



## Parasitic Wasps

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### Introduction

Parasitic wasps, also called parasitoids, are found in multiple families within the insect order Hymenoptera, which also includes the sawflies, bees, and wasps. Parasitic wasps range in size from fairly large and easily seen with the naked eye (2.5 cm or 1 inch) to minute insects that develop within the egg of another insect (Fig. 1). All parasitic wasps live part of their lives developing internally or on the outside of the body of their host.



Figure 1. A clutch of stinkbug eggs parasitized by small scelionid wasps. (David Cappaert, Bugwood.org)

### Description

Like other wasps, parasitic wasps have a constriction between the thorax and abdomen that gives them the appearance of having a “waist.” Female parasitic wasps use their ovipositor, an egg-laying organ on their abdomen, to lay eggs on or within their host (Fig. 2). Some ovipositors are long enough to reach insects hidden inside cocoons, within trees (Fig. 3), and other protected locations. Although the ovipositor may be noticeably large, only a few species of parasitic wasps have an ovipositor capable

of piercing human skin. Most adult parasitic wasps are black or brown in color, but a few are a metallic bluish or green (Fig. 4) and some have bright yellow or orange markings. Most adult parasitic wasps have two pairs of wings (a few species are wingless as adults) and their antennae may vary from short to rather long.



Figure 2. Female parasitic wasp (*Muscidifurax raptor*) inserting her eggs inside a fly pupa. (USDA ARS Photo Unit, ASDA Agricultural Research Service, Bugwood.org)

### Life History

In general, parasitic wasps have a complete life cycle with egg, larval, pupal, and adult stages. However, the life cycle of a parasitoid wasp varies by species and some have the most complex life histories known in the animal kingdom. Males are not known to exist in some species and the females produce offspring without mating. Usually each parasitoid egg produces a single larva, but some species are polyembryonic and many larvae develop from a single egg. Some parasitic wasps have multiple generations within a season while others may take a year or more to complete their development.



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Figure 3. A giant ichneumon wasp (*Megarhyssa* sp.) parasitizing wood-boring insect larvae within a tree trunk. (Steven Katovich, Bugwood.org)



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Figure 4. Brightly colored cuckoo wasp. (Johnny N. Dell, Bugwood.org)

Parasitic wasps attack a wide range of insect groups and a few other arthropods like spiders and ticks. Some of the more common insect hosts include

caterpillars, leafhoppers, aphids, flies, scale insects, beetles, and true bugs. Some parasitic wasps are generalists, attacking a number of different host species, while others are highly specialized and attack only one or two closely related host species. Typically, a species of parasitic wasp will attack a host during one particular stage of the host's development. Some specialize in attacking a host in the egg (Fig. 1) while others may seek out larvae in cocoons; still others parasitize adults. Parasitoid larvae may develop entirely within the body of the host, externally on the body of the host, partially embedded in the body wall of the host, or even externally at first before burrowing into the host's body (Fig. 5). A host may become inactive and moribund soon after the parasitoid larva hatches and begins feeding, or it may continue to live a fairly normal and active life while the parasitoid larva develops until the larva is nearly mature, at which point the host quickly dies. The parasitoid larva may emerge from the host and pupate on the host, nearby the host, or pupate within the husk of the dead host (Fig. 6).



Figure 5. A leafhopper nymph with a parasitic wasp grub attached under the right wing pad. {Sarefo [CC BY-SA (<https://creativecommons.org/licenses/by-sa/4.0/>)]}



Figure 6. White cocoons of parasitoid wasps pupating on the outside of the caterpillar host's body (David Cappaert, Bugwood.org).

Another bizarre feature of the life history of some parasitic wasps is the ability to drastically alter the behavior of their host to their own benefit. Parasitic wasps in the families Ichneumonidae and Braconidae inject a polydnavirus into the host along with their eggs. The virus infects the host cells and modifies the host's immune system so that it cannot encapsulate and kill the wasp eggs before they hatch. A female emerald wasp (*Ampulex compressa*) injects chemicals in the brain of its cockroach target, which alters the behavior of the cockroach, allowing the wasp to lead it along docilely. The wasp leads the cockroach to a burrow, lays an egg on its underside, and then walls up the burrow without the drugged cockroach ever trying to escape. The tropical spider *Anelosimus octavius* begins spinning a very different type of web when its wasp parasite (*Zatypoda* sp.) matures. This web is specifically constructed to protect the wasp after it finally kills its host and discards the spider's body.

## Damage

Parasitic wasps are generally considered to be beneficial as they help control populations of less desirable insects. They are very important in agriculture, attacking a wide range of insect pests that feed on important crops. Some parasitic wasps are deliberately raised and released to assist with the control of insect pests through the practice of biological control. However, some species of parasitic wasps target other species of parasitic wasps already developing within a host whenever the opportunity arises. This lifestyle is called hyperparasitism and it can be very complex: some parasitoid wasps attack parasitoids already attacking another parasitoid inside a single host.

## Habitat

Parasitic wasps are cosmopolitan and can be found in all habitats wherever their hosts are found. Some, like the ensign wasps (Family Evaniidae) that target cockroaches, are very adept at finding their hosts inside buildings and other manmade structures. Immature stages of parasitic wasps hidden inside a host are rarely noticed, but adults can often be found feeding on pollen and nectar of flowering plants.

## Control

Parasitic wasps do not require any control. They do not attack humans or other vertebrate animals and are not medically important, except in rare cases when someone who is very sensitive to wasp venom is stung by one of the larger parasitic wasps. Some species of parasitic wasps are valued for their control of agricultural pests and are raised and released as biological control agents.

## Revised

Theresa A. Dellinger, February 7, 2020.

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2020

ENTO-74NP (ENTO-345NP)