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INSECTS IN THE GARDEN: LESSON 1

THE FEATURES THAT MAKE UP AN INSECT

For nearly 400 million years, insects have called nearly every corner of Earth home. A world without them would have fewer plants, land masses covered with decaying plants and animals, and a poorer human diet, because we ultimately depend on plants pollinated by insects.

Michiganders who spend time outdoors often notice interesting insect visitors on plants, buildings, or flying by. Insects pass through our gardens in search of a drink of nectar, a patch of soil they can build a nest in, a leaf to rest on, or a plant to sit on as they stalk their next meal. There are thousands of insect species that live in Michigan.

The *Insects in the Garden* email course will highlight common beneficial insects you'll see in Michigan and discuss their behavior and life cycles. Before getting into details about specific insects, though, in this lesson we'll describe the basic body parts of insects and how those parts develop and function.

BODY PARTS

Insects come in many sizes, shapes, and colors. This section highlights the major differences between insects and other invertebrates (organisms that lack backbones).

Every adult insect has six legs, three main body parts (head, thorax, and abdomen), and an exoskeleton, or

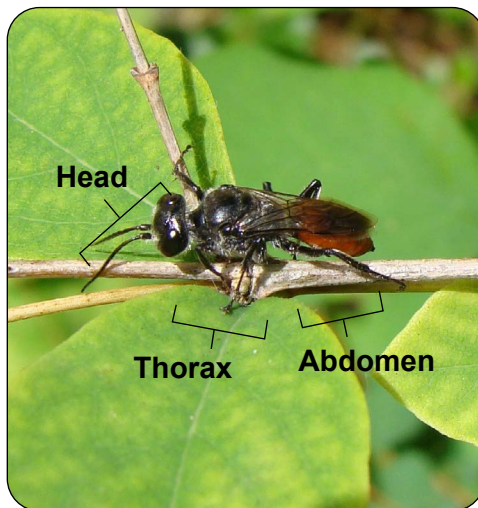


Photo 1-1. The three main body parts of this *Astatia* wasp are labeled head, thorax, and abdomen. The legs and wings of insects are always attached to the thorax. (Photo by David Lowenstein, Michigan State University)

hard outer shell (Photo 1-1). Many adult insects also have wings, though some winged species don't fly at all and others are surprisingly poor fliers.

Though many people lump them into the broad category of insects,

spiders and mites differ from insects in two ways. First, they have eight legs, not six. Second, their heads and thoraxes are fused into a single structure called a *cephalothorax* (Photo 1-2).

Mouthparts

Insects use their mouthparts for eating, to defend themselves, and to build nests. There are four main types of insect mouthparts: piercing-sucking, chewing, siphoning, and sponging (see the table).

Knowing what kind of mouthpart an insect has can give you a clue about what and how it eats. Insects with piercing-sucking or chewing mouthparts could be *herbivores* that eat plants or *predators* that eat other insects and mites. Insects with siphoning mouthparts use them to reach the nectar in flowers. Insects with sponging mouthparts start to digest liquid food (like blood, fungus, and other organic matter) while it's still outside of their digestive systems.

TYPE OF MOUTHPART	INSECT GROUP
Piercing-sucking	Plant bugs and mosquitos
Chewing	Grasshoppers and beetles
Siphoning	Butterflies and moths
Sponging	Many species of flies

Insect groups classified by the mouthparts of their adult stage.



Photo 1-2. An adult wolf spider. Note that it has eight legs and two body parts: the abdomen (left) and the cephalothorax, or combined head and thorax (right). Adult insects, by contrast, have six legs and three body segments. (Photo by Eugene E. Nelson, Bugwood.org)

Wings & Legs

Nearly all adult insects have two pairs of wings, and the wing shape influences how well an insect can fly. Flies have only one pair of wings, while silverfish and some aphids have none. As we mentioned earlier, having wings doesn't guarantee that an insect is an excellent flyer. For example, earwigs have wings but they rarely fly. Mosquitoes and fungus gnats fly poorly and only for short distances.

All insects have six legs, and the size and shape of their legs offer clues about how they move. Grasshoppers and crickets have large hind legs that help them jump. Praying mantises and some predatory plant bugs use their

large front legs to capture and hold their prey. Other insects, such as mole crickets, use their flattened legs to dig underground burrows.

LIFE CYCLES

Adult insects lay eggs that often hatch in four to eight days under ideal conditions. Some insect species lay eggs that hatch in less than one day. Others lay eggs in fall that spend the whole winter in that life stage. After hatching, the immature insects follow one of two developmental paths: simple or complete metamorphosis.

Simple Metamorphosis

Insects that undergo *simple* or *incomplete metamorphosis* have three life stages: egg, nymph, and adult. They include grasshoppers, aphids, cockroaches, stink bugs, dragonflies, and mayflies (often called *fishflies* in Michigan).

After hatching, these insects spend from several days to weeks as nymphs. Nymphs often look like miniature adults. They can't reproduce and often molt (shed) their exoskeletons several times, growing larger each time.

Nymphs live in the same or similar habitats as the adults of their species do. Some, like dragonflies and mayflies, live in water as nymphs and on land as adults.

Complete Metamorphosis

Insects that undergo *complete metamorphosis* have four life stages: egg, larva, pupa, and adult. The immature and adult stages look very different. Insects in this category include ants, bees, wasps, beetles, butterflies, flies, and lacewings.

Some larvae, like those of lady beetles and caterpillars, move around a lot. Others, like fruit fly larvae (often called *maggots*), move very little. The mouthparts may be quite different, too. For example, adult monarch butterflies have siphoning mouthparts for sipping nectar, while their caterpillars (larvae) have chewing mouthparts so they can eat the leaves of milkweed and other plants.

Before reaching adulthood, larvae turn into pupae, and the pupae of all species spend time in a cocoon, gall, or other protective casing. From outside the casing, it looks like nothing much is going on with the pupa inside, but inside the pupa, dramatic changes in structure and muscle are underway.

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WHAT'S NEXT?

Next week, Lesson 2 will cover common insect groups and the features that define them. Lessons 3, 4, and 5 will feature Michigan insect species with interesting stories. Lesson 6 will discuss how to support insect habitat and how to attract and keep beneficial insects in your landscape and garden.

FIND OUT MORE: REFERENCES & RESOURCES

For a more advanced discussion of insect anatomy and growth patterns, visit North Carolina State University's Bug Bytes website at <https://genent.cals.ncsu.edu/bug-bytes/>.