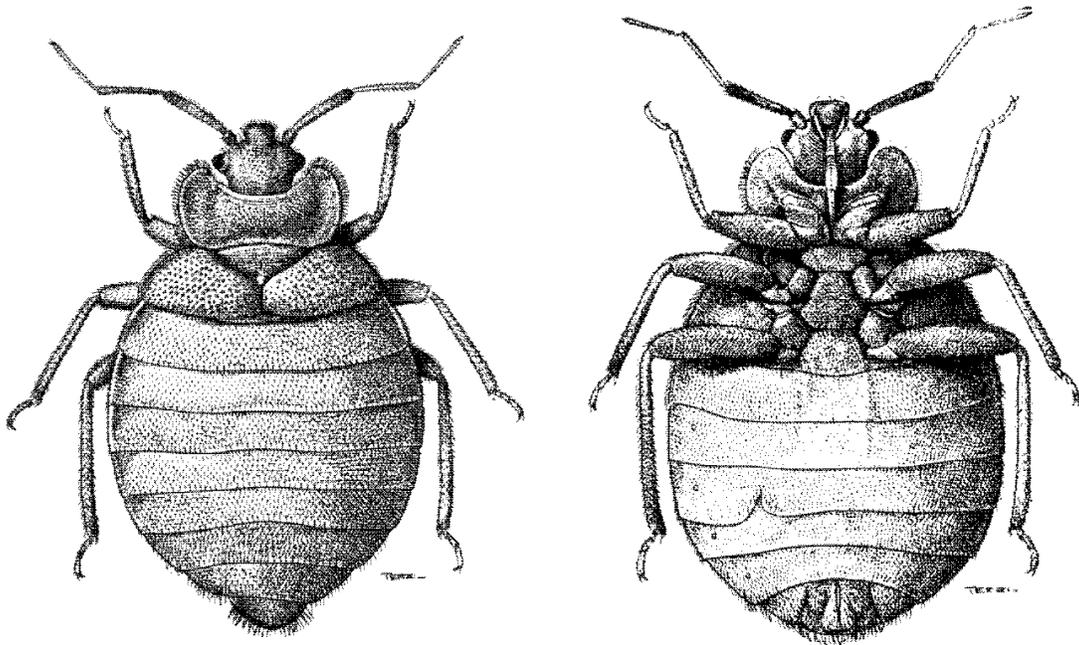

INSECTS AFFECTING MAN

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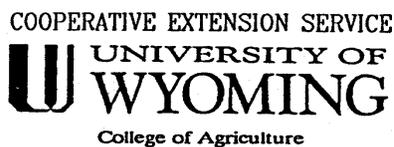


COOPERATIVE EXTENSION SERVICE

College of Agriculture

The University of Wyoming

DEPARTMENT OF PLANT SCIENCES



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INSECTS AFFECTING MAN

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INSECTS AFFECTING MAN

INTRODUCTION

The insects included here are those which, in one way or another, have a direct effect upon or within humans. Many of these utilize the blood of man as a primary source of food; others feed on humans in lieu of other vertebrate hosts which serve equally well. Other species do not suck blood but spread

germs as they crawl about on people and their food and dishes. They may also be a severe annoyance to man by their presence and activities. Many other forms attack man only in self defense; some bite (spiders, ants, etc.) while others sting when disturbed.

BASIC RELATIONSHIPS

Certain blood sucking ectoparasites of man are so closely adapted that they cannot live on another host. Other blood sucking types use man as a temporary host, visiting man only in response to the need for food. The remainder of the insect's time is spent resting, digesting the blood meal, and producing eggs. Some blood sucking insects prefer livestock or other vertebrates as a source of food but will use man when the opportunity exists. Other insects do not feed on

blood but are adapted to life with man or his domestic animals and, in passing back and forth between habitats, spread filth and disease. Another relationship exists when man and insects share the same habitat. The insect may bite or sting defensively when man intrudes. Man, in turn, responds by trying to control the insect with chemicals or other control measures.

PARASITIC RELATIONSHIPS

Lice

Three types of lice are so well adapted to life with man that they normally are unable to survive on another host. Two of these are full-time residents on man's body. The other lives in man's clothing and is entirely dependent upon him for food, temperature and humidity.

Head Louse (Fig. 1): These insects mostly live on the head of the human host, particularly in the hair above the ears and on top of the head. On occasion they may become established in other densely hairy areas of the body. These lice are basically gray colored. However, they may vary with the hair color of the host. They are 1/12 to 1/8th inch long, slender and have pointed heads and a claw-clamp on each leg. A louse attaches to the hair of the head with the leg clamps and are difficult to dislodge. When hair is shed the attached lice or eggs drop off with the hair. Loose hairs can stick inside a hat providing a means of infesting another head when the hat is placed on another head.

Infestations spread easily through exchange of head wear or combs and scarves. Populations begin to build up in late fall and early winter, particularly on people whose habits are unsanitary. Increased spread among school children often occurs after Christmas, when new head wear may be traded back and forth passing eggs and lice to new victims.

Each female produces 50 to 150 eggs, which are glued to the hair near the base. Young lice hatch in 5 to 10 days and develop rapidly. Egg to adult may take only three weeks. Adults and all sizes of young live in the hair and on the scalp.

Eggs are glued to hairs a slight distance above the scalp sealing off a small space within which the lice live by sucking blood or lymph. The egg layer is called a false scalp and inhibits removal of the lice. Severe irritation and subsequent infection of the scalp follow

prolonged feeding by this protected population of lice.

Human Body Louse (Fig. 2): The body louse is a close relative of the head louse. The two can be forced to interchange habits and replace each other. The body louse inhabits the clothing of man in places where it binds tightly against the skin. Lice prefer to live in seams and folds of the clothing but in case of a heavy infestation will remain on the body of the host. They are spread mainly through contact with infected people or their clothing.

These lice are about the same size as head lice but have a more consistently gray color. Each female produces about 300 eggs, deposited on fibers in the seams of clothing. Garments worn for long periods without cleaning become heavily infested with eggs and lice. Hatching occurs after 5 to 7 days. Young lice immediately begin sucking blood and mature about three weeks after eggs are laid. Populations build rapidly, and as many as 10,000 eggs and 10,000 plus lice have been found on an infested shirt.

High populations of body lice and heavy feeding may cause severe blood loss, along with eventual hardening and pigmentation of the punctured skin (vagabond's disease). The lice also transmit disease organisms causing typhus fever, murine typhus fever, trench fever, and relapsing fever.

Pubic Louse (Fig. 2): This insect, also called the crab louse and the crotch cricket, can be recognized by its resemblance to a minute crab. It is very small, 1/12 inch or less in length and is almost as wide as long. The legs are long and extend outward from the body. They also have a clamping-claw for clinging to the hair of the host. The front of the head is more blunt than in either the head or body lice. The body also is more distinctly warty and hairy. These lice are relatively stationary but, as the population increases, they spread to all hairy

parts of the body (including eyebrows, mustaches, and beards). The most common means of spread is by direct physical contact. Eggs or lice attached to loose hairs may also be acquired from bedding, clothing, or (rarely) public toilet seats.

Females produce about 50 eggs or less, which hatch about 7 days later. The adult stage is reached in two to two and one half weeks. Populations increase rapidly and apparently go unnoticed for months. Infested persons often become aware of the problem only after severe itching begins to occur over much of the hairy region of their body.

All stages suck blood or lymph and cause intense irritation followed by skin discoloration. Secondary infection may follow the incessant scratching. These lice have not been known to transmit disease.

Fleas (Fig. 3)

These insects are highly adapted to their parasitic way of life. They live primarily on small mammals, such as dogs, cats, and rodents. They readily bite humans and may be involved in the transmission of various diseases such as bubonic plague. They do not ordinarily remain on humans.

Fleas are very small, wingless, flattened from side to side, and are frequently very spiny. They have long legs which are held close against their body when the insect is on its normal host. The thin flat body and closely held legs allow the insect to slide quickly and easily through the hair or fur of the host. The strong legs are useful for jumping onto another host when the flea is loose on the ground or floor. The mouthparts are piercing-sucking and the bite is extremely irritating.

The most common flea problems of humans arises from infested cats and dogs. These animals may become so heavily infested that the fleas begin breeding in the animal's bedding, in the carpeting of the living room, in the grass and soil of the yard or where ever the animal sleeps or rests. Fleas also develop in great numbers in rodent nests.

Eggs are produced by the female while she is on the host. The eggs drop from the host to the floor or ground and the larvae hatch in 7 to 14 days. They are minute, yellowish white, worm-like, and feed on various organic debris in their habitat, including the feces of adult fleas. Larvae can mature in 10 days when conditions are favorable or may take up to 7 months when food is scarce or temperatures are low. The pupal period may last one week or several months, depending on temperature. Egg to adult stages may require as little as 4 to 5 weeks, allowing rapid population increases. Adult fleas may live two months to more than two years.

Bed Bug (Fig. 4)

The bed bug is a blood sucking insect which has a flattened body, top to bottom, which enables it to crawl into very small cracks and crevices in bedroom furniture, under door and window facings, into lamps and light fixtures, under loose wall paper, in plaster or under carpeting and rugs. The body is covered with long recumbent hair curving backward. Their color varies from dark brown to black when full of blood, to an almost transparent gray-white when starved. They have a defensive scent glands which emit a foul smelling substance when the bug is disturbed.

Bed bugs do not feed every night. The nymphs feed once between each of their average five molts and again as adults before egg laying. Each female produces 200 to 500 eggs, which hatch in about 10 days. The egg to adult period lasts from six week to 11 months or more. Normally, well fed bugs can survive about 10 months without another blood meal. With no food at all, an adult bug lives only about six weeks. After feeding, adult females hide in the various recesses, and after digesting the blood, they glue eggs to the bedding or to the substrate in other locations.

The bugs hide by day in the bedding or in the many other places available in a bedroom. They may even hide inside the back binding of books kept in the bedroom. They come out at night and suck blood from whomever is sleeping in the bed. They also become established in certain types of living room chairs and sofas where they creep out and bite the backs of the people sitting there. Many people are completely unaware of the bites. Others may react with skin irritations or rashes. The scent given off when the bug is disturbed is often more annoying than the bite.

Kissing Bug (Fig. 5)

The habit of biting sleeping people on the lips provides the name for this group of insects. mature kissing bugs may be 1 to 1.5 inches long, have a slender, pointed head and a much wider body, and are usually black or brown. A short, stout beak curves down and back for the lower front of the head. The bite with long, needle-like stylets which are exerted from the tip of the beak. The top of the body is flattened, while the lower surface is curved, resembling the bottom of a boat.

These bugs ordinarily develop outdoors in the burrows or nests of various small rodents. Lack of food or expanding populations cause them to leave these nests and wander around foundations and crawl spaces. From here they work their way into bedrooms where they hide during the day and come out to feed at night.

Kissing bugs bite so tenderly that the sleeping person is usually unaware of their presence. Salivary fluid injected by the bug during feeding may cause

severe reactions a few hours later. If the person is quite sensitive, tissues of the mouth and throat may swell so extensively that breathing becomes difficult. The bugs nearly always defecate immediately after feeding, and may transmit chagas disease to the person. The disease organisms occur mainly in the southwestern part of the U.S.

Blood Sucking or Biting Flies

These insects are two-winged and in the order Diptera. The functional mouthparts are piercing-sucking, cutting-sponging, or ripping-sucking. The structure of the stylets varies from long, fine and thread-like (mosquito) to stout, blade-like cutting tools (horse fly). Salivary fluids are injected by all types, causing excessive bleeding, itching, and in some cases local swelling.

Mosquitoes (Fig. 6): Mosquitoes are well known insects which are pests the world over. They are small to tiny flies, with six very fine piercing-sucking stylets which work as one unit. Most are gray, striped, or brown. The body is slender, the legs long and thread-like, and the proboscis is long and slender. Scales cover the wing veins and various portion of the body. A characteristic hum is produced by the moving wings as the female comes in for a blood meal. Males do not bite.

Many of the mosquitoes common to Wyoming overwinter as eggs on the soil surface. Eggs are also deposited around the edges of impounded water, in swampy areas, and in smaller accumulations of water in cans, old tires, buckets, tree holes, and in seeps or springs. Other very important species overwinter as adult females in damp, protected places, such as caves, old mines, and cellars. Still others pass the winter in the adult stage, hidden away in houses and barns.

Overwintering eggs hatch in the spring upon being flooded with fresh water. Larvae (wigglers) develop in water, feeding upon detritus, organic matter, and minute animals or plants. Larval development requires 7 to 10 days at higher temperatures, but takes much longer when the water is colder. Larvae change to pupae (tumblers) which also live in the water. Pupae do not feed but come to the surface where they hang suspended by the surface tension of the water. They breathe from the air above the water by breaking through the surface film with a pair of minute breathing horns. Slight disturbance of the water sends them tumbling downward. Adults emerge from the pupae, usually after 2 or 3 days. Development from hatching to adult thus may take 10 to 14 days if conditions are ideal. Many of our common species produce only one generation per year. Even so, the various species together often produce such enormous populations that the adults are

a serious problem to humans. females are capable of flying miles from their breeding grounds and bite wherever they go.

The most common effects of mosquitoes on people are irritation and swelling from the bites and annoyance from their presence and persistence in trying to bite. Accidental inhalation of a mosquito will often cause severe allergic reactions. Many people apparently are sensitive to the chemical secreted by the mosquito salivary glands. Prolonged exposure to bites may cause very severe reactions.

Mosquitoes also transmit numerous diseases of man. Encephalitis (sleeping sickness) is a viral disease which is transmitted by certain mosquitoes. In Wyoming, western equine encephalitis occurs in horses and may spread to man when an area is flooded and the mosquito populations increase dramatically. Other diseases involving mosquito transmission are malaria, yellow fever, dengue, and filariasis.

Black Flies: These tiny (1/6 inch long) insects are also called buffalo gnats and black gnats. The thorax is rounded or humped and the head is attached down low on the front. Antennae are short and stout, wings are membranous and have only one or two veins on the front edge. The legs are long and the body is stout. The adults are usually black but some species are brown or gray.

Females produce 400 to 500 eggs each. Eggs are placed at the water surface level on emergent plants, logs, limbs or rocks that stick up out of the water and on rocks with water splashed surfaces. The fly often goes under water briefly while she places the egg on its support. Eggs hatch in 4 to 30 days, depending on water temperature. The flies breed in many types of water, from icy mountain streams to sluggish meadow brooks. Larvae attach to their support by way of an anal sucker, at times aided by a silk thread. Submerged logs or rocks in a swift, high altitude stream may have thousands of larvae. Larvae are very small, usually grayish to black and have a swollen anterior region. Their food is minute aquatic life. Development of the larvae requires 8 to 10 weeks in colder streams. Pupation occurs in the water and may take 5 to 6 days or up to 4 weeks.

This fly is a vicious biter. The mouthparts are minute blades which pierce the skin. A potent venom in the salivary fluid causes bleeding, irritation, localized swelling, and more severe symptoms on occasion. The hungry flies attack any exposed skin on the body. The adults transmit disease to man in other parts of the world. In the U.S. they may transmit certain diseases to poultry.

Punkies (no-see-ums): These very small flies are also

called sand flies, black gnats, or ceratopogonids. They are 1/50 to 1/5 inch long. The smallest species are so tiny that they are difficult to see. The thorax is humped, the head and antennae large, body slender and the wings are laid flat over the abdomen.

Eggs are laid along the edges of small streams, in swampy areas, in moist earth and in moist tree holes. They occur most frequently along rivers or streams. Their distribution in other habitats has not been studied. Larvae develop in water, mud or muck, rich moist soil, salt marshes, clay soils, plant debris. Larval growth is slow in many species; therefore, only one generation is produced per year. Some species have a 2-year cycle.

These flies produce a very painful bite particularly on the hands, face, ears, around the eyes and in the edges of the hair. The bite may be followed by swelling, prolonged itching, and blisters which soon change to persistent open lesions. Secondary infection is always a danger because of the necessity for scratching. They apparently do not transmit disease to humans in the U.S.

Horse Fly (Fig. 7): The horse fly is also called the green eye, gadfly or breeze fly. They are mostly stout-bodied flies, 3/4 inch to 1.25 inch long. They are usually brown or black, with large heads and enormous compound eyes. The wings are held flat over the abdomen, typically in a position with the rather pointed ends held at a 30 degree angle away from the abdomen. The tip of the abdomen usually is visible between the partially separated wing tips. The wings are membranous and may be either transparent or pigmented black or brown.

One hundred to 1,000 eggs are laid in masses attached to leaves, stems, fence posts, branches or trees, or the upper inside surfaces of culverts or bridges. The larvae hatch and drop into the water, swampy areas, or moist soil beneath the oviposition site. Many larvae are predacious. Some species develop rapidly, but most are relatively slow. Most partially grown larvae overwinter. When the larvae are ready pupate, they leave the water or other wet habitat and move to a drier site. Here they form a cell in the earth, about 1 inch below the surface, and later change to the pupal stage within the cell. Adults emerge from the pupal cuticle and work their way up through the soil. Average egg to adult development is 97 days when temperatures are warm. One generation per year is common in Wyoming.

Horse flies bite with broad, blade-like stylets. These slice the skin or hide and an anticoagulant salivary fluid is injected into the wound. Prolonged bleeding, persisting long after the fly has fed and departed, often occurs. The flies will attack almost anything alive and/or moving. They have been known

to strike moving vehicles and experimental models. These flies may transmit anthrax and tularemia to humans.

Stable Fly (Fig. 8): This small gray fly is often mistaken for the house fly and the victim then accuses the house fly of biting. This insect is about 1/4 inch long but is more robust than the house fly, and has mouth parts in the form of a needle-sharp proboscis (ripping-sucking) which projects forward from under the head. The two outside stripes on the thorax are broken and the abdomen has a checkered or spotted pattern. The fly rests on a flat surface with the head end tilted up and the back sloped downward. The wings at rest are spread apart at the tips. In bright light the wings also have an iridescent shine.

This fly probably overwinters in Wyoming in the maggot stage deep in straw piles or in piles of manure mixed with straw. The maggots change to the pupal stage inside a leathery brown oval case (puparium) in the spring. Adults push their way out of the straw or manure-straw mixture in about 10 days to 2 weeks. Females require several blood meals for egg production and males also suck blood. When about 2 weeks old, the females begin oviposition, producing 500 to 600 eggs each, in 5 or 6 batches. Eggs hatch in about 3 days and larvae take 2 to 4 weeks to grow to adults. The pupa stage requires 1 to 3 weeks. The egg to adult period may be 21 to 60 or more days, depending on temperature. If the larvae overwinter, then that stage is greatly prolonged.

Adults of this fly are vicious biters of humans, especially just before a storm. The flies approach quietly and the first indication of their presence is a sharp, stinging pain. They frequently attack the back of the neck, hand, ankles, or other exposed skin. They can and frequently do bite directly through light clothing. They build up into large populations where the breeding sites are good, and cause the people in the area (usually a rural setting) no end of pain and annoyance.

Horn Fly: This insect is about half the size of the stable fly and it also has a needle-like proboscis projecting forward from underneath the head. The fly has light stripes on the thorax and a single dark stripe down the middle of the abdomen. It is primarily a pest of cattle but can be highly aggravating to people working with or living near cattle.

The horn fly overwinters as the larva in cattle droppings. The larvae develop rapidly, pupate inside a small puparium, and the adult flies emerge about 1 week later. New adult females lay eggs on fresh cattle manure and a new generation of flies can appear in about 2 weeks.

The adults are blood feeders but have not been implicated in disease transmission to man.

Snipe Fly: This is another fly which lands very quietly on the back of the neck or other exposed skin and inflicts a very painful bite. The species most likely to bite man in this area is about 1/3 inch long, has a black body and reddish legs. The feet have three pads under the claws instead of the two on a house fly or stable fly. The wings have noticeably more veins than do the stable or house fly.

Snipe flies can be a very severe problem when present in large numbers.

Non-biting Flies

The flies in this group have a sponging pad on the end of a folding proboscis. They suck up liquids for food and have sponging-sucking mouthparts.

House Fly (Fig. 9): The house fly probably makes up 98% of the flies which gather inside or around the outside of the dwelling places of man. Although they do not bite, they habitually crawl over people, food, dishes and almost everything else. They also frequent garbage, sewage, animal droppings, human wastes and any other decomposing organic matter available. Their feet and legs, mouthparts and digestive tract are ideally constructed to gather microorganisms, which later are left behind as the fly walks inside the home. The pathogens of some 35 to 40 disease are known to be transmitted by the house fly.

The adult house fly is about 1/4 inch long, generally slender to medium in body, with distinct black stripes on the thorax and one such stripe on the yellowish abdomen. The mouthparts are a soft, folding proboscis with a wide, soft, grooved sponging pad at the end. The grooves collect liquids and bring them to a central point at the end of the proboscis and a sucking apparatus then takes the fluids into the digestive tract. If a substance tastes good but is not in liquid form, the fly regurgitates a drop of fluid from its digestive system onto the food substance, dissolves part of the substance, and then sucks most of the solution up again. Some of the fluid soaks into the food substance, along with any microorganism which may have been present. Thus, infection may be spread. A house fly has been known to carry over 6 million bacteria.

Females place 500 to 600 eggs in animal manure, garbage, decomposing plant matter, animal droppings and many other moist types of organic matter. Development is rapid. Mature larvae leave the growing place and crawl away to a drier site for pupation. Mass migration of larvae from garbage cans have often been observed, providing the first indication of a fly problem. Pupation takes place inside a leathery tough

brown case. When mature the fly pushes one end of the case and crawls out to expand and dry its wings. New adult females are ready to oviposit in 3 days to 3 weeks. Total life cycle can occur in as little as 10 days or as much as 6 weeks. The house fly apparently overwinters in Wyoming as a larvae or pupae.

Lesser House Fly: This fly is slightly smaller than the house fly but resembles it in color. The indoor flight habits are quite different from those of the house fly. The lesser house fly often hovers without landing. The female places eggs on decaying plant material or excrement, preferably that of humans or livestock. The larvae are short, stout, and spinose. Development is quick. Adults traveling between oviposition sites and a house can carry and spread disease.

Latrine Fly: This fly is very similar to the lesser house fly but is slightly larger and a darker bluish to black. Eggs are placed in the same places and development from egg to adult takes around 18 to 21 days. The habits and possibilities for disease transmission are similar to the lesser house fly.

Myiasis

Myiasis is defined as any disease that results from the infestation of tissues or cavities of the body by larvae of flies. Most often the larval forms are the maggots of blow flies, house flies, flesh flies, screwworm flies, lesser house flies, or bottle flies. The larvae of bot flies and warble flies also attack man.

Obligate myiasis: Obligate myiasis of man occurs when the human bot fly attacks people. This is found mainly in the southern U.S. and Mexico. Eggs are deposited on the skin by the female fly or they may be carried to the human by a female mosquito. Larvae bore into the skin soon after hatching and settle down to feeding in one location. Full grown larvae cause lesions in the skin. They leave through an opening in the skin and drop to the ground to complete their life cycle.

Accidental myiasis: This is a general term which includes all the other fly larvae which invade humans. Certain species are obligate parasites of horses, cattle, sheep, or rodents but on rare occasions have been known to attack man. Most cases of maggot myiasis in man are attributable to species which ordinarily develop in some form of decaying organic matter.

Myiasis of the digestive tract most often follows the ingestion of eggs or very young maggots in or on raw, partially decomposed fruits and vegetables, or when infected soil is carried to the mouth or nose by dirty fingers. The maggots develop in various locations

in the stomach or intestine. When mature, the larvae move down and are voided.

People sleeping outdoors or in other locations when exposed to adult female flies are subject to myiasis of the ears, nasal passages, mouth, or urinary tract. When these body openings are exposed and are infected or grossly unclean, they attract adult female flies for oviposition. Eggs or living maggots are deposited in any of the openings. Larvae work their way inside as soon as they hatch (or are deposited alive). Severe pain and other symptoms follow. The larvae also tend to leave the feeding site and drop to the ground for pupation. Maggots of house fly, blow fly, flesh fly, and screwworm fly are most often involved.

Cutaneous myiasis occurs most often when a wound or infection is untreated and the discharge attracts the female fly. The screwworm fly maggot is the most common invader in this category. Eggs are deposited directly into the wound or sore by the fly. Eggs hatch quickly and the young maggots feed within the infected area. As the maggots grow and the supply of decomposing tissue is cleaned up, the maggots burrow outward into uninfected tissue and continue feeding. The larvae leave the wound and drop to the ground for pupation, if they are still in the vicinity of the original opening. If they have migrated away from the opening; however, their response to gravity may take them downward under the skin. Such a case of screwworm infection of the scalp has been reported. The mature larvae worked their way downward under the scalp, along the sides of the head, with more than 100 maggots ending up in the ear lobes. Medical attention solved the problem. Blow fly and flesh fly maggots may also be involved in cutaneous myiasis.

Creeping dermal myiasis is usually due to larvae of bots or warbles moving about under the skin. The eggs are deposited on exposed human skin and the newly hatched larvae burrow inside without being felt. In time their increased size and activity cause lumpy swellings under the skin. The larvae migrate under the skin to various parts of the body, causing pain and intense irritation. At maturity, the larvae settle down, cause a boil-like swelling, and eventually emerge through the central opening, to drop to the ground for pupation.

Stinging Insects

A number of human deaths have been attributed to the stings of wasps or bees. Such violent and sometimes fatal reactions to insect venom probably occur as a result of hyperallergenic shock. Most people can recover from a bee or wasp sting with only temporary damage and may even profit from the encounter by developing immunity. Others apparently cannot develop a tolerance for the venom and in some cases may become more sensitized with each sting.

Paper Nest Wasps (Fig. 10): These insects, also called *Polisties* wasps, are quick and violent with their sting response to any disturbance. They build one layer nests out of paper they make from chewed up wood. Nests are suspended from tree branches but are also placed in various sheltered sites such as under porches, eaves, door frames, or window frames. Each nest has 10 to 100 or more inverted cells which increase during the summer. Cells contain eggs, larvae, or pupae. Newly emerged adults stay with the nest, as workers, and spend their time on the lower surface of the cells. Some fly out periodically to catch soft bodied insects for food. The wasps will readily leave the nest to attack any apparent intruder.

The wasps attack moving objects and seldom go to a motionless object on the ground. Therefore, if a person sees an attack coming, he can often escape by dropping flat on the ground and remaining still. A slow and careful retreat, with an eye on the nest, can be carried out after the wasps have returned to the nest and settled down.

Most of the paper nest wasps are reddish brown with small darker markings on the abdomen. The wings are clear to smokey grey or brown and are folded longitudinally when at rest. They have a short waist between the thorax and abdomen. Most of the individuals of any given nesting population are female workers and can sting. A few males usually are present and have no stinger. The fertile females (queens) overwinter in sheltered locations.

Yellow Jacket (Fig. 11): The yellow jacket is an ill-tempered species of sting wasp. It is stout bodied, hairy, yellow with brown or black markings. The wings are folded lengthwise when at rest. It usually nests in a hole in the ground but may occupy a hollow branch or tree trunk or a space in an attic or wall. The nest within any such space is made up of several tiers of paper cells, made also from chewed wood pulp. Nesting sites are utilized year after year and the size may increase so that tremendous numbers of workers develop each year. Eggs, larvae, and pupae are housed in the cells of each tier. Workers leave the nest to capture food. This frequently is collected from infestations of webworms or other larvae on trees or shrubs. Because of this, the yellow jacket is at times classified as beneficial. The foraging workers also frequent picnic and camp sites, apparently attracted by sweets or fruit juices, but they usually do not sting readily when collecting food from a picnic table. Around the nest; however, they react violently, often attacking an intruder in large numbers.

Bald Faced Hornet (Fig. 12): The hornet is a larger, more robust wasp. It is essentially black with a few yellow markings on the head, thorax, and end of the abdomen. The wings are folded lengthwise when not in use.

The nest of this wasp is the well-known paper oval, suspended from a branch of a tree. An entrance hole in the bottom leads to one or several tiers of paper-nest cells inside. The size of the nest and number of tiers inside vary with the population. Some hornet nests are 12 to 15 inches tall and contain 6 or more tiers of cells. Such a nest may contain several hundred workers (sterile females).

Eggs are placed singly in the cells and larvae develop one to a cell. The larvae are fed chewed insect larvae by the workers. Pupation occurs in the same cell. A few non-stinging males are usually present. Only the fertile females (queens) overwinter, usually in some sheltered location quite distant from the nest.

Mud Daubers (Fig. 13): These wasps are the architects of a variety of mud nests in the attic of houses or other structures. Nests may be multiple layered tubes or a variety of single cell mud masses. This type of wasp has a very long, slender waist, a small rounded abdomen, and a larger thorax with long, spiny legs. The mud for nest building is scraped up and carried to the site by the legs.

Nest cells are stocked with paralyzed spiders or insects. One or more eggs are laid on the food supply and the cell is sealed. The larvae feed upon the food provided and undergo complete development inside the cell. Each new adult female leaves the nest and begins a new colony elsewhere.

These wasps seldom sting unless severely crowded.

Digger Wasps: There are a number of wasps which dig holes in the ground, pithy stems of plants, or in partially decayed stumps or logs. The nest cavity is provisioned with paralyzed spiders, grasshoppers, and many other types of insects. An egg or two is deposited in each cell. The cell is then sealed and development of the larvae proceeds inside. New adults leave to start a new nest elsewhere.

Honey Bee (Fig. 15): This insect, also called the hive bee, is the most common problem of man when bee stings are involved. This is a domesticated insect whose captivity is tenuous unless proper care is taken by the beekeeper. Honey bee populations increase during the summer when hives become crowded and new queens are ready, swarms of bees leave the hive and settle in new quarters. Problems arise when the swarms settle in wall or attic spaces of homes or in other areas close to human habitation. Disturbance of these nests or interruption of the flight pattern or workers bees may bring out individuals ready to attack any moving object.

A beekeeper should be notified of the arrival of a new swarm since it may be possible to return it to the bee yard.

Bumble Bees (Fig. 15): These are large, hairy bees which occasionally nest in discarded articles near houses or other buildings. These robust, often brightly colored insects generally do not sting people unless the nest is being threatened. The venom of such large bees could cause serious problems to a previously sensitized person.

Velvet Ants: These insects are also known as mutillid wasps, wooly ants, mule killers, and cow killers. The last two names reflect the power of their sting. The stingers are wingless female wasps which resemble ants structurally and move about over the ground in the same manner as do true ants. Males have wings and the same color patterns but do not sting. Both sexes are extremely hairy in some species. They may be reddish orange, light brown, or banded black. They are highly active and have an extremely tough body covering. They can be walked upon in the open without apparent damage.

The stinger of this wasp is exceptionally long for the size of the body. It is curved, needle sharp, and either dark brown or black. The venom is exceptionally powerful and produces excruciating pain. Females of some species may be up to an inch long. The over-sized stinger and large quantity of venom together provide a powerful sting. These insects are especially hazardous to children who have not learned to leave them alone and to any barefoot person who happens to step on one.

Ants (Fig. 20): The true ants include a large number of species which are equipped with a stinger and very effective poison glands. While these structures are mainly defensive mechanisms, many types of ants are always ready to attack. Some species are highly aggressive and will attack in large numbers. The fiery, burning pain from the stings can be serious.

The most dangerous types are the fire ant, a recent introduction into the southern U.S., and certain tropical species in Central and South America. The common harvester ant, commonly found in Wyoming, may be a threat if a person is on or near the nest.

Ants nest in the soil, in hollow pithy stems of plants, hollow or dead tree trunks or limbs, and in a variety of small niches around the home or yard. Many of these do not sting; however, many are capable of inflicting a painful bite.

Ants are typically a nuisance problem in or around the home, where they get into food stuffs.

Blister Beetles

These insects are mostly of secondary concern as direct pests of man. Most blister beetles are elongated, with a tubular shaped body, a narrow neck, and a wider head. Common forms may be grown striped, speckled gray, solid black, or bright iridescent green and blue. These beetles in the larval state are normally predacious

on grasshopper eggs and other forms of insect life in the field.

adult beetles increase to form great swarms during successive dry summer seasons. The swarms travel during the dry, hot part of summer, frequently invading home gardens and flower beds. They can consume a garden over night.

Blister beetles neither bite nor sting, instead, as the common name indicates, they may cause large watery blisters on the skin. Such blisters are due to a chemical irritant in the blood of the beetle which is liberated and rubbed into the skin when the beetle is crushed. When held alive, drops of an amber or colorless liquid are seen forming at the joints of the legs. Each small drop can cause a blister if it comes into contact with the skin. When a beetle is disturbed and walks across the skin a double row of small blisters form along its path. The blisters rise high and are filled with a watery fluid which can cause more blisters which are very slow to heal. People working in infested alfalfa or potato fields, home gardens, where beetles are swarming are highly susceptible to attack.

Other Arthropods

The most common pest here is the spider. Spiders are present in large numbers in many parts of the world. Common habitats include homes, flower beds, gardens, fields and woodlands. Most of these many types of spiders are harmless to man. They almost never bite people and would cause little or no reaction if they were forced to bite. An occasional spider bite may cause a reaction in sensitive people. When this happens it is recommended that the spider be captured and submitted for further identification.

Two poisonous spiders occur in the U.S. They are the black widow spider and the brown recluse or fiddle back spider. Tarantulas in the U.S. although blessed with a bad reputation are harmless to man.

Black Widow Spider (Fig. 16): This native species of spider occurs widely in Wyoming. The name is derived from the popular belief that has the female devouring the male after one encounter. Ordinarily, if the female is well fed, the male gets away to mate another day.

Adult females are usually shining coal black but may be brown or gray. The abdomen usually is noticeably large and rounded, with the thorax region much smaller. Legs are long and slender and the same color as the body. A ruby red hourglass figure is present on the lower surface of the abdomen. An immature spider may have one or more red dots on the abdomen. These spiders hide under loose boards, discarded paper, old boxes and barrels, under steps, beneath the seat in outdoor toilets, and in rodent holes on rangeland. They spin a loosely organized web. When the web is disturbed, the spider charges out to grab

the food or intruding human anatomy.

Severe bite may cause systemic as well as localized effects. One such result of a severe bite is slow paralysis of the abdominal and breathing muscles. Other severe symptoms will also appear. A physician should be consulted and the spider collected for positive identification.

Brown Recluse Spider (Fig. 16): This spider is not a normal resident of Wyoming but may be present when transported in from other locations where it normally occurs. Its natural range occurs from Texas northward to Nebraska, eastward through Iowa, Illinois, Ohio and Indiana; and southward through the Gulf states. It is most widely distributed in Alabama, Arkansas, Georgia, Illinois, Indiana, Kansas, Kentucky, Louisiana, Mississippi, Missouri, Oklahoma, Tennessee and Texas.

This spider naturally occurs in outdoor situations within its range which includes debris, bark, leaves, stones, utility boxes, wood piles, vehicles, etc., but has adapted quite well to indoor habitats. In residences, the brown recluse is commonly found in storage areas such as closets, attics, bedrooms and other dark recesses such as cracks and crevices. They also frequently inhabit clothing, boxes, toys, papers, furniture and other household items.

The spider has a medium sized body but appears larger because of the long, slender legs. The abdomen is about the size of a large pea and may be creamy white, tan or brown. The upper surface usually has fine, curving lines of dark hairs. The thorax is smaller, flat on top, between the legs and has a violin-shaped marking in the center. The handle of the violin is pointed forward.

The brown recluse is nocturnal and searches for food such as firebrats, cockroaches, crickets or other soft-bodied species. At first light, wandering spiders normally return to their retreat of an irregularly spun off-white web with their prey. However, spiders will also crawl into shoes, trousers or other clothing removed at night to be worn the next day. People are most commonly bitten in bed, dressing or cleaning storage areas. The brown recluse can survive long periods without food.

The brown recluse is not generally aggressive and the bite is usually not felt (pain usually follows six to eight hours later) accurate determination of bite incidence is difficult. A typical bite area may resemble a pimple, pustule or blister within six to 12 hours after the bite occurs. Mild to severe pain accompanied by swelling may occur during this interval. The surrounding tissue begins to darken, is irregular in shape with sharply raised edges resulting in a 'sunken' area which may be several centimeters in diameter. Within the next 10 to 14 days this area will eventually slough leaving an open ulcer. Most people are bitten on the hands, arms or feet. Ice and elevation are helpful in reducing inflammation and

swelling while antihistamines will alleviate associated itching. People with a suspected brown recluse bite should see a physician immediately. If possible, the suspected spider should be placed in a vial of 70 percent alcohol for positive identification.

Scorpions (Fig. 17): True scorpions have a bulbous enlargement of the last abdominal segment. This segment contains poison glands which empty through a curved, hook-like stinger on the end. Scorpions normally catch small insects or other prey in its pincers, bends the tail forward and stings the victim into submission. The sting is also used in self defense.

Scorpions have a flattened cephalothorax bearing the legs and pincers. The abdomen is broad at the base where it joins the cephalothorax but is narrowed into a post-abdomen from about the middle of the body on back at the end of which is the stinger. Females give birth to live young which ride about on top of the female's back for several days. The young may be eaten by the female if they fail to get on her back. Although not common scorpions can be found throughout Wyoming.

Ticks (Fig. 18, 19): These arthropods are close relatives of spiders. They are blood-sucking parasites of mammals, birds and reptiles. Ticks can be characterized as having a six-legged larval stage, one or more eight-legged nymphal stages and the eight-legged adult stage, all of which take blood meals. Both males and females feed on blood.

In addition to creating annoyance and discomfort, they efficient vectors of a number of serious diseases of man and his domestic animals. It has been stated that in temperate and tropical countries, ticks surpass all other arthropods in the number and variety of diseases which they transmit to domestic animals and they run mosquitoes a close second in the number of diseases transmitted to man. Some of the diseases vectored by ticks in North America include: benign typhus, Colorado tick fever, endemic typhus, human babesiosis, lyme disease, Powassan encephalitis, Q fever, relapsing fever, rickettsialpox, Rocky Mountain spotted fever, St. Louis encephalitis, tick paralysis, tularemia and western equine encephalitis.

Ticks normally inhabit various wild animals but drop off to deposit eggs or to digest a blood meal. The hungry adults of various ticks, and sometimes hundreds of young seed ticks, climb up whatever vegetation is at hand and wait for a host animal. If a human happens along, the tick grabs onto the clothing and eventually finds its way to the skin. There the tick settles down and inserts the barbed mouthparts deep into the flesh. The tick may remain there for days, sucking blood and filling the body. Eventually the engorged female drops off and hides on the ground for egg laying. It is imperative that all persons inspect themselves thoroughly after a trip through a tick infested

area to prevent transmission of disease to themselves. Ticks should be removed before they become embedded. Once embedded, they are very difficult to remove.

Stinging Caterpillars

A number of caterpillars have poisonous hairs or spines on the body. The spine tips are easily detached and can penetrate the fingers when the insect is caught. The spine tips contain a poison which reacts locally where the tip penetrated the skin. Reactions include immediate pain, whitening of the flesh and numbness lasting a few hours to several days.

Other caterpillars have a dense covering of long, soft hairs on the entire body. These hairs detach easily if the larva is handled. Also, at pupation, the hairs are shed and may be used in building a pupation chamber. Strong winds blow the loose hairs about causing irritation to the eyes, nose, throat and skin. Some areas of eastern forests may be unusable for recreational purposes because of this problem. Caterpillars with irritating hairs or stinging spines are not common in Wyoming.

LIST OF FIGURES

Figure Number	Source
1	U.S. Dept. of Health, Education and Welfare, U.S. Public Health Service, Center for Disease Control
2	U.S. Dept. of Health, Education and Welfare, U.S. Public Health Service, Center for Disease Control
3	United States Department of Agriculture
4	From McKenny-Hughes, British Museum, Natural History
5	From Essig
6	U.S. Dept. of Health, Education and Welfare, U.S. Public Health Service, Center for Disease Control
7	U.S. Dept. of Health, Education and Welfare, U.S. Public Health Service, Center for Disease Control
8	L.O. Howard
9	From Michelbacher and Furman
10	From Kellog
11	From Michelbacher and Furman
12	Nor-Am Chemical Company
13	Diane Walton
14	Diane Walton
15	Nor-Am Chemical Company
16	U.S. Dept. of Health, Education and Welfare, U.S. Public Health Service, Center for Disease Control
17	University of Arizona
18	United States Department of Agriculture
19	United States Department of Agriculture
20	M.R. Smith, United States Department of Agriculture

APPENDIX

FIGURES 1-20

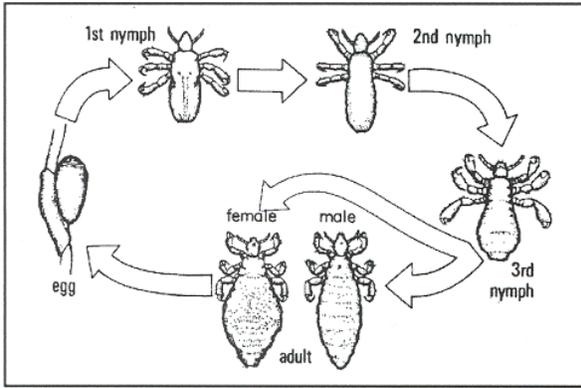


Figure 1. Headlouse life cycle.

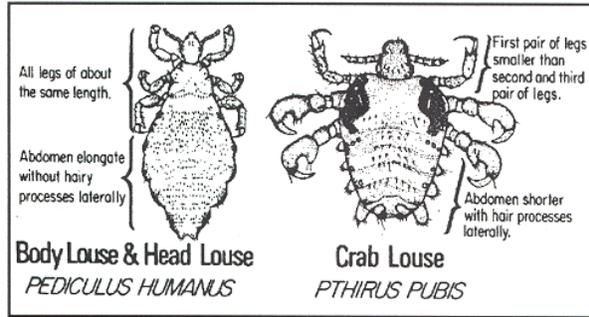


Figure 2. Body and crab louse.

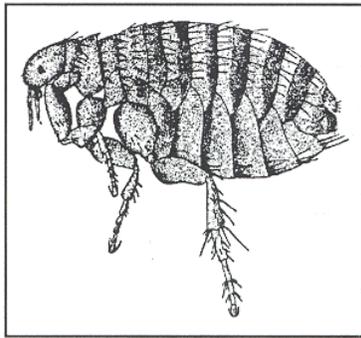


Figure 3. Human flea.

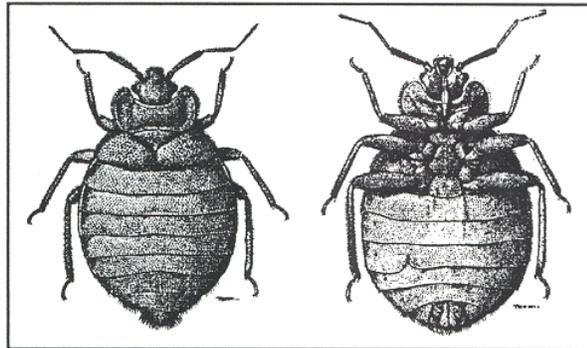


Figure 4. Bedbug.

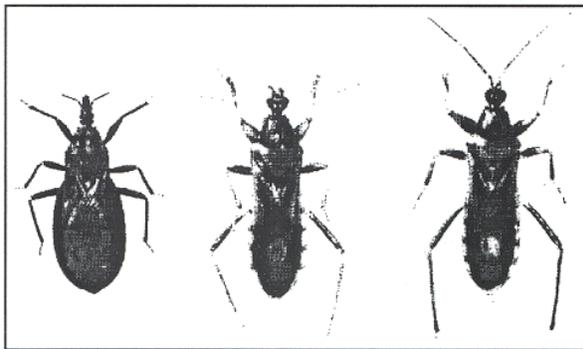


Figure 5. Kissing bugs.

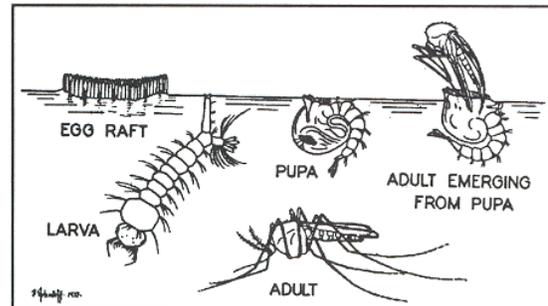


Figure 6. Mosquito life cycle.

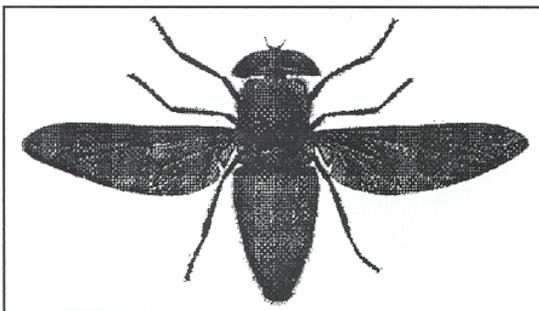


Figure 7. Horsefly.

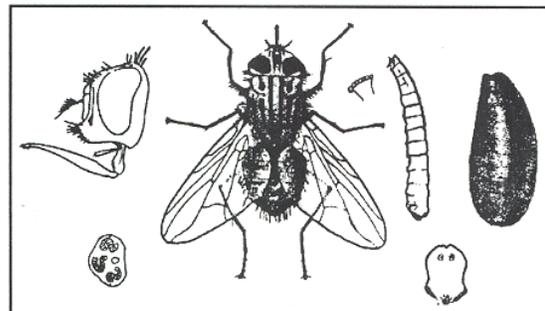


Figure 8. Stable fly.

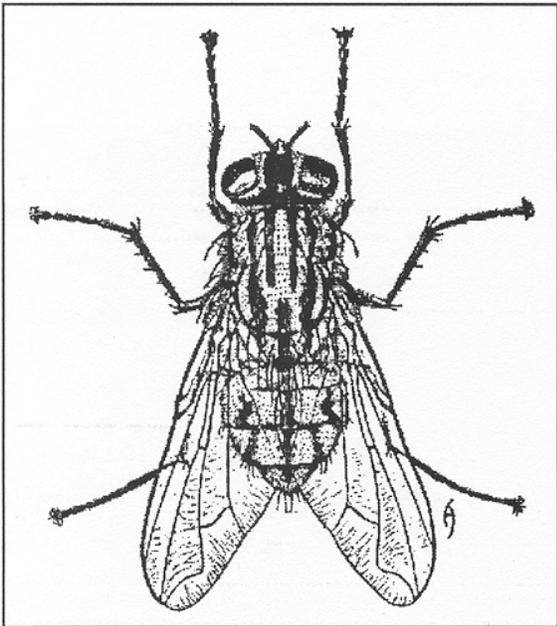


Figure 9. House fly.

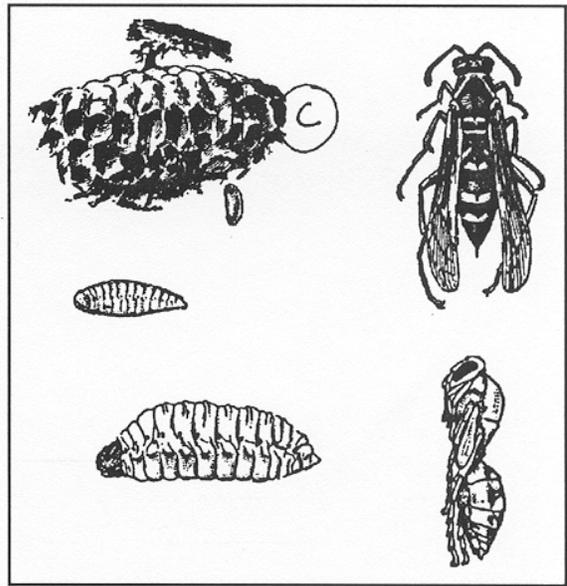


Figure 10. Paper nest wasp.

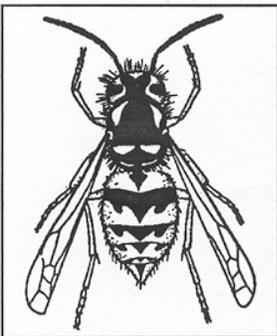


Figure 11. Yellow jacket.

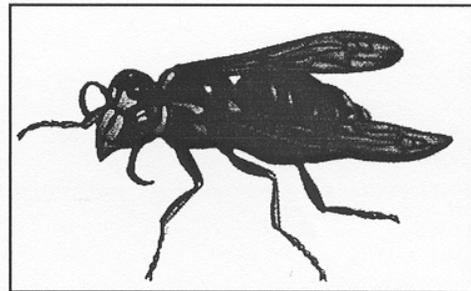


Figure 12. Bald faced hornet.

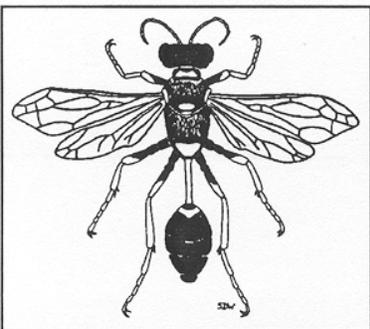


Figure 13. Mud dauber.

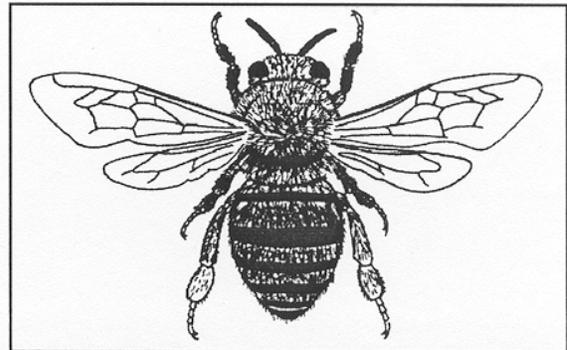


Figure 14. Honey bee.

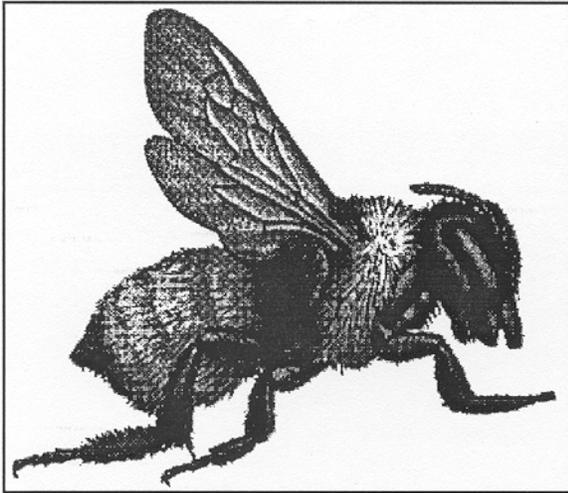


Figure 15. Bumble bee.

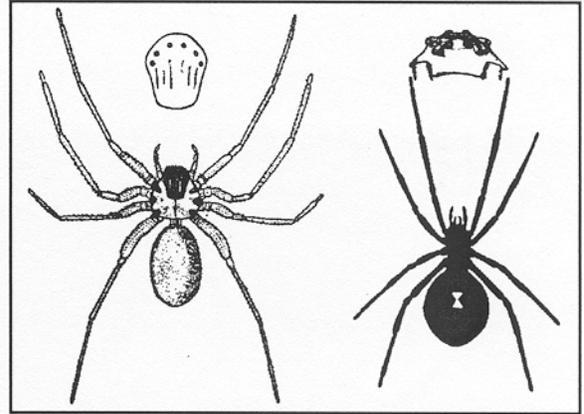


Figure 16. Brown recluse female (left) and black widow female (right).

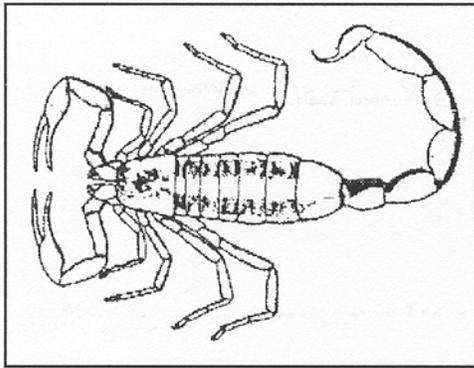


Figure 17. Scorpions.

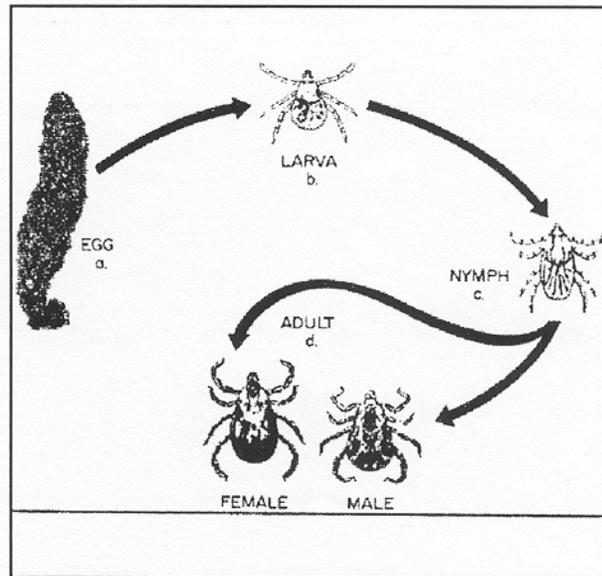


Figure 18. American dog tick life cycle.

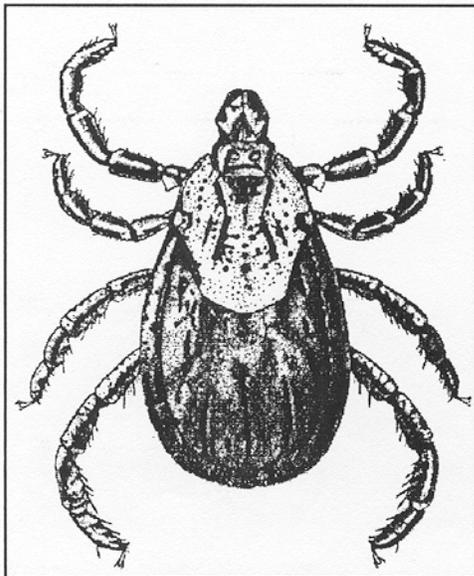


Figure 19. American dog tick.

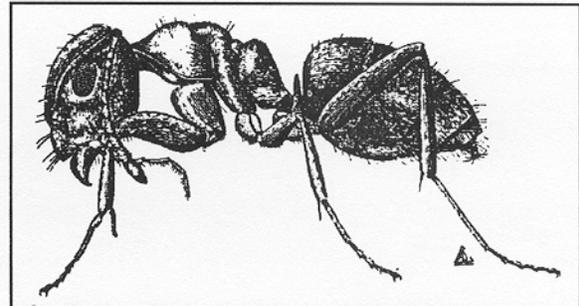


Figure 20. Cornfield ant.

