The amazing life of bees and other insects

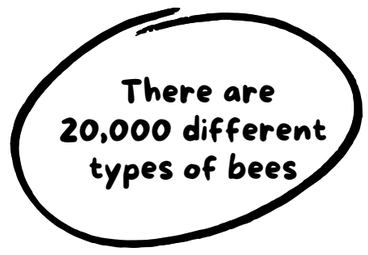
Contents

Insects

Insects are small animals that belong to a group called Insecta. They're the largest group of animals on Earth and are part of the arthropod family — the same group that includes spiders and crabs. Insects have six legs, three main body parts (a head, thorax, and abdomen), a hard outer shell called an exoskeleton, a pair of antennae, and usually two large compound eyes. There are over a million known species of insects — that's more than half of all known animal species!

Anatomy

Insects have a simple nervous system made up of a brain and a nerve cord that runs along the underside of their body. Most insects lay eggs to reproduce. Instead of lungs, they breathe through tiny holes along the sides of their body that lead to tubes inside, which carry air directly to their tissues. Their blood doesn't carry oxygen like ours does, and it moves through an open space inside the body rather than in blood vessels.
Many insects have great eyesight thanks to their compound eyes, and some also have extra small eyes called ocelli. Some can even hear using special organs called tympana, which might be found on their legs or body. Their sense of smell comes from tiny sensors, mostly on their antennae or mouthparts. Insects have an exoskeleton which is stiff and doesn't stretch, so they have to shed it to grow — this process is called **molting**.



Different insects have evolved body parts adapted to their lifestyles:
.
Beetles: have hard forewings called **elytra** that protect the delicate flying wings underneath.

Stick insects: are long and skinny to blend in with twigs and branches — a great example of camouflage.
Dragonflies: have enormous eyes that almost cover their entire head, giving them nearly 360-degree vision for hunting.

Bee Body Parts

Bees have some pretty interesting body parts that help them survive and do their jobs! Like other insects, bees have two big **compound eyes** on the sides of their head, which help them see in lots of directions. They also have three small eyes on the top of their head called **ocelli**, which help them sense how bright the light is. Bees have two antennae on their head. Their antennae bend in the middle like an elbow. These help them feel things, smell, taste, and even sense air movement. Figure 1 shows the parts of a bee,

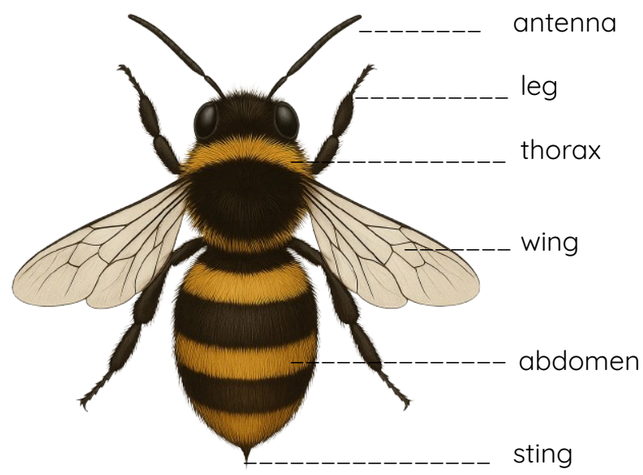
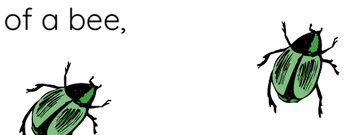


Figure 1: A bee



Check out those legs!

Figure 2: A praying mantis

Bees use their legs to collect pollen

Bees don't just fly from flower to flower—they're also expert pollen collectors, and their legs are perfectly designed for the job! Bees have six legs, like all insects, but their back legs are extra special. On many bees, especially honey bees, these legs have pollen baskets, also called **corbiculae**. These are smooth, curved areas surrounded by stiff hairs that help bees carry big loads of pollen back to the hive. As a bee moves through a flower to drink nectar, it brushes up against the plant's pollen. The bee uses the brush-like hairs on its front and middle legs to groom itself, then transfers the pollen to its back legs. Once the baskets are full, the bee flies home with big yellow or orange blobs of pollen stuck to its legs — like little saddlebags!. Pollen is a super important food for bees. It's packed with protein and is used to feed baby bees (larvae) back at the hive.

Praying mantises and their raptorial legs

Praying mantises have some of the most fascinating legs in the insect world — especially their front legs, which are specialised for hunting. These front legs are called **raptorial legs** (Figure 2). They're large and folded like a jackknife, allowing the mantis to strike out quickly at prey. The legs have sharp spines that help grip and hold struggling insects like flies, crickets, or even small lizards. When a mantis spots prey, it stays completely still, blending in with leaves or branches, and then strikes with lightning speed — usually in less than a tenth of a second! The other four legs of the mantis are used for walking and climbing, but it's those powerful, spiny front legs that give the praying mantis its name — because they often look like they're "praying" when folded in front of their body.

Did you know?
Cockroaches can live for about a week without their heads. This remarkable survival ability is due to their open circulatory system and the fact that they breathe through tiny holes in their body segments, called spiracles, rather than through their mouths or noses. However, without a mouth, they cannot drink water, and eventually, they die of thirst.

Insects have some cool mouth parts!

Insects have some interesting mouth parts. A **proboscis** is a long, tube-like part that sticks out from an animal's head. In insects and other invertebrates, it's usually used for feeding—like a built-in straw for sucking up liquids, such as nectar. Butterflies have a coiled proboscis (Figure 4) that unrolls to drink nectar from deep inside flowers. When not in use, the proboscis coils back like a spring (Figure 3). Bees can both chew and suck. They have strong jaws (called **mandibles**) for chewing and a proboscis for sucking up sweet nectar from flowers.

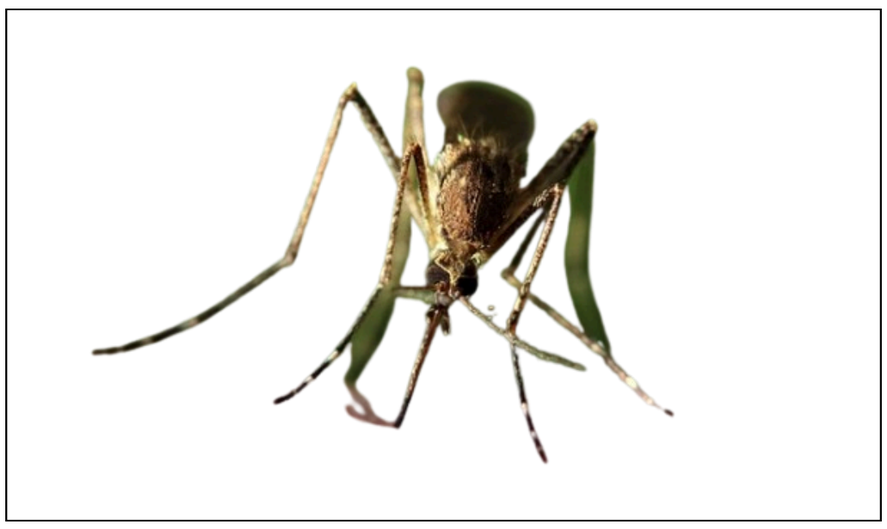


Figure 3: The proboscis of a mosquito

Figure 4: The proboscis of a butterfly

The Strange Mouthparts of Mosquitoes

Mosquitoes might be tiny, but their mouths are like tiny, complex tools—designed especially for piercing skin and drinking fluids. Only female mosquitoes bite, because they need the protein in blood to develop their eggs. Male mosquitoes feed on nectar instead.

A mosquito's mouth is called a **proboscis** (Figure 3), but it's not just one simple tube. It's actually made up of six needle-like parts, all bundled inside a flexible sheath.

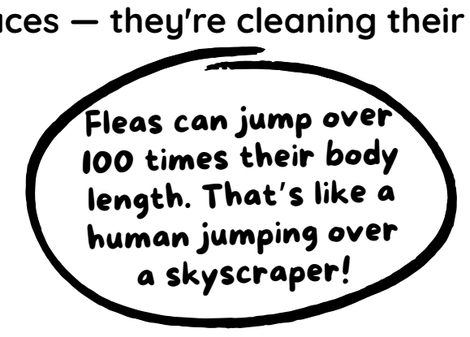
Here's what those parts do:

- Two parts are like tiny saws that cut through skin.
- Two more hold the skin open while the mosquito feeds.
- One thin needle finds a blood vessel and draws up blood.
- The last one injects saliva, which keeps the blood from clotting.

That saliva is what causes the itchy bump we get after a mosquito bite!

Did you know?

Flies can't bite or chew. Instead, they spit out saliva to dissolve food, then use their sponge-like mouth to soak it up. That's why flies are often seen rubbing their faces — they're cleaning their sponge to keep feeding!



Mouth parts for munching dung:

Dung beetles are famous for rolling balls of dung across the ground—but did you know their mouthparts are perfectly adapted for their unique diet? Unlike mosquitoes or butterflies that suck liquids through a proboscis, dung beetles have chewing mouthparts. These strong jaws, called mandibles, are designed to tear and crush dung into smaller pieces. (Figure 5). Some species also have brush-like structures to help filter and suck up the juicy nutrients from fresh dung. Dung beetles don't have teeth like mammals, but their mandibles work like powerful little shovels—breaking down the dung and helping them shape it into balls for food or nesting.

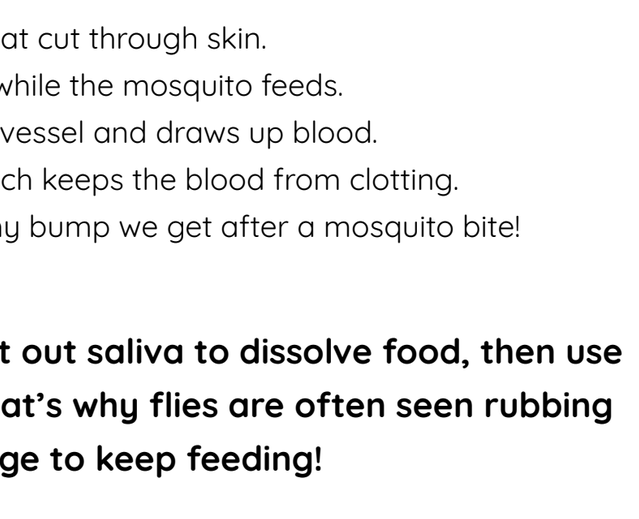


Figure 5: Dung beetles have chewing mouthparts to chew dung!

Wings That Wow

Incredible Insect Wings

Insects may be small, but their wings come in an amazing variety of shapes, sizes, and styles — each perfectly adapted to help them survive, hide, hunt, or soar through the air.

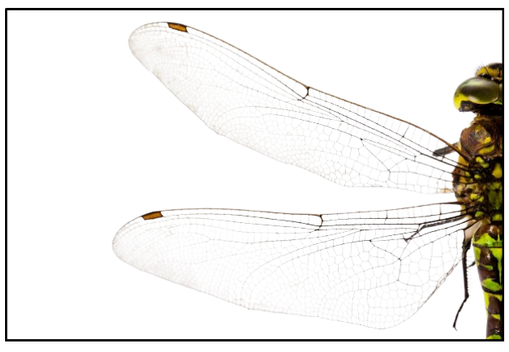


Figure 6: Dragon fly wings are transparent

Figure 7: Moths have powdery wings

Wings for Flying

Many insects can fly, and most have two pairs of wings — a front pair and a back pair. Some, like flies, only use one pair for flying. Dragonflies have two pairs of strong, transparent wings that move independently, giving them excellent control in the air. Houseflies, on the other hand, have **halters** — tiny knob-like structures in place of their second pair of wings. These act like gyroscopes, helping them stay balanced and turn quickly. Dragonflies have large, transparent wings (Figure 7) that allow them to fly with incredible speed and precision. Each of their four wings can move independently, giving them the ability to hover, glide, and even fly backward. Their lightweight, aerodynamic design helps them change direction quickly, making them expert hunters that can catch other insects mid-air with impressive accuracy.

Wings for Protection

Beetles have tough forewings called elytra that protect their delicate flying wings underneath. When a beetle is not flying, the elytra form a hard shield over its back, keeping it safe from damage and predators.

Wings for Camouflage

Some insects have wings that help them disappear in their surroundings. Planthoppers, for example, have wings that look like leaves or even fungi, making them nearly invisible to predators. Moths are covered in tiny scales that help them blend in with tree bark, leaves, or flowers. These scales can also make their wings waterproof (Figure 6).

The lifecycle of an insect

Most insects go through **metamorphosis** — a process where their bodies change dramatically as they grow. Depending on the insect, this change can happen in three or four stages. There are two main types of metamorphosis:

Complete metamorphosis: Butterflies, beetles, flies, ants go through complete metamorphosis where there are four stages:

egg → larva → pupa → adult

n this cycle, the insect looks totally different at each stage. A caterpillar, for example, becomes a butterfly through the pupal stage (chrysalis). It's like nature's own version of shape-shifting.

I**ncomplete metamorphosis** : This involves three distinct stages:

egg → nymph → adult

Grasshoppers, cockroaches, dragonflies have incomplete metamorphosis. Here, the young insect (called a nymph) looks like a smaller version of the adult, but without wings. As it grows, it sheds its skin several times in a process called **molting**.

Figure 8: A dragonfly

Did you know?
The dragonfly starts its life underwater as a nymph with gills and then climbs out of the water to shed its skin and take flight as a winged adult!

The Life of a bee

All bees — whether they live alone or in a colony — go through the same basic life cycle. It starts with an egg, grows into a larva, then a pupa, and finally becomes an adult bee with wings. Bee larvae are white, soft, and kind of oval-shaped. Even though they don't have legs, they can still move around using small bumps on their sides. They have tiny jaws to eat and glands under their mouths that make a sticky liquid — this turns into silk to build their cocoon. Inside the cocoon, the larva becomes a pupa and slowly turns into an adult bee. When it's ready, the adult bee breaks through the cocoon and crawls out to start its life.

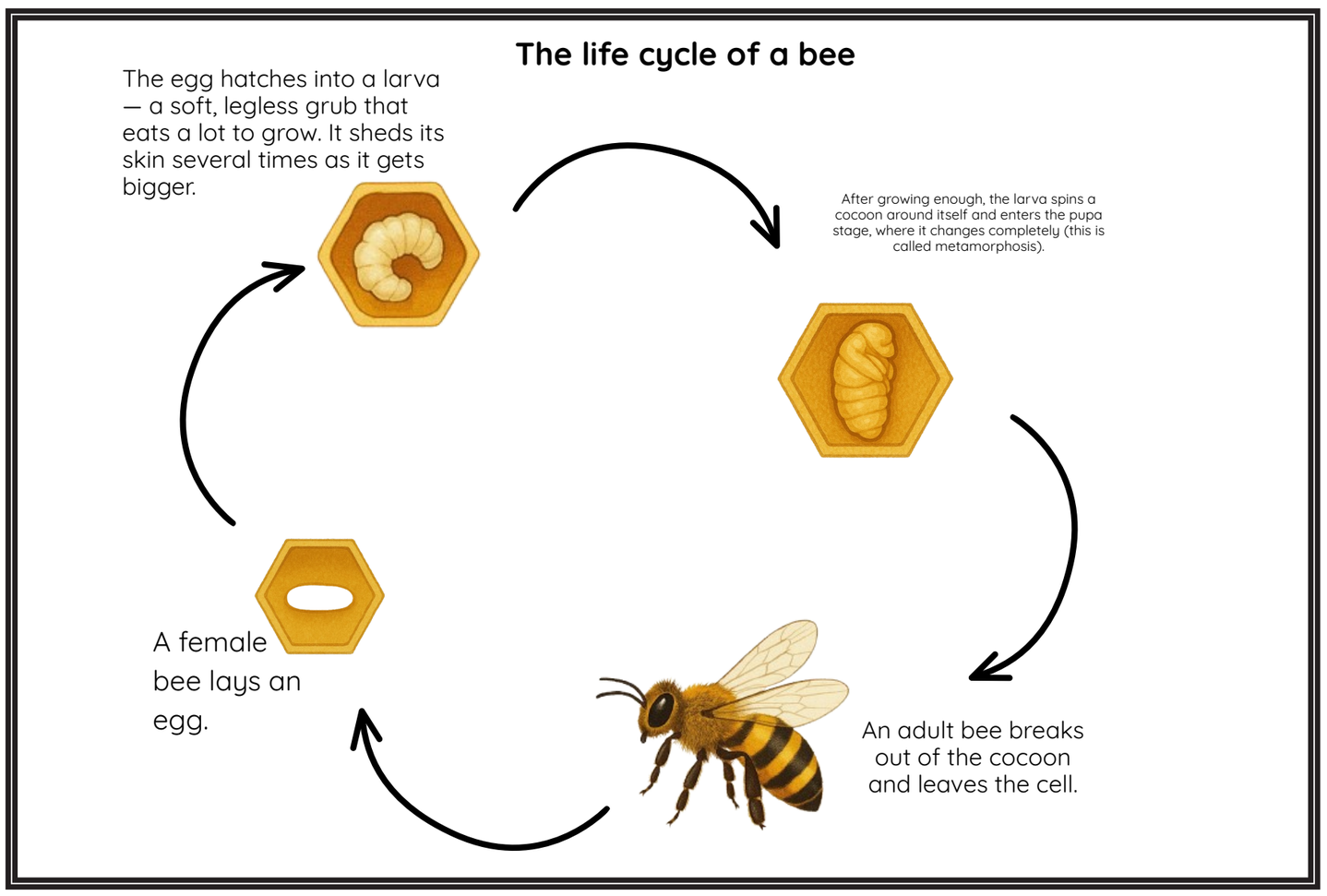


Figure 9: the lifecycle of a bee

Male or Female?

Bees have a way of deciding whether a baby bee will be male or female! The female bee stores sperm from a single mating, and when laying each egg, she can choose to fertilize it or not:

- **Fertilized eggs become female bees**
- **Unfertilized eggs become male bees**

Figure 10: a scarlet lily beetle

The lifestyle of insects

Insects have all kinds of lifestyles — some are solitary and prefer to live alone, while others live in complex, highly organized societies. Social insects, like ants, bees, termites, and some wasps, live in colonies where thousands (or even millions) of individuals work together for the survival of the group.

Solitary Insects

Solitary insects like butterflies, dragonflies, and most beetles live and survive on their own. These insects don't rely on others to survive or raise their young. Instead, they take care of everything themselves. Butterflies and moths, for example, live alone, searching for nectar and laying their eggs one by one on the right plants. Dragonflies are skilled solo hunters, using their excellent eyesight and fast flying skills to catch prey mid-air. Many beetles live solitary lives too, burrowing in the soil or hiding under logs (Figure 10). Even some bees are solitary — like the leaf cutter bee, which cuts pieces of leaves to build a nest for her young. While solitary insects don't have the teamwork of colonies, they make up for it with independence, strong instincts, and clever survival strategies.

Social insects

Some insects are masters of teamwork. Social insects live in large, organized groups called colonies, where every member has a specific role. Ants, bees, wasps, and termites are the most well-known social insects. In these colonies, there's usually a queen who lays eggs, workers who gather food and care for the young, and sometimes soldiers who defend the nest. These insects rely on cooperation, communication, and division of labor to survive. For example, in a beehive, thousands of bees work together to build honeycomb, collect nectar, and protect the queen. Ant colonies can have complex tunnel systems and even go to war with other ant colonies! By working together, social insects can achieve amazing things that solitary insects can't do on their own.

The lifestyle of bees

Solitary bees (which live alone) usually lay one egg in each nest cell, along with a pile of nectar and pollen for the larva to eat. This is called mass provisioning. Solitary bees make nests in things like holes in the ground or wood.

Social bees (like honey bees and bumblebees) feed their young over time, kind of like parents d. .Bumblebees and honey bees build more complex homes with wax combs and many bees living together.

Queen Bees

A queen bee is the main female bee in a beehive. She is the only bee in the hive that can lay eggs, and she is usually the mother of almost all the bees in the colony. Queen bees start out just like any other baby bee, but worker bees choose certain larvae to become queens. These special larvae get extra food to help them grow into queens with fully developed bodies that can lay eggs. Usually, there is only one queen in a hive. The other bees protect her and follow her around because she's so important to the colony. In other types of bees (not honey bees), there can be more than one queen in a nest. For example, in a Brazilian stingless bee nest, there might be a few smaller queens waiting to take over if the main queen dies suddenly.

Worker Bees

A worker bee is a female bee that doesn't lay eggs like the queen. Instead, she does most of the important jobs that keep the hive running smoothly. Worker bees are the most common bees in the hive, and they're smaller than queens or male bees (called drones).
Even though they can't have babies, worker bees are very important. They do almost everything —cleaning the hive, feeding the baby bees, guarding the entrance, and collecting food. As they get older, they take on different jobs in a certain order, starting with chores inside the hive and later flying outside to collect nectar and pollen. Worker bees have special little baskets on their back legs to carry pollen. They collect it from flowers and bring it back to feed the growing baby bees. While they're out gathering, some pollen rubs off onto other flowers, which helps plants grow seeds. This process is called **pollination**, and it's one of the reasons worker bees help pollinate about 80% of the world's crops!
They also collect **nectar** using a long tongue called a **proboscis**. The nectar mixes with **enzymes** in their bodies and is brought back to the hive, where it's stored in wax cells. Later, the bees fan it with their wings to dry it out and turn it into delicious honey!

Figure 11: Worker bees in the hive

Drone Bees

A **drone** is a male bee. Unlike female worker bees, drones don't have stingers, so they can't sting anyone. They also don't collect nectar or pollen and can't even feed themselves—they rely on worker bees to bring them food! A drone's only job is to mate with a young queen bee during a special flight called a **nuptial flight**. If he's successful, he dies right afterward. If not, he just returns to the hive and waits for another chance.

Insect Homes

Insects are some of the most creative builders in the animal kingdom. Even though they're small, they construct homes that are surprisingly complex and adapted to their environment. From underground tunnels to leafy tents, insect homes are built with purpose, teamwork, and often, some pretty amazing materials.

Ants: The Master Tunnellers

Ant colonies can stretch deep underground and contain thousands—even millions—of ants. These nests are full of interconnected chambers used for storing food, raising young, and housing the queen. Ants communicate through pheromones, and their coordination is so impressive that some colonies even have built-in ventilation systems.

Bees: Wax Engineers

Honeybees build hexagonal cells out of wax inside hives. These honeycombs are super-efficient, using the least amount of material to hold the most honey and brood. Wild bees, like carpenter bees, build homes in wood, while mason bees use mud to seal small cavities.

Termites: Skyscrapers of the Insect World

In some parts of Africa and Australia, termites build towering mounds made from mud, saliva, and faeces. These structures (Figure 12) can be over 3 meters tall and have their own air conditioning! Inside, thousands of termites live in a highly organized society with different roles, from workers to soldiers.

Figure 12: Some bees lay just a few eggs in their whole life, while social bees (like honey bees) can lay over a million eggs!

Wasps: Paper Houses

Many wasps chew up wood and mix it with their saliva to create a kind of paper. They use this to build nests that look like layered balls or hanging cones. Some are tiny, while others can get as big as a basketball.

Homes in Surprising Places

Not all insects build in soil or trees—some take advantage of whatever they can find. Bagworms construct portable homes by spinning silk and attaching bits of leaves, twigs, and other debris to camouflage themselves (Figure 13). Caddisfly larvae, which live in freshwater streams, build protective cases from sand, pebbles, or plant material, held together with silk. These tiny architects use the materials around them to stay safe from predators and adapt to their environment, proving that insect engineering is as creative as it is practical.

Figure 13: A bagworm home

Fun Fact: Some insects can walk on water! Insects like water striders have tiny hairs on their legs that repel water and spread out their weight, allowing them to "skate" across the surface without sinking—like real-life insect superheroes!

Communication

Figure 14: Cicadas communicate by creating buzzing sounds.

Insects have some fascinating and unique ways of communicating with each other, since they don't use words like humans do. Instead, they rely on a variety of signals, including chemicals, sounds, and even body movements, to send messages to others in their colony or group.

Chemical Signals (Pheromones)

Many insects communicate through chemicals called pheromones. These chemical signals can carry a wide range of messages. For example, ants use pheromones to leave scent trails that guide other ants to food sources. Bees also use pheromones to alert the hive when there's danger or to signal that they've found a good spot for food. Pheromones are incredibly important because they can help insects organise their behaviour and cooperate, especially in social species like ants, bees, and termites.

Sound

Some insects produce sounds to communicate, often to attract mates or warn others of danger. Crickets, for instance, chirp by rubbing their wings together in a process known as "stridulation." Male crickets chirp to attract females, with different patterns and pitches depending on the species. Cicadas, on the other hand, make loud buzzing sounds using specialised body parts to create vibrations (Figure 14). These sounds are usually used for mating calls, and some can even be heard from miles away!

Body Language

Insects also use their bodies to communicate, especially in social species. For example, bees perform a "waggle dance" to tell other bees in the hive where to find flowers rich in nectar. The direction and duration of the dance provide precise information about the location. Similarly, ants will touch each other's antennae in a behaviour known as "trophallaxis," exchanging not only pheromones but sometimes food, which strengthens the bond between colony members.

Humans and insects

Insects can be both a challenge and a help to humans. Some cause problems by spreading disease, damaging crops, or becoming pests in our homes. But many insects also play important roles in our lives—they pollinate plants, improve soil, and help control other harmful pests.

Figure 15: A worker bee collecting pollen

Insects in the Ecosystem

Insects play an essential role in ecosystems, including in decomposition. They break down organic matter, like dead plants and animals, recycling nutrients back into the soil. This process helps maintain healthy soils and promotes plant growth. Insects are also a vital food source for many animals, such as birds, frogs, and fish, forming the base of many food chains. Bees are important pollinators. This happens when they collect nectar and pollen from flowers. Some pollen sticks to their fuzzy bodies and gets carried to other flowers (Figure 15). This helps plants grow fruits, seeds, vegetables, and nuts. Without pollination, many plants would not be able to produce food! About one-third of the food we eat depends on pollination. This includes foods like mangoes, tomatoes, cashew nuts, watermelons, beans, and even coffee! Bees also help wild plants grow, which provide food and homes for birds, animals, and other insects. That means bees don't just help people—they help the whole environment. So when we protect bees, we are also protecting our food and our planet.

Insects as Inspiration

Insects have inspired humans in the fields of technology and design. The study of insect flight has led to innovations in drones and other flying technology. The way insects like bees and dragonflies (Figure 16) manoeuvre in the air has inspired engineers to create more efficient flying machines.

Figure 16: dragonfly

Insects as pests

However, not all insects are beneficial to humans. Some insects are pests that damage crops, invade homes, or carry diseases. For example, mosquitoes transmit diseases like malaria, dengue fever, and Zika virus, which affect millions of people worldwide. Termites can destroy wooden structures, and cockroaches are known to spread bacteria and cause allergies. Managing and controlling these pests is a major concern in both agriculture and public health.

Insects and pest control

Not all insects are pests—some are actually the heroes of the garden! Certain insects help control populations of harmful bugs without the need for chemical pesticides. For example, ladybirds (also called ladybugs) are famous for eating large numbers of aphids, which damage plants by sucking out their sap. A single ladybird can eat up to 50 aphids a day! Other helpful insects include lacewings, whose larvae also feed on aphids, and parasitic wasps, which lay their eggs inside pest insects like caterpillars or whiteflies. When the eggs hatch, the larvae feed on the host, keeping pest numbers down. Using these natural predators is a smart and eco-friendly way to protect crops and gardens.

Some insects can make clothing!

Silkworms (Figure 17) might look small and ordinary, but they're responsible for producing one of the most valuable fabrics in the world — silk. These insects are actually the larvae (caterpillars) of the silk moth (Bombyx mori). As they get ready to transform into moths, silkworms spin a protective cocoon around themselves using a special liquid they produce from glands near their mouths. This liquid hardens into silk when it comes into contact with air. The silkworm moves its head in a figure-eight pattern, releasing a continuous, super-thin thread of silk — sometimes up to 900 meters (almost 3,000 feet) long! Farmers carefully collect the cocoons and unwind the silk fibers, which are then woven into the soft, shimmering fabric we know as silk. Silk farming, or sericulture, has been practiced for thousands of years, especially in China, where it first began. Without these tiny, hardworking insects, the world wouldn't have luxurious silk scarves, dresses, and other beautiful items!

Figure 17: A silkworm

Insects in medicine

Scientists are studying insect venoms for potential use in treating conditions like cancer, arthritis, and heart disease. Honey as Medicine Honey isn't just sweet and tasty—it can also help people feel better when they're sick! For hundreds of years, people have used honey as a natural medicine.

- Sore Throats & Coughs: A spoonful of honey can help soothe a sore throat and calm a cough. That's why it's often mixed with warm water or tea when someone has a cold.
- Wound Healing: Honey can help small cuts and burns heal faster. It has natural ingredients that fight germs and keep wounds clean. In some hospitals, special medical honey is used on bandages!
- Fighting Germs: Honey has something called antibacterial properties. This means it can help kill certain bacteria and stop infections.
- Helping Digestion: Some people use honey to help with stomach problems, like ulcers or upset tummies, because it's gentle and natural.

Insects and food

Insects are an important source of food for humans in many parts of the world. Edible insects like crickets, mealworms, and grasshoppers are rich in protein, vitamins, and minerals. They are also a more environmentally friendly option compared to traditional livestock, as they require less land, water, and food to raise. In some cultures, insects have been part of the diet for centuries, while in others they are just beginning to be explored as a sustainable and nutritious alternative to meat.

In places like Thailand, Mexico, and parts of Africa, insects are commonly sold in markets and eaten as snacks or cooked into meals. They can be roasted, fried, or ground into powder and added to other foods like protein bars, pasta, or baked goods. Some restaurants around the world are now serving gourmet dishes made with insects, showing that they can be both delicious and nutritious. As the global population grows and the demand for food increases, many scientists and food experts believe that insects could play a key role in solving future food shortages. With growing interest, improved farming methods, and changing attitudes, insect-based foods may soon become a regular part of diets around the world—helping to feed people in a more sustainable way

Honey

Probably the most well-known insect-made food is honey, created by honey bees. Bees collect nectar from flowers, bring it back to the hive, and turn it into honey by adding enzymes and evaporating the water. Honey has been used for thousands of years as a sweetener and natural medicine. It’s not only tasty but also has antibacterial properties, which is why it's sometimes used on wounds or sore throats.

Royal Jelly

Bees also make a special substance called royal jelly. This creamy, nutritious food is fed to all young bee larvae, but the queen bee eats it for her entire life. Royal jelly is rich in protein, vitamins, and minerals, and some people believe it has health benefits, though research is still ongoing.

What Is Honey and How Do Bees Make It?

Honey (Figure 18) is a sweet, sticky liquid made by bees—especially honey bees. Bees make honey as food to feed their colony, especially during times when flowers aren't blooming.

Bees collect nectar from flowers (and sometimes sugary liquids from other insects, like aphids). Inside their bodies, the nectar gets mixed with special enzymes, and then the bees regurgitate (spit it back up!) into the hive. There, the honey sits in little wax cells in the honeycomb, where water slowly evaporates, making the honey thicker and sweeter.

The honeycomb is made of wax and has hundreds of little six-sided (hexagon) cells. That’s where bees store their honey. Some other kinds of bees, like stingless bees, store their honey in little pots made from wax and tree resin.

Sometimes, honey is sold still inside the comb, called "comb honey." People often eat it by spreading it on bread.

Over time, **broodcomb** (where baby bees grow) turns dark because of leftover cocoons, shed skins, and bees walking over it. Beekeepers call these marks "travel stains." Honeycomb that’s only used to store honey (not babies) usually stays light in color.

Other insects, like some wasps, also build honeycomb-shaped nests, but theirs are made of paper instead of wax. Some wasps even store honey too! But we don’t usually call those nests "honeycombs."

Figure 18: A jar of honey

What is a Honeycomb?

A honeycomb (Figure 19) is a group of tiny six-sided wax cells made by honey bees. Bees use these cells to store their babies (eggs, larvae, and pupae), honey, and pollen.

Beekeepers sometimes take the honeycomb out of the hive to collect honey. To make just 1 pound (about 450 grams) of wax, bees have to eat more than 8 pounds (about 3.8 kilograms) of honey! That’s why beekeepers often give the wax back to the bees after taking the honey, so the bees don’t have to work as hard.

There’s a special machine called a honey extractor that can spin the honey out of the comb without breaking it. If the comb gets too old or damaged, the wax can still be reused. Beekeepers can turn the wax into flat sheets with tiny hexagon patterns to help the bees rebuild the honeycomb more easily. These sheets also help bees make the right-sized cells for worker bees instead of larger ones for male bees (drones).

Figure 19: honeycomb

People collect honey from wild bee nests or from hives kept by beekeepers. The work of raising honey bees is called beekeeping or apiculture. If someone raises stingless bees, it’s called meliponiculture.

Who Loves Honey Besides Us?

Lots of animals love honey too! Bears, raccoons, birds, and even some insects will go after wild honey or kept hives to get a sweet treat!

How Do People Collect Honey?

Figure 20: A beekeeper tending her bees

People collect honey from wild bee nests or from beehives kept by beekeepers. On average, a single hive can make about 29 kilograms (or 65 pounds) of honey every year—that's a lot of sweetness! Sometimes, wild hives are found with the help of a clever little bird called a honeyguide, which actually leads people to the bees!

To safely collect the honey, beekeepers use a tool called a **bee smoker**. The smoke makes the bees calm down and less likely to sting. It also hides their pheromones, which are scents they use to talk to each other. Once the bees are calm, the beekeeper removes the honeycomb from the hive (Figure 20). The honey can then be taken out by crushing the comb or spinning it in a machine called a honey extractor. After that, it's filtered to remove bits of wax or anything else that doesn't belong.

Before special beehive frames were invented, collecting honey often meant destroying the whole colony. Thankfully, that changed! Now, beekeepers leave enough honey behind—or feed the bees sugar water or sugar blocks—to help them survive the winter. The amount of food bees need depends on the kind of bee and how cold or long the winter is where they live.

Figure 21: An infographic about bees

How Can We Protect Bees?

As Figure 21 shows, bees are very important. Around the world, the number of bees is going down because of things like pollution, cutting down trees, using too many chemicals on farms, and destroying wild plants. But the good news is—we can all help protect bees!

1. Plant flowers that bees love, like sunflowers, hibiscus, and wildflowers. These give bees the nectar and pollen they need to stay alive.
2. If you see a bee, don't be afraid—just give it space and let it do its work.
3. Avoid using strong chemicals like pesticides on gardens or farms, because these can hurt bees. You can also help by protecting trees and natural areas where bees like to live.
4. Teaching others about how important bees are is also a great way to protect them. When people understand how bees help grow food, they'll want to protect them too.

Did you know?

Before special beehive frames were invented, collecting honey often meant destroying the whole colony. Thankfully, that changed! Now, beekeepers leave enough honey behind—or feed the bees sugar water or sugar blocks—to help them survive the winter.

Insects are important!

Insects might be easy to overlook, but they play a huge role in our lives. Some help by breaking down waste, controlling pests, or even serving as food. Others can cause problems, like spreading disease or damaging crops. But whether they're helpful or harmful, insects are a vital part of the world around us. By learning more about them and how they affect our lives, we can make smarter choices about how we treat the environment. Understanding insects is one step toward creating a healthier, more balanced future—for both humans and the planet.

Glossary

Bee Smoker - A tool used by beekeepers to blow gentle smoke into a beehive. The smoke helps calm the bees so the beekeeper can work safely.

Broodcomb - A part of the honeycomb where the queen bee lays her eggs. It's where baby bees (larvae and pupae) grow and develop.

Compound Eyes - Big eyes made up of thousands of tiny lenses. They help bees see colors, patterns, and even movement very quickly.

Corbiculae (singular: corbicula) - Also known as pollen baskets. Are smooth, slightly concave areas surrounded by stiff hairs found on the hind legs of certain bees, like honeybees and bumblebees. Bees use their corbiculae to collect and carry pollen back to the hive. As they gather pollen from flowers, they pack it into these baskets using their legs, sometimes adding a bit of nectar to help it stick together.

Elytra - Hard, protective forewings of beetles and some other insects. Unlike regular wings, elytra are not used for flying. Instead, they act like a shield, covering and protecting the delicate hindwings and soft body underneath. When the insect is ready to fly, it lifts the elytra out of the way to unfold its flight wings.

Enzyme - special protein that helps speed up chemical reactions inside an insect's body. In insects, enzymes are important for breaking down food during digestion, allowing nutrients to be absorbed and used for energy, growth, and repair. For example, some insects produce enzymes that help them digest tough plant material, while others—like ants or termites—use enzymes to break down wood or fungi.

Exoskeleton - A hard, protective outer covering that supports and protects an insect's body. Unlike humans, who have internal skeletons (bones), insects wear their skeleton on the outside. It gives their body shape, protects their organs, and helps prevent water loss. Because it doesn't grow, insects must shed their exoskeleton through a process called molting as they develop.

Halteres - Small, knob-like structures found in some insects, such as flies (order Diptera), where they replace the second pair of wings. These tiny organs act like gyroscopes, helping the insect balance and stay stable in the air during flight. As the insect flies, the halteres vibrate and detect changes in direction or rotation, allowing the insect to make quick, controlled movements. Without halteres, flies would have a much harder time staying upright or changing direction mid-air.

Mandibles - Strong, jaw-like mouthparts found in many insects. They are used for biting, cutting, crushing, or holding food. In some insects, like ants and beetles, mandibles are large and powerful, helping them chew through tough materials or defend themselves. Other insects may have smaller or differently shaped mandibles, depending on what they eat and how they live.

Molting - The process insects go through to shed their old exoskeleton and grow a new, larger one. Because an insect's hard outer shell doesn't stretch, it must be replaced as the insect grows. During molting, the insect splits its old exoskeleton and crawls out, leaving it behind. This process may happen several times before the insect reaches its adult size and form.

Nectar - A sweet liquid made by flowers. Bees collect nectar to make honey.

Nuptial Flight - A special flight where a young queen bee leaves the hive to mate with male bees (drones) high up in the sky. After this, she can start laying eggs.

Ocelli - Tiny simple eyes on the top of a bee's head. They help bees sense light and dark.

Pollination - When bees carry pollen from one flower to another. This helps plants make fruits and seeds. It's how plants grow new life!

Proboscis - A long, tube-like mouthpart found in some insects, such as butterflies, moths, and mosquitoes. It is used for sucking up liquids like nectar or blood. In butterflies, the proboscis stays coiled up when not in use and unrolls to reach deep into flowers. In mosquitoes, the proboscis is sharp and can pierce skin to draw blood. The shape and function of the proboscis can vary depending on the insect's diet.

Raptorial legs - Specialised front legs found in some insects, such as praying mantises and certain types of beetles, that are adapted for catching and holding prey. These legs are often strong, spiny, and folded in a way that allows the insect to strike quickly—similar to how a bird of prey uses its talons. The sharp spines help grip the prey tightly so it can't escape.

Royal Jelly - A special food made by worker bees. It's creamy and full of protein. Only queen bee larvae are fed royal jelly so they can grow into queens.