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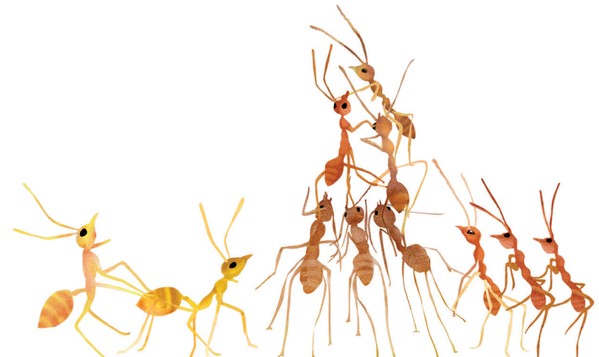
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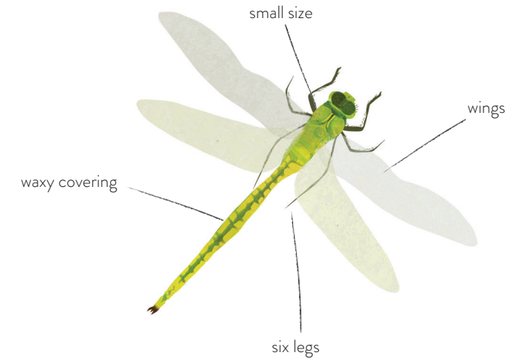


Welcome to Planet Insect!

Who rules the world? Is it the most numerous animals? Or the group with the greatest number of species? Or the animals that live on all seven continents? Insects are all three!

The first insects appeared around 400 million years ago, long before the time of the dinosaurs. They survived four mass extinctions that wiped out bigger, tougher animals. They watched as mammals and flowering plants appeared for the first time. Right now, up to 10 quintillion insects are creeping, crawling, fluttering and scuttling in every corner of the world. They outnumber humans by around 1.4 billion to one! Insects are also the most diverse group of living things. Just over a million species have been spotted and named so far.

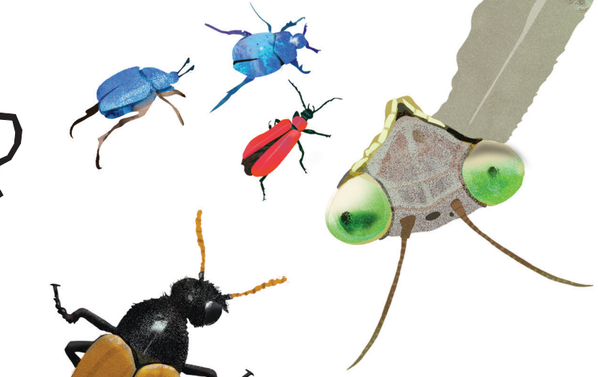
From the wettest forest to the driest desert, from the frozen Arctic to the tropical rainforest, insects have found ways to survive in every possible habitat. There are even insects that live inside other insects! The million or more species of insects have many differences, but they all share features which make this group so successful.



Insects aren't just the most successful creatures on the planet – they're also the most important. In these pages you'll meet insects that pollinate plants and spread seeds. Insects that prey on pests and provide food for millions of different animals. Insect decomposers, who break down dung and dead things, recycling their particles to be used by new life. One million insects that support almost every ecosystem on Earth.

Is it an insect?

Lift a fallen log, dip a net into a pond or shake a tree and you'll find our planet is crawling with small animals! But not all of these are insects. What makes insects different, and special?



There are millions of different types of living things on Earth. To keep a track of them, scientists sort them into groups based on their similarities. Insects belong to a large group of animals known as invertebrates: animals without a backbone. In fact, they have no skeleton inside at all. Some invertebrates are quite squishy as a result, but one group – the arthropods – have a tough covering, called an exoskeleton, on the outside instead.

This exoskeleton is extremely useful. It provides protection from predators and it stops water from moving out of an arthropod's body, so they don't dry out! All arthropods have a symmetrical body divided into segments, and legs that grow in pairs. Spiders, crabs and centipedes all share these features, but the biggest group of arthropods is the insects.

Three parts

Each part of an insect's body has a different role. The head has parts for feeding and sensing. The thorax is where the legs and wings are attached. The abdomen contains parts for digesting food and for reproducing.

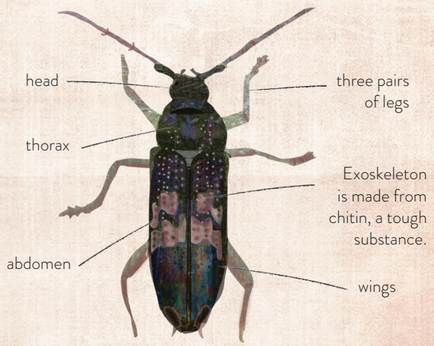


Winged visitors

Most insects have wings for at least part of their life. They were the first creatures on Earth to ever take to the air. Insects are still the only animals with proper wings that aren't just reshaped arms or fins.



Class: insects
Species: more than one million
Lives: almost everywhere



Walking tripods

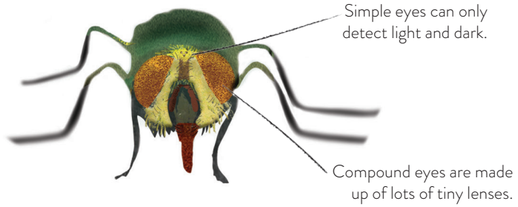
As an insect walks or runs, it always keeps three feet on the floor. Two on one side, and one on the other. This 'tripod gait' helps the insect keep its balance or stick to a surface as it climbs straight up!





Eye, eye

How many eyes does this fly have? Look closely... Wasps, bees and flies all have five eyes! They include both types of eyes that insects have.



No lungs

Insects breathe air, but not through their mouths or even their heads. Air gets into their bodies through tiny holes called spiracles on the sides of their bodies.

Super senses

Senses let an insect find out all about the world around them – to avoid danger, and find friends – or lunch! Their senses are very different from ours. There are insects that smell with their antennae, taste with their feet, hear with their legs and see with their bottoms!

Flower meals

As insect senses evolved, so did flowers! Delicious scents and beautiful colours are there to tell insects where to find food. The flowers advertise free meals of nectar to ensure they get pollinated. Some insects prefer the smell of poo or dead meat, so there are flowers that produce those smells instead!





NOT AN INSECT!

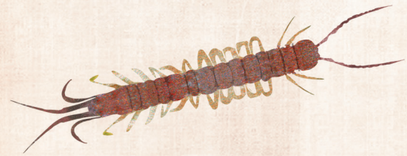
Spider and scorpion

Arachnids, such as spiders and scorpions, are arthropods. They have eight legs and no wings, so are not insects.



Millipede and centipede

Millipedes and centipedes are arthropods but have no wings, and many more legs and body segments than insects.



Woodlice

Most crustaceans live in water. But woodlice are crustaceans that live on land.



Springtails, coneheads and two-pronged bristletails

Springtails have six legs, however, they never have wings, their mouthparts are hidden away inside their heads, and they often don't have eyes or antennae.



Dazzling diversity

Insects are a vast group of animals. The million species we know about have lots in common, but plenty of weird and wonderful differences, too.

Insects come in...

- all shapes – from long, thin stick insects to large round beetles.
- all sizes – from dinner plate-sized moths to fairy wasps too tiny to see.
- all colours – from black and yellow jackets to peacock butterflies.

Different wings

Most insects have four wings, but some have just one pair and some never grow wings at all. Insect wings look and work in diverse ways, from the purposely clumsy fluttering butterflies to dragonflies dive-bombing with fighter pilot precision.

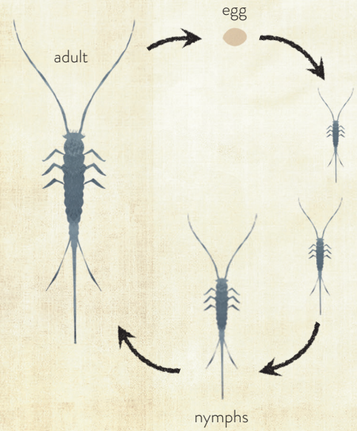
Different mouths

An insect's mouthparts give us a massive clue about what it likes to eat. Tough jaws are good for chewing leaves or crunching other insects. Needle-sharp tubes are better for piercing skin or stems and sucking blood or sap. A coiled proboscis can find its way to the best-hidden nectar. And sponge-like mouthparts can soak up liquid food – but only if it's been digested beforehand!

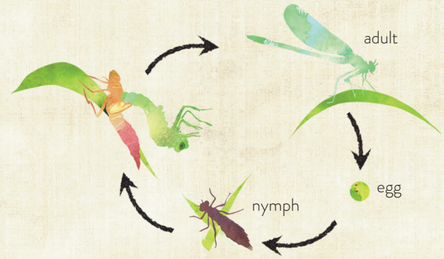
Different life cycles

Animals with a stiff exoskeleton can't grow gradually like we do. As they get bigger, they have to shrug off their cuticle like a coat that no longer fits and replace it with a larger one. This is called moulting, and young insects do it all the time, until they reach their adult form. All insects lay eggs, but there are three different routes to follow from egg to adult.

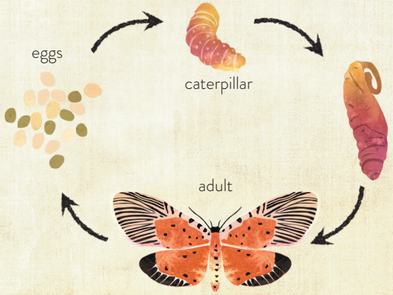
1. Some insects are born looking like tiny versions of their parents. These nymphs moult several times as they grow until they are adults.



2. Some insect nymphs look different from their parents. For example, they may have no wings, or they may live underwater instead of on land. With each moult, their body changes a little. This is called incomplete metamorphosis.



3. Most newly-hatched insects look (and behave) completely differently to their parents. Their last moult is a very special one. They form a pupa and rest while their whole body is rearranged. This is how a caterpillar changes from a squidgy blob to a beautiful butterfly.



Sorting insects

To help keep track of this dazzling diversity, scientists sort insects into smaller groups that share similar features. These groups are known as orders. Each chapter of this book explores one insect order, or group of closely-related orders. You'll meet some of the most common species (who still have plenty of secrets to share) and you'll also meet some rarer insects, with life cycles that boggle the brain (quite literally, if you happen to be a ladybird). Prepare to be delighted, disgusted, discombobulated and dazzled.

True bugs

Did you know that 'bug' isn't just another word for insect? Only around one in ten types of insects belong to the group known as 'true bugs'. At first glance, these insect families seem very different from one another. But look a little closer, and you'll find they have lots in common.

Pale giant oak aphids

Sucking sap

True bugs feed by stabbing something (or someone!) with their needle- or beak-shaped mouthparts, then sucking out the juices inside. Most feed on plants, and large groups of aphids, scale insects or whiteflies can damage crops.

Best breeders

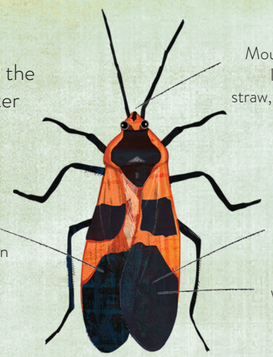
There are thousands of species of aphids, and their superpower is producing more aphids! In a perfect aphid world (with no hungry predators and unlimited food) a single mother aphid could have BILLIONS of offspring. Each of these would go on to have billions more, and soon, Earth would be covered in a layer of aphids 150 kilometres thick! Luckily, this doesn't happen because ladybirds, birds and plenty of other creatures love to eat aphids.

Scale insects

These are the smallest true bugs. There are about 8,000 different types, but it's hard to get a good look at them. Most spend their lives underneath a hard shell or soft, waxy covering, making a plant look like it's covered in scales, such as these whiteflies.

Whiteflies feed underneath plant leaves, and are very unpopular with farmers and gardeners because they can spread viruses from plant to plant.

True bugs
Order: Hemiptera
Species: around 80,000–82,000
Lives: many different habitats around the world, including on and under the water



up to 10 cm long

Large milkweed bug

Ant farmers

Aphids and scale insects guzzle so much sugary sap, they poop out a sweet, sticky goo called honeydew. Ants think honeydew is completely delicious. Some types of ants live alongside aphids or scale bugs and act as tiny farmers, herding the bugs from place to place and protecting them from weather and predators. Their reward is unlimited honeydew.

Froghoppers and leafhoppers

Froghoppers are named for their froggy faces and amazing leaping skills. They're also known as spittlebugs, because their nymphs like to hang out in bubbles of foamy froth. It's not really spit – the froghoppers make it by blowing air through slime. It hides them from predators and stops them from drying out on a warm day.

The Peanut bug has eyespots and a lizard-like head to fool potential predators, but if that fails it releases a smell like a skunk!

Two-lined spittlebug

Bugs we eat

Have you ever eaten an insect? Unless you cook everything from scratch, the answer is almost certainly YES! Cochineal are tiny scale insects that live on cactus leaves. They can be dried and crushed up to make a bright red dye that is often used as food colouring. Many people don't like the idea of eating bugs, so on food labels it's listed as carmine, carminic acid, natural red 4, crimson lake or E120.

Cochineal scale