

Insects: resource information

The study of insects is called entomology

What are insects?

Insects are animals belonging to the class known as Insecta.

The body is divided into 3 sections:

- **head,**
- **thorax,**
- **abdomen.**

They have **6 legs** attached to the thorax.

They usually have wings, also attached to the thorax. In insects such as beetles, the elytrae (= hard wings) cover the flying wings and lie flat against the abdomen at rest.

Closest relatives

Centipedes and millipedes (which have many more than 6 legs!).

How many different species are there?

There are probably more than five million (5,000,000) different species in the world, but the exact number is unknown. By comparison, there are only 9,000 species of birds and 4,000 species of mammals. New Zealand has about 20,000 species of insects, and many of these still require an official scientific name (genus and species names).

Insect skeleton

Humans have bone skeletons on the inside with all our soft bits on the outside surrounded by a soft skin.

However, in insects:

- the skeleton is an external, hard **exoskeleton** which provides:
 - support for the animal contents and muscles;
 - protection against water loss.
- the exoskeleton of insects doesn't grow with them, so they have to moult (shed their skin) to grow. They only do this when they are young, and cease to moult once they become an adult.

Life cycles of insects

All insects start as eggs.

There are 2 different types of life cycle:

1. **young stages (nymphs) look similar to adults.**

In a cicada, for example:

- a nymph hatches out of the egg;
- the nymph then feeds on the roots of plants underground, often for several years;

- the nymph looks a bit like the adult cicada, but it is white and has no wings;
- during this time as a nymph it sheds its skin several times and grows bigger and bigger;
- eventually it crawls out of the ground and climbs up a tree where it sheds its skin for the last time;
- it emerges from its nymphal skin as the adult cicada with its wings;

2. **young stages (larvae) look different from the adults.** In insects like butterflies, beetles, and flies:

- the egg hatches into a caterpillar or larva;
- the larva feeds for anything from days to several years (different insects have larvae feeding on many different types of food);
- the larva looks very different from the adult insect;
- when the larva sheds its skin for the last time it becomes a pupa;
- the pupa is a resting stage; it is usually fixed in one place, often inside a cocoon made by the larva, and it can't move much;
- inside the pupa the body of the larva breaks down into a kind of living soup, and reorganises itself into the adult insect;
- these big changes in the life cycle of insects are called **metamorphosis**, which is a Greek word meaning "change of shape" or "transformation".

Insect senses

The world must look and feel very different to an insect. Apart from being much smaller than us, and (unlike us) constantly in danger of being eaten by something bigger (such as a spider, a bird, or even another insect), their senses are different from ours.

Sight

- Each eye of an insect is like a lot of eyes all stuck together, they are called compound eyes.
- They see the world very differently to us.
- They can see colour.
- They are very good at seeing movement, but they can't see shapes nearly as well as humans.

Smell

- Insects don't have noses, but they can smell extremely well.
- They smell with the antennae which stick out of the front or sides of the head.
- Moths and other insects often have antennae like feathers; this increases the surface area so that they can pick up scents particularly well.
- Female insects produce special substances called **pheromones**; these are like perfumes and are used to attract the males.

- A male European emperor moth (*Pavonia pavonia*) is known to be able to pick up the female's scent from a distance of 11 km!

Sound

- Most insects don't have ears, but they can pick up sounds through their skin.
- Some insects have **tympanal organs**, which are basically ears, except that they are not on the head but elsewhere on the body. For example, crickets have the tympanal organs on the front legs.
- Male crickets, cicadas, and grasshoppers "sing" to attract females to mate with; each species has its own special song.

Insect food

Insects eat all sorts of different things.

Many species eat the leaves of plants, like the caterpillars of butterflies and moths. Adult butterflies and bees are examples of insects that have long tubular tongues to suck up nectar from flowers.

Some insects, like the praying mantis, feed on other insects. They lie in wait for other insects and suddenly grab them with their spiny front legs. Sometimes the female praying mantis will even eat the male after mating with him! (Note, the female of the native New Zealand species (*Orthodera novaezealandiae*) seldom eats the male; but it is common in the Southern African species (*Miomantis caffra*), first found here in 1978).

Many insects live on other animals and are called "parasites"; for example, fleas and lice, which live on mammals and birds, and either suck their blood (fleas and some lice), or feed on their skin and feathers (many lice).

Diseases carried by insects

Some blood-sucking insects are very dangerous to humans because they can carry diseases. The Oriental rat flea (*Xenopsylla cheopis*) carries bubonic plague, a disease that in the 14th century wiped out a quarter of the population of Europe (25 million people)! Mosquitoes are a group of blood-feeding insects that carry diseases, in particular malaria, which is often fatal. Malaria does not occur in New Zealand but is very common in tropical countries, where about 120 million people get the disease every year.

Fossil history

Insects have been around for at least 380 million years, before even the dinosaurs! We know about these ancient insects from fossils. Some of these extinct forms were very large indeed: a group of insects called palaeodictyopterans, which looked like

giant cockroaches and lived about 250 million years ago, had wingspans up to 56 cm! Even larger were the giant dragonflies that lived at the same time; these had wingspans up to 71 cm!

Biggest, heaviest, smallest?

The **biggest wingspan** of any insect living today is about 35 cm for the hercules moth (*Coscinocera hercules*) of Australia.

The **heaviest insect** is probably the goliath beetle (*Goliathus goliath*) of Africa, which is reputed to weigh up to 100 grams (more than a small bird)! We have an insect in New Zealand, the giant wētā or wētāpungā (*Deinacrida heteracantha*, only found today on Little Barrier Island), which is very big and can weigh up to 71 grams.

At the other end of the scale, there are very tiny wasps called mymarid wasps (fairy flies) which are less than 0.4 mm in length, and these are regarded as the **smallest insects**.

How many species to be discovered yet?

In the tropics, there are thousands upon thousands of unknown species waiting to be found. Even in New Zealand we can be sure that there are species that no one has yet discovered, and many more that have been found and not formally named.

The insects you usually see

Many of the insects you find in your back garden in New Zealand are foreign species that have come from elsewhere, for example: the honeybee (Europe), bumblebee (Europe), European wasp, and the paper wasp (Asia). There are about 2,000 species from other parts of the world living in New Zealand now. Only a few native species have adapted to human-modified environments, for example, cicadas.

The insects you don't usually see

You usually have to go into the bush to find the native species. About 18,000 of these live in New Zealand and nowhere else in the world! Just as New Zealand has special birds like the kiwi, it has special insects like the giant wētā and the giraffe weevil, that are found only here. And there is much more out there to be discovered . . . !

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