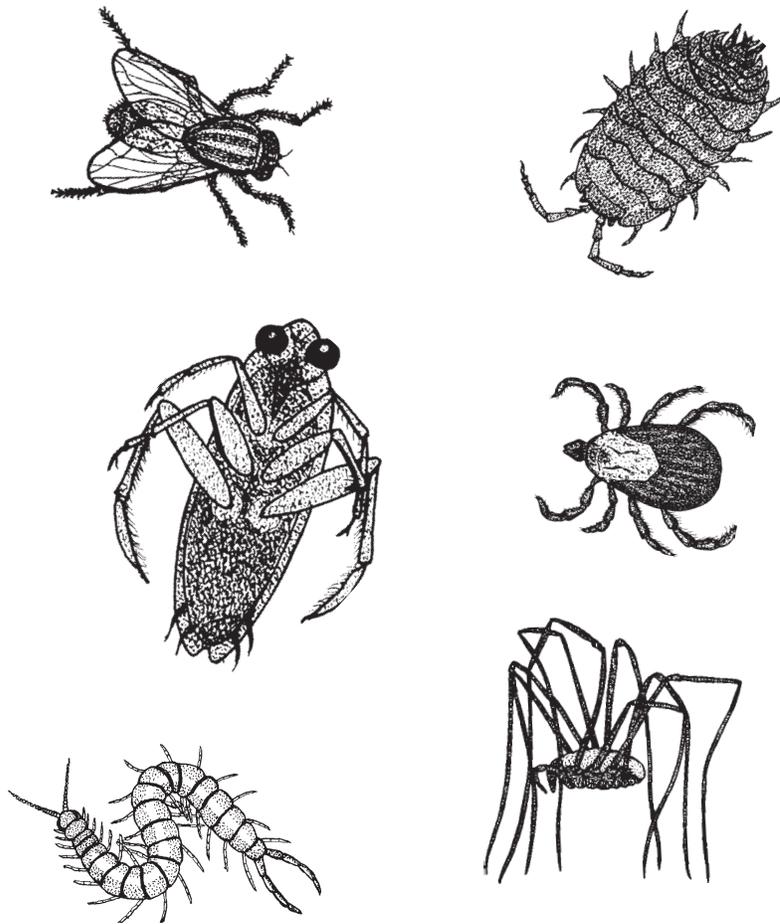
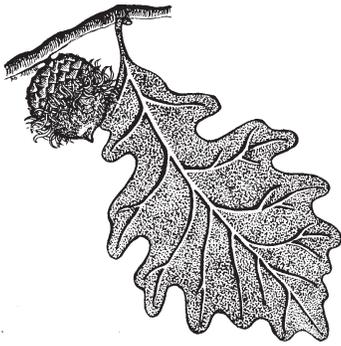


Iowa Insects, Spiders, and Other Invertebrates

Iowa Association of Naturalists



Iowa Wildlife Series



Iowa Association of Naturalists

The Iowa Association of Naturalists (IAN) is a nonprofit organization of people interested in promoting the development of skills and education within the art of interpreting the natural and cultural environment. IAN was founded in 1978 and may be contacted by writing the Conservation Education Center, 2473 160th Rd., Guthrie Center, IA 50115, 515/747-8383.

Iowa Wildlife Series

Students need to be knowledgeable about and appreciate local wildlife in order to better understand the natural environment. The Iowa Association of Naturalists has created this series of booklets to offer a basic understandable overview of Iowa wildlife. These booklets will assist educators in teaching students about Iowa wildlife. The six booklets in this series are:

- Iowa Mammals (IAN-601)
- Iowa Winter Birds (IAN-602)
- Iowa Nesting Birds (IAN-603)
- Iowa Reptiles and Amphibians (IAN-604)
- Iowa Fish (IAN-605)
- Iowa Insects and Other Invertebrates (IAN-606)



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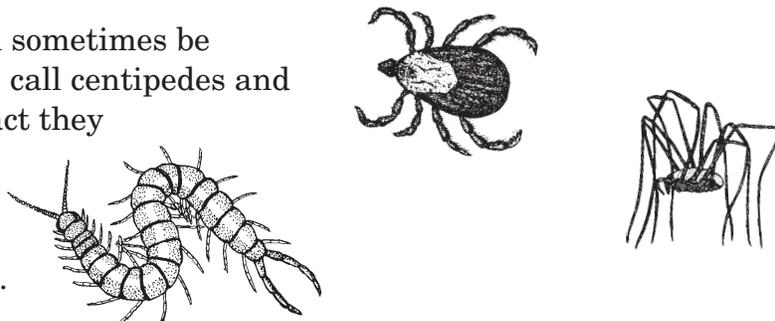
Iowa Insects, Spiders, and Other Invertebrates

What is an invertebrate?

Invertebrates are small animals without backbones. Many invertebrates have bodies divided into distinct regions and an external skeleton. Other invertebrates do not have these features. Most animals on this planet are invertebrates.



Classifying invertebrates can sometimes be confusing. People sometimes call centipedes and sowbugs “insects,” when in fact they are not. Invertebrates have specific characteristics which determine exactly what kind of animal they are.

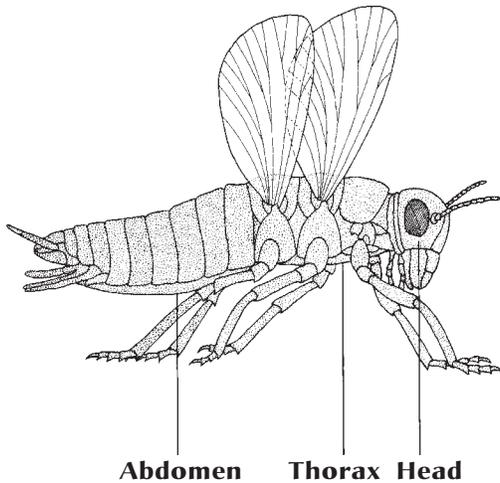


The six-leggeds: insects

They hop, creep, fly, and swim. They live in forests, prairies, ponds, and rivers. They live in tops of trees and under the ground. We even find them in our homes. Some are considered pests and others objects of beauty. They are the most diverse and prosperous of all animals. They are insects.

What is an insect?

Insects have six legs and three body parts called the **head**, **thorax**, and **abdomen**. They also have an external skeleton. The eyes, antennae, and mouthparts are located on the head. Most insects have **compound eyes**, which are one eye made up of many smaller eyes, as well as simple eyes. The simple eyes look like a small dot in front of the larger compound eyes. The mouthparts of insects are generally of two types - chewing and sucking. Chewing insects have mandibles which move back and forth to chew up food. Sucking insects have mouthparts modified into a beak with which they suck liquid.



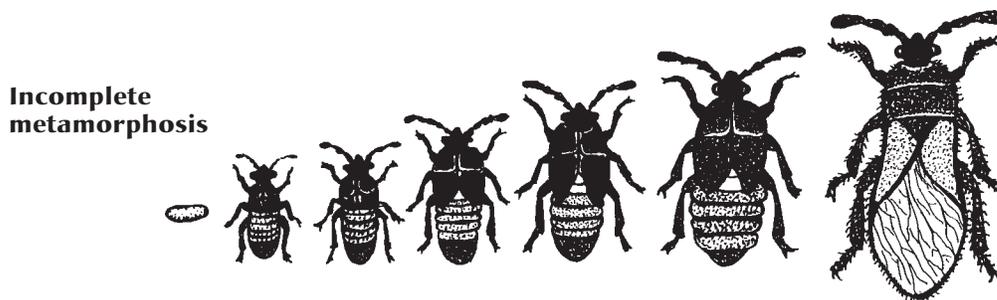
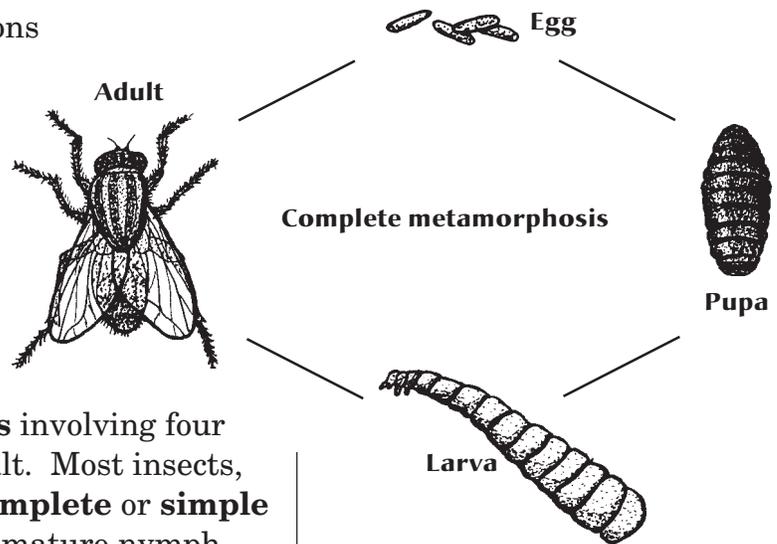
The legs and wings of insects are attached to the thorax. Insects may have no wings, one pair, or two pairs of wings. Other appendages such as cerci (pronounced *sir-see*) and reproductive organs are sometimes visible at the end of the abdomen.

Incredible insects

Insects are the most numerous group of animals on Earth. There are more than 750,000 different kinds of insects known. This is more than all the other animal groups combined! Springtails in the soil can number more than 900 million per acre, and a single female aphid can have 500 billion descendants in a single year. This may seem overwhelming. Fortunately, 95 percent of all insects are either harmless or actually helpful to humans.

On Earth, there are many areas devoid of human life, but few are without insect life. Insects have existed on Earth for more than 200 million years, living in all conditions ranging from boiling hot springs to icy Antarctica.

Insects have incredible adaptations for survival. Ants, bees, and termites live in colonies with hierarchies and divisions of labor. Viceroy butterfly larvae are camouflaged to look like bird droppings. Monarch butterflies are toxic to some predators. Some insects such as flies, moths, and beetles have **complete metamorphosis** involving four stages: egg, larva, pupa, and adult. Most insects, such as grasshoppers, have **incomplete or simple metamorphosis** in which an immature nymph hatches, grows, develops wings, and continues to grow into adult size. Some insects hatch young that look like miniature adults. All these adaptations have made insects some of the most abundant creatures on Earth - underground, on the ground, in the skies, and underwater.



Crawlers on the ground – Beetles

“The creator, if he exists, has an inordinate fondness for beetles on observing that there are 300,000 species of beetles on this planet, but only 8,000 species of mammals.”

JBS Haldane, Scottish mathematical biologist (1892-1964)

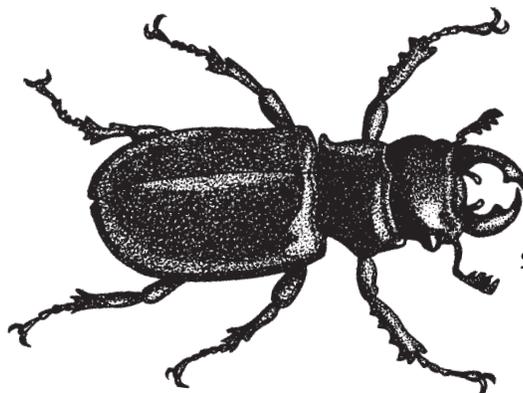
One of the most common insect orders found crawling on the ground is beetles. Beetles are the most diverse insect group and have the largest number of species of any group of organisms. One out of four insects identified so far is a beetle. If a

person began collecting beetles at the rate of one new species every day, their life wouldn't be long enough to collect them all. There are more than 300,000 known kinds of beetles!

The most distinguishing characteristic of beetles may be the hard front wings which protect the softer rear wings and abdomen. They also have powerful jaws for chewing. Beetles are adapted to live in a variety of habitats. Some live under bark and some bore into stems, wood, seeds, and roots. Some are predators living in leaf litter, leaf mold, soil, or gravel. Others feed on carrion, leaves, decaying vegetation, or fungi.

Examples of beetles in Iowa

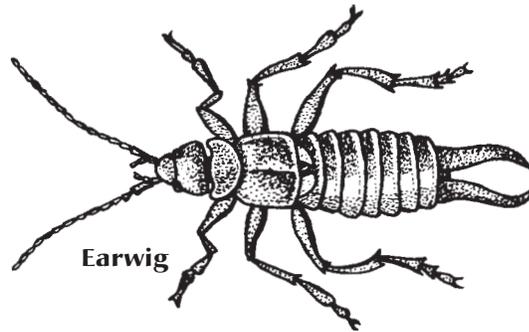
<u>Name</u>	<u>Description</u>	<u>Other information</u>
Stag beetle	Males have huge mandibles which resemble antlers on male deer (stags)	Adults feed on sap; larvae feed on juice from decaying wood
Nine-spotted ladybird beetle (ladybug)	Orange to reddish-yellow front wings with four black spots on each wing and a spot where the two wings come together	Helpful predators; adults and larvae feed on aphids and are beneficial to some crops
Dermeestid beetle	Covered with hair; appear black or brownish; sometimes with a pattern	Feed on many things, including cereal, woolen rugs, woolen upholstery, mounted bird or mammal specimens; leaves a pile of powdery material as evidence of its presence
Acorn weevil	Has a long, slender snout which is as long as the body or longer	Adults drill holes in acorns and drop in an egg; look for acorns with holes in early fall



Stag beetle

Beetle-like insects

Earwigs are another crawling insect. Earwigs were named because they were believed to crawl into the ears of sleeping people but this is almost unheard of. Earwigs have short, flexible front wings and they have pincer-like **cerci** (sir-see) attached to their abdomen. These cerci are for defense and can sometimes cause a painful pinch. Females have straight cerci compared to the males' curved cerci. They are nocturnal and spend the day in crevices or damp places.



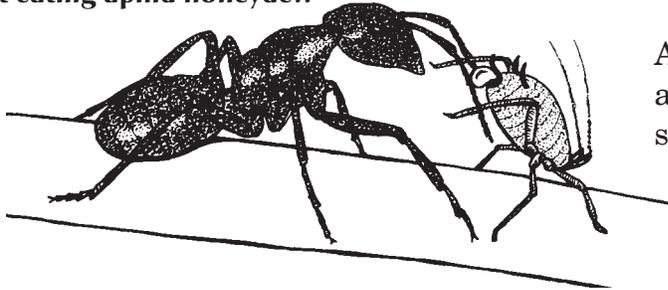
Cockroaches usually do not win popularity contests with people, but they have an ancient and impressive lineage. Back in the days when coal swamps covered a good portion of America, cockroaches were often six inches long. In the 300 million years that have passed, present-day cockroaches have never matched their ancestor's size but have found many habitats to their liking.

Cockroaches have flat, oval bodies and are generally black or brown. They usually have wings but their front wings are more leathery. Some cockroach species are at home under logs and stones. Most are nocturnal and, with their flattened shape, are able to invade homes and public buildings. They eat mostly organic material and can be hard to control. They have two cerci at their posterior end which detect sounds and are sensitive to puffs of air which may come from your foot or hand. This adaptation, along with being rapid runners, makes them especially difficult to swat or step on.

Aphids and aphid-like insects

Just as we tap maple trees for their sugar-rich sap, many insects tap stems and leaves for the same reason. Aphids are small, pear-shaped insects with sucking mouthparts. By sucking plant juices, aphids can cause plants to wilt. They can also transmit diseases as they feed. Ladybugs help combat this problem by eating aphids.

Ant eating aphid honeydew



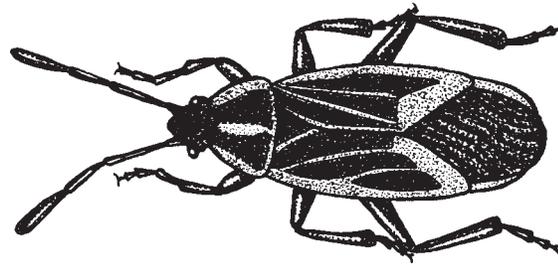
Aphids sometimes live closely with ants. Aphids use only a portion of the sugars found in the plant juice and discharge the rest as a clear watery liquid, called **honeydew**, from their anus. This honeydew may attract ants and other

insects. Ants will eat this honeydew, and some ants gather aphid eggs and keep them over winter in their nest. In spring, they transport the aphids to a food plant and tend to them by transferring them from one plant to another.

Aphids - This is your life!

Each year, aphids hatch from eggs laid the preceding fall. All these aphids are wingless females. These females do not mate and do not lay eggs but give birth to live young through **parthenogenesis** - producing young from unfertilized eggs. These young are just like their mothers - wingless females. The cycle continues with a new generation of wingless females appearing as often as every ten days. This lasts until the leaves and stems where they feed become too crowded. Then the wingless mothers give birth to winged daughters that fly off to colonize new leaves and stems. These winged generations can alternate with the wingless generations several times during the course of the summer until the final generation - twelfth or thirteenth - appears. Only at this point do male aphids finally hatch and mate with females. This brings the year to an end, as it began, with the fertilized eggs left behind.

Another sap-feeding insect is the boxelder bug. Boxelder bugs are in a group called plant bugs. They are blackish with red markings and feed on sap from boxelder trees. They often enter our homes in the fall.



Not all insects are "bugs." True bugs have sucking mouthparts, and many suck sap from plants. In North America, about 3,800 species, including the boxelder bug shown above, are true bugs.

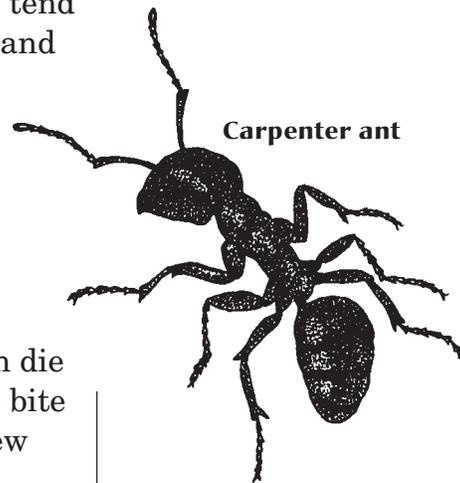
Ants and termites

Ants and termites are crawling insects have complex social structures. There are more than 2,500 species of ants and all are social animals. Ant colonies can be found in large numbers everywhere beneath our feet. Ants are black, brown, or red in color and may have wings or be wingless. They have a thin waist between the thorax and abdomen.

The ants of a particular colony usually only have one queen which is the mother of all the workers. These workers are all females. While the queen continues laying more and more eggs, workers tend the eggs, feed and clean their younger sisters, and search for food above ground.

Periodically, this routine is broken when winged ants develop from the eggs laid by the old queen. These are males and new queens which swarm from the colony to mate. Clouds of flying and mating ants are sometimes common in the spring. The smaller males soon die after this aerial adventure. The larger queens bite off their own wings and settle down to start new colonies beneath the ground.

Termites are sometimes called white ants but they are not ants. They have a thick body from head to tail, lacking the thin waist characteristic of ants. They are small, pale in color, and live in damp wood. They are also highly socialized and live in colonies with four distinct **castes**, or social classes.



Carpenter ant

The first caste is made up of the king, the queen, and the winged termites which may become kings and queens of new colonies. The second caste is made up of whitish, blind workers hatched from the thousands of eggs laid by the enlarged and almost helpless queen. The last two castes are made up of soldiers, with large heads and jaws that protect the nest from enemies, and nymphs which take over the task of reproduction should the king or queen die.

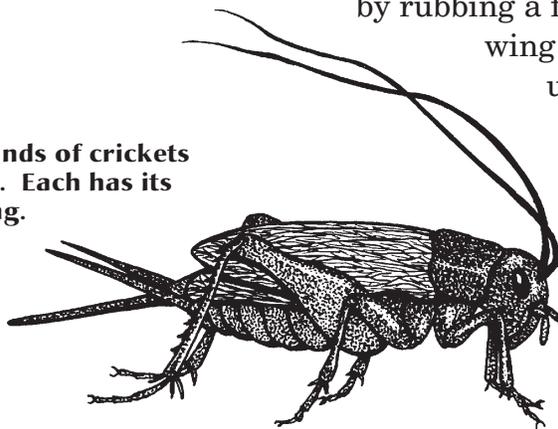
Termites have protozoa in their digestive tracts which allow them to feed upon and digest wood. Each year termites do approximately one billion dollars worth of damage to buildings in the United States.

The hoppers

Hopping insects offer fun and challenge when trying to catch them. Their rear set of legs are modified for jumping. The best known members of this group are the grasshoppers, katydids, and crickets. Each has a long abdomen, a large, flat-sided head, and chewing mouthparts. In years when these species are prolific, they can do considerable defoliation and crop damage.

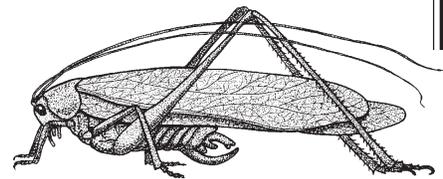
Periodically, they swarm. These insects serve as food for larger birds, small mammals, and other animals. Some katydids and crickets make music by rubbing a file on the undersurface of one wing against a rough patch on the upper surface of the other wing. Some male grasshoppers rub their legs against their wings or snap their wings in flight. These “concerts” only are performed in late summer when they have reached full maturity.

More than 2,000 kinds of crickets has been identified. Each has its own distinctive song.



Examples of hoppers in Iowa

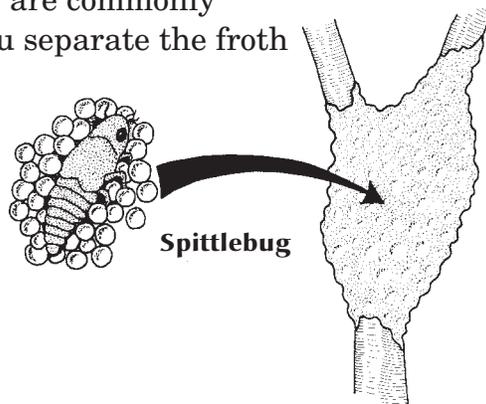
<u>Common Name</u>	<u>Description</u>	<u>Other information</u>
Nebraska conehead	Long-horned grasshopper; long, slender antennae; green in color	Found in tall grass or other tall grass-like plants; high-pitched buzzy song
Bush katydid	Long-horned grasshopper; green with thin, leaf-like wing covers	Hear with “ears” on upper part of the front legs
Field cricket	Black or brown in color; common	Their song is probably the most familiar to people



Bush katydid

Leafhoppers and treehoppers are hopping insects with sucking mouthparts that produce honeydew similar to aphids. Leafhoppers are often green in color but can also have bright spots or stripes. Treehoppers have incredible jumping ability and are known for some of their bizarre shapes and colors which keep them camouflaged among plants. Often, this camouflage is so effective they only are noticed while moving. For example, the buffalo treehopper is camouflaged like a green thorn.

Froghoppers are small jumping insects which are dull in color and shaped somewhat like tiny frogs. The nymphs, known as spittlebugs, are recognized by the whitish froth they produce to cover themselves while feeding. They are commonly found in grass and weeds. If you separate the froth on the plant and peek in, it is likely you will see the small, green nymph inside.



Spittlebug

Fleas are generally an unpopular hopping insect, although they do carry the prestige of being the insect high-jump champions. They can jump up to 150 times their body length, sideways or straight up. This would be equivalent to a human jumping about 1,000 feet! Fleas often are observed by people merely as a brown speck running across the hair of a pet. A closer look, however, reveals interesting adaptations to keep them close to their host. Their bodies are vertically flattened with antennae in grooves behind the eyes where they cannot snag hair. They also have hooked claws to help them keep their grasp in a tangle of hairs. Fleas are difficult to catch which can be frustrating since they are considered pests to humans and pets. Adult fleas feed on blood from their hosts. Larvae feed on dust and debris.

High in the sky

Insects in the sky have many interesting behaviors and adaptations for their aerial way of life. Some flying insects make people nervous as they buzz by, while others offer great beauty and pleasure being sighted. A whole book could easily be dedicated just to flying insects. A few of the more common groups will be discussed here.

Flies

The fact that most homes are equipped with a flyswatter indicates that flies are considered a common nuisance. Because we encounter them so often, they are insects that are familiar to us. Flies have just one pair of wings, as opposed to other common flying insects which have two pairs. Where other insects have a second pair of wings, flies have knobs attached to the thorax. If these knobs are injured, they cannot fly.

Bees and wasps

Bees and wasps are fliers which send some people into a panic. Many types of flies are mistaken for bees but a close look, if you dare, will let you know if you need to make a “beeline” or not. Bees and wasps have four clear-colored wings, as opposed to just two found on flies. This group also has slender waists and mouthparts for chewing and sucking. They are the only insects with stingers. Their yellow and black stripes advertise these stingers to other animals who may want to eat them. Usually people are not stung unless they disturb a nest.

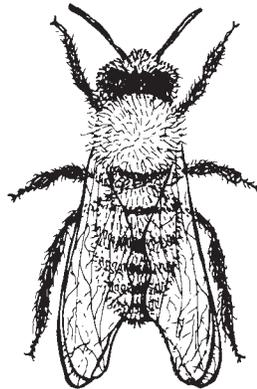
Many bees live in large nests with a queen that lays the eggs and is cared for by the female workers. Not all bees live in hives. Bumblebees are mostly solitary and make their homes in holes in the ground or sometimes use an old mouse nest.

Butterflies, moths, and skippers

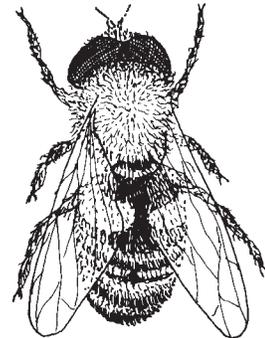
Butterflies, moths, and skippers may be the most attractive group of insects for many people. These fliers have two pairs of wings. The body and wings are covered with scales to give them their color. The mouthparts are modified into a sucking tube for feeding on nectar or sap. These insects have complete metamorphosis, including egg, larva, pupa, and adult.

There is no rule of thumb to distinguish the caterpillars of moths from those of butterflies. Both have chewing mouthparts and can do damage to some crops. Adult moths and butterflies are quite different, although one group, the skippers, show characteristics of both groups. Butterflies

Honeybee



Hover fly



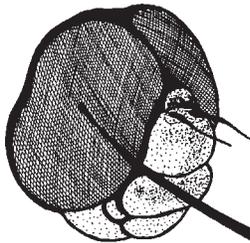
usually are active during the day, while moths fly at night. Butterflies rest with their wings folded, while moths rest with theirs spread apart.

Butterflies have antennae which are thin, ending in a knob, while antennae of moths never end in knobs and are often feathery. Though butterflies often are considered more attractive, the moths form a larger, more diverse group.

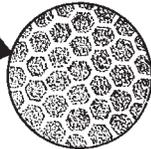
Skippers are small butterflies with characteristics of moths. They have a rapid, darting flight. The front and hind wings at rest are usually held at slightly different angles from each other.

Dragonflies and damselflies

Dragonflies and damselflies live near water. They have large, slender bodies and large compound eyes, and are predaceous. Both have two rows of long, sharp spines on their legs which they use to snag mosquitoes, gnats, and midges in flight.



Dragonflies may have more than 28,000 tiny lenses in their eyes giving them the sharpest vision of any insect.



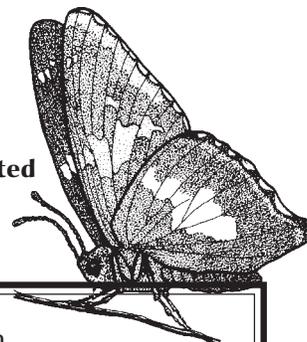
Dragonflies are one of the fastest insects, using their powerful wings to propel them at speeds ranging from 35 to 60 mph. They come to rest quietly with their wings outstretched. Dragonflies also have the ability to hover in one place and fly backwards. Green darners are common dragonflies with a green thorax, bluish abdomen, and target-like mark on the upper part of the head.

Damselflies are named for damsels - elegant women of noble birth. The damselfly's flight is more fluttering and weaker than the dragonfly. Damselflies hold their wings resting elegantly erect over their back, like a butterfly. One common damselfly in Iowa is the black-winged damselfly. Males have blackish wings and a metallic-greenish-black body. Females have dark gray wings with a white spot on the front edge of the wing and a non-iridescent colored body.

Lacewings

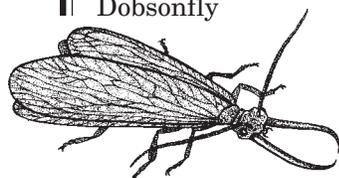
Lacewings are characterized by their four thin wings with a network of visible veins. These wings often are held roof-like when the insect is at rest. Most are poor-flying predators seen flying at night around lights.

Silver-spotted Skipper



Examples of flying insects in Iowa

<u>Common name</u>	<u>Description</u>	<u>Other information</u>
Deer fly	About the size of a house fly; light tan markings and markings on wings	Females give a painful bite while attempting to suck blood
Mosquito	Small size; males have feathery antennae; females have a few hairs on antennae	Only females bite to get blood for their eggs to develop
Honeybee	Have pollen baskets of stiff hairs on legs to carry pollen back to the hive; workers only sting once, leaving the stinger in the victim's body and then dying	A midsummer hive has one queen, approximately 50,000 sterile female workers, and a few hundred male drones
Paper wasp	Brownish with long legs; painful sting	Queen builds a paper nest out of wood it rasps from a tree and mixes with saliva; nests are open and lack a covering like a hornet's nest
Yellow jacket (hornet)	Black and yellow bands on abdomen; painful sting	Queen builds a paper nest about one-inch in diameter; as workers are produced, nest may be expanded to a foot in diameter
Monarch butterfly	Black and orange; males have black spot on third vein of back wing; Wingspan: 95-105 mm.	In fall, swarms of adults migrate southward, covering entire trees while resting; larvae feed solely on milkweed
Luna moth	Delicate, light green color; distinctive tail; Wingspan: 100-120 mm.	Larvae feed on sweet gum, walnut, hickory, and persimmon trees
Silver-spotted skipper	Black wings with orange stripes on upper wings; white blotches on lower wings; Wingspan: 44-60 mm.	Larvae feed on leaves and live in a shelter of rolled-up leaves
Green lacewing	Green wings and golden eyes	Sometimes called aphid lions; important in keeping pest aphids under control
Dobsonfly	Large, soft body; found near streams; males have huge curved mandibles for clasping females during mating	Larvae are called hellgrammites; often used as live fishing bait



Diving deep

Many people who have had the opportunity to dip a net into an Iowa pond have been amazed at what they found. There are approximately 5,000 species of insects which spend all or part of their lives in North American ponds and lakes. These insects have fascinating adaptations for breathing, capturing food, rearing young, and escaping predators in their watery world. An abundance of immature and adult insects play important roles in aquatic food webs. Many of these small critters are vital to the growth and success of fish populations and fishing opportunities.

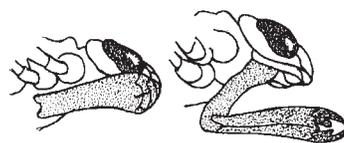
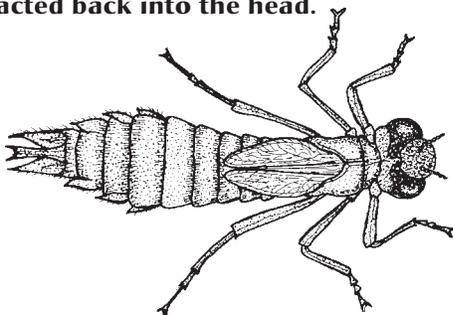
Aquatic larvae and nymphs

Mosquito larvae are approximately one-quarter inch long. Their head and thorax are much larger than the rest of their body. They breathe at the surface of the water through the help of a siphon on their posterior end. They eat microscopic plants and animals or organic debris filtered through brushes that surround their mouth. They take just a week to develop into an adult.

Dragonfly and damselfly nymphs are not likely to win any beauty contests. The nymphs are dull-colored, awkward-looking creatures. They catch their prey using an enlarged lower lip called a **mask**, armed with a pair of hooks which can be shot out of the head to hook prey and then drawn back into the jaws. Nymphs prey on tadpoles, small fish, and other aquatic insects. Damselfly nymphs are slim and have three leaf-shaped gills at the tip of the abdomen. Dragonfly nymphs are more broad and lack

these gills. Both of these nymphs serve as food for large fish.

Dragonfly and damselfly nymphs snatch their prey with a pair of hooks that can be shot out and retracted back into the head.



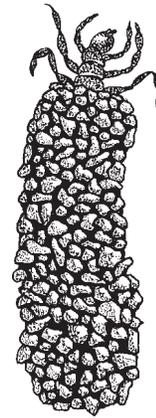
Stonefly nymphs generally live in flowing water where they are found under rocks, leaves, and other debris. They grow up to two inches long and have tufts of gills behind each leg. Some feed on plants, while others feed on animals. Fish and other water animals feed on stonefly nymphs.

Mayfly nymphs have rows of leaf-like gills along the sides of their abdomen and, like the adults, have three long tail appendages. They live from a few months to a few years in the water, depending on the species. As they near maturity, they float to the surface, shed their skin, and transform to a sub-adult and then to an adult. As adults, they do not have functional mouthparts and cannot feed. They merely mate in flight. The female lays her eggs in the water and the adults die. Both the nymphs and adults are important food for fish.

Caddisfly larvae are home builders of the water world. They are found in Iowa streams and live in a case of leaves, sand, grains, twigs, or other debris glued together by sticky silk. They spend all their time as larvae in these cases and are anchored in them by two tail hooks. As the larvae grow and molt, they simply remodel and expand their cases by adding material to the entrances. Caddisfly species can be identified by examining the forms of their cases.

Aquatic adult insects

Whirligig beetles are black, round beetles found whirling like a top on the surface of the water. They use their short, fan-shaped middle and hind legs for skimming and diving. These beetles don't need liability insurance because they never run into one another. Their antennae float on the surface and monitor all ripples that come their way. This "radar" allows them to make split-second changes in their direction of travel.



Encased
caddisfly
Larvae

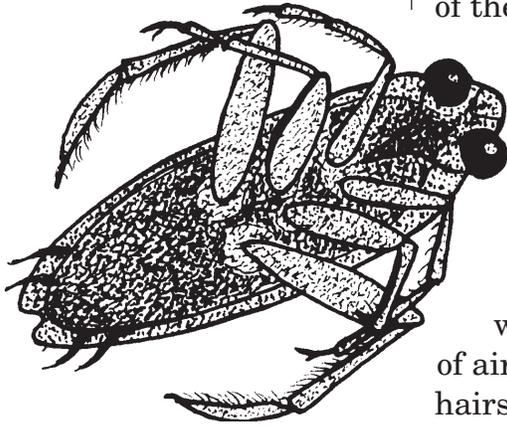


Caddisfly
without a case

Perhaps most unique about this beetle is that it has its own version of bifocals - each eye is divided into two parts so the beetle can see above and below the water at the same time.

Two insects use their hind legs as oars in the water. The first is the backswimmer, appropriately named since it swims on its back. It is able to do this by carrying air supplies on its belly and beneath its wings. They come to rest and replenish their air supplies by sticking the tip of their abdomen above the water surface. Be

careful when picking up a backswimmer - their bite can be painful.



Backswimmer

The other insect with “oars” is the water boatman which swims on its belly. As the water boatman rows through the water, its entire body glistens from the blanket of air that wraps around it. Thousands of tiny hairs coat the surface of the boatman’s body and hold the blanket of air in place. In order for the insect to stay underwater, it must hold onto some object. Adult water boatmen feed on algae or decaying plant and animal matter sucked from the bottom mud.

Another insect gracing Iowa waters is the diving beetle, unsurpassed among aquatic insects for grace and speed. Both the adults and larvae are predaceous and will eat any insect, snail, fish, or tadpole they are fast enough and strong enough to catch. Adults have **spiracles** which open between their abdomens and wing cases. Spiracles are small holes along the abdomen through which insects breathe. Each time a diving beetle surfaces, it sticks the end of its abdomen out of the water and collects air beneath its wing case for the next dive. Out of the water, adults are strong fliers and often are attracted to lights.

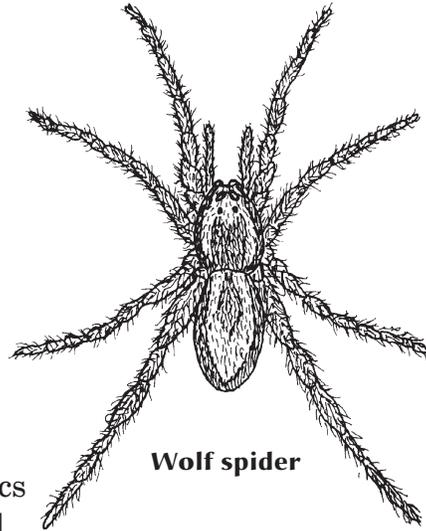
The eight-leggeds: spiders, ticks, and mites

Spiders, ticks, and mites belong to a group called **arachnids**, a Greek word for spider. They have two body parts: a **cephalothorax**, which is a combined head and thorax, and an abdomen. They have eight legs, no antennae, and no wings. Like insects, they have an external skeleton.

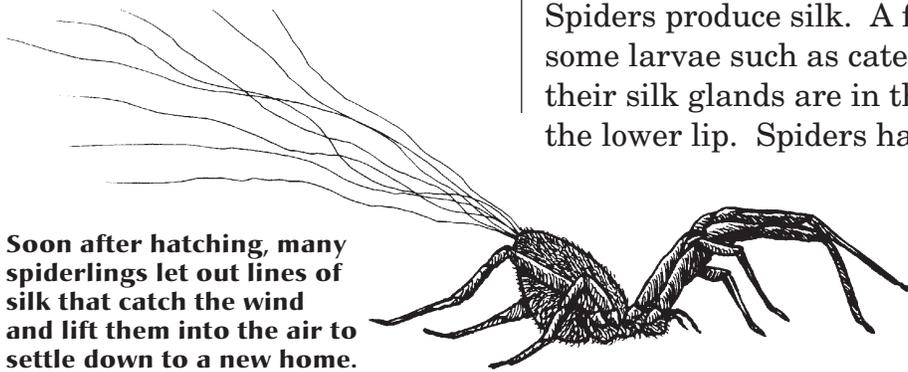
Spiders

Spiders have all the basic arachnid characteristics and usually eight simple eyes - never compound like insects. They do not chew and swallow their prey. They crush their prey with nippers called **chelicerae** attached to their heads. There are two ways spiders ingest their food. Those with weak jaws puncture the body of their prey with their chelicerae and alternate between injecting and sucking back digestive fluids which dissolve the soft parts until all that remains is the empty shell. Spiders with strong jaws such as wolf spiders and large orb weavers mash their prey to pulp between their jaws as the digestive fluid is regurgitated over it. Only a small mass of indigestible material remains to be discarded.

Most spiders are not dangerous to people, but there are a few exceptions. The most well-known venomous species is the black widow. It has a bright red mark on its abdomen. Fortunately, it is not commonly found in Iowa. Another venomous spider is the brown recluse or violin spider. It is yellowish-brown with a dark mark resembling a violin on the cephalothorax. It is more common than the black widow, but is still not numerous.



Wolf spider



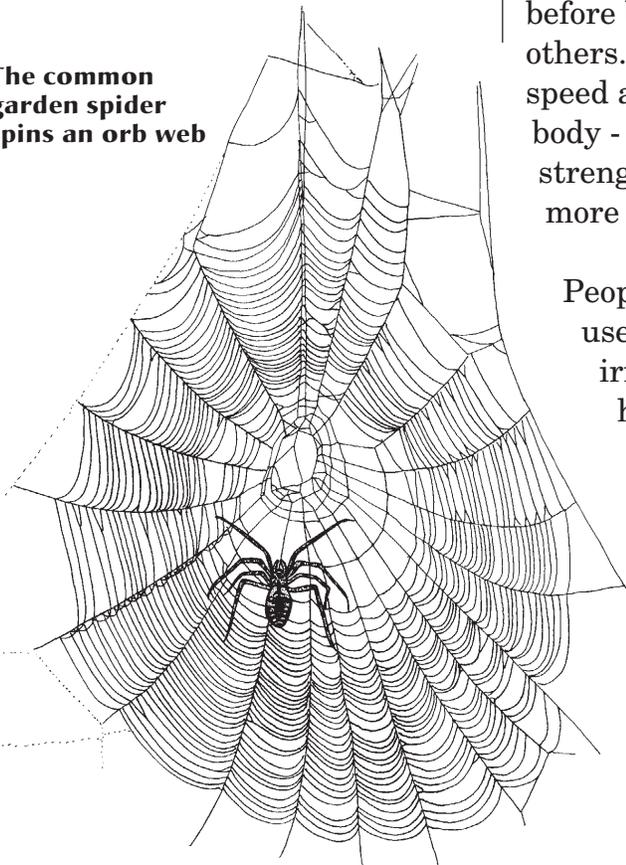
Soon after hatching, many spiderlings let out lines of silk that catch the wind and lift them into the air to settle down to a new home. Spiderlings have been found ballooning 14,000 feet above Earth and 200 miles from shore.

Spiders produce silk. A few adult insects and some larvae such as caterpillars produce silk, but their silk glands are in the head and emerge from the lower lip. Spiders have their silk glands in the abdomen and the strands come out of openings on spinning fingers at the hind end. The silk changes from a liquid to a solid as it hits the air.

Threads of versatility

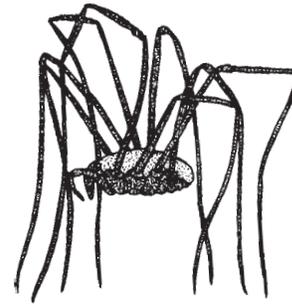
Spiders use silk for traplines, draglines, ballooning lines, egg sacs and nursery webs, chambers in which to hibernate or mate, webs designed to snare food, and traps to entangle and swathe their prey. These strands are very strong and can be stretched as much as one-half their normal length before breaking. Some strands are stronger than others. The strength depends somewhat on the speed at which the fibers are drawn out of the body - the greater the speed, the greater the strength. Many of the threads are made up of more than one strand.

The common garden spider spins an orb web



People are often most fascinated by a spider's use of silk for their webs. Webs vary from irregular cobwebs tucked into a corner of the house to beautiful orbs found in the garden. Each type of web is built with a precise plan. For example, the orb spider begins with a suspension bridge, upon which the whole web will hang. After this is established, the spider joins two or three more lines to make the triangle or rectangle outline. Next the lines are laid in which the round trap is formed. The spider attaches the lines that resemble spokes of a wheel using dry

silk so it can walk on these lines like scaffolding. The spider finishes the job using sticky threads to fill in the corners and spiral around the spokes to make the sticky snare. It cuts away the temporary scaffolding as it leaves the gummy trap behind. People have wondered how spiders keep from getting caught in their own webs. The secret is oil found on the spider's body.



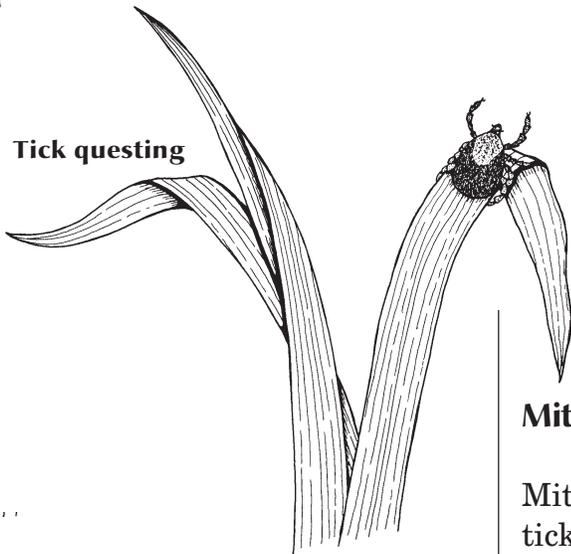
Daddy longlegs

Daddy longlegs are also arachnids but not true spiders. They are in their own group. Daddy longlegs are recognized by their long, thin legs and one-part body. They do not spin silk. They are often seen in great numbers in the fall around harvest and sometimes are called harvestmen. These critters are harmless to people. They are scavengers and feed mostly on dead animals. Sometimes they may kill small insects and suck juice from soft vegetables and other foods.

Ticks

Ticks have a one-part body and are **external parasites**, meaning they attach to the outside of a living host to get their nutrients - blood. Ticks carry and transmit a number of disease-carrying organisms which can infect humans. These include the organisms which cause Lyme disease, Rocky Mountain spotted fever, and tick-borne relapsing fever.

Many people believe ticks fall out of trees when, in fact, ticks most often live in tall grass. They seek out hosts by **questing**—grasping the blades of grass with their lower legs and waving their front legs, waiting for a suitable host to come walking by. Once a host brushes by their waiting legs, they climb aboard and seek a suitable site for attaching. The tick inserts its mandibles into the skin and begins to suck blood. The outside surface



Tick questing

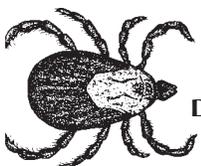
of a tick is made of cuticle and is able to grow to accommodate the large volume of ingested blood, which for some ticks can be 200-600 times their unfed body weight!

Mites

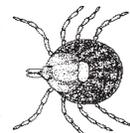
Mites have the same physical characteristics as ticks but are more predatory. Mites are the most abundant eight-legged creatures on the planet but often are overlooked due to their small size. One study gave an estimate of 666 million mites in one acre of grassland! Mites can be found in the nostrils of seals, the gills of crayfish, and the hearing organs of moths. In Iowa, many mites are found in the leaf litter.

Examples of arachnids in Iowa

<u>Common name</u>	<u>Description</u>	<u>Other information</u>
Wolf spider	Dark brown with gray hairs; may be more than an inch long	Air tubes which supply air to the eyes also act as light reflectors
American dog tick	Larger size (3/16 inches); white pattern on dorsal shield contrasting with dark-brown body	Most common tick in Iowa; does not transmit Lyme disease
Lone star tick	Same size as American dog tick; white star on base of dorsal shield; chestnut-brown color	Has been known to transmit Lyme disease
Black-legged (Deer) tick	Less than 1/16 inches long; blackish dorsal shield and reddish brown body	Relatively uncommon in Iowa; biggest tick transmitter of Lyme disease
Red velvet mite	Large (by mite standards); bright red in color	Feeds on eggs of other small animals in leaf litter



Dog tick



Lone star tick

The many-leggeds

Centipedes and millipedes often are confused with insects each are in separate taxonomic classes. They both have many body segments, many legs, and an external skeleton.

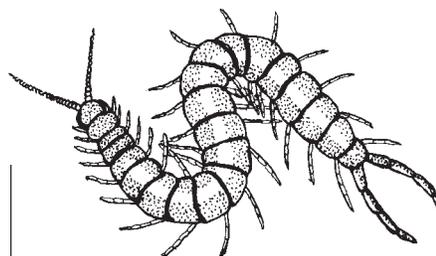
Centipedes have long antennae and just one pair of legs on each segment. Millipedes have short antennae and two pairs of legs on each segment. Centipedes are generally faster than millipedes, but both can have more than 100 pairs of legs. Both use chemical repellents to ward off insects and other predators. If you disturb a millipede or centipede, it's likely you will come away with a foul-smelling odor on your fingers.

Crustaceans

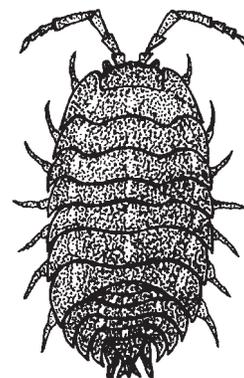
Crustaceans have two body parts - a cephalothorax and abdomen. The cephalothorax often has a hardened cover called a **carapace**. They usually have at least five pairs of legs and two pairs of antennae.

Crayfish are Iowa's version of lobsters. They have a carapace and five pairs of walking legs. The first pair of legs are enlarged pincers used for holding and tearing food. They eat mainly plants and scavenge on dead plants and animals. They are active mostly at night.

Isopods are small land-dwelling crustaceans. They have flattened bodies and lack carapaces. Pillbugs and sowbugs are examples of isopods. They both have many legs and are often found under rotting logs. Pill bugs have the ability to roll



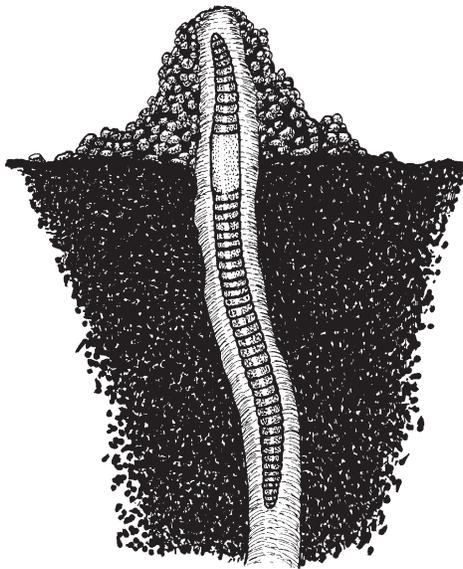
Centipede



Sowbug

into a ball when touched. Their genus name is *Armadillidium*, because armadillos use the same protective tactic. Female isopods carry their eggs and newly hatched young in pouches on the lower surface of their body - much like kangaroos and opossums!

The zero-leggeds: leeches and earthworms



Earthworm casting

Leeches and earthworms are both **annelids**. Annelids are segmented animals with little difference between body regions. They do not have an external skeleton, and the annelids discussed here do not have legs.

Leeches are sometimes called bloodsuckers although not all feed on blood. Leeches are flattened worms often found in calm, warm, shallow waters with bottom debris. They move around by swimming and by **looping** - alternately attaching the mouth sucker and tail sucker to the bottom surface. Blood-sucking leeches have well-developed jaws, while scavenger and carnivorous species do not.

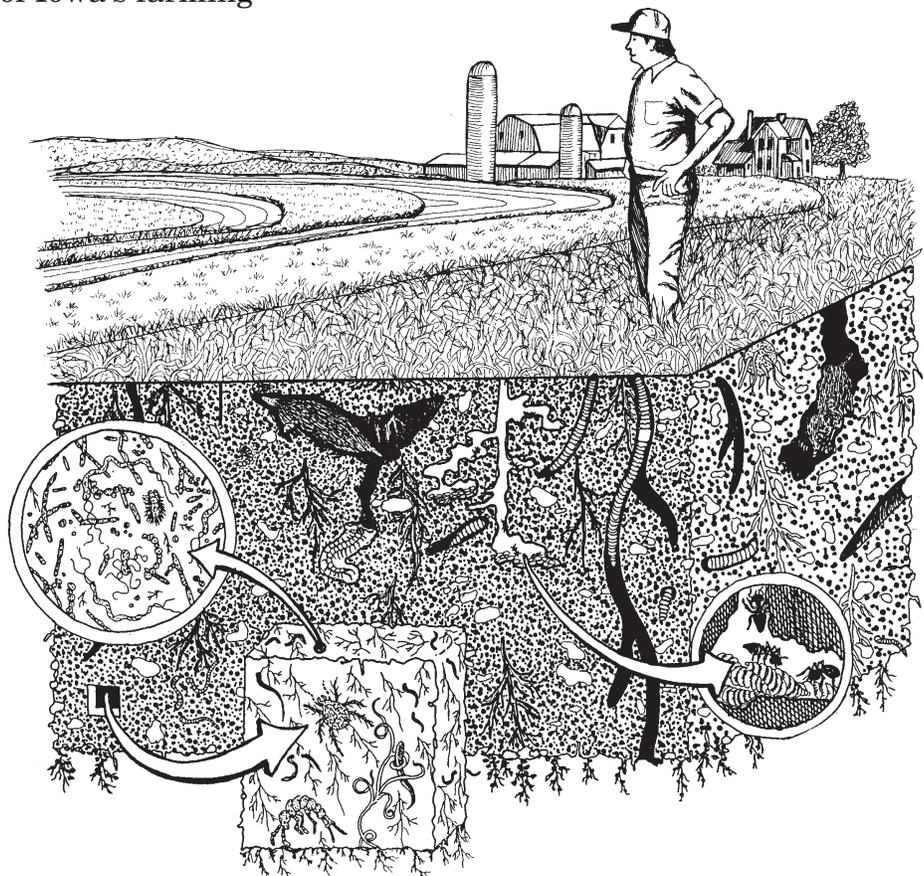
Earthworms are annelids with four pairs of **setae** - retractable bristles on each body segment. They feed on detritus. They dig extensive tunnel systems by swallowing soil as they burrow making use of any food present in the particles. The soil that remains is excreted into **castings** which are small mounds commonly seen along the ground surface. In a single acre, there can be more than a million earthworms, eating ten tons of leaves, stems, and dead roots per year and turning over 40 tons of soil! This activity makes earthworms efficient underground farmers, turning and aerating the soil like a fine plow. This aerated soil and fertilization enhance plant growth.

Earthworms have another interesting adaptation. They are **hermaphrodites**. Each individual possesses both male and female reproductive parts. Earthworms mate by lying on the surface of the ground while each individual lays eggs in a cocoon.

Good things in small packages

Since most insects and many invertebrates are small, it is easy to underestimate their role in the ecosystem. However, many of these creatures are important food sources for larger species of insects, birds, fish, reptiles, amphibians, and mammals. Insects are also important plant pollinators. Still others, such as earthworms, play significant roles in improving soil quality - a vital part of Iowa's farming economy.

There are many reasons to learn more about Iowa's insects and invertebrates. Not only do they play important roles in the ecosystem and greatly impact our lives, but they also have many special adaptations for survival. See the *Useful Resources* section of this booklet to learn more about these fascinating creatures.



Useful resources

- Bug Watcher: Iowa Youth and 4-H Entomology** (4-H 423A); Iowa State University Extension; ISU Extension Publications Service, Ames, IA; 1997.
- Close Encounters with Insects and Spiders**; James B. Nardi; Iowa State University Press, Ames, Iowa; 1988.
- Encyclopedia of Insects and Arachnids**; Maurice and Robert Burton; Octopus Books; 1975.
- Entomology at Iowa State University**; <http://www.ent.iastate.edu/>
Information about insects and ticks in Iowa.
- A Field Guide to the Insects**; Donald J. Borror and Richard E. White; Houghton Mifflin Company, Boston, MA; 1970.
- The Golden Book of Insects and Spiders**; Laurence Pringle; Western Publishing Company, Inc., Racine, WI; 1990.
- A Guide to Spiders and Their Kin**; Herbert W. Levi and Lorna R. Levi; Western Publishing Company, Inc., Racine, WI; 1968.
- The How and Why Wonder Book of Insects**; Ronald N. Rood; Wonder Books, Inc., New York, NY; 1960.
- IAN Booklet Series**; Iowa Association of Naturalists; ISU Extension Service, Ames, Iowa.
Adapting to Iowa (IAN-408); Iowa Wildlife and People Series; 1996.
Iowa's Biological Communities (IAN-201); Iowa's Biological Communities; 1994.
Iowa Food Webs and other Interrelationships (IAN-405); Iowa Wildlife and People Series; 1996.
Iowa Prairies (IAN-203); Iowa's Biological Communities; 1994.
Iowa Waterways (IAN-205); Iowa's Biological Communities; 1994.
Iowa Wetlands (IAN-204); Iowa's Biological Communities; 1994.
Iowa Woodlands (IAN-202); Iowa's Biological Communities; 1994.
Misconceptions about Iowa Wildlife (IAN-403); Iowa Wildlife and People Series; 1996.
- Insect Biology: A Textbook of Entomology**; Howard E. Evans; Addison-Wesley Publishing Company, Inc., Reading, MA; 1984.
- Insects**; Steve Parker; Dorling Kindersley, Inc., New York, NY; 1992.
- Insects: A Guide to Familiar American Insects**; Herbert S. Zim and Clarence Cottam; Western Publishing Company, Inc., Racine, WI; 1987.
- Pond Life: A Guide to Common Plants and Animals of North American Ponds and Lakes**; George K. Reid; Western Publishing Company, Inc., Racine, WI; 1987.
- Simon and Schuster's Guide to Insects**; Ross H. Arnett, Jr. and Richard L. Jacques, Jr.; Simon and Schuster, New York, NY; 1981.
- The Story of Spiders**; Dorothy E. Shuttlesworth; Garden City Books, Garden City, NY; 1959.
- The Strange Lives of Familiar Insects**; Edwin Way Teale; Dodd, Mead & Company, New York, NY; 1962.

Iowa Insects and Other Invertebrates is one in a series of six booklets that are part of the *Iowa Wildlife Series*. The booklets in the series include:

Iowa Wildlife Series

Iowa Mammals	(IAN-601)
Iowa Winter Birds	(IAN-602)
Iowa Nesting Birds	(IAN-603)
Iowa Reptiles and Amphibians	(IAN-604)
Iowa Fish	(IAN-605)
Iowa Insects and Other Invertebrates	(IAN-606)

The Iowa Association of Naturalists also has produced five other booklet series that provide readers with a clear, understandable overview of topics concerning the Iowa environment and conservation. The booklets included in each of the other five series are listed below.

Iowa's Natural Resource Heritage

Changing Land Use and Values	(IAN 501)
Famous Iowa Conservationists	(IAN 502)
Iowa's Environmental Laws	(IAN 503)

Iowa Wildlife and People

Iowa Wildlife Management	(IAN-401)
Keeping Iowa Wildlife Wild	(IAN-402)
Misconceptions About Iowa Wildlife	(IAN-403)
State Symbols of Iowa	(IAN-404)
Iowa Food Webs and Other Interrelationships	(IAN-405)
Natural Cycles In Iowa	(IAN-406)
Iowa Biodiversity	(IAN-407)
Adapting To Iowa	(IAN-408)

Iowa Plants

Iowa's Spring Wildflowers	(IAN-301)
Iowa's Summer and Fall Wildflowers	(IAN-302)
Benefits and Dangers of Iowa Plants	(IAN-303)
Iowa's Trees	(IAN-304)
Seeds, Nuts, and Fruits of Iowa Plants	(IAN-305)
Iowa's Mushrooms and Other Nonflowering Plants	(IAN-306)
Iowa's Shrubs and Vines	(IAN-307)

Iowa's Biological Communities

Iowa's Biological Communities	(IAN-201)
Iowa Woodlands	(IAN-202)
Iowa Prairies	(IAN-203)
Iowa Wetlands	(IAN-204)
Iowa Waterways	(IAN-205)

Iowa Environmental Issues

Iowa Habitat Loss and Disappearing Wildlife	(IAN-101)
Iowa Air Pollution	(IAN-102)
Iowa Water Pollution	(IAN-103)
Iowa Agricultural Practices and the Environment	(IAN-104)
People, Communities, and Their Iowa Environment	(IAN-105)
Energy In Iowa	(IAN-106)
Iowa Waste Management	(IAN-107)

✓ Booklets may be ordered through the Iowa State University Extension Service at a cost of \$1.00 per booklet. When ordering, be sure to use the IAN number to the right of each listed booklet title. Please send written orders and payment to:

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