



Hymenoptera

Ants / Wasps / Bees / Sawflies / Horntails

The name Hymenoptera is derived from the Greek words "hymen" meaning membrane and "ptera" meaning wings. It is also a reference to Hymeno, the Greek god of marriage. The name is appropriate not only for the membranous nature of the wings, but also for the manner in which they are "joined together as one" by the hamuli.

Classification & Distribution	Life History & Ecology	Physical Features	Economic Importance	Major Families	Bug Bytes
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• Classification & Distribution

Holometabola

- complete development (egg, larva, pupa, adult)
The Hymenoptera is divided into two suborders:
- **Symphyta** (sawflies and horntails) have a broad junction between thorax and abdomen
- **Apocrita** (ants, bees, and wasps) have a narrow junction between the thorax and abdomen.

Distribution: Common worldwide. Third largest order of insects.

	North America	Worldwide
Number of Families	70	90
Number of Species	17,777	103,000

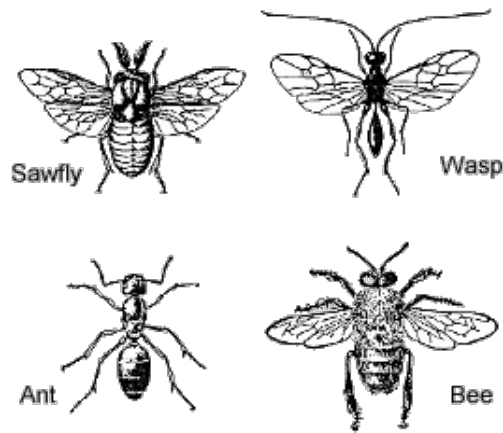
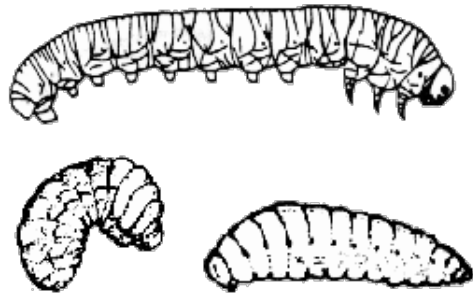
• Life History & Ecology

As a rule, members of the order Hymenoptera can be regarded as ecological specialists. Most species are rather narrowly adapted to specific habitats and/or specific hosts. Their remarkable success as a taxon probably has more to do with their immense range of behavioral adaptation rather than any physical or biochemical characteristic. The Hymenoptera is the only order besides the Isoptera (termites) to have evolved complex social systems with division of labor. Herbivory is common among the primitive Hymenoptera (suborder Symphyta), in the gall wasps (Cynipidae), and in some of the ants and bees. Most other Hymenoptera are predatory or parasitic. The large hunting wasps are agile predators that catch and paralyze insects (or spiders) as food for their offspring. The greatest diversity, though, is found among the many families of parasitoid wasps whose larvae feed internally on the living tissues of other arthropods (or their eggs). These insects eventually kill their host, but not before completing their own larval development within its body. Despite their small size and characteristically narrow host range, these wasps are highly abundant and exert a tremendous impact on the population dynamics of many other insect species.

Most of the Hymenoptera have relatively unspecialized mandibulate mouthparts. An exception is found in the bees (superfamily Apoidea) where the maxillae and labium are modified into a proboscis that works like a tongue to collect nectar from flowers. In these insects, the mandibles are used to gather or manipulate pollen and wax.

Except for worker ants, most adult Hymenoptera have two pairs of wings. Front and hind wings are linked together by hooks (hamuli) along the leading edge of the hind wings that catch in a fold near the back of the front wings. In flight, both wings operate in unison to form a single aerodynamic surface.

• Physical Features



Immatures

- **Sawflies:** Eruciform (caterpillar-like); well developed head capsule; chewing mouthparts; fleshy abdominal prolegs
- **Bees and wasps:** Grub-like; well developed head; chewing mouthparts; legless and eyeless
- **Parasitic wasps:** Body form highly reduced; lacking head, eyes or appendages

Adults

- Chewing mouthparts - except in bees where maxillae and labium form a proboscis for collecting nectar.
- Compound eyes well developed.
- Tarsi usually 5-segmented.
- Triangular stigma in front wings.
- Hind wings smaller than front wings, linked together by small hooks (hamuli).
- Narrow junction (wasp waist) between thorax and abdomen - except in sawflies and hornails.

• Economic Importance

Although some species are regarded as pests (e.g., sawflies, gall wasps, and some ants), most members of the Hymenoptera are extremely beneficial -- either as natural enemies of insect pests (parasitic wasps) or as pollinators of flowering plants (bees and wasps).

• Major Families

Sawflies: Larvae feed on foliage or burrow into plant tissues.

- **Diprionidae** -- Conifer sawflies
 - **Tenthredinidae** -- Common sawflies
 - **Cepidae** -- Stem sawflies
- Hornails: Larvae are wood borers.
- **Siricidae**
- Parasitic Wasps: Larvae are parasitoids of other insects.
- **Ichneumonidae** -- largest family of the Hymenoptera; parasitoids of other holometabolous insects (or spiders)
 - **Braconidae** -- mostly parasitoids of lepidopterous larvae
 - **Encyrtidae** -- mostly parasitoids of aphids and scale insects
 - **Eulophidae** -- parasitoids of beetles, moths, and other insects
 - **Trichogrammatidae** -- egg parasites

Gall Wasps: Larvae are herbivores. They induce the formation of plant galls and live in or on these tissues.

- **Cynipidae** -- most species live on oak trees
- Predatory Wasps: Adults provision nest sites with prey that they catch and paralyze by stinging.
- **Sphecidae** (digger wasps) -- prey on caterpillars and spiders
 - **Pompilidae** (spider wasps) -- prey on spiders
 - **Tiphiidae** (tiphiid wasps) -- prey on beetle larvae
 - **Scoliidae** (scoliid wasps) -- prey on beetle larvae
 - **Vespidae** (potter wasps) -- prey on caterpillars

Social Wasps: True social insects. Paper-like nests are tended by sterile female workers.

- **Vespidae** -- yellowjackets, hornets, paper wasps
- Ants: True social insects. Wingless workers (sterile females) forage for provisions (vegetation, seeds, or other insects)
- **Formicidae** --- Ants

Solitary Bees: Adults construct individual nests and provision them with plant materials (usually nectar or pollen).

- **Halictidae** -- sweat bees
- **Megachilidae** -- leafcutting bees
- **Anthophoridae** -- carpenter bees

Social Bees: True social insects. Communal nests are built in the soil (bumble bees) or in cavities (honey bees). Workers (sterile females) forage for nectar and pollen.

- **Apidae** -- bumble bees and honey bees

• Bug Bytes

- In the Hymenoptera, females develop from fertilized eggs and males develop from unfertilized eggs. Since females control whether or not an egg is fertilized, they can regulate the sex ratio of their offspring.
- The fairyflies (family Mymaridae) are probably the world's smallest insects. They parasitize the eggs of other insects.
- Some species of cuckoo wasps (family Chrysididae) invade the nests of wasps or bees, kill the larvae they find, and deposit their own eggs on the stored provisions. This behavior is known as kleptoparasitism.
- Slave-maker ants raid the nests of other species to steal their pupae. When the stolen ants emerge as adults, they become workers in the slave-maker's colony.
- Aculeate Hymenoptera (certain wasps, bees, and ants) are the only insects that can sting.
- Larvae of bees, ants, and wasps do not form a complete digestive system until near the end of the pupal stage. Wastes accumulated by larvae are excreted just before the insect emerges as an adult.
- The females of some parasitic hymenoptera produce extremely large numbers of eggs. One Eucharitidae female was observed to lay 10,000 eggs in one hour.
- Some parasitic wasps swim beneath the water to lay their eggs on aquatic prey. *Caraphractus cinctus* (family Mymaridae) is an egg parasite of water beetles (genus *Dytiscus*).
- Fig wasps (family Torymidae, subfamily Agaoninae) are the only insects that can pollinate fig trees. The wasp larvae, which develop in flower galls, become coated with fig pollen when they emerge as adults. They unwittingly cross-pollinate each flower they visit when laying eggs. The Smyrna fig is a commercial variety that does not produce any pollen. Its survival depends entirely upon *Blastophagus psene*, a wasp that develops in wild Caprifigs but cross-pollinates the Smyrna fig in a fortuitous case of mistaken identity

Russian translation