

HEMIMETABOLA

_____ are usually found in moist locations around houses or under stones and boards outdoors. They run rapidly and hide in cracks and crevices. They are secretive and usually are most active at night. They can be a nuisance in houses. Occasionally they damage book bindings, curtains, wallpaper etc. They are wingless with long antennae and three thread-like filaments at the tip of the abdomen.

Young live in water and are not like the adults. Adults are common around ponds, lakes and streams. Both adults and aquatic nymphs feed on insects. They are beneficial, because they feed to some extent on mosquitoes and other small flies. _____ can hover like a helicopter or fly and dart around rapidly. They have been called "mosquito hawks" and "snake doctors."

They have two pairs of membranous, many-veined wings; the hind pair is as large as or larger than the front pair. They have large conspicuous eyes.

_____ are somewhat general feeders, but prefer materials high in fats and starches. They deposit their eggs in a capsule called an ootheca. Several species invade homes where they can contaminate food and spread disease. They have an unpleasant odour and can be very annoying. They are adapted for running and move rapidly. They have flattened bodies and two pairs of wings, but in some species the wings are greatly reduced.

_____ are important to humans because they do millions of dollars in damage to houses each year. They feed on wood and digest it with the help of microbes in their digestive systems or enzymes they produce themselves. They are also important decomposers of wood in the ecosystem.

They usually live in colonies. Colonies consist of three castes: workers, soldiers and swarmers. Workers and soldiers are wingless and never leave the colony. Swarmers, or the reproductive forms, have dark bodies and four long, many-veined wings.

_____ are predaceous on a large variety of insects. They usually wait motionless for their prey to venture within striking distance. They are well known as biological control agents. However, they do not distinguish between useful and destructive species, but feed on any prey that comes near. They are large, elongate and slow-moving insects. Their front legs are greatly modified for grasping prey.

_____ are usually found hiding under leaves, boards or in cracks outdoors during the day. They can be destructive in greenhouses. They release a badsmelling substance when disturbed. A pair of nonvenomous pinchers is found at the end of their abdomen.

Nymphs resemble adults. Adults in several groups in this order never develop wings. Some members of this group are quite destructive to crops (_____). They have long antennae and various leg modifications. They generally have two pairs of wings with many veins. The front pair is usually slender and the hind pair is broad and fan-like.

_____ are slow moving and are generally found on trees or shrubs. They may be able to regenerate lost legs. They have elongate bodies. Some tropical forms are winged and are called leaf insects. These insects have chewing mouthparts and feed on foliage.

_____ feed on bits of hair, feathers or skin of the host. They deposit their eggs on the hair or feathers of the host. They are important pests of domestic birds and animals, but they do not live on humans.

_____ feed mainly on blood. These insects are found commonly on mammals (including humans), but not on birds. They feed by sucking blood and are important pests of domestic animals and humans. Eggs are laid on individual hairs and are commonly called "nits". The human body louse has been responsible for millions of human deaths through the centuries because it spreads the organism causing epidemic typhus.

Hemiptera means "half wing" and refers to the fact that part of the first pair of wings is toughened and hard, while the rest of the first pair and the second pair are membranous. They also have modified piercing and sucking mouthparts; some suck plant juices and are plant pests, while others can bite painfully. The _____ have forewings that are uniform in texture and are held like a tent over the abdomen. _____ usually have soft bodies and most species are wingless. They often cover themselves with wax or froth which prevents their soft bodies from drying out.

Aquatic nymphs live in water and have chewing mouthparts. Adults are common around water, especially in spring, when they often emerge in large numbers. They are an important fish food. Fish eat both the nymphs and adults. Adult _____ live only for one or two days. They do not feed during their adult life; their purpose is to mate and lay eggs for future generations of mayflies. Mayflies molt once after they have developed wings. They have long front legs and two or three long, tail-like appendages. The adults have reduced mouthparts and do not feed.

_____ are found around old books and in damp, dark rooms. Most live out-of-doors and are found resting in soil litter, around vegetation or on stones, logs and fences. They are rather uncommon but may be locally abundant. Some booklice feed on stored grains while others are library pests. They are microscopic in size.

HOLOMEABOLA

Coleoptera is the largest order, including about 1/4 of all known insects (about 280,000 different species). Immature stages are grub-like or worm-like and the insects pass through a pupal stage before becoming adults. Food habits are varied. Some feed on living plants; some are predaceous; some are scavengers; and some bore in wood. This order includes some of the best-known and most important insect pests. Most of the members are terrestrial, but some are aquatic. Perhaps the most famous members of this group _____. Coleoptera have the front pair of wings (elytra) hard and shield like, meeting in a straight line down the middle of the back. They usually have two pairs of wings. The hind wings are membranous and are folded under the front wings when at rest.

_____ are well known as pests of domestic animals and humans. One species transmits the bacterium that causes plague. Plague has killed more than 125 million people during the past 3,000 years. These insects suck blood only as adults, and females must have a blood meal before they can reproduce. They usually feed on animals but will attack humans. Larvae feed on organic matter and blood excreted by adults is often found in nests of various animals. They are small, wingless, flattened from side to side, and have jumping hind legs. Spines on the body point to

the rear of the insect which allows them to move through the hair of an animal easily. **Diptera** is a very important order. It includes forms that are parasitic, predaceous, and other forms that live on either living or dead plant or animal material. Some Diptera cause significant damage to crops, while others can act as pollinators. Many harmful flies, such as _____, spread diseases (such as yellow fever, West Nile virus and malaria) and are responsible for millions of human deaths. Because many of the species carry diseases, this is one of the most important orders from the standpoint of human health. Diptera are usually winged, but have only one pair of wings with few veins. Hind wings are represented by a pair of slender, knobbed structures called halteres that are reduced in size and sensory in function. Mouthparts are formed for sucking or piercing and sucking. Fly larvae are known usually as maggots; they are entirely unlike the adults. Flies occur in many shapes and sizes.

This is one of the best-known orders of insects and contains some of our most important pests, such as the _____ and _____. Most of the caterpillars feed on leaves of plants, while others bore in plant stems and fruit and still others are leafminers. Adults usually have four well-developed wings covered with overlapping scales. Mouthparts of the adults are formed for sucking. Immature stages (larvae) are worm-like. Some are known as caterpillars, cutworms or hornworms; and their mouthparts are formed for chewing.

Habits of these insects are varied: some are predaceous, some are parasitic, some cause plant galls, and some feed on plant foliage. Others, such as _____ and _____ eat plant pollen and nectar. This order includes some of our most harmful, as well as some of our most beneficial insects.

The abdomen in the females is usually furnished with a stinger. These insects have a painful sting and should be avoided if possible. They have membranous wings with few veins and the front pair larger than the hind pair. Some individuals are wingless. Mouthparts are formed for chewing or for both chewing and sucking. The body is usually constricted greatly between the abdomen and thorax. Immature stages are maggot-like or caterpillar-like and are entirely different from the adults.