piercing and sucking, do not have visible palps (mouthparts that look like a 'chain of beads').
A slightly curved or straight tube (rostrum) originates from front of the head.
The tube rests in a groove between the legs so that the tip points towards the rear end of the insect.
The tube is hinged at the head so that it points downward or forward when the insect is feeding.

Wings:

One or two pairs, if present.
Forewing has a partially see-through membranous tip with a few visible veins.
The remaining portion of the wing is hardened and shield-like.
Hindwing membranous, clear or partially see-through with few veins and cross-veins.
Hindwing usually shorter and wider than the forewing.
At rest, wings are held flat over body, and overlapping at least at the tips - hindwings are folded and hidden.

Limbs:

Six legs.
Shape highly variable depending on their lifestyle - for example digging bugs have spade-like legs while predatory bugs may have raptorial legs.

Abdomen tip:

Cerci (tails) absent.

Where are true bugs found?

- Most habitats on land or in water, incl. the surface of the ocean out into open sea.
- On plant surfaces particularly leaves and stems but some favour roots or flowers.
- Amongst leaf litter, on open ground or in soil.
- Under bark, rocks or logs.
- In or on the surface of freshwater but coming to the surface to breathe.
- In the house in areas such as pot plants or cracks in furniture and walls.

What do true bugs do?

- They may be solitary or live together in groups.
- When disturbed they have a variety of responses. For example they may fly away, run or move out of the line of sight, remain still, drop to ground as if dead, flash warning colours, release noxious chemicals, bite, or swim away and dive.
- They are strong fliers with a rapid wing.
- Most bugs are herbivores (plant feeders) piercing and sucking nutrients from plants.
- Some are active or ambush predators, sucking internal fluids of victims or liquefying tissue of victims for consumption. Their prey is normally eggs, larvae or adults of other invertebrates but some such as the Fish-killer bugs (family Belostomatidae) have been known to eat small fish and tadpoles.
- Some such as Bed bugs (family Cimicidae) and some assassin bugs are external parasites sucking the blood of mammals and birds.
- Many true bugs are experts at camouflage. They may behave in a particular way or they may use colouration, patterns, and special body forms to help them blend in with their surroundings. For example some look like sticks, leaves, dirt or bark.
- In some special circumstances true bugs may also look, smell and behave like other insects. This special ability maybe useful for predation as well as protection.
- They are active during the day or night.

Atypical bugs

- Water scorpions and fishkiller bugs (families Nepidae and Belostomatidae) are typically bug like but they have a long siphon tube that extends from their abdomen tip, which acts as a breathing apparatus from below the surface of the water much like a snorkel.

What looks similar?

- Beetles maybe confused with jewel bugs (family Scutelleridae). The scutellum (small triangular plate between wings) of these true bugs is often so enlarged that it covers the wings (eg. cotton harlequin bug Tectocoris diophthalmus). This might be mistaken for the hardened forewings of beetles. Beetles may be distinguished by their munching mouthparts.
- Beetles maybe confused with burrowing bugs (family Cydnidae). Beetles and burrowing bugs can be separated by close inspection of the forewings and mouthparts. Beetles have hardened forewings that meet along a midline and mouthparts for chewing or munching, whilst burrowing bugs have sucking tube mouthparts and their forewing has a membranous tip with veins, with the tips of the forewing overlapping at rest.
- Praying mantids maybe be confused with some bugs that have raptorial legs for example water scorpions (Family Nepidae), fishkiller bugs (Family Belostomatidae), and some assassin bugs (Family Reduvidae). However unlike mantids they all have conspicuous sucking mouthparts in the form of a beak-like tube.

Wasps (Order Hymenoptera)

What do wasps look like?

Size:
0.15 mm - 120 mm in length.

Body:
Elongate or stout.
Constricted at 'waist' appears to be pinched or like a leaf stalk.
Appears hard.

Antennae:
Short or long.
Thread-like or club-like. Often distinctly elbowed.
Segment closest to body longer than the others.

Eyes:
Large and well separated.

Mouthparts:
For chewing or munching.
Held downward at rest.

Wings:
Two pairs if present.
Both pairs are membranous and clear; with few veins and if cross-veins present form few cells. Veins never reach wing margin.
Hindwing always shorter and narrower than forewing.
Fore- and hindwing coupled tightly by a row of minute hooks (hamuli) along adjacent edges.
At rest, wings are held flat over body, parallel or overlapping or they are held upright but not touching.

Limbs:
Six legs. Generally thin, though thigh region of hindlegs often enlarged.

Abdomen tip:
With long spike (ovipositor/sting) sometimes visible but often folded below body, or retracted within the abdomen.

Where are wasps found?

- Almost everywhere.
- In soil, amongst plant debris and on vegetation especially flowers.
- On the ground.
- In galls created by them or others.
- Inside fruit especially figs.
- In the air.

- In the nests or burrows of other insects or even other species of wasps.
- Holes in the ground, or pre-existing cavities in rocks and wood.
- In mud or paper nests. Wasps that make these nests are often found hovering around water collecting moisture necessary for nest construction.
- Around the house.

What do wasps do?

- Most wasps are solitary nesters. Some nest together in groups occupying the nest much like the way humans occupy an apartment block.
- A few are truly social, that is, they form colonies where individuals share the responsibility of providing care for the young. Social wasps have a queen, reproductive males and sterile workers and soldiers.
- When disturbed run or fly away; may bite, sting or even swarm (rare) if threatened.
- They tend to hold their antennae out in front at rest and in motion.
- When searching they may rapidly flicker their antennae or wings. As they move they may also hop or stutter walk.
- They are generally strong fliers capable of long and rapid flights as well as hovering. Some may also just simply drift on air currents.
- Adults mostly feed on nectar. Some consume fluids from prey provided to young.
- They provide food for their young. Most are parasitoids laying eggs inside, on or near a host for offspring to devour as they grow. In this circumstance they may attack and paralyse prey before returning it back to the nest. A few capture prey, and chop it up for their offspring.
- Some look, smell or behave like other invertebrates. This mimicry lets them get close to intended prey or potential food stores.
- They are active during the day or night. Some are only active during twilight periods.

What looks similar?

- Bees are closely related to wasps (in the same Order) and so share many features. In general the following features distinguish bees from wasps: legs and body hairy with forked hairs; hindlegs enlarged to form baskets of hairs to carry pollen; wings have cells; movement generally restricted to interaction with flowers and returning to nests.
- Ants are closely related to wasps (in the same Order) and so share many features. To further complicate matters some wasps look and behave remarkably like certain ant species. In general the following features distinguish ants: constricted 'waist' with one or two knobs; antennal segment closest to body very long (five times as long at least) to any of the remaining segments; presence of certain glands (microscope and taxonomic expertise required). Wasps never have all of the above.
- Sawflies are closely related to wasps and so share many features. Sawflies can be distinguished by a lack of constriction at 'waist' and more complete wing venation. The wings have more veins and cross-veins that form cells, with at least one vein extending to wing margin. They are nearly always plant feeders (one or two are parasites of wood-boring beetles), and females have a saw-like ovipositor folded into a groove when not in use.
- Some moth families are wasp-like in appearance. Some species of case moths (Family Psychidae), cup moths (Family Limacodidae), clearwing moths

(Family Sesiidae), forester moths (Family Zygaenidae), and hawk moths (Family Sphingidae) have adults which have clear membranes on their wings, with scaling restricted to veins and the body of the moth. This can sometimes give a wasp-like appearance (eg. Family Sesiidae), and may result in incorrect identifications. The scales on the body should still identify these insects as moths.

Alderflies and Dobsonflies (Order Megaloptera)

What do alderflies and dobsonflies look like?

Alderfly.

Size
- Wingspan 20 mm -100 mm.

Body
- Cigar-shaped.
- Appears soft and fragile.

Antennae
- Thread-like, with many segments.
- Shorter than body length.

Eyes
- Large, bulging and well separated.

Mouthparts
- For chewing or biting.
- Held in front at rest. Enlarged in some species, especially in males.

Wings
- Two pairs. Both pairs membranous and clear.
- Both pairs have moderate cross-veins forming mainly rectangular cells.
- Similar in length but hindwing usually wider than forewing due to a foldable lobe at the base of the wing.
- At rest wings held tent-like over body, hindwing hidden.

Limbs
- Six legs, slender or stocky. Held below body at rest.

Abdomen tip
- Cerci (tails) absent. Males may have claspers - used to hold female during mating.

Where are alderflies and dobsonflies found?

- Near water often on adjacent plants.

What do alderflies and dobsonflies do?

- They are solitary. Females may group together to lay eggs but otherwise found in low numbers.
- When disturbed they fly away.
- They are weak, flapping fliers.
- The adults do not feed and are short-lived.
- They are active at twilight or during the night, and are attracted to light.

What looks similar?

- Lacewings can be separated from alderflies and dobsonflies by their forked veins along the margin of their wings.
- Stoneflies can be distinguished from alderflies or dobsonflies by cerci extending from their abdomen. Many stoneflies wrap their wings around their body at rest and hold their legs (which are bent at the 'elbows') out from their body. Stoneflies also tend to run rather than fly when disturbed.

Caddisflies (Order Trichoptera)

What do caddisflies look like?

Size:

2 mm - 40 mm.

Body:

Long and usually widest at wing attachment (wide shoulders), abdomen tapers.
Very hairy.
Appears soft and fragile.

Antennae:

Thread-like with many segments.
Longer than half its body length, to much longer than the body.

Eyes:

Large, bulging and well separated.
Ocelli (tiny single lens eyes) often visible on top of head.

Mouthparts:

Reduced and mostly non-functional, if functional they are for ingestion of fluids.
Palps (mouthparts that look like a chain of beads) usually long and visible.

Wings:

Two pairs.
Both pairs covered in hairs include the membranous regions of the wing.
Both pairs are membranous and partially see-through due to either pigmentation or numerous hairs.
Both pairs have few cross-veins forming at most long rectangular cells.
Hindwing shorter and wider than the forewing.
At rest wings are held tent-like or rarely flat over body.

Limbs:

Six legs.
Hairy, slender and often with paired spines at joints.

Abdomen tip:

Cerci (tails) absent.
Maybe modified with male reproductive parts.

Where are caddisflies found?

- Close to water on rocks, among plants and under overhangs.
- Some are coastal marine species.

What do caddisflies do?

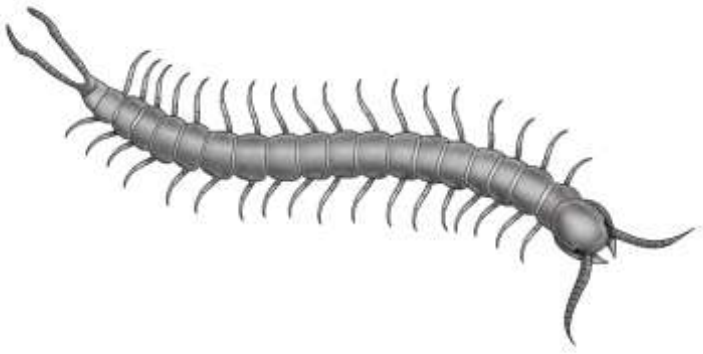
- Caddisflies often group together in mating swarms.
- When disturbed they fly away but may travel only short distances.
- They are awkward fliers with a rapid wing beat. They tend to fly in a kind of circular motion and usually in short bursts.
- They often perch with head facing upwards.
- Adults are short-lived, do not feed, or at most ingest fluids.
- They are active during the night or day, night-active species are often attracted to light.

What looks similar?

- Moths are often confused with caddisflies. Moths never have the extremely long antennae that many caddisflies possess. Unfortunately, distinguishing caddisflies with short antennae from some moth species is very difficult without a microscope. The wings and bodies of moths, unlike caddisflies, are covered to some degree with scales and not hairs. Moths also have mouthparts (when present) that are usually a long curved or coiled pair of tubes. Moths also have ocelli (when present) near the top of their eyes instead of on top of the head.
- Lacewings can be distinguished from caddisflies in most cases, by having wings with numerous cross-veins and forked veins along the wing margin. If lacewing wings are hairy they are only hairy along the veins and wing edges, never on the membranous areas.

Centipedes (Class Chilopoda)

What do centipedes look like?



Size:
4 mm - 300 mm in length

Body:
Elongate and column-like.
Tergites (plates on upperside of body) alternating long and short in several groups.
Appears hard.

Antennae:
Single pair.
Thread-like with many segments.
Rarely longer than body.

Eyes:
Variable between different groups.
Usually a pair of complex eyes (compound) with one or more simple eyes (ocelli) on each side of head. Some blind species exist.

Mouthparts:
For munching.

Wings:
Absent.

Limbs:
15 to 191 pairs of legs (always an odd number), one pair per body segment.
Maxillipedes (appendages found between first walking legs and mouth) have a poison gland near tip.

Body tip:
Appendages that have a sensory, grasping or defensive function. These may appear thread-like with many segments or forcep-like.

Where are centipedes found?

- Common in wet forests.
- In dry forests, grassland and deserts.
- Some species in caves.
- In leaf litter and soil or under rocks, wood or bark

What do centipedes do?

- They are solitary except when mothers are tending eggs or hatchlings.
- When disturbed many are capable of running extremely fast and usually try to conceal themselves. Some raise the end of their bodies in a threatening pose while others are capable of dropping legs, which are replaced during next moult.

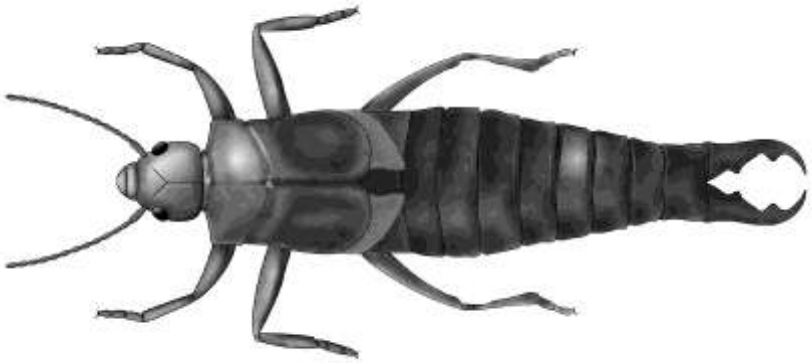
- They are almost exclusively predators feeding typically on soft-bodied invertebrates.
- They are venomous. Venom used to paralyse prey and is not harmful to humans.
- They are often aggressive towards same species, sometimes cannibalistic.
- Some produce silk, which is used during mating or for entangling prey.
- They are active at night, if active during day then in dark places.

What looks similar?

- Millipedes are often confused with centipedes. They can be distinguished from centipedes by having two pairs of legs on each body segment. They tend to be slow moving and non-aggressive (although often emit pungent secretions). They are also usually harder, feed on decaying plant material and many curl or roll into a ball when resting or threatened.
- Symphylans (Class Symphyla) are mostly smaller than centipedes (body length usually less than 10 mm), they are all blind, mostly pale yellow (none with striking colours as may be seen in centipedes) and only have 12 pairs of walking legs.

Earwigs (Order Dermaptera)

What do earwigs look like?



Size:
5 mm - 50 mm in length.

Body:
Column-like or vaguely tear-drop shaped. Flattened as if pressed from above.

Antennae:
Thread-like, never longer than body.

Eyes:
Large and well separated or very small to absent.

Mouthparts:
For chewing or munching. Held in front at rest.

Wings:
Two pairs if present.
At rest the wings are held flat to body, meeting at midline, with hindwing hidden.
Forewing hardened, cloudy and without veins; rectangular shaped and so short the abdomen is uncovered.
Hindwing membranous, and partially see-through; larger than forewing and folds like a hand fan.

Limbs:
Six legs, slender.
Tarsi (toes) with three segments.

Abdomen tip:
Two hardened tails modified as forceps.

Where are earwigs found?

- Amongst leaf litter, under bark and rocks, and within crevices or rotting logs.

What do earwigs do?

- They are usually found alone or at most in small numbers.
- When disturbed they run away, in search of cover; they rarely fly.
- They are weak fliers, usually flying for short bursts.
- They feed on decaying plant or animal debris; some will also feed on live plant material and capture live insect prey.
- Most are active during the night.

What looks similar?

- Diplurans (Order Diplura) can be distinguished from earwigs by a lack of eyes, paired ventral appendages under all or most of the abdominal segments and tarsi (toes) with only one segment.
- Rove beetles have small forewings, with large folded and functional wings underneath, but unlike earwigs they lack fully developed forceps.

Earthworms (class Oligochaeta, order Haplotaxida)

What do earthworms look like?

Size:
6 mm - 3000 mm in length.
Body:
Snake-like, elongate with many segments.
Appears soft.
Antennae:
Absent.
Eyes:
Absent.
Mouthparts:
Opening for siphoning food items.
Wings:
Absent.
Limbs:
None.
Body tip:
Cerci (tails) absent.

Where are earthworms found?

- In many habitats but the majority occupy moist well-vegetated regions.
- In soil, leaf litter, and under rocks and logs.
- Some are associated with water environments such as freshwater mud and saltwater shorelines.

What do earthworms do?

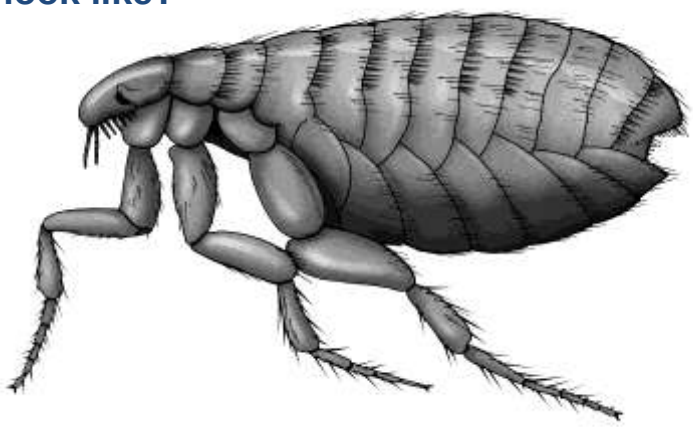
- Earthworms are solitary, though they may group together to feed and/or mate.
- When disturbed they recoil, withdraw into burrows, jump and thrash about, drop tail segments, or exude body fluids some of which are noxious.
- They feed on dead or decaying animal and plant material. Earthworms that operate in soils ingest vast volumes of soil particles with organic matter.
- Earthworms discarded waste products as castings, trails of well-digested organic material. This material maybe discarded on the soil surface, an indicator of earthworms being present.
- Some form burrows, which they exit from to grab food items.
- They are active during the day or night.

What looks similar?

- Leeches can be distinguished from earthworms as they have a large sucker at end of their body, which they use to feed and move. They are also all external parasites feeding on body fluids of hosts.

Fleas (Order Siphonaptera)

What do fleas look like?



Size:
0.5 mm - 10 mm in length but most are shorter than 5 mm.

Body:
Very thin as if pressed from the sides.
Covered with hairs and spines directed backwards, some in comb-like formations.
Appears hard.

Antennae:
Very short, held in a groove hence often difficult to see. Never longer than body.

Eyes:
Very small or absent.

Mouthparts:
For piercing and sucking.

Wings:
Absent.

Limbs:
Six legs.
Hindlegs enlarged and modified for jumping;
Have claws modified for clinging to feathers and hair.

Abdomen tip:
Cerci (tails) absent.

Where are fleas found?

- On mammals and birds (rarely) among hairs or feathers.
- Few are found on semi-aquatic animals such as the platypus, but never on marine mammals.

What do fleas do?

- Fleas are external parasites. They may be found alone or in large numbers on suitable hosts.
- When disturbed they jump. They can jump incredible distances.
- They feed on blood.
- They are active during the day.

What looks similar?

- Flies that do not have wings can be mistaken for fleas. Unlike fleas, wingless flies are never thin as if pressed from the sides.
- Lice differ from fleas in that they are flattened as pressed from above, do not jump when disturbed, and can occur on fully aquatic hosts.

Lice (Order Phthiraptera)

What do lice look like?

Size:
0.5 mm - 10 mm in length but most are shorter than 5 mm.
Body:
Ovoid or the abdomen is swollen making it look like a lopsided dumb-bell.
Flattened as if pressed from above.
Body appears hard.
Antennae:
Very short; sometimes held in a groove hence often difficult to see.
Thread-like, or club-like; never longer than head.
Eyes:
Very small or absent.
Mouthparts:
For chewing or munching, or a pointed tube for piercing and sucking.
Wings:
Absent.
Limbs:
Six legs.
Have modified hook-like claws for clinging to feathers or fur.
Abdomen tip:
Cerci (tails) absent.

Where are lice found?

- On mammals and birds clinging to hairs or feathers.
- Often restricted to one host and usually favour one specific part of the host's body.

What do lice do?

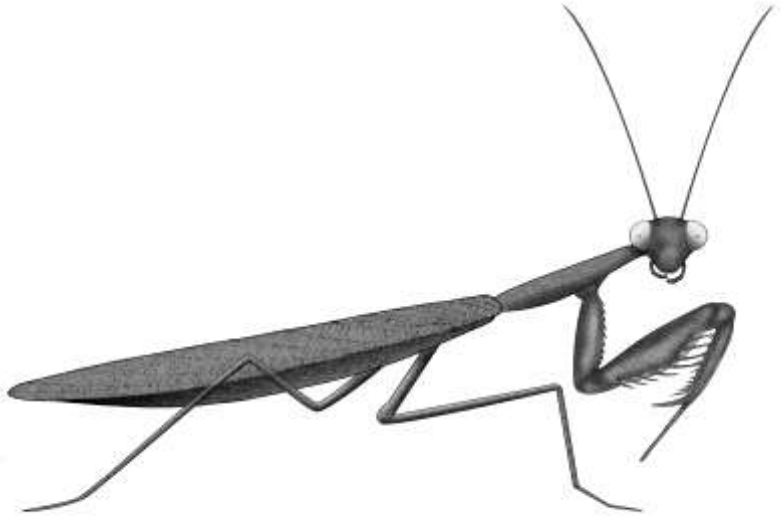
- They are external parasites and are often found groups around food source.
- When disturbed they may run but generally they cling to hair or feathers.
- They feed on feathers, hairs, skin flakes and blood. Some will feed on eggs of other lice species.
- They are active day and night.

What looks similar?

- Psocids can be distinguished from lice by their long thread-like antennae, and ovoid body. They also do not occur as external parasites, but may accidentally crawl on birds or mammals.
- Fleas can be distinguished from lice as they are flattened from the sides and jump when disturbed.

Praying Mantids (Order Mantodea)

What do praying mantids look like?



Size:

10 mm - 120 mm in length.

Body:

Variable in shape but they are mostly elongate and stick like.
Head triangular.
Appears hard.

Antennae:

Thread-like and usually shorter than body length.

Eyes:

Large, bulbous and well separated.

Mouthparts:

Used for chewing or munching, and held downwards.

Wings:

Two pairs if present (often absent in females).
Forewing leathery, partially see-through or cloudy.
Hindwing membranous and clear - larger than forewing and folds like a hand fan.
Both wings have numerous cross-veins that form many cells.
Both wings normally extend to the end of the abdomen but maybe shortened.
At rest the wings are held flat over body, or curved around abdomen, overlapping, with the hindwing hidden.

Legs:

Six legs.
Forelegs are always raptorial, that is, bearing rows of sharp teeth, which are used for clasping prey.

Abdomen tip:

Two short to moderately long cerci (tails).
Mantid cerci are never longer than the body and have many segments.

Where are praying mantids found?

- On vegetation such as flowers, tree trunks and tall grasses. There are also some that live on the ground.

What do praying mantids do?

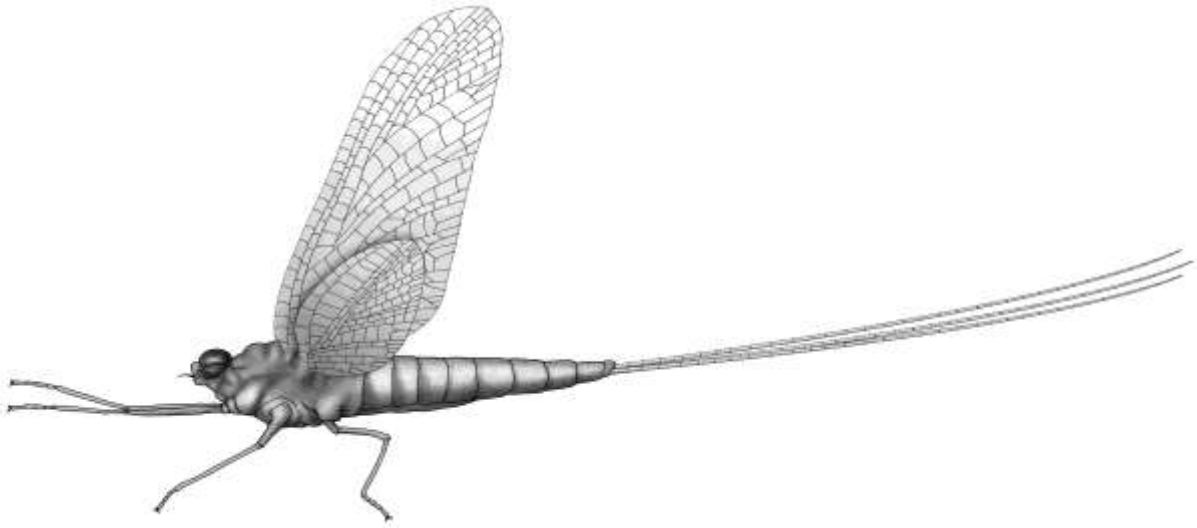
- They are usually found alone and are possibly territorial.
- When disturbed they usually remain still or run out of the line of sight. Other responses include aggressive displays, the release of noxious odours or flashing warning colours.
- They are experts at camouflage. Many have cryptic colouration and structural modifications that help them blend in with their surroundings. They also tend to spend a lot of their time motionless with their forelegs outstretched awaiting prey.
- They have good vision and their head often turns to face moving objects.
- They are weak fliers usually flying in short bursts.
- They are predators, eating mostly insects but have been known to eat small vertebrates.
- They are active during the day and night.

What looks similar?

- Mantis Flies are often confused with praying mantids as they also have raptorial forelegs. Mantid flies can be distinguished by their wings, which unlike mantids, are always present. The wings of mantis flies are clear, held tent-like over their body (at rest), and possess forked veins along the wing margin.
- Stick insects are superficially like mantids. However, their forelegs are never raptorial and their head is often rectangular-like.

Mayflies (Order Ephemeroptera)

What do mayflies look like?



Size:
4 mm - 35 mm in length with an average wingspan of 15 mm across.

Body:
Widest at wing attachment (wide shoulders), abdomen long and column-like. Body appears soft and fragile.

Antennae:
Very short, bristle-like or thread-like.

Eyes:
Large, covering most of the head, and are very close together or actually touch.

Mouthparts:
Reduced in adult.

Wings:
One or two pairs but usually two.
Hindwings much smaller than forewings.
Both wings are membranous, clear and have numerous cross-veins forming many cells.
At rest wings are held upright above abdomen often pressed together.

Limbs:
Six slender legs.

Abdomen tip:
Usually three tails (two cerci, one middle filament) rarely two with middle tail reduced or absent; all tails longer than body, thread-like and similar in size.

Where are mayflies found?

- Near water on vegetation, rocks or in the air.

What do mayflies do?

- They group together in large numbers to form mating swarms. The swarms are often over a particular object such as a rock, tree, or bridge. This object can be indicative of a particular species.
- When disturbed they fly away.

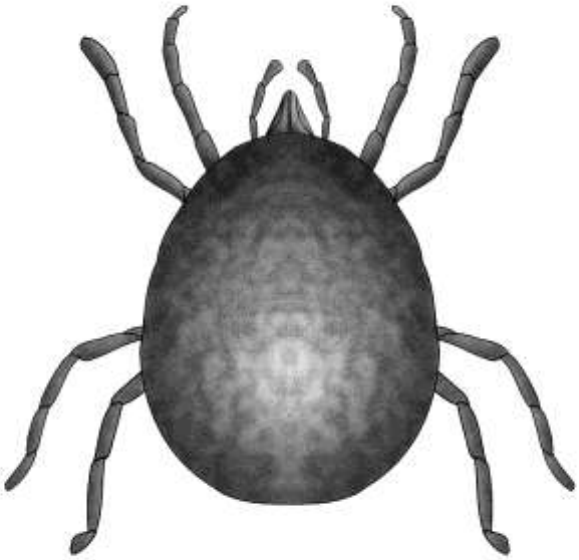
- Many hold their front legs out in front when perched.
- They are weak flapping fliers.
- Adult mayflies do not feed.
- Adults are short-lived, on average survive for 1-2 days, but can live for only minutes.
- They are active night and day. Some are attracted to light.

What looks similar?

- Stoneflies can be distinguished from Mayflies by their wings. Their wings are similar in size and folded around the body at rest. Stoneflies also never have more than two tails.
- Caddisflies can be distinguished from Mayflies by their wings, antennae and a lack of tails. Their wings are hairy, similar in size and held tent-like at rest. While their antennae tend to be more than half their body length.
- Alderflies and dobsonflies can be distinguished from Mayflies by a number of features. Their wings are similar in size and held tent-like at rest. They also have chewing mouthparts, long antennae and very short tails.
- Flies can be distinguished from Mayflies by their wings and a lack of tails. The forewings of flies have few cells, while their hindwings are replaced by a club-like structure called halteres.
- Male scale insects are occasionally confused as Mayflies. Wings of scale insects have few cells and their tails, if present, are never multi-segmented.

Mites and Ticks (Order Acarina)

What do mites and ticks look like?



Mite.

Size:
Most are microscopic but some reach a size of almost 10 mm in length.

Body:
No constriction between the cephalothorax (front portion containing head) and the abdomen. Though the two regions may be distinctive.
Abdomen without segments, highly variable in shape and appear hard.

Antennae:
Absent.

Eyes:
Up to four simple eyes.

Mouthparts:
Variable depending on their food choice. Generally they have mouthparts for ripping, cutting, mushing, chomping, clinging, piercing or sucking.

Wings:
Absent.

Limbs:
Eight legs but young mites often have only six.
Pedipalps (appendages between first legs and mouthparts) are leg-like or modified for gripping prey.

Abdomen tip:
Cerci (tails) absent.

Where are mites and ticks found?

- Ticks and some mites are associated with animals, including humans. They can be found on the surface of animals or internally in nasal passages or lung chambers.
- Mites can be found anywhere on land but are prolific in the soil, in leaf litter and on plants.
- Mites are found in most freshwater and marine environments including the depths of the ocean.
- Mites are found in houses, especially in carpets.

What do mites and ticks do?

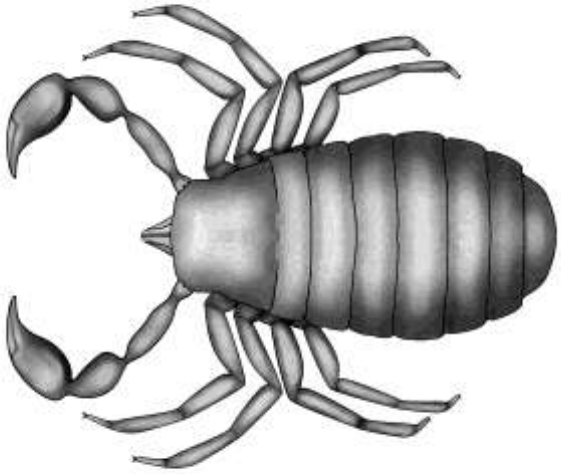
- They are free-living or parasitic.
- They can be solitary or they can group together in large numbers to feed.
- When disturbed mites run from danger, while ticks clamp onto the animal they are on.
- As a group they have adapted to feed on anything including small invertebrates, bacteria, fungi, plants, animal bodily fluids, decaying organisms and waste products.
- Predatory mites hunt or ambush prey. They are known to kill prey by impaling, jabbing, entangling with silk or poisoning them.
- Many move from one region (or host) to the next by clinging to larger animals.
- They are active during the day or night.

What looks similar?

- Ticks and mites are not generally confused with other invertebrates, but their young are occasionally mistaken for insects as they have only six legs.

Pseudoscorpions or 'false scorpions' (Order Pseudoscorpionida)

What do pseudoscorpions look like?



Size:

Less than 10 mm in length.

Body:

No constriction between the cephalothorax (front portion containing head) and the abdomen.

Abdomen is segmented, cigar- to tear-drop shaped, flattened and appears hard.

Antennae:

Absent.

Eyes:

Two or four eyes along front margins of cephalothorax, but some species may have no eyes at all.

Mouthparts:

For mashing and chopping up prey and slurping liquids.

Wings:

Absent.

Limbs:

Eight legs.

Pedipalps (appendages between first legs and mouthparts) are large with pincers (chela) at their ends.

Abdomen tip:

Absent.

Where are pseudoscorpions found?

- On land in many habitats, including deserts.
- In leaf litter, under bark and rocks.

What do pseudoscorpions do?

- Pseudoscorpions are usually solitary but some live in groups.
- When disturbed they run under cover.
- They have venom that is delivered via glands in their pincers. The venom is used to paralyse prey and is not harmful to humans.

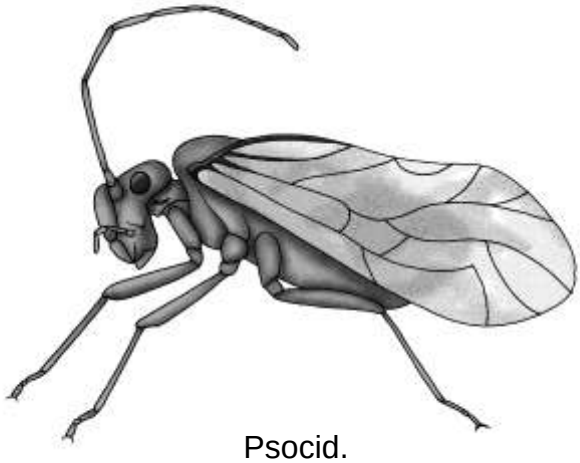
- All pseudoscorpions are predators feeding on other invertebrates. They use their pincers to clasp prey, inject venom and then liquefy victims with digestive juices.
- They move with their pincers outstretched in front.
- Most spin silk that is generally used for home building and protecting pseudoscorpions that are moulting or breeding.
- Some species move from one region to the next by clinging to larger animals (mostly insects).
- They are active at night. If active during the day it is generally in dark places.

What looks similar?

- Scorpions are easily distinguished from pseudoscorpions as they have long tails with stingers and are usually larger than 10 mm.

Psocids and Booklice (Order Psocoptera)

What do psocids and booklice look like?



Psocid.

Size:
Less than 1 mm - 10 mm in length, but most are shorter than 5 mm.

Body:
Ovoid or abdomen swollen making it look like a lopsided dumb-bell;
Some flattened as if pressed from above;
Front of head bulges like a big round nose;
Appears soft and fragile.

Antennae:
Thread-like, usually longer than half their body length.

Eyes:
Small to large, prominent and well separated.

Mouthparts:
For chewing or munching; held downwards at rest.

Wings:
Two (males only) pairs if present.
Both pairs membranous and clear,
Forewing usually wider and longer than hindwing.
Forewing venation simple, few cross-veins forming inconsistent shaped cells, with 'S-shaped' veins.
Wings usually extend beyond abdomen but some species have shortened wings.
At rest, wings held tent-like over body and hindwing is hidden.

Limbs:
Six legs, short and stocky.

Abdomen tip:
Cerci (tails) absent.

Where are psocids and booklice found?

- On or under vegetation, bark, rocks or leaf litter.
- Some are found in houses such as booklice.

What do psocids and booklice do?

- They are solitary or group together (eg. some species of Myopsocus).
- When disturbed they run or fly away.
- They are weak fliers, flying for short bursts then landing soon after.

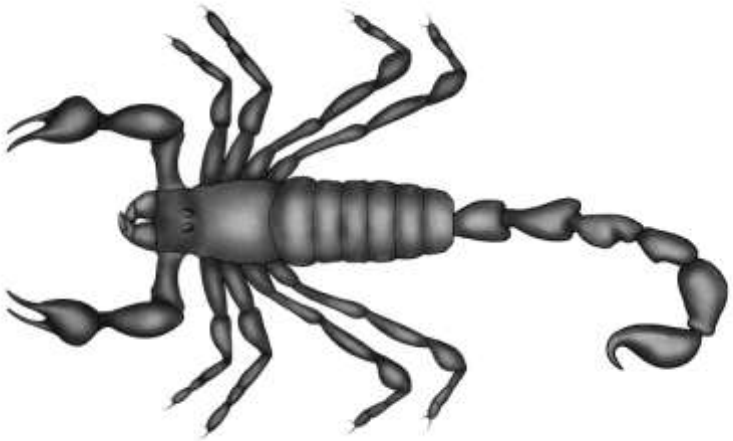
- They primarily graze on microflora such as algae, lichens, and fungi and bits of plant or insect debris. They are an important group for breaking down microflora into units useful for other organisms in the food web.
- They are active during the day.

What looks similar?

- Psyllids can be separated from Psocids by a number of features including: they often have large bulbous backward-pointing spines on hind coxae ('thighs'); frontal region of head is divided vertically, so there are two halves of the facial region; first segment of antennae that attaches to head is enlarged and shaped like a doughnut; they jump when disturbed instead of running or flying.
- Waxy-wings are a group of Lacewings that do not have obvious forking of their wing veins. They can be distinguished from Psocids as their wing veins are nearly straight or if bent curve in one direction only and their antennae are bead-like.
- Springtails can be mistaken for Psocids. They can be distinguished by a lack of wings and obvious mouthparts, a forked springing organ from tip of abdomen or if the organ is not obvious a siphon tube arising from their 'chest'. They also jump when disturbed.

Scorpions (Order Scorpionida)

What do scorpions look like?



Size:
9 mm - 210 mm in length.

Body:
No constriction between cephalothorax (front portion containing head) and the abdomen.
Abdomen is segmented, cigar-shaped to tear-drop-like, with narrow tail.
Body appears hard.
Pectines (a sensory organ) present on underside of body behind legs.

Antennae:
Absent.

Eyes:
Up to 12 simple eyes, two found centrally the remainder on the front margins of cephalothorax.

Mouthparts:
For mushing and chopping up prey and slurping liquids.

Wings:
Absent.

Limbs:
Eight legs.
Pedipalps (appendages between first legs and mouthparts) are large with pincers (chela) at their ends.

Abdomen tip:
Long tail with sting at tip.

Where are scorpions found?

- On land in many habitats including deserts.
- Under rocks, logs and bark.
- In burrows, especially desert dwelling scorpions.

What do scorpions do?

- They are commonly solitary, with few found in groups.
- When disturbed they run under cover, or raise pincers and mobilise tail.
- They are venomous. The venom is delivered via their tail and is used to paralyse or kill prey. Few are harmful to humans.
- All scorpions are predators feeding mostly on other invertebrates but have been known to snare small vertebrates such as lizards. They use their pincers

to clasp prey, then repeatedly sting the held victim, once paralysed the victim is liquefied with digestive juices.

- They move with their pincers stretched out in front and the tail outstretched behind.
- They are active at night or if active during the day generally in dark places; detectable at night with ultraviolet light.

What looks similar?

- Pseudoscorpions are easily distinguished from scorpions as they are smaller than 10 mm in length and lack a tail.

Scorpion-flies and hanging-flies (Order Mecoptera)

What do scorpion-flies and hanging-flies look like?

Hanging-fly.

Size:
- Wingspan up to 50 mm across.

Body:
- Column-like or widest at wing attachment ('wide shoulders') tapering past this point.
- Head with a beak-like extension.
- Appears soft and fragile.

Antennae:
- Thread-like, with many segments and longer than half their body length.

Eyes:
- Large, bulging and well separated.

Mouthparts:
- For chewing or munching.
- Located at the tip of beak-like extension of the head.
- Held downwards at rest.

Wings:
- Two pairs if present (though rarely absent).
- Both pairs are similar in size, membranous, clear, and have numerous cross-veins forming mainly rectangular cells.
- At rest most hold their wings tent-like above their body though some species overlap them.

Limbs:
- Six legs, very long and slender.
- Have large spines at joints.
- Often have large claws for grabbing onto prey and plants.

Abdomen tip:

Cerci (tails) absent.
Males have claspers, which are used to hold onto the female during mating.
In some groups the abdomen is raised similar to the stinging tail of a scorpion hence the common name scorpion-fly.

Where are scorpion-flies and hanging-flies found?

- Usually around moist environments or adjacent to open water. Some however are found in drier habitats.
- On herbs and low shrubs that have many leaves.
- Occasionally amongst tall grasses or on flower heads.
- One wingless species can be found on snow (Tasmania only).

What do scorpion-flies and hanging-flies do?

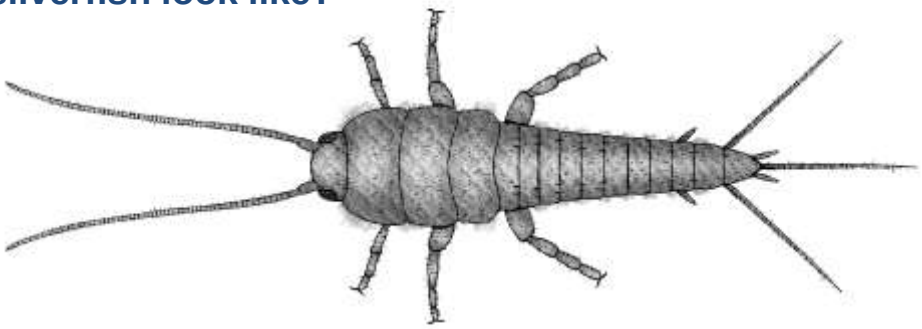
- They are solitary.
- When disturbed they fly away, flying only in short bursts.
- They tend to be weak, slow, flapping fliers.
- Hanging-flies hang from plants by their forelegs waiting to catch prey with their hind legs.
- Both hanging-flies and scorpion-flies tend to be predators preying on flies, moths, bees, spiders and various larvae. Some are also scavengers taking nectar as they hunt.
- They are active during the day.

What looks similar?

- Lacewings can have a beak-like extension of the head but it is never as long as you would see in a hanging-fly or a scorpion-fly. Lacewings are distinguished by the forked veins along the margins of their wings.
- Alderflies/Dobsonflies are easily distinguished as they lack a beak-like extension of the head.
- Crane flies (order Diptera, family Tipulidae) are often confused with hanging-flies as they have long legs and have a habit of hanging on plants. Craneflies can be distinguished by only having one pair of fully functional wings.

Silverfish (Order Zygentoma)

What do silverfish look like?



Size:

2 mm - 18 mm in length.

Body:

Column-like, tear-drop or spindle-shaped.
Often hairy, with tufts common between eyes
Appears hard and covered in scales.
Have tiny styli (soft finger-like projections) coming from the underside and some of the abdomen segments.

Antennae:

Thread-like, with many segments. Longer than half the body length.

Eyes:

Absent or small, berry-like and well separated.

Mouthparts:

For chewing. Held in front or downwards at rest.

Wings:

Absent.

Limbs:

Six legs, short and stocky.

Abdomen tip:

Three tails (two cerci and one middle filament), thread-like, and similar in size; at rest the two outer tails are directed at an angle away from the body.

Where are silverfish found?

- Under bark, rocks or among leaf litter.
- In soil or within caves.
- In the desert, as some are capable of absorbing water from the atmosphere.
- Living in ant and termite nests.
- In houses, where they favour areas of high humidity like bathrooms.

What do silverfish do?

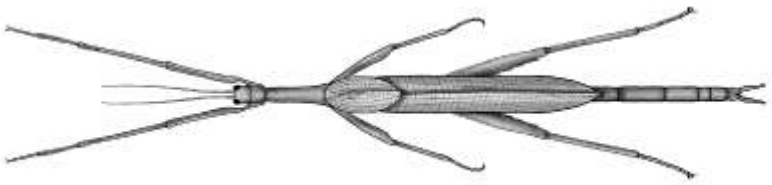
- They often group together around food sources.
- When disturbed they remain still, run for cover or hop.
- They feed on fungi, and plant material. In the home they may feed on starchy substances such as wallpaper glue, book bindings and photographs.
- They are normally active at night, if active during the day generally found in dark places.

What looks similar?

- Bristletails are easily confused with Silverfish. They may be separated from Silverfish by their large eyes that touch; their long middle tail, which is considerably longer than the cerci; and they jump when disturbed.

Stick insects (Order Phasmatodea)

What do stick insects look like?



Size:

30 mm - 300 mm in length.

Body:

Commonly stick-like or cigar-shaped while other varieties include leaf-shaped and grass-like.
Many bear spines or outgrowths.
Appears hard.

Antennae:

Thread-like.
Length variable but never longer than body.

Eyes:

Small but prominent and well separated.

Mouthparts:

For chewing or munching.
Held downward at rest.

Wings:

Two pairs if present.
Forewings hardened and leathery, partially see-through or cloudy.
Hindwing visible much larger than forewing and folds like a hand fan; folded region of wing membranous and clear
Both wings have numerous cross-veins forming many cells.
At rest, wings are held flat or rolled around body, overlapping and much shorter than the abdomen.

Limbs:

Six legs.
Usually long and slender.
Groove at base of forelegs in which the head rests when the legs are held in front outstretched.
Tarsi (toes) with five segments.

Abdomen tip:

Two moderate to long cerci (tails) which are unsegmented.
In males the tip may be modified as clasping organs.

Where are stick insects found?

On the foliage of trees and shrubs, on herbs, grass tussocks or in leaf litter.

What do stick insects do?

- They are solitary and are infrequently encountered due to their secretive nature.
- When disturbed they commonly remain still, sway or if really stressed act dead by dropping to the ground like a fallen branch. Alternatively some rapidly raise brightly coloured wings, which in turn creates a fluttering or hissing sound.
- They are weak clumsy fliers, usually flying for short bursts.

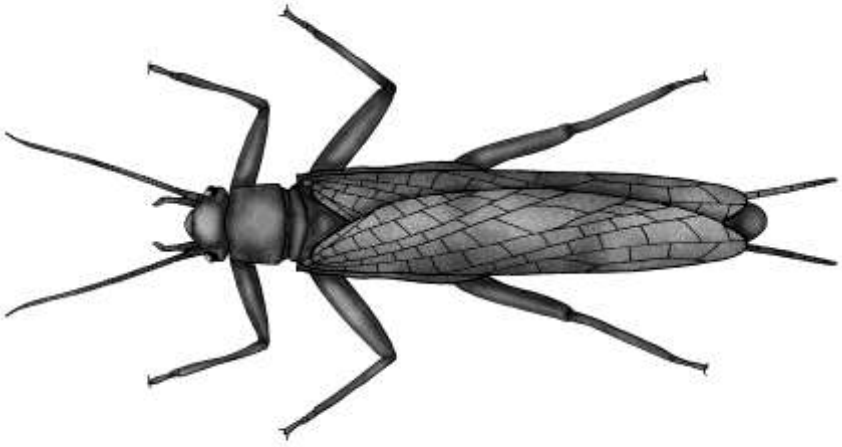
- They are experts at camouflage. They may behave in a particular way and use colourations, patterning or special body forms to blend in with their surroundings. They are also capable of remaining motionless for long periods of time.
- They are plant feeders.
- Most are only active at night.

What looks similar?

- Grasshoppers, certainly some species, greatly resemble Stick Insects in behaviour and appearance. They differ from Stick Insects by their pronotum (segment behind head), which appears to drape over the sides. Additionally their tarsi never have more than four segments and when they have wings the hindwing is hidden and both wings tend to be longer than the abdomen.
- True bugs can be distinguished from Stick Insects by having tube-like mouthparts, and membranous wings.
- Praying Mantids can be distinguished from Stick Insects by having raptorial forelegs and a triangular head.

Stoneflies (Order Plecoptera)

What do stoneflies look like?



Size:
- 4 mm - 60 mm in length.
- Wingspan 10 mm - 110 mm.

Body:
- Column-like and often flattened.
- Appears soft and fragile.

Antennae:
- Thread-like, with many segments.
- Often longer than half body length.

Eyes:
- Bulging and well separated.

Mouthparts:
- For chewing or munching.
- Held in front at rest.

Wings:
- Two pairs if present.
- Both pairs membranous and clear.
- Most species have moderate number of wing cross-veins that form long rectangular cells.
- Few species have numerous cross-veins and cells.
- Hindwings are shorter and wider than the forewings.
- At rest, wings overlap and are held flat over body or often curving around the abdomen.
- Generally cover the abdomen though a few species have short wings.

Limbs:
- Six short legs.
- Fore- and midlegs held out from body and bent at 'elbows'.

Abdomen tip:
- Two moderately long cerci (tails) with many segments.

Where are stoneflies found?

- Close to creeks or rivers generally on adjacent vegetation, or behind bark and logs.

What do stoneflies do?

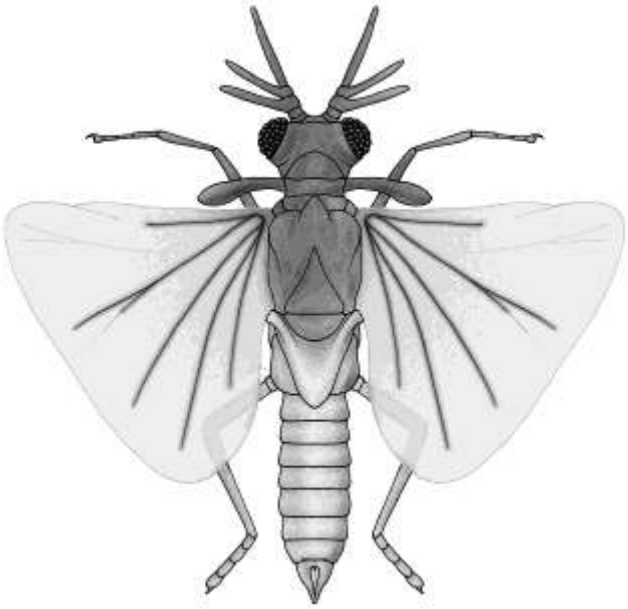
- They are solitary.
- When disturbed they are reluctant to fly: often running quickly to cover, raising wings to appear larger or flying away to land again soon after.
- They are weak flapping fliers, only flying in short bursts.
- Most use colours and patterning to blend in with their surroundings. Though some large alpine species have brightly coloured wings.
- They feed on plant debris, algae, lichen, rotting wood and bark.
- They are active during either the day or night; night active species are attracted to lights.

What looks similar?

- Alderflies or Dobsonflies can look a lot like stoneflies. However they can be distinguished by the fact most hold their wings tent-like, they do not have cerci (tails), and they hold their legs underneath their body.

Stylops (Order Strepsiptera)

What do stylops look like?



A male stylops.

Size:
- Wingspan of males 1 mm - 8 mm.
- Body no more than 4 mm in length.

Body:
- Widest at wing attachment (wide 'shoulders'), abdomen tapering.
- Segment behind head of male small but segment bearing hindwings enlarged.
- Females larvae-like.
- Appears soft.

Antennae:
- In males only.
- Branched, antler-like and never longer than body.

Eyes:
- In males only.
- Berry-like, bulging or extended on short stalks, and well separated.

Mouthparts:
- Reduced and non-functional.

Wings:
- Two pairs (males only).
- Forewings very small, club-like and hardened; no veins.
- Hindwings broad, cape-like and with few veins and no cross-veins.
- At rest, wings folded loosely over body though male stylops rarely rest.

Limbs:
- Six legs.
- Short and stocky.
- Trochanter (second segment of leg) absent in fore- and midlegs.

Abdomen tip:
- Cerci (tails) absent.

Where are stylops found?

- Rarely sighted due to unique lifestyle.
- Female stylops and their larvae can be found inside other insects especially wasps and bugs such as plant hoppers. They have also been found in cockroaches, silverfish, mantids, grasshoppers, other bugs, and flies.
- Males, if you are extremely lucky, can be seen as they emerge from hosts, or whilst they are looking for mates adjacent to hosts.

What do stylops do?

- Larval stages and female stylops of most families are internal parasites; adult males are free-living. In most cases they do not reduce the lifespan of the host significantly but are known to induce sterility.
- Males are rarely found at rest, as they spend their brief adult life looking for females to mate with.
- Adults do not feed.
- Males are attracted to light.

What are the exceptions?

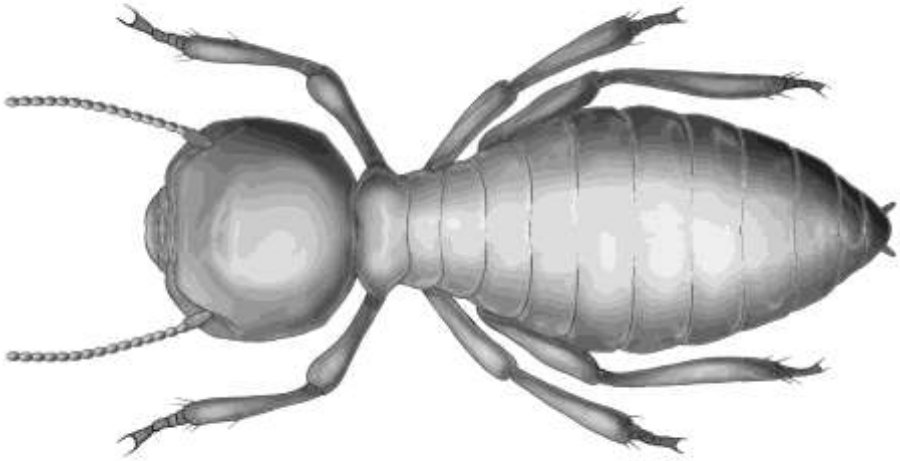
- Females in the family Mengenillidae are free-living with eyes, legs and antennae. Females in all other families are legless, without eyes or antennae, and are parasites inside their insect hosts.

What looks similar?

- Flies and Stylops can be easily confused. Unlike stylops, flies have a club-like hindwing and a fully functional membranous forewing.
- Wedge-shaped beetles (Order Coleoptera, family Rhipiphoridae) are a lot like stylops. However they tend to be much larger and although their forewings are reduced they are never club-like in appearance. Females of wedge-shaped beetles are also, larvae-like and internal parasites but unlike stylop females they still retain legs.

Termites (Order Isoptera)

What do termites look like?



Size:
3 mm - 70 mm in length.

Body:
Long and column-like, or constricted at the neck with a swollen abdomen.
Head sometimes modified for defense.
Appears soft.

Antennae:
Beadlike.
Shorter than body length.

Eyes:
Winged termites have small and well-separated eyes.
Worker and soldier termites have very small or no eyes at all.

Mouthparts:
For chewing or munching.
Held downward at rest, though soldier termites may have large modified jaws held out in front.

Wings:
Two pairs if present. Reproductive castes have wings but worker and soldier termites do not.
Fore- and hindwing membranous, clear and similar in size and shape.
Wing venation simple, lacking cross veins.
At rest, wings are held flat over body, overlapping and with hindwing hidden.
Wings are discarded after mating.

Limbs:
Six slender legs.

Abdomen tip:
Two short cerci (tails) with few segments.

Where are termites found?

- In earthen or wooden nests formed in trees, soil mounds or underground. These nests are made from mixing soil or wooden material with their faeces.
- In runways, which are undercover pathways that lead from nests to food or moisture source.
- In the house, generally introduced species known as 'white ants'.

What do termites do?

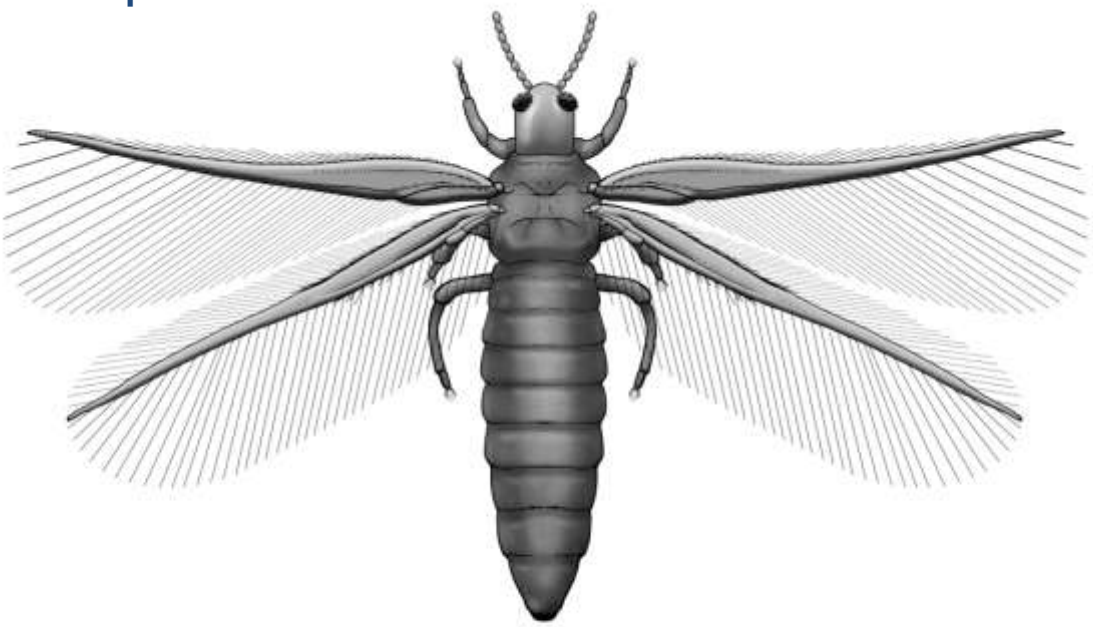
- They form large colonies with a sophisticated social class system with queen, king, worker and soldier castes. They share the responsibility for tending their young.
- Australian species forage under shelter at all times; some foreign species forage in exposed situations.
- When disturbed they run for cover. Soldiers may initially stand their ground and often swell in numbers to defend the nest. Soldier termites generally respond by attacking with large jaws or squirting noxious chemicals not harmful for humans but unpleasant for other invertebrates.
- They are important recyclers of plant material. They are especially good at breaking down cellulose and lignin into useable nutrients.
- Immature termites remain in the nest and are fed by workers.
- They are active during the day and night.

What looks similar?

- Ants can sometimes be confused with termites. However ants can be easily distinguished as they have a distinctive 'waist' with knobs, a hard body; and their antennae are thread-like with a distinct elbow.
- Lacewings are occasionally mistaken for winged termites. The wings of lacewings, unlike those of termites, usually have many veins and numerous cells. They also have forked veins along the wing margin and are held tent-like over the body at rest.

Thrips (Order Thysanoptera)

What do thrips look like?



Size:

0.5 mm -15 mm in length but most are shorter than 5 mm.

Body:

Cigar-shaped, column-like or widest at wing attachment (wide shoulders), with abdomen tapering.
Flattened as if pressed from above.
Head square or rectangular-like.
Appears soft or hard.

Antennae:

Bead-like or thread-like.
Never longer than body.

Eyes:

Berry-like.
Very small or large.
Moderately separated.

Mouthparts:

For piercing, scraping and sucking.

Wings:

Two pairs, if present.
Both pairs thin with no more than three veins.
Margins entirely or partially lined with long hairs.
At rest, wings held flat over body and either overlapping or held alongside each other.

Limbs:

Six legs, short and stocky.
Adhesive bladders expand from last tarsal (toe) segment.

Abdomen tip:

Cerci (tails) absent.
Last segment of abdomen may be long and tubular, with a ring of long hairs at the tip.

Where are thrips found?

- On leaves, and fruit.
- On flower heads where they may spend their entire life.
- Axils of grasses, leaves and flower stalks.
- Under bark and among leaf litter, moss and fungi.
- Some live in galls or shelters made by folding leaves. Galls maybe constructed by the thrip or more likely by another insect group.

What do thrips do?

- Most thrips are solitary, though they may form large groups in areas where preferred food sources are minimal.
- Some form colonies in galls or folded leaf-shelters.
- When disturbed they run or fly away.
- Their flight activity is often associated with a change in weather (hence common name 'thunder flies').
- Some flightless species are small enough to be dispersed by wind.
- Most are plant feeders feeding on leaves, pollen, nectar, flowers, fruits and young shoots of trees and shrubs.
- They tend to feed by sucking up juices created after rasping surfaces.
- They may also feed by piercing and sucking out internal juices or eat items whole such as pollen.
- Other thrips feed on fungal spores hyphae.
- Some are predators. Thrip predators prey on eggs, larvae or even the adults of a variety of insects, mites and nematodes.
- Some are pests to crops (mostly introduced species).
- They are active during the day or night. Some night active species are attracted to light.

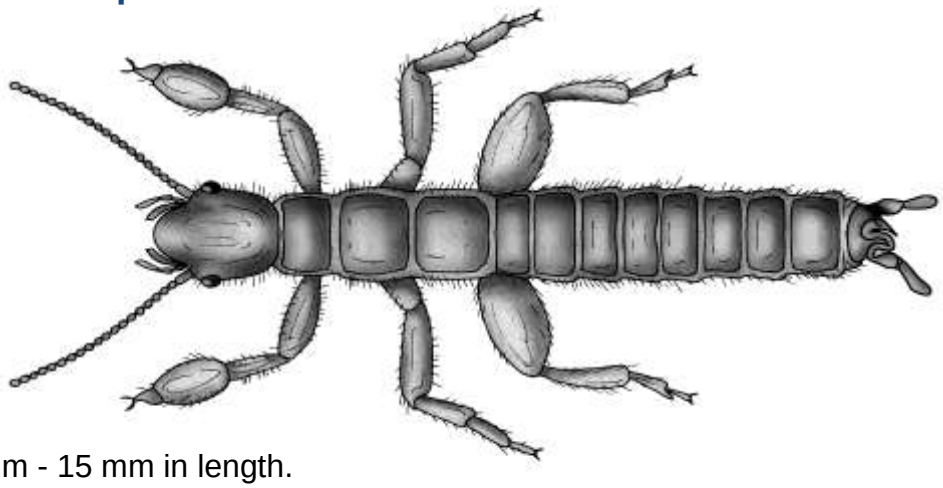
What looks similar?

- Not readily mistaken due to unique appearance and lifesytle.

Web spinners (Order Embioptera)

Web spinners are also known as Embiids or Foot spinners

What do web-spinners look like?



Size:
- 4 mm - 15 mm in length.

Body:
- Long and column-like.
- Appears hard.

Antennae:
- Bead-like.
- Never longer than body.

Eyes:
- Usually small, well separated, and often kidney-shaped.

Mouthparts:
- For chewing or munching.
- Held forwards at rest.

Wings:
- Two pairs (males only) if present.
- Both pairs membranous, similar in size and spatula shaped.
- Both pairs have few wing veins but the wing maybe pigmented giving it the appearance that it has veins.
- At rest the wings are held flat to body, overlap and do not extend to tip of abdomen.

Limbs:
- Six legs
- Bottom segment of front tarsi (toes) greatly enlarged and bulbous. This segment contains numerous glands for silk production.

Abdomen tip:
- Two short cerci (tails) with two segments.
- In males right cerci differs in size and shape to the left.

Where are web-spinners found?

- They are confined to silken nests, which have many tunnels.
- The nests are spun on bark surfaces, and rocks or among crevices and leaf litter.
- Due to their secretive nature they are rarely seen.

What do web-spinners do?

- They form large colonies sharing living quarters much like humans share an apartment block.
- When disturbed, they run backward into silken tunnels. Their wings can flex over their head to allow backward movement into the tunnels.
- They are weak fliers that flutter; insect blood (hemolymph) is pumped into the upper veins to stiffen the wings during flight. Males tend to only fly when in search of a reproductive mate.
- They primarily feed on dead and decaying plant material but are known to feed on living lichen and moss.
- They are active during the night and are attracted to light.

What looks similar?

- Nothing due to their unique anatomical features and lifestyle.