

Social Insects: Bees, Wasps, Ants and Termites

Teacher Resource Guide

Before one understands what 'social' insects are it is first important to understand what an **insect** is in the first place. Insects are small arthropods with six legs and usually one or two pairs of wings; they are placed in the class Insecta or Hexapoda. They have an exoskeleton divided in three parts; head, thorax and abdomen.

What are Social Insects?

The eusocial, or most social of the insects, are the **bees**, **wasps**, **ants**, and **termites**. The bees, wasps, and ants are in the Order **Hymenoptera**, while the termites are in the Order **Isoptera**. All of the ants and termites are eusocial, while both the bees and wasps have many species that live solitary lives.

Certain traits characterize the eusocial insects:

-**Reproductive division of labor**: this means that the queen reproduces almost exclusively while other members of the colony specialize on different tasks.

-**Cooperative brood care**: this means that contrastingly to many different animals, social insects all tend the brood together indiscriminately of whose offspring it is.

-In the ants and termites there are castes that carry out different functions necessary for the survival of the colony depending on the size or age of the insect they carry different functions

Social insects are organized into different 'castes', these are characterized by specialized roles (**queen**, **soldiers**, **workers** and such). Usually there is a queen that produces a lot of offspring and apart from her, many other sterile daughters (workers) that depending on their age or structure carry out specific tasks in or around the **colony**. Social insects are able to communicate mainly through pheromones; bees are also able to communicate through elaborate 'dances' to convey the direction and distance of food sources.



Three different
castes of termites

Queen: The queen is the only reproductive individual in the colony, can control workers via pheromones and possesses wings for flight. Mates with drones (males) only once and can lay hundreds of eggs per day. The queen can live for several years.

Worker Daughters: these are all infertile females who perform all necessary tasks for the survival of the colony. They Work on defense, nest construction, food cultivation, foraging and tend younger larvae. All worker daughters are sterile. Workers only live for a few months.

Males: Serve exclusively for reproduction and fertilize queens (they are called 'drones' in bee colonies). Live for only a couple of months and die soon after mating and are often chased away from colony.

Life-cycle of social insects:

All social insects have a similar life cycle that is holometabolous and is characterized by metamorphosis.

-Egg stage: small white eggs laid by queen (in cells for bees or wasps, or in egg chambers for ants and termites). The eggs are washed and transported by sterile adults sisters.

-Larval stage: It is defenseless and it is completely dependent on the care of adult workers, the larva molts its skin as it grows.

-Pupal stage: spins a cocoon and metamorphoses into adult

-Adult stage: Depending on size and characteristics carry out different tasks to support the colony. In bees age-related polytheism occurs (bees perform different tasks exclusively depending on their age, young adults tend larvae while older bees forage).

What are some common social insects in our local environment?

There are many common species of social insects that we can find in our backyards in the United States. These range from **honeybees** that are often seen collecting pollen from flowers to small **ants** that have colonies in many diverse habitats, including human homes. Social insects, as we have discussed before can directly influence our lifestyle in different ways such as by a hornet stinging us to honeybees indirectly providing us with fruit. Another common social insect is the **termite**, it usually lives in decaying wood in colonies that can reach millions of individuals; some colonies in Africa reach many meters in height.

How can social insects harm or help us?

Here in the table below are some examples of how social insects can **help** or **harm** our environment or us:

POSITIVE EFFECTS	NEGATIVE EFFECTS
Pollination	Leaf-cutter ants harm plants
Food production (honey, basic food source for some populations) and production of materials such as wax for candles	Invasive Fire Army and Pharaoh ants in homes (pests)
Seed dispersal	Hornets can be aggressive and sting
Breakdown of waste	Termites can cause great housing damage
Pest control of some insects	Wood ants can cause damage to wooden structures

From the examples in the table above we can see that social insects contribute greatly to society and to the whole natural environment as a whole.



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The two pictures above depict what is perhaps the most well known social insect, the honeybee; in each of the two different images it is performing an action helpful to society. Producing nutritious honey in the top picture and pollinating a flower in the bottom picture.

Additional Resources & Books:

The Superorganism: The Beauty, Elegance, and Strangeness of Insect Societies, by Bert Holldobler and Edward O. Wilson; this very well know book offers a great and accurate insight on how weird and wonderful insect societies can be.

Ants At Work: How An Insect Society Is Organized, by Deborah Gordon; this is a scientific book about how ant societies work but it is very readable and can be a good resource for anyone interested in ants.

The Handy Bug Answer Book, by Gilbert Waldbauer; this is a very comprehensive book about insects in general but it is very easy to read and answers a lot of questions that relate to social insects as well.