

GENERAL HOUSEHOLD PESTS

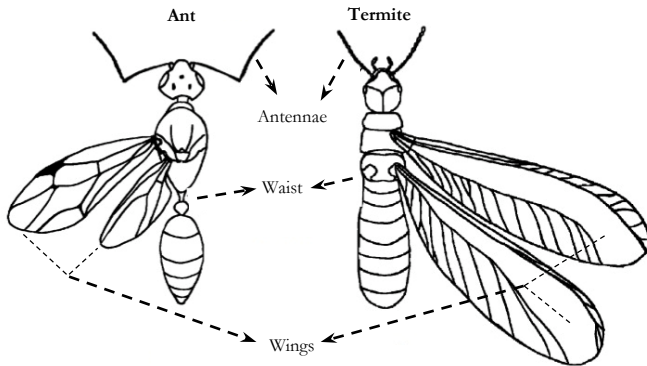
Ants are some of the most ubiquitous insects found in community environments. They thrive indoors and outdoors, wherever they have access to food and water. Ants outdoors are mostly beneficial, as they act as scavengers and decomposers of organic matter, predators of small insects and seed dispersers of certain plants. However, they can protect and encourage honeydew-producing insects such as mealy bugs, aphids and scales that are feed on landscape or indoor plants, and this often leads to increase in numbers of these pests.

A well-known feature of ants is their sociality, which is also found in many of their close relatives within the order Hymenoptera, such as bees and wasps. Ant colonies vary widely with the species, and may consist of less than 100 individuals in small concealed spaces, to millions of individuals in large mounds that cover several square feet in area. Functions within the colony are carried out by specific groups of adult individuals called ‘castes’. Most ant colonies have fertile males called “drones”, one or more fertile females called “queens” and large numbers of sterile, wingless females which function as “workers”. Many ant species exhibit polymorphism, which is the existence of individuals with different appearances (sizes) and functions within the same caste. For example, the worker caste may include “major” and “minor” workers with distinct functions, and “soldiers” that are specially equipped with larger mandibles for defense. Almost all functions in the colony apart from reproduction, such as gathering food, feeding and caring for larvae, defending the colony, building and maintaining nesting areas, are performed by the workers. Ant colonies usually multiply and spread by either or both of the processes called “swarming” and “budding”. Only the drones and queens are capable of flight. During favorable times of the year, newly matured drones and queens will fly out (“swarming”) or travel by foot on the ground (“budding”), away from their nest to mate and start new colonies. The sole function of the drones is to mate with the queens. After mating, the drones soon die, while the queens find nesting sites and start laying eggs. The ant life cycle consists of four stages: egg, larva, pupa and adult. Ant larvae are called “grubs”, and they are wormlike and legless. They are tended by the workers through the pupal stage, till they emerge as adults and assume the specific duties of their caste.

Ants have chewing mouthparts. While most ants are omnivorous and will consume a variety of food material, each species has certain food preferences such as sweets, starches, fats or meat, and this knowledge is useful in their management. In general, ants are considered a nuisance mostly because of their numbers, and will not cause significant damage if managed in a timely manner. However, many species can inflict painful bites and stings, and this is a cause for concern. Some species such as Pharaoh ants are reported to transmit disease organisms such as *Staphylococcus*. Others such as carpenter ants can cause damage to wooden structures by hollowing out wood.

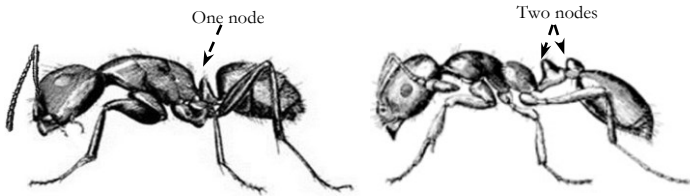
Winged ants are often mistaken for winged termites that also swarm to mate and usually appear at the same time of the year. However, ants can be differentiated from termites by their narrow, constricted waist, elbowed (bent) antennae, and forewings that are shorter than their hind wings. Termites have a uniformly

elongate body with no constrictions, straight, “beaded” antennae, and both pairs of their wings are similar in size and much longer than their body.



Diagrammatic representation of differences between winged ants and termites
Source: University of Hawaii Termite Project

The body of an ant can be divided into three distinct regions: head, thorax, and abdomen which consists of the narrow constriction (waist or petiole) and the part beyond it (gaster). The waist can be made up of one or two small segments (nodes) and this is an important preliminary identifying feature, based on which ants are broadly grouped as one-node and two-node ants.



Diagrammatic representation of differences between one-node and two-node ants
Source: USDA-ARS

NOTABLE SPECIES – One-node ants

Common name(s): Argentine ant

Scientific name, classification:

Linepithema humile, **Order:** Hymenoptera,

Family: Formicidae

Distribution: Worldwide, in regions with Mediterranean, subtropical and mild-temperate climates. Native to Northern Argentina. In the southwest, mostly found in irrigated, moist areas in urban and agricultural settings.



Argentine ant worker
Photo: Eli Sarnat, Bugwood.org

Description and ID characters: Adults are dull brown in color. All workers are uniform sized (about 1/8th inch in length), queens are larger. Waist has one erect node. Thorax is uneven in shape when observed from the side.

Best identifying feature: Habit of traveling in well-defined trails between colonies and food sources. Crushing releases a musty odor.

Pest status: Invasive pest, common nuisance pest in most community environments.

Damage/injury: Although they do not generally bite or sting, these ants are considered a nuisance and a cause for concern because of their huge colonies. Prefer sweets, but will feed on many different food materials.

Argentine ant colonies are unique in having several queens and large numbers of workers. Individual colonies may connect and become “supercolonies” that exist in harmony with each other and even share workers. This is possible because unlike other ant species, all Argentine ants in an introduced range are believed to be similar in genetic makeup, and therefore seldom attack or compete with individuals of other colonies.

Argentine ants are extremely **invasive** and can displace native ant species when they are introduced to a new area. This can in turn affect other animal and plant species in the ecosystem that depend on the native ants for food or seed dispersal. Argentine ants also tend colonies of plant sap-sucking insects such as aphids, by warding off their predators and parasitoids and in turn getting rewarded by the sweet honey dew secreted by these insects. In most areas, an infestation of Argentine ants is accompanied by an increase in the numbers of these pests and their damage.

Life history: Drones mate with fertile adult females within the nest. They do not have swarming flights as in other ant species. The mated females leave the nest by the ground with a group of workers and start new colonies, and the process is called “budding”. New colonies are mostly close and connected to the original colony and in time, may enlarge to form supercolonies.

Nests built outdoors are usually in fallen wood or debris, in tree cavities or in soil close to ground level, because these ants are not equipped to dig very deep. Indoors, they will nest in any moist, concealed spaces such as wall voids, or damaged wood. They usually move indoors when outdoor nests are disturbed, or when unfavorable conditions occur, or if they come across an attractive food source while foraging.

Common name(s): Carpenter ant, Western carpenter ant

Scientific name, classification:

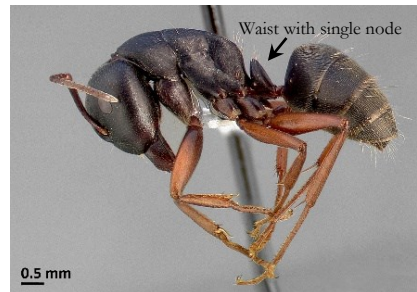
Camponotus modoc, **Order:** Hymenoptera,

Family: Formicidae. Other species of carpenter ants found in the desert southwest include *C. vicinus*, *C. herculeanus*, *C. noveboracensis* and *C. esigi*.

Distribution: Western U.S.

Description and ID characters:

Carpenter ants are the largest ant species



Carpenter ant *C. modoc* worker
Photo: April Nobile, AntWeb.org

found in community environments. The western carpenter ant *C. modoc* is black in color, with dark red legs. Queens can measure up to $\frac{3}{4}$ inch, and workers from $\frac{1}{4}$ to $\frac{1}{2}$ inch in length. Waist has one erect node. Thorax is uniform in shape when observed from the side. Workers in a nest may be polymorphic (differ in appearance).

Best identifying feature: Size, followed by color. Microscopic examination will be needed for species level identification.

Pest status: Common nuisance pest in most community environments, occasional biting pest and structural pest.

Damage/injury: Do not sting, but can cause painful bites using their powerful mandibles. The pain of the bite is accompanied by a burning sensation due to spraying of formic acid into the wound.

Damage wooden structures by nesting in them, but do not eat wood. They chew along or across the grain of the wood, creating clean and smooth tunnels. The tunnels may resemble subterranean termite tunnels, but can be distinguished by absence of soil or other termite tubes.

Feed on a wide range of food material, including human food. Prefer sweets and meat.



Carpenter ant damaged wood
Photo: R.Werner, Bugwood.org



Carpenter ant damage produces piles of wood shavings (left)-Photo: Edward H. Holsten;
Closer view of wood shavings mixed with ant body parts and other debris (right)- Photo: NY State IPM, Cornell

Life history: Winged drones and females mate during their swarming flight. Soon after mating, drones die and mated females shed their wings and seek out a suitable concealed spot, usually in weakened or damaged wood to lay eggs, thus beginning a colony. Colonies can be formed indoors or outdoors.

Usually if an initial colony is first established outside within 300 feet of a building, 'satellite' colonies may then be formed inside the building. The initial outside nests are formed in decayed wood, such as dead trees, stumps, logs or decorative landscape wood. Once established, the tunneling may eventually extend into sound wood. The workers create galleries in the wood to allow for their movement within the nest. They do not eat this wood, but instead carry it and deposit it in piles outside the nest. These piles of wood shavings, mixed with ant body parts and dead ants are helpful to identify nesting locations. Indoor colonies are often built in moist, softened wood in areas where water leakage occurs. These may include porch

pillars, around bathtubs, sinks, roof leaks, poorly flashed chimneys and poorly sealed windows and doorframes. When carpenter ants are spotted inside dwellings, it does not mean that a colony has also been established inside the house. They may be simply foraging for food. This is called non-seasonal foraging. Outdoor colonies typically forage during warm weather such as in the spring and summer.

Common name(s): Crazy ant, longhorn crazy ant

Scientific name, classification: *Paratrechina longicornis*, **Order:** Hymenoptera,

Family: Formicidae.

Distribution: Worldwide. Native to southeast Asia.

Description and ID characters: Small, dark colored ant. Workers are all uniform in size, dark brown to black in color, and $1/8$ to $1/16$ th inch in length. Waist has one node.

Best identifying feature: Confused, erratic movements. Very long antennae and legs compared to body. Circular ring of hair at end of abdomen (needs magnification to observe).

Pest status: Invasive pest. Occasionally considered a biting pest. Nuisance pest.

Damage/injury: Crazy ants cannot sting, but will bite and then curve their abdomen forwards and secrete formic acid onto the wound. They colonize a wide range of indoor and outdoor environments and feed on a variety of food materials.

Life history: Mating takes place in large congregations of males and females on the ground, when favorable weather conditions occur. Swarming flights do not take place. Colonies are small, with up to 2,000 workers and multiple queens. Several such colonies can exist interconnected with each other, resulting in larger infestations. Colonies are also mobile, and may spontaneously abandon one nest site and move to another.

The **tawny crazy ant/Raspberry crazy ant** *Nylanderia fulva* is a similar ‘crazy’ ant, earning its name from its erratic movements and reddish-brown color. These ants are native to South America, and are considered an invasive species in the U.S. They are problematic in parts of Texas in the southwest. They form huge colonies, which when combined with their tendency to protect and tend aphids results in significant threats to agricultural crops. Like many other ants, they feed on a variety of food materials, with a preference for sweets. They are attracted to electrical equipment and often chew through electrical wires causing short circuits. Tawny crazy ants are also known for their ability to detoxify fire ant venom, by coating themselves with formic acid. They can thus displace fire ants in certain locations. Although tawny crazy ants are a tropical species, they can be spread to drier climates by humans. Once introduced, they can thrive in community environments which offer several warm and humid locations, and therefore it is good to be aware of this invasive species.



Crazy ant
Photo: Eli Sarnat, Bugwood.org

Common name(s): Odorous house ant, coconut ant, stink ant

Scientific name, classification:

Tapinoma sessile, **Order:** Hymenoptera,

Family: Formicidae.

Distribution: Throughout U.S. Native to U.S.

Description and ID characters:

Adults are dark brown to black in color.

Workers are polymorphic, $1/8^{\text{th}}$ to $1/16^{\text{th}}$ inch in length, queens are larger. Waist has one erect node, and is hidden

because the abdomen appears to be resting on top of the waist. Thorax is uneven in shape when observed from the side.

Best identifying feature: Hidden waist due to abdomen positioning. Crushing releases pungent smell of rotting coconut. Move in quick, erratic movements when disturbed or alarmed, raising their abdomens into the air.

Pest status: Common nuisance pest in most community environments.

Damage/injury: Tend colonies of plant sap-sucking insects such as aphids, and encourage these insects. Do not sting or bite. Feed on a wide range of food material, including human food. Prefer sweets, meat and dairy products.

Life history: New colonies can be created through swarming or budding. These ants are opportunists and will start colonies in a variety of environments both indoors and outdoors. They can be found nesting in kitchens and bathrooms.



Odorous house ant worker
Photo: Eli Sarnat, Bugwood.org

Common name(s): Pyramid ant, bicolored pyramid ant

Scientific name, classification:

Dorymyrmex bicolor, **Order:** Hymenoptera,

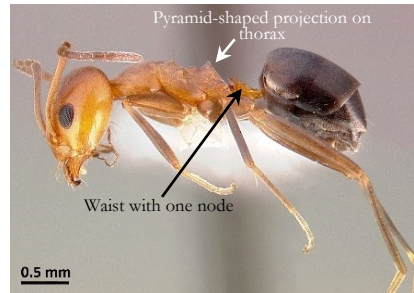
Family: Formicidae.

Distribution: Throughout southwestern U.S.

Description and ID characters: Adults have reddish brown head and thorax, and black abdomen. All workers are uniform sized (about $1/8^{\text{th}}$ inch in length), queens are slightly larger. Waist has one node. Thorax is uneven in shape when observed from the side and has a prominent pyramid shaped projection, which gives the ants their common name.

Best identifying feature: Bicolored body, pyramid-shaped projection on thorax, one-noded waist. Move in distinct trails.

Pest status: Nuisance pest.



Bicolored pyramid ant
Photo: Eli Sarnat, Bugwood.org



Bicolored pyramid ant nest
Photo: Shaku Nair

Damage/injury: Practically harmless, do not bite, sting or transmit disease. Rarely found indoors, as they are an outdoor species, feeding on honey dew produced by plant sap sucking insects. Occasionally drawn indoors by the presence of sweet food materials.

Life history: Most new colonies are formed by swarming. Nests are constructed in soil in sunny, open areas free of shading vegetation. Mounds are small and about 2 to 4 inches in diameter. The workers excavate the soil and deposit it around the nest entrance in a raised circular mound.

Common name(s): Rover ant, dark rover ant

Scientific name, classification:

Brachymyrmex patagonicus, **Order:** Hymenoptera, **Family:** Formicidae.

Distribution: Native to Argentina and Paraguay, recently introduced to the U.S. and present in southwestern and Gulf States.

Description and ID characters: Adults vary in color from pale to dark brown. All workers are uniform sized (about $1/16^{\text{th}}$ inch in length), queens are slightly larger. Waist has one node. Thorax is uneven in shape when observed from the side.

Best identifying feature: Size, one-noded waist, relatively large eyes, sparse pale hairs on abdomen, 9-segmented antennae lacking clubbed tips. Do not trail.

Pest status: Nuisance pest.

Damage/injury: Practically harmless, may be cause for concern if found in large numbers. Do not bite, sting or transmit disease. A frequent concern is finding of large numbers of winged adults in swimming pools. They feed on a variety of food materials with a preference for sweets and proteins, and often associate with aphids and mealy bugs to feed on the sweet honey dew secreted by these insects. Management should focus on reducing water sources close to the structure.

Life history: New colonies are formed by swarming, and may be initiated outdoors in the soil, among leaf litter or other debris, especially in spots close to water sources and moisture. Occasionally, colonies may be found indoors, in kitchens and bathrooms. They have been found to exist closely with many other native and introduced ant colonies, including fire ants that are not usually tolerant of other ant species.

Common name(s): Velvety tree ant

Scientific name, classification: *Liometopum* spp., **Order:** Hymenoptera, **Family:** Formicidae. The velvety tree ants *L. occidentale* and *L. apiculatum*, and the pine tree ant *L. luctuosum* are common southwestern species.

Distribution: Southwest U.S.

Description and ID characters: Brownish-black colored ants, workers are polymorphic, varying from $1/8$ to $1/4$ inch in length.



Rover ant
Photo: Eli Sarnat, Bugwood.org

Best identifying features: Brownish black head, red thorax and velvety black abdomen. Thorax is uniform in shape when observed from the side. Waist has one node. Distinct, pungent odor when crushed. Resemblance to carpenter ants due to single-noded waist and nesting habit in wood. Pine tree ants can be confused with odorous house ants due to their odor and size.

Pest status: Nuisance, occasional biting and structural pest, commonly seen in landscapes.

Damage/injury: May damage wooden structures by nesting, but usually only weakened or decaying wood. Do not feed on wood. Do not sting, but can bite in defense.

Life history: Winged drones and females mate during their swarming flight usually in the summer. Nests are typically built in weakened wood, such as in crevices of trees, old tree stumps, fallen logs, under bark or in soil under dead wood. The nests may consist of several chambers built of a honeycomb-like material made of soil and saliva. The workers form extensive foraging trails above ground as well as shallow underground galleries. They feed on different food materials, but have a preference for plant-sap feeding hemipterans such as aphids and leaf hoppers. They are known to tend these insects for their honey dew, but will also capture and drag them back to their nests to feed on them.



Velvety tree ant
Photo: April Nobile, Antweb.org

NOTABLE SPECIES – Two-node ants

Common name(s): Red imported fire ant, RIFA

Scientific name, classification:

Solenopsis invicta, **Order:**

Hymenoptera, **Family:** Formicidae

Distribution: Worldwide. Native to South America. In the southwest, they are mostly found in highly irrigated, open, sunny areas such as golf courses in California.

Description and ID characters:

Adults have reddish-brown colored head and thorax, with darker brown abdomen. Body is covered with golden hairs. Waist has two erect nodes. Antennae have clubbed tips. Workers are polymorphic, $1/16^{\text{th}}$ to $1/5^{\text{th}}$ inch in length, queens are larger.

Best identifying feature: Two-noded waist, three tooth-like projections in front of head (will need magnification to be observed. This is as opposed to two projections in the southern fire ant, but atypical individuals may exist and it might be best to seek expert help if further ID is required). Travel in distinct trails between nests and food sources.

Pest status: Extremely aggressive, stinging and biting pest, common nuisance pest in most community environments where they exist.

Damage/injury: Build unsightly mounds, mostly outdoors, near a source of moisture. Workers characteristically “boil” out of mounds in large numbers when disturbed and inflict painful bites and stings, which can result in itchy,

persistent pustules and severe allergic reactions. Feed on different food materials, including human food. Prefer protein-rich foods as well as sweets.

Life history: New colonies are formed by swarming or by splitting of the original colony. RIFA mounds are much larger than other fire ant mounds, and may reach up to 18 inches in height and 24 inches in width, gradually assuming a dome shape if undisturbed for 2-3 years. Lower mounds are seen in younger colonies, or in those that are disturbed due to mowing or other activities. Mounds usually do not have a visible central opening into the colony. The ants enter through multiple subterranean entrances, that link up to an extensive tunneling system within the



Red imported fire ant worker
Photo: Eli Sarnat, Bugwood.org



Red imported fire ant mound
Photo: Jake Farnum, Bugwood.org

mound. Established colonies can contain up to 500,000 individuals with multiple queens.

Common name(s): Southern fire ant

Scientific name, classification:

Solenopsis xyloni, **Order:**

Hymenoptera, **Family:**

Formicidae. Other species of fire ants found in the desert southwest include *S. aureus* and *S. amblychila*.

Distribution: Throughout southern, southwestern and south-central U.S. Native to southwestern U.S.

Description and ID characters:

Adults have dark reddish-brown colored head and thorax, with darker brown or black abdomen.

Body is covered with golden hairs. Waist has two erect nodes. Antennae have clubbed tips. Workers are polymorphic, $\frac{1}{8}$ th to $\frac{1}{4}$ th inch in length, queens are larger.

Best identifying feature: Two-noded waist, two tooth-like projections in front of head (will need magnification to be observed. This is as opposed to three projections in the Red imported fire ant (RIFA), but atypical individuals may exist and it might be best to seek expert help if further ID is required). Do not trail, but move in random paths.

Pest status: Stinging and biting pest, common nuisance pest in most community environments.

Damage/injury: Build unsightly mounds in different indoor and outdoor locations, mostly near a source of moisture. Workers pour out of mounds in large numbers when disturbed and inflict painful bites and stings. Although they are less aggressive than RIFAs and their stings and bites are less intense, people vary in their sensitivity to fire ant venom and so the presence of fire ants should be given due importance and attention. Feed on different food materials, including human food. Prefer sweets and proteins.

Life history: New colonies are formed by swarming, in a variety of environments both indoors and outdoors. Colonies are more common outdoors, in warm, sunny areas especially favoring bare, dry or stressed turf. Mounds are irregular and flattened in shape, with one or several openings. The workers are drawn indoors by attractive food sources or extreme temperatures and can subsequently build nests



Southern fire ant worker
Photo: Eli Samat, Bugwood.org



Southern fire ant mound
Photo: Shaku Nair

in wall voids, crawl spaces and under carpets. Colonies can contain up to 10,000 individuals with multiple queens.

Common name(s): Harvester ant, western harvester ant, pogo ant

Scientific name, classification: *Pogonomyrmex occidentalis*, **Order:** Hymenoptera,

Family: Formicidae. Other species of harvester ants found in the desert southwest include *P. barbatus* (red harvester ant) and *P. maricopa* (Maricopa harvester ant), which is believed to possess the most toxic venom among insects.

Distribution: Throughout southwestern U.S. Native to western U.S.

Description and ID characters:

Adults are dark red in color. Waist has two nodes. Workers are mostly uniform sized, 1/4 inch in length, queens are larger.

Best identifying feature: Size, color, two-noded waist, characteristic “beard” or groups of long hairs on the underside of the head, which helps to carry seeds and nesting material. Travel in distinct trails between nests and food sources.

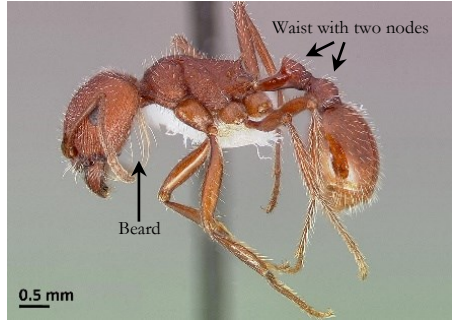
Pest status: Aggressive, stinging and biting pest, common nuisance pest in most community environments.

Damage/injury:

Workers can be extremely aggressive, especially when defending their nest. Derive their common name from their habit of harvesting seeds and pollen directly from plants, which can cause economic damage in some cases. They are also known to cause

erosion of asphalt roads and pavements by their nesting behavior.

Life history: New colonies are formed by swarming and are often distant from the original colonies. Nests consist of mounds of gravel, small pebbles or dirt surrounded by a large cleared area, free of plants or other obstructions to prevent shade. The mounds may be up to 12 inches in height, but the nests extend much deeper into the ground, with several interior chambers. Some of these chambers are used to store seeds and other food material gathered by the foraging workers.



Western harvester ant
Photo: AntWeb.org



Western harvester ant mound
Photo: Gerald Holmes, Bugwood.rog

Common name(s): Pavement ant

Scientific name, classification:

Tetramorium caespitum, **Order:**

Hymenoptera, **Family:** Formicidae.

Distribution: Throughout southwestern U.S. Native to Europe.

Description and ID characters:

Adults are small dark brown to black in color, about $1/16^{\text{th}}$ inch in length, with lighter colored legs and antennae.

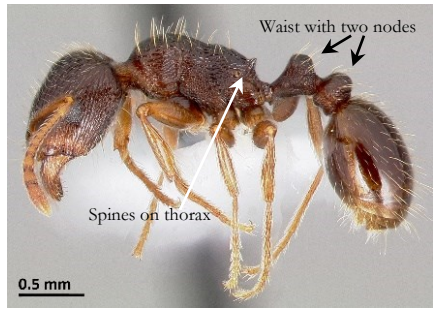
Waist has two nodes. Head and thorax appear to have parallel lines running lengthwise (will need magnification to observe this), and the thorax has a pair of spines.

Best identifying feature: Size, two-noded waist, habit of building nests on pavements and moving in distinct trails.

Pest status: Nuisance pest.

Damage/injury: Can sting and bite. Feed on a wide variety of foods, including human food. Can become a nuisance when they build nests in pavements, and can also enter homes.

Life history: New colonies are formed by swarming. Nests appear as piles of misplaced soil along gaps in the pavement, without a distinctive appearance. Workers are very aggressive and guard their colonies from other neighboring pavement ant colonies, sometimes resulting in large numbers of dead ants on pavements. Besides pavements, they also build nests in driveways, patios, sidewalks and foundations as well as inside homes and other structures. In natural areas, they nest beneath mulch, landscaping, stones and logs.



Pavement ant
Photo: April Nobile, AntWeb.org



Pavement ants on a pavement
Photo: Joseph Berger, Bugwood.org



Pavement ant nest beginning to form
Photo: Shaku Nair

Common name(s): Pharaoh ant

Scientific name, classification:

Monomorium pharaonis, **Order:**

Hymenoptera, **Family:** Formicidae.

Distribution: Worldwide. Origin unknown.

Description and ID characters: These are among the smallest of household ants. Workers are all uniform in size, pale yellow in color, and less than $1/16^{\text{th}}$ inch in length. Waist has two nodes.

Best identifying feature: Size, light color, two-noded waist.

Pest status: Nuisance pest, contaminates sterile environments, transmits disease causing microorganisms.

Damage/injury: Causes of concern because they are known to be carriers of disease causing microorganisms. They have a wide range of preferred foods that includes sweets, fats and proteins. Their daily water requirement is very high, and so workers actively forage for water in addition to food. They can harvest water from any source including wounds of persons who are infirm, elderly or rendered immobile due to other reasons.

Life history: New colonies are formed by budding, when a young queen with a group of workers migrate to a new area. Nests are usually formed indoors, in any dark, undisturbed and concealed space. They do not form mounds or galleries, but use the concealed space itself as their nest. They also build nests outdoors, in leaf litter or debris. Colonies can have as many as 300,000 individuals and multiple queens, and they are very mobile, readily moving from one location to another when disturbed.



Pharaoh ant
Photo: Eli Sarnat, Bugwood.org

Common name(s): Thief ant, grease ant

Scientific name, classification: *Solenopsis*

molesta, **Order:** Hymenoptera, **Family:**

Formicidae.

Distribution: Throughout U.S. Native to central U.S.

Description and ID characters: Another of the smallest of household ants. Workers are all uniform in size, yellowish brown in color, and less than $1/16^{\text{th}}$ inch in length. Waist has two nodes.

Best identifying feature: Size, light color, two-noded waist. Can be mistaken for pharaoh ants, but have larger heads and smaller eyes. Thief ants move in definite trails, as opposed to pharaoh ants, which trail only after locating a food source.

Pest status: Nuisance pest.

Damage/injury: Owing to their small size, they can colonize homes and structures for long periods without attracting attention, and can enter almost any



Thief ant
Photo: AntWeb.org

small space, including sealed packages of food. They feed on a range of food materials, but have a preference for foods high in fat and protein content such as grease (sometimes called grease ants), cheese, meat and seeds. Unlike most other ants, they do not appear to prefer sweets.

Life history: New colonies are formed by swarming, and nests can be built in practically any location indoors or outdoors. Nests are large and often have small tunnels connecting to the nearby nests of larger ants from which they habitually steal food and brood, thus deriving their common name.

ANT LOOK-ALIKE

Common name(s): Velvet ant

Scientific name, classification: Multiple species, **Order:** Hymenoptera, **Family:** Mutillidae.

Distribution: Worldwide. Genera encountered in the desert southwest include *Pseudomethoca* and *Dasymutilla*. Please refer section on wasps for detailed description.



Velvet ant
Photo: Joseph Berger, Bugwood.org

Sources, further information:

Ants http://cals.arizona.edu/urbanipm/pest_press/2004/april.pdf

Ant pests and management

<http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7411.html>

Field, H.C., Evans, W.E., Hartley, R., Hansen, L.D. and Klotz, J.H. 2007. A Survey of Structural Ants Pests in the Southwestern U.S.A. *Sociobiology* 49(2), available at

<http://urban.ucr.edu/docs/Argentine%20Ant/2007%20Field%20et%20al.%20A%20Survey%20of%20Structural%20Ant%20Pests%20in%20the%20So.pdf>

Fire ant management <http://ag.arizona.edu/urbanipm/buglist/fireants.pdf>

Identification and habits of key ant pests in the Pacific Northwest

<http://cru.cahe.wsu.edu/CEPublications/PNW624/PNW624.pdf>

Cockroaches are members of the insect order **Blattodea** and are worldwide in distribution. There are over 4,500 species of cockroaches of which only about 30 are associated with human habitats and 10 may be considered pests. Generally, cockroaches are medium to large sized, elongated oval shaped, dorso-ventrally flattened insects (0.5 to over 2 inches in length). They live in a wide range of habitats and most species prefer warm and moist environments. They are mostly nocturnal and tend to hide in dark, concealed spaces during the day and feed at night. Cockroaches are omnivorous and are known to feed on a wide variety of materials including human food, pet food, plant and animal debris, paper, cloth, cardboard and any kind of decaying organic matter. They are extremely hardy insects and can survive adverse conditions such as limited food for extended periods of time.

The problems caused by pest cockroaches often go beyond their mere presence, which itself is a cause of alarm or panic in many persons. Besides feeding and damaging food and other items, they can carry and spread a number of pathogens. Cockroaches are a leading cause of asthma and allergies in sensitive people due to the allergens produced in their bodies, which are spread into the environment through their feces, shed body parts and dead bodies.

NOTABLE SPECIES

Common name: German cockroach
Scientific name, classification: *Blattella germanica*, **Order:** Blattodea, **Family:** Blattellidae.

Distribution: Worldwide

Description and ID characters: Small cockroaches, about ½ inch in length or slightly longer. One of the smallest domestic cockroaches. Both males and females have functional wings, but rarely fly. Females can often be identified by the presence of the egg case (ootheca) protruding from the end of the abdomen.

Best identifying feature(s): Adults are slender, light brown or straw colored cockroaches with two dark longitudinal stripes on the pronotum, just behind the head. The young ones (nymphs) are dark brown to black in color, with a lighter shade in the middle.

Pest status: Most important and problematic indoor cockroach species. Nuisance pest, of public health concern due to their allergens and role in spreading disease-causing microorganisms.

Damage/injury: Damage is manifold, including destruction and spoilage of food,



German cockroach, adult female with egg case
Photo: Kansas Dept. of Ag. Archive



German cockroach nymph
Photo: Mike Gordon

fabric, paper and other household materials, staining of surfaces with fecal material, causing bad odor, contamination of food and surfaces with pathogens, and causing allergies in sensitive persons. Both adults and nymphs are problematic.

German cockroaches produce certain proteins that are allergens (chemicals that generate allergies), which can cause severe reactions such as itching, swelling of face and respiratory tract, skin rashes, or asthma symptoms in certain people. The allergens are spread into the environment through their feces, molted skins, fallen body parts and dead bodies. Therefore, killing the cockroaches alone will not solve the problem, but intensive cleaning to remove all remains, including dead bodies and feces is necessary.

A number of disease-causing microorganisms are associated with German cockroaches including bacteria, viruses, protozoans, helminthic worms and fungi. These microorganisms are passively carried on the outside of cockroaches' bodies, and can also survive in their digestive tract. The cockroaches spread the microorganisms as they move about on food and surfaces through direct contact, as well as through saliva and feces.

German cockroaches are introduced to new environments through infested bags, boxes, cardboard containers or other items and also through used furniture or appliances. Multi-unit residences are particularly prone to infestation because they move easily between apartments.

Life history: German cockroaches have an extremely high reproductive rate and can multiply faster than any other domestic cockroach. The entire life cycle takes 3-4 months, with several overlapping generations existing together. After mating, the



German cockroach-life stages
Photo: Univ. of Nebraska, Dept. of Entomology



Telephone handset heavily stained with German cockroach feces
Photo: Dawn Gouge



Piles of black fecal pellets below cracks or crevices may indicate infestation
Photo: Armed Forces Pest Management Board

eggs develop inside the female's abdomen and gradually the egg sac (ootheca) containing 30-40 eggs can be seen protruding beyond the tip of her abdomen. The female carries the ootheca throughout its development until just before hatching. Newly hatched nymphs pass through 6-7 molts during which at least half of them die of natural causes before turning into adults. In spite of such heavy mortality, populations can rapidly build up to unmanageable levels under favorable

conditions. Average adult lifespan is 200 days, during which they produce 4-6 egg sacs and about 200 nymphs.

German cockroaches are an indoor species and cannot survive cold temperatures.

They thrive in homes and similar structures, in warm and moist spots such as kitchens and bathrooms, inside electrical boxes and behind electrical wiring. Mostly nocturnal by nature, they stay hidden in cracks and crevices and other dark confined spaces during the daytime, and emerge at night to forage. However, they can be seen occasionally during the daytime especially when their hiding places are too

crowded or disturbed, and such sightings are indicative of an infestation. Piles of black fecal pellets on the floor below cracks, crevices or spaces behind wall fixtures, as well as fecal stains on walls, furniture or surfaces may also indicate infestations.

Their diet includes a wide range of materials of plant or animal origin, and if food is in short supply, they are known to eat household items such as glue, toothpaste and soap, and even human hair, especially from eyebrows and eyelashes of young children. Under extreme food shortage, they may cannibalize one another.

Once established, German cockroaches may be difficult to control because of several reasons, their high reproductive rate being the most important factor. Their small size enables them to hide in very small spaces and escape notice, and there are few or no larger predators within homes and structures that might prey on them. Although they are not social and do not exhibit organized maternal care, the extended attachment of the ootheca to the female ensures better survival of the young ones, unlike in other cockroaches which randomly drop their egg cases around their habitat.

German cockroaches have developed behavioral avoidance of baits in some instances, and also exhibit widespread insecticidal resistance to certain spray formulations, so the efficacy of control methods should be closely monitored.

Common name: Brown-banded cockroach

Scientific name, classification: *Supella longipalpa*, **Order:** Blattodea, **Family:** Blattellidae.

Distribution: Worldwide.

Description and ID characters: Small cockroach, about 1/2 inch in length. One of the smallest domestic cockroach species. Males are slender and elongated, yellowish-brown in color, with black head and wings that completely cover the



German cockroaches inside equipment
Photo: Armed Forces Pest Management Board



German cockroaches along and behind electric cables
Photo: Armed Forces Pest Management Board

abdomen. Females are wider, dark brown or black in color, with short wings that leave the sides and the tip of the abdomen exposed.

Best identifying feature(s): Two light-brown or tan colored bands running horizontally across the middle of the body. , which are dark brown in color. The bands may be partly hidden by the wings in the adults, but are clearly visible in the nymphs.

Pest status: Nuisance pest, of public health concern due to their allergens and role in spreading disease-causing microorganisms.

Damage/injury: Damage is manifold, including feeding on and damaging food and surfaces, staining of surfaces with fecal material, causing bad odor, contamination of food and surfaces with pathogens, and causing allergies in sensitive persons. Both adults and nymphs are problematic. Common in crowded, poorly maintained medical facilities where they are known to feed on bodily fluids from wounds of patients, causing cross-infections. Brown-banded cockroaches are difficult to control using baits, because they feed on a wide variety of materials.

Life history: Brown-banded cockroaches are more widely distributed because they need less moisture, and are often found in higher locations within a building, where other cockroach species may not be found (e.g., tops of kitchen and bathroom cabinets). They are pests in elder-care homes and animal rearing facilities where higher temperatures (>80°F) are maintained. They thrive in the hot, dry conditions in the southwest, and are primarily an indoor species like the German cockroach. Brown-banded cockroaches are mostly nocturnal and spend the day hidden in dark, concealed spaces. After mating, the female carries the egg sac for about 1-2 days and then fastens it to a protected, hidden spot using an adhesive material. The egg sacs contain 10-15 eggs and are smaller than those of German cockroaches. Total life cycle is can vary in duration from 3-6 months.



Brown-banded cockroach nymph, clearly showing horizontal bands on the thorax
Photo: Gary Alpert



Brown-banded cockroach nymphs and fecal stains
Photo: Gary Alpert



Brown-banded cockroach, life stages
Photo: Univ. of Nebraska, Dept. of Entomology

Common name: American cockroach

Scientific name, classification: *Periplaneta americana*, **Order:** Blattodea, **Family:** Blattidae.

Distribution: Worldwide

Description and ID characters: Large reddish-brown cockroach, about 1 ½ inches in length, with long slender antennae, often longer than the body.

Best identifying feature(s): The largest of the domestic cockroaches. The shield-like pronotum just behind the head has a yellowish-brown or tan border. Both males and females are capable of flight, and can be seen fluttering around homes and structures during warmer months. They can also run very fast enabling them to hide quickly and escape from predators. Nymphs resemble the adults, but are smaller and wingless.

A related species is the **brown cockroach** *Periplaneta brunnea*, which also looks very similar to the American cockroach, but darker in color and has thicker, wider and darker cerci at the tip of the abdomen. It is an introduced species, but now widely distributed over warm climates throughout the world. Both species occupy similar habitats, but in the southwest, brown cockroaches are found inside homes and buildings, whereas the American cockroaches frequent sewers.

Pest status: Nuisance pest, of public health concern due to their allergens and role in spreading disease-causing microorganisms, as well as spoilage of food with their odor.

Damage/injury: American cockroaches have a wide food range, and will feed on almost any organic material that can be found in and around human dwellings, including garbage and dead animals. They will readily feed on human food and their oral secretions can alter the taste and quality of food materials. They also contaminate food and surfaces with several microorganisms that they acquire due to their association with unhygienic habitats. They also produce allergens which can cause severe reactions in sensitive people.

Life history: American cockroaches are essentially outdoor cockroaches, and are well adapted to survive outdoors in **warm, wet** areas such as under rocks, debris and mulch. However, they will readily infest and reproduce in indoor environments in humid locations. In the southwest, their primary habitats are sewer lines, sewage treatment plants and garbage dumps. They are also common in greenhouses. When outside temperatures get cooler, they move indoors seeking warmth and food. They enter homes and similar structures through sewer lines, gaps in doors and window frames, or cracks in floors and foundations, and once indoors, thrive in warm, moist areas such as kitchens, bathrooms and basements. Therefore, their presence indoors is indicative of pest entryways into a home and poor sanitation.



American cockroach
Photo: Kansas Dept. of Ag. Archive



Brown cockroach
Photo: Caroline Harding,
MAF Plant Health & Env. Lab.



American cockroach egg case
Photo: Eran Finkle

American cockroaches are nocturnal and spend the day hidden in dark, concealed spots, emerging after darkness to feed. These cockroaches do not multiply as fast as German cockroaches, and so large infestations are not as common. The females produce dark reddish-brown or black, purse-shaped egg cases, each with 15-20 eggs, which are carried on the abdomen for 1-2 days and then deposited in or attached to in a warm, concealed spot. Nymphs pass through 10-13 molts before turning into adults. Total life cycle can take from 6 months to 1 ½ years or more depending on availability of favorable conditions.



American cockroach life stages
Photo: John Obermeyer, Purdue University

Common name: Oriental cockroach

Scientific name, classification: *Blatta orientalis*, **Order:** Blattodea, **Family:** Blattellidae.

Distribution: Worldwide.

Description and ID characters: Large, glossy dark brown or black cockroaches, about 1-1 ¼ inch in length. Females are shorter and wider, with wings reduced to stubs, while the males are more elongated and have longer wings, but these do not cover the abdomen fully.

Best identifying feature(s): Glossy, dark brown bodies, sluggish movement. Adult males are elongated and dark reddish brown in color, with short wings that leave about a quarter of the abdomen exposed. The pronotum is uniformly dark reddish brown, and lacks a lighter colored border. Adult females are larger and wider than the males, very dark brown to shiny black in color, with wings reduced to short stubs. Neither males nor females can fly. The males may attempt short clumsy flights occasionally, but not more than a few yards. Nymphs are dark brown or black and wingless. Adults and nymphs are sluggish and do not run or climb well, but only crawl very slowly. They are often trapped in sinks, tubs and toilets because they cannot climb smooth surfaces. Adult males and nymphs may be confused with American cockroach nymphs, but can be distinguished by their uniformly colored pronotum and shorter wings in the adults.

Pest status: Nuisance pest, can spread disease-causing microorganisms.



Oriental cockroach adult female
Photo: Clemson Univ.-USDA



Oriental cockroach adult male
Photo: Ken Schneider

Damage/injury: Occasionally wander indoors, and may feed on human food or other organic matter, but do not cause any major damage due to their sluggish nature. Can potentially be a source of disease-causing microorganisms due to their association with decaying organic matter and garbage.

Life history: Mostly found outdoors in cool, moist areas such as beneath mulch, litter or other organic matter and garbage, and debris that builds up under trailers or gathered around water sources such as outdoor taps or birdbaths and birdfeeders. They will come indoors through wall voids, basement boards and crawlspaces, and also through drains and sewer lines. They feed on any kind of organic matter and are highly dependent on water, being unable to survive without water beyond 12-14 days. In the southwest, they occur more in cooler areas or higher elevations. Females produce egg cases with 16-18 eggs each, and deposit them in a suitable concealed spot. Nymphs hatch and pass through 7 molts before becoming adults. Life cycles can vary in duration from 10 months to 3 years depending on environmental conditions, and average adult lifespan is 5-6 months.



Oriental cockroach, life stages
Photo: Univ. of Nebraska, Dept. of Entomology

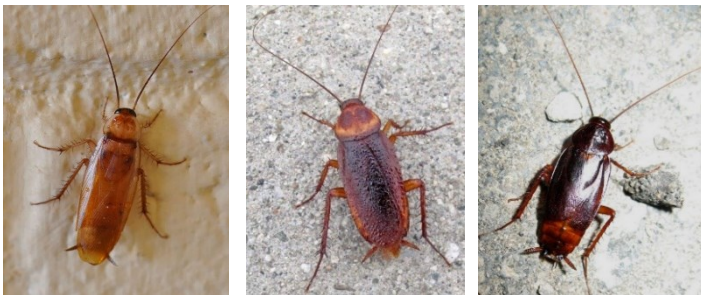
Common name: Turkestan cockroach, rusty red

Scientific name, classification: *Blatta lateralis* (= *Shelfordella lateralis*), **Order:** Blattodea, **Family:** Blattidae.

Distribution: Worldwide

Description and ID characters: Adult males are more commonly seen, they are medium sized, slender cockroaches, about 1 inch in length. Males and females vary greatly in appearance and may not look like the same species.

Best identifying feature(s): Adult males are slender, yellowish-brown in color. They have well developed wings that enable flight and as a result, are more often encountered than females. Adult females are shorter and broader, dark brown to black in color, and wingless. Their wings are reduced to short, wide stubs, with cream-colored markings along the sides. These marks help to distinguish them from Oriental cockroach females, which are also similarly colored dark brown or



Adult male Turkestan (left), Photo: Dave Beaudette;
American (center) and Oriental (right) cockroaches, Photos: Ken Schneider

black and have short wing stubs, lack the cream-colored markings and the wing stubs are also more widely spaced.

Nymphs are yellowish brown initially, and turn darker and reddish brown as they grow.

Pest status: Nuisance pest, invasive species.

Damage/injury: They feed on any kind of organic matter. The males are attracted to lights, and will often come indoors if doors and windows are not well sealed, and can thus serve as indicators of poor weather proofing.

Life history: Turkestan cockroaches are a primarily outdoor species, believed to have been introduced to the U.S. from Central Asia. Turkestan cockroaches thrive inside in-ground, enclosed structures such as water-meter, irrigation valve and electrical boxes, raises of concrete and hollow block walls. They feed on debris and decaying vegetation in their habitat, as well as human or pet food in and around homes and buildings. Birdfeeders are a common and preferred habitat.

On an average, life cycles from egg to adult are completed in 10 -12 months. Females produce 20-25 egg cases in a year, with 14-16 eggs each. Nymphs pass through 5 molts and mature in 8-9 months. Average adult lifespan is 1 ½ years, and females live longer, enabling them to produce more offspring. Turkestan cockroaches are considered as an invasive species in many areas of the southwest. Their shorter life cycle and higher reproductive rate are enabling them to rapidly outcompete the closely related Oriental cockroaches, which are the existing outdoor species.

Common name: Surinam cockroach, greenhouse cockroach

Scientific name, classification: *Pycnoscelus surinamensis*, **Order:** Blattodea, **Family:** Blaberidae.

Distribution: Worldwide.

Description and ID characters: Medium sized, dark-brown to black burrowing cockroaches about 1 inch in length, found in soil or other organic matter. Most individuals are females.



Adult female Turkestan (left) and Oriental (right) cockroaches
Photo: Dong-Hwan Choe, UC Riverside
(From Kim and Rust, 2013 DOI: [dx.doi.org/10.1603/EC13052](https://doi.org/10.1603/EC13052))



Turkestan cockroach nymphs
Photo: Nathaniel Long



Surinam cockroach adult female
Photo: Peter Chew, www.brisbaneinsects.com

Best identifying feature(s): Adult females have a shiny black shield-like pronotum and slightly transparent brown wings that do not cover the abdomen completely. Although the wings are functional, they rarely fly. The legs are equipped with strong spines that enable them to burrow in soil. Males, if present, look similar but have longer wings that completely cover the abdomen.

Nymphs are shiny dark-brown to black and wingless.

Pest status: Nuisance pest, occasional pest of plants, especially indoor plants and those grown in contained environments such as greenhouses.

Damage/injury: Usually found in potting media in indoor plants, more in large plant pots such as those in malls or offices, or among mulch or other debris near outdoor plants that are located close to water sources. Generally do not cause damage. Occasional large populations in greenhouses can cause damage to young plants by burrowing and feeding on roots.

Life history: Commonly found in protected, climate-controlled environments such as greenhouses, and are therefore also called “greenhouse cockroaches”. They burrow into the soil and are often spread when potting soil or media containing them are shipped to different locations. Essentially an outdoor species, they usually occur in warm moist areas in home gardens, lawns, under mulch and compost piles, feeding on any kind of organic matter. They are highly susceptible to water-loss and cannot survive in dry areas. These cockroaches do not thrive long indoors and rarely produce any significant infestation. If found, they are usually associated with indoor potted plants and can be easily removed. Surinam cockroaches exhibit a form of asexual reproduction called parthenogenesis, in which young ones can develop without fertilization and the population consists mostly of females. They are ovoviviparous, meaning that the egg case develops within the female and the nymphs, which also hatch within the female are delivered live. An egg case contains about 30 eggs, and they are produced year-round.

Common name: Sand cockroach, desert cockroach

Scientific name, classification:

Arenivaga spp., **Order:** Blattodea, **Family:** Corydiidae (previously Polyphagidae).

Distribution: Southwest U.S.

Description and ID characters: These cockroaches are found exclusively in dry, desert-like areas all over the southwest US and their genus name, *Arenivaga*, literally means “sand wanderer”.

Best identifying feature(s): Adult males are about $\frac{3}{4}$ inch in length, tan or light brown in color, with well-developed wings that are used for flight. Adult females are slightly over $\frac{1}{2}$ inch in length, wingless, and darker in color, with ovoid bodies. Their legs are equipped with spines for digging into the sand.

Pest status: Occasional nuisance pest.



Desert cockroach males of different species
Photo: Jacob Kalichman

Damage/injury: Not of significance. Males are attracted to light and can come indoors through open doors or windows, but they cannot breed indoors and therefore pose no significant problem.

Life history: Desert cockroaches can thrive in desert landscapes around homes and similar structures. They are nocturnal and hide under sand, gravel, wood piles or mulch during the day, and feed at night.



Desert cockroach female burrowing in sand
Photo: Marshal Hedin



Desert cockroach, female with egg sac
Photo: Kevin Lentz

The females burrow into sand, going deeper as the temperatures increase, and coming back to the surface when they get cooler. Both males and females feed on decaying leaves and roots of desert plants. They are able to obtain water from the plant roots. Some species are also able to extract atmospheric water to sustain themselves.

Sources, further information:

Cockroach allergy <http://www.aafa.org/display.cfm?id=9&sub=22&cont=312>

Cockroaches and management

<http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7467.html>

Cockroach management <http://ag.arizona.edu/urbanipm/buglist/cockroaches.pdf>

Common cockroaches and IPM solutions

http://cals.arizona.edu/urbanipm/pest_press/2005/dec.pdf

German cockroaches

<http://entomology.ifas.ufl.edu/creatures/urban/roaches/german.htm>

Flies belong to the insect order Diptera, the name of which refers to their two visible wings, the other pair being modified into minute structures called “halteres” that help to balance these excellent fliers during flight. This feature of having a single pair of flight wings differentiates most of the true flies from other insects that have the word “fly” as part of their names, such as whiteflies, mayflies, dragonflies, butterflies, etc. Diptera is one of the most diverse insect orders and is considered to be of utmost importance to humans in economic and ecological terms. This is mainly because of the role of many of its members as annoying, biting pests that vector infectious diseases of humans and animals. Of particular significance among these diseases are malaria, yellow fever, West Nile fever, St. Louis encephalitis, dengue, and chikungunya, which are all vectored by mosquitoes. Adults of many other Dipterans are passive vectors of disease causing microorganisms. Many Dipterans are pests of plants and can result in serious crop losses. Some Dipterans however, are beneficial and serve as pollinators of crops, predators and parasitoids of other pest organisms. They are also efficient decomposers of organic matter, and important components of the food chain, serving as food for many groups of vertebrate predators. Many dipterans display excellent camouflage and mimicry, using resemblances to wasps, bees and other aggressive insects to escape predation.

Dipterans are all holometabolous, meaning that they undergo complete metamorphosis and their life cycle includes four distinct stages: egg, larva, pupa and adult. All adult Dipterans feed on liquids or semi-solid food materials. Their mouthparts are variously modified to cut or pierce the host surface and suck up fluids such as blood, or to directly moisten solid food with their saliva and “sponge” it up into their mouths (house flies). The food of larval dipterans usually differs from that of their adults, in most species it includes different kinds of decomposing organic matter. The body of dipterans can be clearly divided into a head, thorax and abdomen, a body plan that is typical of insects. However, the presence of a single pair of wings makes them unique amongst all others.

The order Diptera is divided into two suborders – Brachycera and Nematocera. Brachycerans are characterized by stout, stocky or round bodies, short, stiff antennae, and their larvae called maggots, have no distinct head or appendages. They are terrestrial, and live in different kinds of decomposing organic matter depending on the species. Examples include house flies, flesh flies, horse flies, fruit flies, etc. Nematocerans are characterized by slender, elongated bodies, long, feathery antennae and their larvae are usually aquatic, with heads that can be clearly or at least partially differentiated from their bodies; examples include mosquitoes, midges, gnats, crane flies, etc.

NOTABLE SPECIES – Brachycera

Common name(s): Blow fly, blowfly, carrion fly, bluebottle, greenbottle fly

Scientific name, classification: *Calliphora* spp., **Order:** Diptera, **Family:** Calliphoridae. Other blow flies include those in the genera *Chrysomya*, *Cochliomyia*, *Lucilia* and *Phormia*.

Distribution: Worldwide.

Description and ID characters: Adult blow flies are easy to identify by their shiny, metallic coloration. They are mostly larger than house flies, reaching up to ½ inch in length.

Best identifying features: Metallic blue, green or bronze colored thorax and abdomen, with orange or red eyes.

Pest status: Nuisance pest, can spread disease-causing microbes.

Damage/injury: Mostly feed on carrion or other decaying organic matter. They are attracted to unclean animal fur or skin soaked in urine, blood or feces, and open wounds on animals. The adult females will lay eggs on these surfaces and the emerging maggots feed first on the open flesh, and may later burrow into healthy surrounding flesh. These infested wounds may become secondarily infected with other pathogens, resulting in blood poisoning of the animal. Adult flies are also attracted to feces, and are very common in dog parks, as well as around other animal droppings or manure. Some species are attracted to flowers with strong odors resembling decaying flesh, and may occasionally pollinate them. Adult blow flies can carry and transmit disease-causing microorganisms to humans and animals, and larvae can cause myiasis.

Life history: Duration of the life cycle varies with species, location and environmental conditions, but is highly predictable if the conditions are known. Most species overwinter as larvae or pupae and adults emerge in the spring. After mating, eggs are deposited on a suitable substrate. The maggots are much larger than house fly maggots, about ¾ inch in length and yellowish-gray in color. After pupation for 10-14 days, they emerge as adults and the cycle is repeated.

Common name(s): Cluster fly, attic fly

Scientific name, classification: *Pollenia* spp., **Order:** Diptera, **Family:** Calliphoridae.

Distribution: Worldwide.

Description and ID characters: Cluster flies are blow flies belonging to the genus *Pollenia*. Adults are slightly over ¼ inch long. They are exclusively parasitic on earthworms.

Best identifying features: Thorax is covered with short golden hairs, abdomen has black and gray checkered pattern.

Slightly larger than regular house flies, and move sluggishly.

Pest status: Nuisance pest.

Damage/injury: Cluster flies do not pose any health hazard because they are not attracted to human food, but seek out earthworm burrows to lay eggs. Adults usually feed on debris or other decaying organic matter near the earthworm



Blow fly

Photo: Joseph Berger, Bugwood.org



Cluster fly

Photo: Tristram Brelstaff

burrows. However, they can be a nuisance when they enter houses in large numbers in the fall to hibernate. They often gather in warm, sunny sides of houses and other structures, and gain entry through roof cavities or under tiles and other gaps. Once inside and when the weather warms up, they try to move towards the light and can be found aggregating on windows of less inhabited spaces such as attics, and are therefore called attic flies.

Life history: Adults emerge from hibernation in the spring or early summer and after mating, the females lay eggs in soil near earthworm burrows. The emerging larvae seek out earthworms and live parasitically in their bodies for several days. When they are ready to pupate, they leave the earthworm's body and pupate in the soil. The adults emerge in about 2 weeks, and soon they are ready to seek out new earthworm burrows to lay eggs and repeat the life cycle, which typically takes 30-40 days.

Common name(s): Flesh fly

Scientific name, classification:

Sarcophaga spp., **Order:** Diptera,

Family: Sarcophagidae. Other flesh flies include those in the genera *Craticulina*, *Sarcophila* and *Wohlfahrtia*.

Distribution: Worldwide.

Description and ID characters:

Adult flesh flies are often mistaken for houseflies due to their color, habits and habitats, but most species are much larger than house flies, reaching up to ½ inch in length.

Best identifying features: Adults have three dark stripes that run lengthwise on the thorax and abdomen has a gray checkered pattern, often with a red tip.

Pest status: Nuisance pest, can spread disease-causing microbes.

Damage/injury: Majority of flesh flies are scavengers, feeding and breeding in carcasses of various other organisms. They also thrive in decaying vegetable matter and excrement, and can be found around compost pits and poorly maintained toilets and pet waste. Occasionally they may infest open wounds on animals, however they do not bite as they have sponging type mouthparts. Although flesh flies are known to carry leprosy bacteria, they are not regarded as much of a concern as house flies in being disease carriers. Accidental consumption of larvae has been reported to cause myiasis (infection of living tissue by fly larvae) in animals and humans.

Life history: Duration of the life cycle varies with species, location and environmental conditions. Most species overwinter as pupae and emerge in the spring. After mating, the eggs hatch within the body of the female (**ovoviviparous**) and this makes flesh flies different from most other flies. The newly hatched maggots are deposited on a suitable substrate, where they will feed for 3-4 days. The maggots are much larger than house fly maggots, reaching slightly



Flesh fly

Photo: Susan Ellis, Bugwood.org

over $\frac{3}{4}$ inch in length and are yellow in color. After pupation for 10-14 days, they emerge as adults and the cycle is repeated.

Common name(s): Horse fly, deer fly, kleg, clegg, gad fly

Scientific name, classification:

Tabanus spp., **Order:** Diptera, **Family:** Tabanidae. *Tabanus* species found in the southwest include *T. atratus*, *T. punctifer*, *T. lineola* and *T. vivax*. Other horse flies include those in the genera *Apatolestes*, *Chrysops*, *Esenbeckia*, *Haematopota*, *Hybomitra* and *Silvius*.

Distribution: Worldwide.

Description and ID characters:

Adults are medium to large-sized flies, measuring from $\frac{3}{4}$ to $1\frac{1}{4}$ inches in length. Extremely swift and nimble fliers, making them very difficult to swat even during feeding.

Best identifying features: Large size, with large and often brilliantly colored and patterned eyes that meet on the top of the head and extend sideways. Wings may be clear or solidly colored.

Horse flies in the genus *Chrysops* are called deer flies. They are usually

smaller than other horse flies, and have patterned eyes and dark patches across their wings.

Pest status: Nuisance and biting pest, can spread disease-causing microbes.

Damage/injury: Only female stable flies feed on blood, but both sexes can cause annoyance outdoors. Female horse flies cut open the skin of their hosts with their sharp mouthparts and feed on the blood flowing from the wound, and this is very painful. Some people can develop sensitive reactions to the bites, and scratching may lead to secondary infections. Large populations of flies can cause significant irritation and injury to livestock and humans. They are a hindrance to grazing, and blood loss from bites can adversely affect milk production in dairy animals, and anemia in severe cases.

Horse flies can carry and spread several disease-causing bacteria, viruses, trypanosomid parasites and worms by virtue of their blood-sucking habits and the habitats they frequent. They are often disturbed during feeding, requiring them to visit multiple hosts to obtain a full meal and this increases the chances of spreading pathogens. Diseases reported to be vectored by horse flies include equine infectious anemia, anthrax, and tularemia.

Life history: Fly populations and their intensity of attack vary from year to year, and even between seasons. Most species overwinter as larvae, pupate in the spring and adults emerge during early summer. Horse flies are usually active during the



Black horse fly

Photo: Johnny N. Dell, Bugwood.org



Deer fly

Photo: Johnny N. Dell, Bugwood.org

day and the females locate their animal hosts using body temperature and carbon dioxide as cues. Male horse flies feed on pollen and nectar, and are not of any major concern. When they are ready to mate, male and female flies swarm in wooded areas or atop a hill. Later, after obtaining a full blood meal for their eggs to develop, the females lay eggs on vegetation, tree stumps, rocks or other objects near water. The larvae on hatching, fall into the water or the moist soil near its edge and lead an aquatic or semi-aquatic life. They feed aggressively on organic debris and other small organisms in or near the water. As they near pupation, the larvae move to drier spots, pupate and emerge as adults. Adult horse flies live for 30-60 days, but the larval stage lasts from 1-3 years, depending on the species and circumstances.

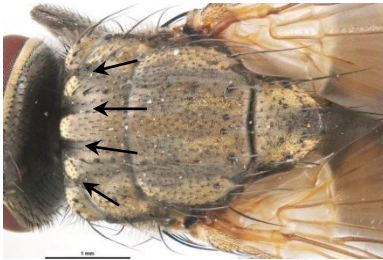
Common name(s): House fly
Scientific name, classification: *Musca domestica*, **Order:** Diptera, **Family:** Muscidae
Distribution: Worldwide.

Description and ID characters: Adults are small flies, about 1/4 inch in length, and dark grey in color. The entire body is covered with bristle-like hairs. Females are slightly larger than males, and have wider-spaced eyes.

Best identifying features: Adults have dark red eyes, four dark stripes that run lengthwise on the thorax and light gray-tan colored abdomen. Rest with body almost parallel to the surface.



House fly
Photo: James K. Lindsey



House fly thorax showing four stripes
Photo: Pest and Disease Image Library,
Bugwood.org



House fly lateral view showing abdomen
Photo: Pest and Disease Image Library,
Bugwood.org

Pest status: Common nuisance pest, spreads disease-causing microbes.

Damage/injury: The most common domestic fly, found in large numbers near any kind of decaying organic matter, especially during summer months. They do not bite or sting because their mouthparts are adapted for sponging up food that is moistened and diluted by their saliva. However, they can be extremely annoying, when flying into homes and settling on food and other surfaces. The awareness that houseflies can carry disease organisms makes their presence unacceptable. House flies are known as transmitters of several microorganisms including those causing diarrhea, dysentery, typhoid, food poisoning, cholera, and eye infections.

They mechanically carry these pathogens on their body surfaces and hair, as well as within their digestive tracts, expelling them through saliva, vomit and feces.

Life history: House flies have extremely short life-cycles, and large populations can develop within short periods of time under favorable conditions. Development is accelerated at higher temperatures, with the entire life cycle from egg to adult taking about 15 days at 27-30°C. Eggs are laid in any decomposing organic matter and hatch in 1-2 days. Larvae (maggots) are pale-white or cream colored and slightly over ¼ inch in length. They live and feed on the decomposing matter and seek drier spots nearing pupation. The larval stage takes 3-4 days, and pupation up to 7 days. Adult houseflies live for an average 15-30 days in the open.



House fly life stages

Photo: Clemson Univ. Coop. Extn.-USDA

Sometimes, smaller sized house flies may be found in and around homes and other structures. These may be naturally smaller-sized adults that were poorly nourished during their larval stage, or adults of the **little house fly** (*Fannia canicularis*), a similar household species. Little house flies are more common during cooler months and their numbers diminish as the temperatures rise during summer. They can be distinguished from common house flies by the lack of distinct stripes on the thorax, in addition to their smaller size. Little house flies do not enter indoors as frequently as common house flies, but prefer outdoor areas close to homes such as patios, porches and garages. They often hover at face height, causing great annoyance during outdoor activities near homes. They are not regarded as significant carriers of human pathogens.



Little house fly

Photo: Pest and Disease Image Library, Bugwood.org

Common name(s): Stable fly, biting house fly, dog fly, barn fly

Scientific name, classification: *Stomoxys calcitrans*, **Order:** Diptera, **Family:** Muscidae

Distribution: Worldwide.

Description and ID characters: Adults greatly resemble house flies, but are much more robust and aggressive. They are smaller than house flies (slightly below ¼



Stable fly

Photo: David Gould, Naturespot.org.uk

inch in length), and have a slightly wider, spotted abdomen.

Best identifying features: Resemblance to house flies, with four dark stripes on the thorax, but are lighter colored, have a wider abdomen with spotted pattern (not checkered), bayonet-like mouthpart (proboscis) protruding from the front of the head. Rest at an angle to the surface, with head raised above abdomen.

Pest status: Nuisance biting pest, spreads disease-causing microbes.

Damage/injury: Both male and female stable flies feed on blood, and their bites are known to be painful and irritating. They are most abundant in locations close to stables, as their name suggests, or where horses or cattle are maintained, and will also attack dogs and other domestic animals in these locations. They prefer to feed on the legs and lower body in cattle, horses and humans, but in dogs and smaller animals, they feed on the external ears. They can feed continuously for about 5 minutes to get fully engorged with blood, and then fly away to rest and digest their blood meal in a suitable nearby spot in surrounding vegetation or structures. Stable flies usually need one or two blood meals a day and are most active during mid-day. Although they are blood feeders, stable flies are not a significant cause of concern as carriers of disease-causing pathogens. However, they are known to carry and spread several of these microorganisms, including certain trypanosomid parasites, and bacteria causing anthrax, Lyme disease and bartonella.

Life history: Duration of the life cycle is highly influenced by temperature and larval nutrition. Stable flies overwinter as larvae or pupae, but in warmer locations, they can be active year-round. At temperatures around 27°C, the life cycle takes about three weeks. The eggs are laid among moist, decaying organic materials such as hay, silage or manure and hatch in 1-3 days. Emerging maggots immediately start feeding on the substrate and continue feeding till pupation. As they approach pupation, they move to drier areas. Adults emerge about a week after pupation. Adults are aggressive and actively seek hosts for a blood meal, often flying long distances. The female requires a full blood meal to lay eggs, but they often get disturbed during feeding and as a result, will make several bites to get a full meal.



Stable fly, showing resting posture
Photo: Whitney Cranshaw, Bugwood.org



Comparison of stable fly (left) with house fly (right)
Photo: Jim Kalisch, UNL Entomology

The following table provides useful points for quick comparison between stable flies and house flies.

House flies	Stable flies
Do not bite	Give painful bites
Sponging mouthparts, tucked beneath head when not in use	Bayonet-like mouthpart, projects out in front of the head, even when not in use
Rest on any surface, but prefer higher points on walls, rafters, hanging cables or wires.	Rest mostly within 3 feet of the ground
Rest with bodies parallel to the surface	Rest with heads raised higher than abdomens
Leave brown, gray, or pale yellow spots of feces	Leave black fecal spots containing digested blood
Attracted to a wide range of food material, including garbage, manure, decaying organic materials and human food	Feed only on blood, and attack legs of the hosts.
Oviposition and larval development sites vary with availability of suitable substrates, and will utilize fresh or old manure	Oviposition is restricted to 2-3 week old, aged manure, compost piles, decomposed, moist grass clippings or hay soaked in livestock urine or feces.
Life cycle can be as short as 7-10 days	Life cycle takes 3-4 weeks

Common name(s): Phorid fly, humpbacked fly, scuttle fly, coffin fly

Scientific name, classification: *Megaselia* spp. (*M. scalaris* is a cosmopolitan species),

Order: Diptera, **Family:** Phoridae. Other phorid flies include those in the genera *Apatolestes*, *Conicera*, *Phora* and *Pseudacteon*.

Distribution: Worldwide.

Description and ID characters: Adults are small flies, about $\frac{1}{16}$ th to $\frac{1}{8}$ th inch in length, yellowish-brown to gray in color, with dark eyes. They are often found in many of the same locations as vinegar flies, and therefore are easy to be mistaken for them. However, when disturbed, phorid flies can be seen scuttling across surfaces in short, jerky movements (because of which they are sometimes called scuttle flies) rather than flying, and this can help to distinguish them from other flies.

Best identifying features: Humpbacked appearance from the prominent hump on the thorax when viewed from the side, small head that tapers towards the front,



Phorid fly

Photo: Charles Schurch Lewallen

dark eyes (as opposed to larger head and red eyes in vinegar flies), visibly expanded, laterally flattened femora on hind legs.

Pest status: Nuisance pest, can potentially spread disease-causing microorganisms.

Damage/injury: Readily feed on a wide variety of decaying organic material, and therefore can be found in more locations in a home or building than vinegar flies.

They are seen frequently near drains with a deposit of rich, moist organic matter lining the insides, and are therefore sometimes called drain flies. They thrive in the decaying material and large populations can build up in a short time. The adult flies can be a nuisance when they aggregate around food sources, and can potentially carry and spread disease-causing microbes when they move from one source to the other. Phorid flies can become serious problems in improperly maintained food service areas. They are also causes of concern in health care facilities, where they aggregate near eyes and open wounds on humans. They are greatly attracted to carrion, and seek out human burial sites to lay eggs. They can actually dig into the ground to enter buried coffins due to their small size (unlike other larger carrion-seeking flies) and their larvae can remain active inside coffins for long periods of time, because of which they are also called coffin flies.

Phorid flies in the genus *Pseudacteon* are known to parasitize fire ants, and might therefore be an important component of fire ant biological control.

Life history: At normal room temperatures around 80°F, the life cycle can be completed in about 3 weeks. Eggs are laid in decaying matter in any suitable site, and the larvae are thus assured of a constant food supply. A preferred substrate is the organic matter lining the insides of drains. Larvae are tiny, pale white maggots that feed voraciously on their decaying substrate, including the microbes it contains. Full grown larvae move to drier spots to pupate. Pupae are also tiny, and turn dark brown as they are ready to emerge as adults. Male flies emerge earlier than females, which gives them time to mature by the time the females emerge and are ready to mate. Both males and females are very active and are often found far from breeding sites. Outdoor populations build up in the summer and drop to low levels in colder months, but the flies can be active year-round indoors if habitats are available.

Common name(s): Vinegar fly, fruit fly, small fruit fly, pomace fly

Scientific name, classification: *Drosophila melanogaster*, **Order:** Diptera, **Family:** Drosophilidae (not to be confused with fruit flies, Family Tephritidae, many of which are economic pests of fruit and vegetable crops).

Distribution: Worldwide.

Description and ID characters: Adults are tiny flies, about $1/16^{\text{th}}$ inch in length, yellowish-brown or tan in color, with transverse dark bands around the abdomen. Males are slightly smaller and have a distinct dark patch at the end of the abdomen. Eye color can vary, but red is common.



Vinegar fly
Photo: Joseph Berger, Bugwood.org

Best identifying features: Tiny body, bright red eyes, and presence near fruit, vegetables or fermenting foods.

Pest status: Nuisance pest, can potentially spread disease-causing microorganisms.

Damage/injury: Adults are always found in and around fruit, vegetables, or any other sugary or fermenting organic material. They lay eggs in these materials, and the larvae live and feed in them, leading to rotting, secondary infection by fungi and bacteria, and further decay.

Life history: Life cycle is usually completed in about 7 days around 82°F, and adults can live for approximately one month at this temperature. After mating, eggs are deposited on a suitable substrate, preferably ripe fruit. Larvae are pale white in color and about 1/8th inch in length. They feed on microorganisms, as well as the sugars and starches in the decaying matter into which they hatched, and continue feeding till pupation, also in the same location. Pupae are also tiny, about 1/8th inch in length, cream in color when formed, but turn dark brown as they are ready to emerge as adults. Vinegar flies can be active year-round indoors if suitable habitats are available.

Common name(s): Hoverflies, flower flies, syrphid flies

Scientific name, classification: Multiple species, **Order:** Diptera, **Family:** Syrphidae.

Distribution: Worldwide.

Description and ID characters: Adult flies vary widely in size, shape and colors, most are medium sized. Often resemble bees and wasps, which serves to ward off predators.

Best identifying features: Single pair of wings, short, stiff antennae, elongated body without a waist, hovering flight, sometimes stopping in mid-air, (as opposed to two pairs of wings, longer antennae, 'wasp waist' in the middle of the body, and strong yet smooth flight of wasps).

Pest status: Non-pest. Beneficial.

Can generate some concern due to resemblance to wasps and bees, but can be easily distinguished by a closer observations.

Damage/injury: Syrphid flies are some of the most beneficial species of flies. Adults of most species are pollinators, while the larvae are decomposers, or predatory, feeding on aphids, thrips and other small insects that damage plants, thus providing biological control of pests. They do not sting or bite.

There are very few species that lay eggs on plants and their larvae feed on plant parts.



Syrphid fly

Photo: Joseph Berger, Bugwood.org



Syrphid larva attacking aphids

Photo: David Cappaert, Bugwood.org

NOTABLE SPECIES – Nematocera

Common name(s): Black fly, turkey gnat, buffalo gnat

Scientific name, classification: *Simulium* spp., **Order:** Diptera, **Family:** Simuliidae.

Distribution: Worldwide.

Description and ID characters: Adults are small but robust, black, dark brown or dark gray colored flies, ¼ to ½ inch in length, with short legs and antennae.

Best identifying features: Short, stocky body, shiny thorax that has a humped or arched appearance.

Pest status: Nuisance and biting pest, vectors disease-causing microorganisms.

Damage/injury: Females of most black fly species feed on mammal blood, although some feed on birds and other smaller vertebrates. The males feed on pollen and nectar and are not a biting concern. However, both sexes cause great annoyance during outdoor activities especially near streams and rivers when they swarm around people's faces, getting into their noses, eyes and hair.

Females feed during the day, and can give painful bites as they feed. They pierce into, cut open the skin and inject their saliva which contains anticoagulants into the wound, so that the blood pools without clotting and they can feed easily. The saliva also numbs the spot temporarily so that the host does not feel the bite initially, but later the bites turn itchy and scratching can lead to secondary infections as well as allergic reactions. Intense feeding on livestock can lead to severe irritation and may affect milk production.

Black flies are known to transmit the river blindness parasite, a nematode (*Onchocera volvulus*) in parts of Africa, Central and South America. They can potentially carry and transmit other pathogens due to their blood feeding habits.

Life history: Black flies can have single or multiple generations in a year depending on the species. Mature adults can fly long distances from their breeding spots, to swarm and mate. The females lay their eggs in an unpolluted water source that has moving or flowing water and a high oxygen content. Ponds or lakes, with stagnant water are not suitable for black fly development. Immediately after hatching, the larvae attach themselves to stones, water plants or other debris under water using hook like structures on their abdomen. They can move about in the water using silk threads. The larvae are about ½ inch in length and dark brown or black in color. They feed on passing debris or other small organisms using foldable fan-like filters



Black fly adult feeding from human arm
Photo: Jarmo Holopainen



Black fly larvae
Photo: Toby Hudson

around their mouth. Pupation also takes place under water, attached to a stationary object. Adults emerge from the pupae and fly out of the water. The length of the life cycle can vary greatly depending on the species, and ranges from about 3 weeks to 3 months or more.

Common name(s): Crane fly, daddy-long-legs

Scientific name, classification: *Tipula* spp., **Order:** Diptera, **Family:** Tipulidae.

Distribution: Worldwide.

Description and ID characters: Adults are large but slender, delicate flies, 1 – 1 ½ inches in length, with long slender legs and clear, solid colored or patterned wings. Body colors vary with species, *Tipula* spp. are mostly shades of brown in color.

Best identifying features: Giant-mosquito-like appearance, slow and clumsy movements, slender delicate legs and wings fall off at the slightest touch.

Pest status: Harmless to humans and animals, larvae of most species are

beneficial decomposers, some are occasional plant pests, often mistaken for giant mosquitoes.

Damage/injury: They do not bite or carry diseases. Large numbers of adults can be annoying in rare situations. Larvae of some species can occasionally damage turf and other plants by feeding on roots and near-ground parts.

Life history: Adults are short-lived, mostly living only for 1-2 weeks. They rarely, or do not, feed, but all energies are spent on mating and egg laying. They are attracted to lights, and may be seen indoors occasionally. Mating takes place when the adults are active at night, or in cool, dark spots during the day. Eggs are laid in various kinds of habitats, ranging from dry soil to water bodies, and as a result larvae are also observed in all these different habitats. Crane fly larvae are large (some measure up to 2 inches in length), and feed on different kinds of organic matter and smaller organisms available in their surroundings. They also serve as an attractive food source for larger predators such as birds, reptiles, and even larger insects. Some develop a tough outer cuticle and are called “leatherjackets”. Pupation takes place in the soil, or within the larval habitat, but the pupae can move towards the surface for the adults to emerge and fly away.



Crane flies mating
Photo: Richard Avery

Common name(s): Drain fly, moth fly, sewage fly, drain gnat

Scientific name, classification: *Clogmia* spp., *Psychoda* spp., *Telmatoctopus* spp.,

Order: Diptera, **Family:** Psychodidae.

Distribution: Worldwide.

Description and ID characters: Adults are tiny flies, about 1/8th inch in length, dark-grayish brown in color, with long feathery antennae and furry, leaf-shaped wings covered with soft hairs. These hairs leave a powdery residue if the fly is crushed. Wing veins run parallel to the length of the wing, and this is unique to the family. Adult flies can fly, but weakly and for short distances.

Best identifying features: Small size, short, hairy body, miniature moth-like appearance, resting with wings held over their backs in a roof-like manner, presence near drains or sinks. Movement is mostly in short, hopping flights.

Pest status: Nuisance pest, can potentially spread pathogenic microorganisms.

Damage/injury: Adults are usually nocturnal and found in damp environments in homes and other structures that contain organic debris such as bathroom and kitchen sink drains, showers, laundry and floor drains. They may also be found outdoors, near storm drains, sewer sump pits, or other moist decaying organic matter. The adult flies are attracted to odors from the organic matter lining drains and will lay eggs in it. Their larvae live and feed in this layer of organic matter. Moth flies do not bite, but can be exposed to several disease-causing microorganisms in the habitats they occupy, and can carry these to other surfaces. They can also fall into food if present in large numbers and their hairs can trigger allergic reactions in sensitive people.

Life history: Life cycle is usually completed in about 20 days in indoor environments where conditions are uniform. After mating, eggs are deposited on a suitable moist, organic substrate. Larvae are semi-aquatic and have a distinct head, and a siphon on the other end, which helps them to breathe in the moist environment. Mature larvae nearing pupation measure about ¼ inch in length. Pupation is in the same location as the larvae.

Common name(s): Sand fly

Scientific name, classification: *Lutzomyia* spp., **Order:** Diptera, **Family:** Psychodidae.

(The term “sand fly” or “sandfly” may also refer to flies from several other Dipteran families such as Ceratopogonidae, Simuliidae and Tabanidae, in different parts of the world).

Distribution: Worldwide.

Description and ID characters: Adults are tiny delicate flies, about 1/8th inch in length, with hairy, yellowish brown bodies, slender legs, wings and antennae. Males have a pair of prominent claspers at the tip of their abdomen that they use in mating.

Adults fly very slowly and weakly, they mostly move in short hops for short distances.



Moth fly/drain fly
Photo: Sanjay Acharya



Sand fly
Photo: Ray Wilson, Liverpool School of Tropical Medicine

Best identifying features: Delicate mosquito-like appearance, but usually smaller than mosquitoes, wings held erect on the thorax, conspicuous black eyes. Movement is mostly in short, hopping flights.

Pest status: Nuisance and biting pest, vectors pathogenic microorganisms.

Damage/injury: Females are blood suckers, and are active at night. Like most other bloodsucking flies, they inject anticoagulants to prevent blood clotting and ensure easy feeding. The flies and their bites often escape notice due to their small size, but the bites develop irritation several hours or days later. Male sand flies feed on plant sap or nectar and are of no biting concern. Both sexes can be a nuisance when they fly about at night.

Sand flies primarily vector leishmaniasis, which is caused by a protozoan parasite *Leishmania*. The parasite is picked up by sand flies feeding on other mammalian hosts such as rodents and bats, and transmitted when the flies bite humans. Leishmaniasis is not reported as a major problem among humans in the U.S. However, it is an emerging problem among domestic dogs and cats, which can serve as reservoirs of the parasite, with multiple cases reported in south-central Texas. Sand flies are also potential vectors other arboviruses (arthropod-borne viruses).

Life history: Eggs are laid in a suitable dark, moist habitat such as tree-hollows, etc. Larvae are pale white, with a black head capsule and a pair of long dark bristles at the tail end. Pupation is in the same location as the larval stage, but in a drier spot. Adults are ready to mate in a day after emergence. Males emerge earlier than females.

Common name(s): Fungus gnat

Scientific name, classification: Different genera, **Order:** Diptera, **Family:** Different families. Common species in the southwest include *Bradysia* spp., *Sciara* spp. (family Sciaridae); *Orfelia* spp. and *Mycetophila* spp. (family Mycetophilidae).

Distribution: Worldwide.

Description and ID characters: The term ‘fungus gnat’ may refer to any of several tiny, dark-colored flies that are commonly seen hovering near moist soil or potting media at the base of plants, as well as many other similar sources of decaying organic matter that support fungal growth. Most species are $\frac{1}{16}$ th to $\frac{1}{8}$ th inch in length and resemble mosquitoes. Wings may be clear or pale gray, females of some species are wingless.

Best identifying features: Tiny, dark-colored, delicate body that can be crushed by the gentlest touch, long antennae often longer than the body and slender legs. Often found by gently shaking or tapping indoor potted plants. Those that fly weakly off the plants are most likely to be sciarids, others mostly walk around moist soil around plants, foliage or other surfaces. Attracted to light. Some species of the family Mycetophilidae are bioluminescent and glow in the dark.



Adult fungus gnat
Photo: David Cappaert, Bugwood.org

Pest status: Nuisance pest, larvae can damage plant roots and spread plant pathogens.

Damage/injury: Fungus gnats do not bite, but cause annoyance when they hover around indoor plants and other substrates and may fly into the faces, eyes and noses of humans. The larvae can cause damage to roots of potted plants and some species also mine into above ground parts of the plants. Fungus gnats are pests of concern in greenhouses and other controlled environments such as



Fungus gnat larvae among grass roots
Photo: Whitney Cranshaw, Bugwood.org

mushroom houses and can cause significant damage to plants resulting in yield losses. They can spread plant pathogens as they move from between plants.

Life history: Overlapping generations can occur in a year, but naturally existing populations of adults emerge during late winter and spring under cooler temperatures. They can be active year-round if suitable conditions exist indoors. Eggs are laid in moist soil or other media and the larvae hatch in a week. The larvae appear in thousands in infested soil. They are legless, translucent dirty-gray in color with a shiny black head. They feed voraciously on fungi and other debris in their surroundings and leave slime trails as they move about. Pupation takes place in the same surroundings. Adults are short-lived, and survive at most for 7-10 days during which they rarely feed. A typical life cycle in indoor conditions is completed in 14-20 days.

Common name(s): Midge, non-biting midges, midges, chironomids

Scientific name, classification: *Chironomus* spp., Order: Diptera, Family: Chironomidae.

Distribution: Worldwide.

Description and ID characters: Adults are slender, delicate flies slightly over ¼ inch in length, with long slender legs.

Best identifying features: Delicate, mosquito-like body, males have prominent feathery antennae.

Pest status: Mostly harmless.

Damage/injury: They cause no damage or injury, but are in fact beneficial in many ways. Large numbers of adults can be annoying in certain situations, and can stain surfaces with droppings. Adults are short-lived, and large accumulations of adult dead bodies can trigger allergic reactions in some people.

Life history: Adults are extremely short-lived and survive at most for a week, during which they feed sparingly and concentrate on mating and egg laying. Mating takes place in mating swarms near aquatic or semi-aquatic habitats. Eggs are laid in gelatinous masses in almost any kind of habitat close to or containing water,



Non-biting midge
Photo: ©Entomart

including river banks, tree holes, rotting organic debris, and even garbage. The larvae are important components of the ecosystem in semi-aquatic habitats including polluted or degraded habitats, because they are adapted to live in low-oxygen environments. Larvae of many species are called 'bloodworms' because they possess a bright red pigment similar to hemoglobin, which helps them to capture minute amounts of oxygen from such anoxic environments.



Bloodworm (chironomid larva)
Photo: Amada44, Wikimedia Commons

Common name(s): Mosquito

Scientific name, classification: Different species, **Order:** Diptera, **Family:** Culicidae.

Distribution: Worldwide.

Please refer section on public health pests for detailed description.

Common name(s): No-see-um, punky, midgie, biting midge, sand fly

Scientific name, classification: *Culicoides* spp., **Order:** Diptera, **Family:** Ceratopogonidae.

Distribution: Worldwide.

Description and ID characters: Adults are small but robust, dark flies, $\frac{1}{8}$ th to $\frac{1}{4}$ inch in length, with short legs and feathery antennae.

Best identifying features: Short, stocky body, shiny thorax that has a humped or arched appearance, feathery antennae.

Pest status: Nuisance and biting pest, can potentially vector pathogenic microorganisms because of blood-feeding habits.

Damage/injury: Females of most species feed on blood from various hosts, although exclusively parasitic, predatory and nectar-feeding species exist. Males feed on pollen and nectar and are not a biting concern, but the females can cause painful and irritating bites, that may be accompanied by allergic reactions. The flies are active during dawn or dusk, and often go unnoticed owing to their small size. Both sexes cause great annoyance during outdoor activities, in almost any habitat near water sources such as river banks, beaches, and swamps, but they are reported from plains and mountain areas also.

Many of the blood-feeding species vector pathogenic bacteria, viruses, protozoa and filarial worms. Bites from *Culicoides* spp. are known to cause an allergic reaction known as 'sweet itch' in horses.

Life history: Eggs are laid in dark, damp locations with rich organic matter such as tree hollows, under bark, rotten wood, edges of ponds and lakes, etc. Larvae lead a semi-aquatic life in the moist environment, and cannot survive total lack of moisture or more than 2-3 inches of water, but pupate in drier spots. Duration of each stage and the total life cycle varies widely with the species and environmental conditions.



Biting midge/no-see-um
Photo: Mike Gordon

Sources, further information:

Filth breeding flies: identification and management

<http://nmapestworld.org/events/documents/HARLANFilthFliesIdContrSugstnsDubai.pdf>

Flies and management

<http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7457.html>

Fly management <http://ag.arizona.edu/urbanipm/buglist/flies.pdf>

Fly management

https://pested.unl.edu/c/document_library/get_file?uuid=c38034aa-d485-4f5b-9e8d-ad01c85d2cd9&groupId=4093510

Fly management handbook

<http://www.ct.gov/caes/lib/caes/documents/publications/bulletins/b1013.pdf>

Nuisance non-biting flies <http://edis.ifas.ufl.edu/ig091>

OTHER MINOR HOUSEHOLD PESTS

Common name(s): Booklouse, barklouse, psocid

Scientific name, classification: *Liposcelis* spp. is a common species, **Order:** Psocoptera, **Family:** Liposcelidae.

Distribution: Worldwide.

Description and ID characters: Psocids are tiny, delicate, soft-bodied insects, mostly $\frac{1}{16}$ th to $\frac{1}{8}$ th inch in length. Some species are wingless, and some can spin silk from glands in their mouth.

Best identifying features: Booklice: tiny, delicate, almost translucent, swollen forehead, large compound eyes, and long slender antennae and legs. Barklice: darker, wings with dark bands or spots, swollen forehead, long slender antennae and legs, humped appearance.

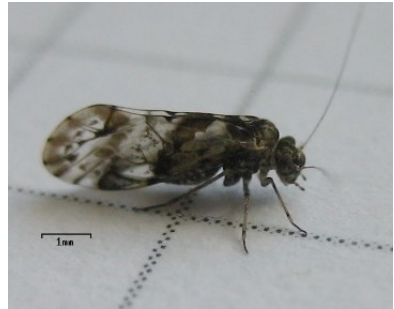
Pest status: Occasional nuisance pest.

Damage/injury: Psocids are not of any major concern. They do not bite, sting or carry diseases, but are typically scavengers. Outdoor species feed on fungi, algae, lichen and other organic detritus often found on tree bark. Indoors, they feed on mold, mildew, and other dry, starchy materials such as cereal, cardboard, books and papers, and glue used in binding. Occasionally, populations can build up in undisturbed corners of bookshelves and closets in high-humidity environments, but damage is rarely significant.

Life history: Most species lay eggs, but some are known to be viviparous, giving birth to live young. Some wingless species can be mistaken for bed bug nymphs owing to their translucent appearance.



Booklouse
Photo: Stephen Luk



Barklouse
Photo: Magnus Manske

Common name(s): Caddisfly, sedge fly, rail fly

Scientific name, classification: Different genera, **Order:** Trichoptera, **Family:** Different families. *Brachycentrus americanus* and *B. occidentalis* are common southwestern species, family Brachycentridae.

Distribution: Worldwide

Description and ID characters: Small, moth-like insects about $\frac{1}{2}$ - $\frac{3}{4}$ inch in length, appearing in large numbers at certain times of the year in locations near water sources such as streams, pools and canals. Their wings are



Caddisfly larva in its case
Photo: Devon Buchanan

covered with fine hairs, similar to the scales in moths and butterflies, to which they are closely related. Caddisflies are aquatic for a major part of their lives, the eggs, larvae and pupae being found in water. Larvae are elongated and worm-like, some species stay hidden within special cases or nets that they build around themselves. Some species are free-living as larvae, but will build a pupal case close to pupation.

Best identifying features: Delicate, moth-like appearance of adults, two pairs of hairy membranous wings usually shades of gray, brown or white, and long, slender antennae. Larvae can be identified by their cases.

Pest status: Non-pest. Serve as indicators of water quality because they prefer clean water. Can be a nuisance in locations near water bodies, when the adults emerge in large numbers.

Damage/injury: None.

Life history: Eggs are laid in a gelatinous mass on or below the water surface in a clean, well-aerated water body. Eggs hatch into larvae, which construct distinctive cases or nets around themselves using silk produced from their salivary glands, and various materials available in their

aquatic habitat such as bits of rocks, gravel, pieces of plant matter and other debris. Cases are portable and the larvae can move around along with them, while nets are constructed between aquatic vegetation and are used to trap food materials as well as for harborage. The larval stage lasts for up to 10 months, during which the larvae feed on algae and other small organisms, plants and debris. Pupation is triggered when water temperatures drop, and pupation takes place within cases similar to the larval cases. Emergence of adults is usually synchronized to enable quick location of mates. These mass emergences of the adults are known as “hatches” and occur from May to September. The adults live for a maximum of 2 weeks, during which they are most active at dawn or dusk will mate and the females will lay eggs in the water before dying.



Caddisfly adult
Photo: James K. Lindsey

Crickets. The term ‘cricket’ may include insects belonging to several families under the order Orthoptera. Crickets are well known for their characteristic “chirps” that they use for communication within their species, and these sounds can be annoyingly loud especially if produced in close proximity. They are mostly nocturnal in habit and are omnivorous, feeding on a wide variety of materials using their chewing mouthparts. Crickets are not harmful to humans, and are sometimes kept as pets. They are commercially reared as food for other pet animals and birds.

NOTABLE SPECIES

Common name(s): Indian house cricket, decorated cricket

Scientific name, classification: *Gryllobates suppleans*, **Order:** Orthoptera, **Family:** Gryllidae

Distribution: Worldwide.

Description and ID characters: Small to medium sized wingless crickets, about 1 inch long when mature. They are light yellowish brown or tan in color, and mottled with darker bands and spots, which give them their other common name “Decorated cricket”.

The wings appear as short stubs in females, while in males they cover only half the abdomen and are used solely for stridulation (chirping). Females have a very long and prominent ovipositor, while males have only cerci.

Best identifying features: Reduced wings that cannot be used for flight even in adults (see picture, the adult female has prominent ovipositor, but no wings), flattened body, long antennae, often longer than body. Piles of black fecal pellets can build up around their favored locations, such as around building foundations, near external door mats or articles stored against building walls.

Pest status: Common nuisance pest.

Damage/injury: Adults and nymphs often gather around foundations and doorways and readily come indoors through cracks or openings. Once indoors, they typically hide during the day and come out at night to feed. They feed on a wide range of food sources including table scraps, pet food, plant debris, fabrics and even drywall, when their numbers are very high. They also seek water and can be found pet water bowls regularly. Fabrics are damaged by the crickets pulling or picking the fibers loose, leaving the surface rough and uneven. Occasionally, they may damage young garden plants outdoors.

Life history: They are often found associated with human dwellings, and they are the only type of cricket that live and produce young indoors.

Common name(s): House cricket, European house cricket

Scientific name, classification: *Acheta domestica*, **Order:** Orthoptera, **Family:** Gryllidae

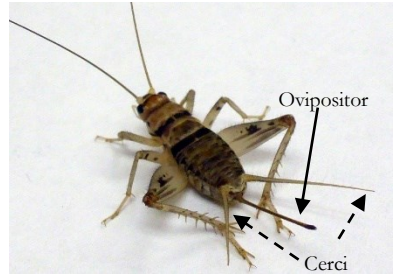
Distribution: Worldwide.

Description and ID characters:

Adults measure up to 1 inch in length and are yellowish-brown in color.

Both males and females have short forewings. Hind wings are long and cover the abdomen in the newly emerged adults, but these may be shed later. Females have a prominent ovipositor, and their cerci are also more prominent than in the males.

Best identifying features: Lighter color than field crickets, three dark transverse bands on the head (a horse-shoe shaped one between the bases of antennae, a broad one between the eyes, and a



Indian house cricket
Photo: Shaku Nair



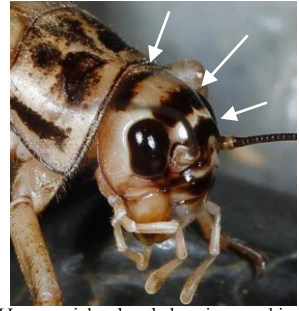
House cricket
Photo: Joseph Berger, Bugwood.org

narrower one across the back of the head capsule), pronotum light brown with dark brown or blackish markings on side and top, short forewings, which are often shed.

Pest status: Common nuisance pest in the open. Widely reared commercially.

Damage/injury: These crickets can survive outdoors, but move indoors when it gets colder. They feed on young plants, plant debris or other organic matter, table scraps and different kinds of fabrics and upholstery.

Life history: Widely distributed due to human activities, although feral populations in the southwest are found only in parts of southern California.



House cricket head showing markings
Photo: Joseph Berger, Bugwood.org

Common name(s): Field cricket

Pest status: Common nuisance pest.

Scientific name, classification: *Gryllus* spp., *Gryllodes* spp., *Acheta* spp., **Order:** Orthoptera, **Family:** Gryllidae

Distribution: Worldwide.

Description and ID characters:

Medium to large sized crickets, often larger than Indian house crickets (slightly over 1 inch when mature) and usually dark brown to shiny black in color.

Best identifying features: Larger size

for adults, both males and females have longer wings that completely cover the abdomen. Females can be identified by their prominent ovipositor between the cerci, while males have only the cerci at the tip of the abdomen.

Damage/injury: Feed on several kinds of plants, smaller insects, dead animals and any other organic matter. They will readily move indoors in search of hiding places, especially when temperatures drop outside, but they will not produce young indoors. They can chew on and damage woolsens, cottons, silks, synthetic fabrics, furs and carpeting. Clothes with perspiration stains or food spills are particularly attractive.

Life history: Field crickets prefer to live and breed outdoors.



Field cricket
Photo: Joseph Berger, Bugwood.org

Common name(s): Camel cricket, cave cricket, cave weta

Scientific name, classification:

Different genera, *Ceuthophilus* spp. are



Camel cricket
Photo: Neda Dilmaghanian

common, **Order:** Orthoptera, **Family:** Rhaphidophoridae.

Distribution: Worldwide.

Description and ID characters: Medium to large sized, wingless crickets, often over 1 inch when mature, dark brown to shiny black in color.

Best identifying features: Body is curved or humpbacked, with very long hind legs and antennae.

Pest status: Occasional nuisance pest.

Damage/injury: Almost none, apart from occasional nuisance.

Life history: Camel crickets/cave crickets are commonly found in caves or similar dark, undisturbed subterranean places such as under basements, drains, inside wells and firewood stacks. They feed on any kind of available organic matter in these habitats, and cause no harm to humans. Many species serve as prey for larger predators in their habitats, such as scorpions.

Common name(s): Mole cricket

Scientific name, classification:

Different genera; *Gryllotalpa* spp. and

Scapteriscus spp. are common, **Order:**

Orthoptera, **Family:** Gryllotalpidae.

Distribution: Worldwide.

Description and ID characters:

Medium to large sized crickets, often over 1 inch when mature. Body colors are often light brown, tan or yellowish brown to dark brown or almost black. Both sexes are winged, and capable of strong and sustained flight.

Best identifying features: Small head with small eyes, short antennae, prothorax is enlarged and smooth, cylindrical body, forelegs are enlarged and equipped with distinct teeth, modified for digging and burrowing. The number and arrangement of teeth are specific to species. Hind legs are shorter and resemble legs of other crickets.

Pest status: Occasional pest of turf and landscapes, occasional nuisance pest indoors. Can give painful bites if handled, but are mostly harmless.

Damage/injury: Mole crickets can cause significant damage to turf by feeding on the roots of grass plants as well as the above ground parts. They also girdle seedlings and other small garden, landscape or crop plants, or cut them down at the base and feed on the entire plant. Mole crickets can also tunnel below the soil surface which can damage plant roots and affect their stand.

In other situations, mole crickets are omnivorous scavengers, feeding on other smaller invertebrates, weeds, and other organic matter.

Life history: The adults are mostly seen in the summer and fall. After mating, eggs are deposited in a small underground chamber. The hatching nymphs overwinter, complete their nymphal stage in the following spring and emerge as adults in late spring or summer.



Mole cricket
Photo: Emma Heywood

Common name(s): Earwig

Scientific name, classification: *Euborellia* spp. are cosmopolitan, **Order:**

Dermaptera, Family: Anisolabididae. *Forficula* is another common genus, Family: Forficulidae.

Distribution: Worldwide.

Description and ID characters: Ring-legged earwigs *Euborellia annulipes* are very common indoor species. The adults are small, elongated and flattened, wingless, typically dark brown in color, about ½ inch in length, with dark, fairly straight cerci (pincers at the tip of their abdomen). Legs are light brown or tan, with dark, ring-like bands. A related species is the African earwig *E. cincticollis*. They are similar in appearance, with dark brown bodies and light brown or tan colored legs, but shorter and stouter cerci. Winged and wingless forms exist.



Ring-legged earwig
Photo: Kansas Dept. of Ag, Bugwood.org

European earwigs *Forficula auricularia* are common outdoors and indoors. They are reddish brown with light brown legs and short wing stubs. The males have prominent, curved cerci, but these are straight in the females.

Earwigs vary greatly with species, in size, shape and appearance of the cerci.

Best identifying features: Characteristic pincer or forceps-like cerci at the tip of the abdomen, short and stubby forewings and membranous hind wings (in winged species). Legs are usually lighter colored than the rest of the body.

Pest status: Occasional nuisance pest.

Damage/injury: Small domestic species such as the ring-legged earwigs *E. annulipes* are not of any major concern.



European earwig
Photo: Joseph Berger, Bugwood.org

However, several species feed on plants and are therefore considered pests.

Contrary to popular belief, earwigs do not enter ears, nor do they bite, sting or spread diseases.

Life history: Earwigs are mostly nocturnal, preferring to hide in damp, dark, concealed spaces during the day and emerging to feed at night. Outdoors, they are mostly predators and feed on a variety of small insects. But some species feed plants, especially seedlings, and other organic matter. They can occasionally wander indoors through open doors or windows, but do not cause any significant damage in indoor environments. A high population of earwigs may be noted indoors following a wet spring. They are commonly associated with new homes for a few years, or after a water leak event. Sudden appearance of earwigs, firebrats, psocids and such small insects can indicate a water leak.

Common name(s): Silverfish, firebrat, bristletail

Scientific name, classification: Different genera, **Order:** Thysanura, **Family:** Lepismatidae.

Distribution: Worldwide.

Description and ID characters: Silverfish and firebrats are small wingless insects, mostly less than ½ inch in length.

Best identifying features: Flat carrot-shaped body, covered with scales, that has two long, slender antennae at the broad (head) end, and tapers down to three long “bristles” at the tail end (therefore called ‘bristletails’). Move fast in a wiggling motion, resembling the swimming action of a fish.

Pest status: Occasional nuisance pest.

Damage/injury: Silverfish and firebrats are considered pests when they consume and stain foods, fabric, books and wallpaper. Damage is manifested as yellowish stains and notched edges, but is usually not significant unless large populations have built up over long periods of time in undisturbed, warm and damp environments.

Life history: Silverfish prefer damp, cool places, whereas firebrats prefer damp, hot places with temperatures above 90°F. Accordingly, they collect in suitable spots near sinks and other plumbing fixtures in bathrooms, kitchens and basements.

Silverfish are most often discovered in sinks and bathtubs, though they can be present throughout the house. They are frequently introduced with newly installed dry wall, feeding on the paper backing and occasionally large populations form within new buildings where the walls are still damp from plaster and fresh lumber. Firebrats normally live outdoors under rocks, leaves and inside bird nests where heat and moisture are generated by the natural composting process. However, they are also known to occur in homes, but due to their preference for high heat, they collect around furnaces, water heaters, fireplaces and within the insulation surrounding hot water pipes, and are therefore discovered less. Both are mostly nocturnal, and forage at night. They prefer vegetable matter with a high carbohydrate and protein content. Indoors however, they will feed on almost anything, but seldom damage fibers of animal origin such as wool or hair. These insects are hardy and can live without food for up to one year.

Bristletails are relatively slow growing, and are known to molt throughout their life, with several sexually mature stages between molts. Lifespans of up to four years have been recorded.



Silverfish

Photo: Joseph Berger, Bugwood.org



Firebrat

Photo: Clemson Univ.-USDA, Bugwood.org

Common name(s): Springtail, collembolan

Scientific name, classification: Different genera, **Order:** Collembola, **Family:** Different families.

Distribution: Worldwide

Description and ID characters: Minute, wingless jumping insects, mostly $\frac{1}{16}$ to $\frac{1}{8}$ inch in length. Some species are elongated and louse-like, others are globular. Colors range from off-white, tan, gray or black. Antennae and legs are prominent.

Best identifying features: Jumping action on disturbance using a spring-like organ under their bodies. This organ or 'furcula' is tucked under the abdomen when not in use. Magnification may be needed to examine further details of the body structure such as hairs and scales.

Pest status: Nuisance pest when occurring in large numbers, some species can damage crops by feeding on plant parts.

Damage/injury: Mostly not significant.

Appearance in large numbers in moist places in and around homes and buildings (bathtubs or sinks, around swimming pools, near water sources, regularly irrigated indoor or outdoor plants, etc.) can cause annoyance to people. They sometimes enter swimming pools or other water containers in search of moisture, and form large floating groups on the water surface, that appear like moving piles of dirt. Some species can attack plants in well irrigated

conditions, such as greenhouse and indoor plants, and chew on young leaves and roots. The feeding damage can be seen as small, irregular holes on the plant parts, but is mostly insignificant.

Can be mistaken for fleas, but springtails do not bite or sting humans, or cause other damage to household articles.

Some persons believe that collembolans can parasitize humans and cause various kinds of symptoms on skin. While the actual presence of the insects or their hair or fallen body parts might cause mild irritation, there is no scientific proof that collembolans can live parasitically on humans. Continued claims of infestation by collembolans or similar minute insects may be an indication of a condition known as 'delusional parasitosis', or Ekbom's syndrome. Affected persons might need help from specialists including a dermatologist to rule out the possibilities of other skin disorders that might be causing the symptoms, and a psychiatrist.

Life history: Eggs are laid in moist soil rich in organic matter. Immatures resemble adults, but are smaller and paler in color. All stages feed on available organic matter in their environment, and are highly dependent on and unable to survive without moisture. They move into homes and buildings in search of moisture and often end up in sinks, drains and other moist spots. Regular occurrence indoors can be indicative of a water leak, or poor pest proofing.



Collembolan
Photo: U. Burkhardt



Collembolans forming a floating mass
Photo: Whitney Cranshaw

Common name(s): Webspinner, embiid
Scientific name, classification: Different genera, **Order:** Embiidina/
Embioptera/Embiodea, **Family:** Oligotomidae.

Distribution: Worldwide.

Description and ID characters:

Webspinners are tiny, dark, delicate and soft-bodied insects that often come in large numbers to lights during summer months.

Best identifying features: Tiny, dark elongated body, dark smoky wings, end segments of front legs are enlarged.

Pest status: Occasional nuisance pest.

Damage/injury: None, except for slight nuisance when in large numbers, which is rare.

Life history: Webspinners are adapted for life inside the silken webbings and galleries that they construct using silk glands on the enlarged tarsomere (end segment) of their front legs. The webbings are spun on tree bark, leaves or other fallen debris on the ground, and most of their lives are spent inside them. Females and nymphs (immatures) are wingless, males can be winged or wingless depending on the species. Nymphs and adults of both sexes can spin webs. The webs serve to protect them from predators and also maintain a favorable environment for their life. Winged males sometimes fly out of the webs to locate mates and are attracted to lights. They are short-lived, and do not eat but spend all their energies in locating a mate and mating with her. Females and nymphs feed on bark, leaf litter, mosses or other debris.



Webspinner near a penny
Photo: Shaku Nair

Common name(s): Darkling beetle, mealworm, lesser mealworm

Scientific name, classification: Different genera; *Alphitobius diaperinus* is cosmopolitan, **Order:** Coleoptera, **Family:** Tenebrionidae.

Distribution: Worldwide.

Description and ID characters:

Darkling beetles comprise a large, diverse group of beetles occupying a variety of community environments. Many are major pests of stored products, others are plant feeders, generalist feeders, or scavengers.

The larvae are worm-like and some are called mealworms. The species *Alphitobius diaperinus* (lesser mealworm) that commonly infests homes, structures and



Darkling beetle/lesser mealworm beetle
Photo: ©Entomart

damages stored products and other items is discussed here. The adults are small, shiny black or dark brown, elongated oval shaped beetles, about 1/4 inch in length.

Best identifying features: (May need magnification). The elytra (hardened forewings) have shallow longitudinal grooves and are dotted with small pit-like depressions. Antennae are dark brown, but lighter at the tips, with tiny hairs.

Pest status: Pest of structures and stored products.

Damage/injury: Lesser mealworm beetles thrive in warm, humid spaces in human environments, and consume and damage a large number of materials, including stored grain, wood, clothes, cardboard, even chewing through fiberglass, plastic and polythene.

These beetles can be serious pests in poorly managed poultry houses and pet enclosures, where they feed not only on animal and bird litter, droppings and carrion, but also on eggs and weak animals. They also bite animals and birds, causing irritation. The adults are known to vector a number of viruses causing bird diseases, and can spread bacteria such as *E. coli*, *Staphylococcus* and *Salmonella*, fungi, protozoa, tapeworms and nematodes.

Beetles ingested by the birds cause indigestion and gut lesions, and this severely affects egg production and weight gain.

Life history: Eggs are laid in the ground, litter, cracks and crevices in structures, or other similar suitable spots. Larvae are similar to other mealworms, but smaller in size and pass through 6-10 instars before pupation and emerging as adults. Populations build up quickly in favorable environments such as poultry houses, and soon the beetles in huge numbers colonize the entire facility.



Mealworms infesting stored grain
Photo: Richard Chambers



Darkling beetle infestation in poultry house
Photo: Magno Borges

Common name(s): Ironclad beetle

Scientific name, classification: *Zopherus nodulosus baldemani* is a common species,

Order: Coleoptera, **Family:** Zopheridae.

Another southwestern species is the desert ironclad beetle *Asbolus verrucosus*, which belongs to the closely related family Tenebrionidae.

Distribution: Southwest US.

Description and ID characters: Adults are medium sized beetles, about ½ inch or even more in length. Colors vary in other species, often shades of gray, brown or black. The body is elongated and appears to have a distinct thorax and abdomen, with the head pointing downwards and often hidden by the thorax when viewed from above.

Best identifying features: Gray or tan color with black blotches, often in a symmetrical pattern. Extremely tough exoskeleton.



Ironclad beetle
Photo: Steve Wertz

Pest status: Non-pest.

Damage/injury: None.

Life history: The biology is not well-studied. Eggs may be laid on tree trunks, under bark, or other debris on the ground.

Grubs, pupae and adults have been observed on trunks of pecan, oak and other trees. The grubs and adults feed on fungi, lichens or debris. Adults are sometimes found wandering slowly on the ground. They often enter homes and structures, but are of no concern as they do not bite or sting, but play dead by rolling into a hard ball when touched or disturbed. Ironclad beetles true to their name, have one of the toughest exoskeletons among arthropods. They cannot be crushed between fingers using normal force, and insect collectors and curators have to first drill a hole in their exoskeleton to pin them. Some species are used as living jewelry or decorative pets, by gluing jewels and other material on them because they are so tough and easy to maintain.



Desert ironclad beetle
Photo: Shujuan Li

Sources, further information:

Booklice and silverfish <http://edis.ifas.ufl.edu/ig094>

Booklice and their relatives

<http://extension.usu.edu/files/publications/factsheet/booklice.pdf>

Caddisflies [http://www.cap-](http://www.cap-az.com/index.php/departments/maintenance/caddisflies)

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Mole crickets

http://solutionsforyourlife.ufl.edu/hot_topics/lawn_and_garden/mole_crickets.html

Household and nuisance pests

<http://www.ipm.ucdavis.edu/PMG/menu.house.html#DESTROY>