This presentation aims to teach you about bees and their role in global ecosystems.

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What is a Bee?

Bees are flying insects that are closely related to wasps and ants (under the insect order Hymenoptera). Bees are known for their role in pollination and, in the case of one of the best-known bee species - the European honey bee - for producing honey and beeswax. They are found on every continent except Antarctica and in every habitat on the planet that contains insect-pollinated flowering plants.

Some species including honeybees, bumblebees, and stingless bees live socially in highly complex and well-organised colonies. For example, a honey bee colony typically consists of three kinds of adult bees: workers, drones, and a queen. Several thousand worker bees cooperate in nest building, food collection, and brood rearing, and each member of the colony has a specific task to perform, related to its age and rank.

Bees collect pollen and nectar both for themselves as well as their young. They have developed a number of adaptations that make them particularly good pollen carriers. Bees have special hairs that are arranged to form pollen 'baskets' on their hind legs and the underside of their abdomen. These adaptations allow them to gather and carry large volumes of pollen.

Bees may be general pollinators by visiting flowers of many species, or they may have adapted (i.e., elongated) their mouthparts to different flower depths and have become specialized to pollinate only a single species.



Types of Bee

There are approximately 20,000 known species of bee in the world. Bees are included in the superfamily *Apoidea* along with some species of wasps. Though there is some debate among scholars and scientists, traditionally, these 20,000 species can be divided into nine families.

Some commonly known bees, such as the honey bee and bumblebee, are members of the *Apidae* family within the *Apoidea* superfamily.

Bee vs Wasp

Bees and wasps share many physical characteristics, however, there are small details that set them apart. Generally, most species of bee have branched or plume-like setae (bristles) as well as combs on the forelimbs for cleaning their antennae. Bees also, generally, have a round abdomen, while a wasp's abdomen is more cylindrical.

One of the most notable differences between bees and wasps are their feeding habits. Bees are pollinators; while wasps are carnivorous predators which feed on other insects. However, there is an exception to this; a small group of stingless bees of the genus *Trigona*, feed their young on other insects instead of pollen.



The Role of the Bee

Bees play a vital role in balancing ecosystems and ensuring global food security. As primary pollinators, they are responsible for more than one-third of global food production.

Pollinators strongly influence ecological relationships, ecosystem conservation and stability, genetic variation in the plant community, floral diversity, specialization and evolution. Bees play an important, but little-recognised role in most terrestrial ecosystems where there is green vegetation cover for at least three to four months each year. Among the pollinating insects, bees are the major pollinators.

Pollination is needed for plants to reproduce. Nearly 90% of all wild flowering plants depend at least to some extent on bees or other insects as pollinators. When a bee collects nectar and pollen from the flower of a plant, some pollen from the stamens—the male reproductive organ of the flower—sticks to the hairs of its body. When the bee visits the next flower, some of this pollen is rubbed off onto the stigma, or tip of the pistil—the female reproductive organ of the flower. When this happens, fertilization is possible, and a fruit, carrying seeds, can develop.

The main role of bees in the different ecosystems is their pollination work. Other animal species are connected with bees, either because they eat the brood or honey, pollen, or wax; because they are parasitic to the bees; or simply because they live within the bees' nest.



Pollination

Pollination is the process whereby pollen moves from the pollen-producing male reproductive organ of a flower (called the stamen) to the female reproductive organ (called the pistil).

Pollination can be accomplished by many animals such as birds, insects, and bats, while some species of plants even rely on wind.

Bees are one of the most well-known and important types of pollinator. Pollination by bees occurs when a foraging bee brushes against the male organ of a flower, causing pollen to attach to its hairy body. When the bee visits another flower, pollen can fall off onto the flower's female organ, which then allows for fertilization to take place, and the forming of a new seed. Pollen may be transferred from male organs of a plant to female organs on the same plant (self-pollination) or another plant of the same species (cross-pollination).

Most crops grown for their fruits (including vegetables such as squash, cucumber, tomato and eggplant), nuts, seeds, fibre (such as cotton), and hay (alfalfa grown to feed livestock), require pollination by insects. Pollinating insects also play a critical role in maintaining natural plant communities and ensuring production of seeds in most flowering plants.

A honeybee visits between 50 and 100 flowers during one foraging flight. With approximately twelve foraging flights per day, a single honeybee can pollinate thousands of flowers in a single day.



THE POLLINATION CYCLE



- 1. ANTHERS PRODUCE & RELEASE POLLEN
- 2. BEES PICK UP THE POLLEN ON THEIR FUZZY BODIES
- 3. BEES RUB OFF THE POLLEN ONTO ANOTHER FLOWER'S STIGMA
- 4. THE FLOWER IS POLLINATED
- 5. THE FLOWER BECOMES FRUIT / VEGETABLE
- 6. THE FRUIT / VEGETABLE PRODUCES A SEED
- 7. THE SEED GERMINATES
- 8. A NEW PLANT IS GROWN AND CONTINUES THE CYCLE

Threats to Bees

A growing number of pollinator species, including bees, are being driven toward extinction by diverse pressures, many of which are human-made; threatening millions of livelihoods and hundreds of billions of dollars worth of food supplies.

Bee declines are attributed to a variety of factors, including climate change, agriculture intensification, habitat loss and urbanisation, parasites, pesticides, and fungal, bacterial and viral diseases.

In the US, species of both the bumblebee and honey bee, which are essential pollinators of one-third of all U.S. crops, have decreased by 90% since the 1990's. Similarly, 9.2% of bees are considered threatened in Europe, with over 44% of bumblebee species declining in the region. Of the five most important pollinators of European crops, three are bumblebee species.

Since no other single animal species plays a more significant role in producing the fruits and vegetables, the consequences of declining bee populations pose a grave threat to all species on Earth.



Colony Collapse Disorder

Colony Collapse Disorder (CCD) is the phenomenon that occurs when the majority of worker bees in a colony disappear and leave behind a queen, food, nurse bees and young bees. Without the mature worker bees to bring nectar and pollen back to the hive, it collapses (and dies).

The term CCD was first coined in 2006 in conjunction with a drastic rise in the number of disappearances of Western honey bee colonies in North America.

Many factors contribute to the presence of CCD, but the main culprits seem to be the overuse of pesticides, attacks from parasites and pests.

Colony Collapse Disorder has been observed most significantly throughout North America, Europe, the United Kingdom and Asia and has resulted in significant population declines.





Australian Curriculum Mapping

GRADE 5 SCIENCE (ACSSU043): Living things have structural features and adaptations that help them to survive in their environment.

GRADE 6 SCIENCE (ACSSU094): The growth and survival of living things are affected by the physical conditions of their environment.

GRADE 6 HUMANITIES AND SOCIAL SCIENCES (ACHASSI132): Reflect on learning to propose personal and/or collective action in response to an issue or challenge, and predict the probable effects

YEAR 7 SCIENCE (ACSSU112): Interactions between organisms, including the effects of human activities can be represented by food chains and food webs.

YEAR 9 SCIENCE (ACSSU176): Ecosystems consist of communities of interdependent organisms and abiotic components of the environment; matter and energy flow through these systems.

YEAR 10: SCIENCE (ACHGK070): Human-induced environmental changes that challenge sustainability.

SUSTAINABILITY (01.2): All life forms, including human life, are connected through ecosystems on which they depend for their well being and survival.



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