

SUMMARY OF BIOLOGY OF SOME COMMON BEES AND WASPS

Whitney Cranshaw, Department of Bioagricultural Sciences and Pest Management, Colorado State University, Ft. Collins, CO 80523 (Whitney.Cranshaw@ColoState.EDU)

Colorado Arthropods of Interest web site:

<http://www.colostate.edu/Depts/bspm/extension%20and%20outreach/arthropods%20of%20colorado.html> Sheets available on bumble bees, leafcutter bees, European paper wasp, yellowjackets, baldfaced hornet, wool carder bee – and many other insects

Additional reference: The Xerces Society Guide *Attracting Native Pollinators*

BEES/SOCIAL

HONEY BEE

Scientific Classification: *Apis mellifera* (Family: Apidae)

Social Structure: Social insects with distinct castes: queen (fertile female), workers (non-fertile female), drones (males)

Nest Construction: Wax produced from glands of the body and drawn into hexagonal cells.

Almost all hives currently are maintained by beekeepers; feral (wild) colonies originating from swarms may occur in aboveground cavities such as hollow trees or in wall voids of buildings.

Life Cycle: Colonies are perennial. Queens may live for several years, workers and drones for months. Workers and drones are produced continuously from mid-winter through late summer. Queens are produced periodically during this period, particularly in response to overcrowding or decline of the existing queen. New colonies are formed by colonies splitting (swarming), with a single queen leaving with a large percentage of the workers.

Feeding Habits: Nectar and pollen are the primary foods. Other sweet materials may sometimes be taken such as honeydew and sugary drinks.

Sting: Stinger of the workers is barbed and is pulled out in the act of stinging. Queens have a barbless stinger. As the stinger is a modified ovipositor possessed only by females, drones do not sting. Sting is quite painful.

BUMBLE BEES

Scientific Classification: *Bombus* species (Family: Apidae/Subfamily: Bombinae)

Social Structure: Social insects with castes including queens (fertile female), workers (non-fertile female), drones (males). There is wide range in size of workers, sometimes described as being minor or major workers.

Nest Construction: Wax produced from abdominal glands drawn into jug-like containers.

Nests are most often constructed below ground in abandoned rodent nests. Other sites of nesting might be stuffed furniture or walls with appropriate insulating debris of some sort.

Life Cycle: Colonies are annual. Fertilized queens are the only overwintering stage. Nest construction begins in spring. Since all rearing is done by the queen at this time the first bumble bees are almost all minor workers, quite small in size. After they emerge, the workers assist with colony functions and colonies increase rapidly. By late summer several hundred workers may be

present and some fertile queens and drones are produced. These new queens mate and disperse, wintering in protected locations away from the nest. Drones and workers die at the end of the season and the colony dies out.

Feeding Habits: Nectar and pollen.

Sting: Queens and workers can sting, but the stinger is not barbed. Sting is quite painful.

BEES/SOLITARY

LEAFCUTTER BEES

Scientific Classification: Family Megachilidae. Most commonly encountered are *Megachile* species that line the nest cell with leaf fragments. However, the family includes many other bees including the mason bees (*Osmia* spp., *Hoplitis* spp., *Chelostoma* spp.) And sower bees (*Anthidium* spp.).

Social Structure: Solitary insects with the female doing all nest construction and maintenance. Fertile females and males are produced.

Nest Construction: Nesting is done alone by the female which emerges in late spring; overwintering occurs as a larva within the nest cells. Nests usually are excavated out of soft, rotten wood or the pith of plants. However, they will nest in existing holes of the proper size, including holes in clay banks or stone walls. Some leafcutter bees are semidomesticated and are managed by providing them predrilled "bee boards".

After the nesting tunnels are constructed, the female cuts fragments of leaves or flower petals and uses them to line the tunnels. Individual nest cells are constructed in this manner, somewhat resembling cigar butts. The cells are filled with pollen and some nectar and sealed. A series of cells is produced in each tunnel.

The mason bees (*Osmia* spp.) similarly nest in holes excavated out of wood or pith, use existing holes such as are left by wood boring beetles, or may nest in crevices. However, their cells are not lined with leaf fragments and the cells are sealed with a mixture of small pebbles and plant resin. Solitary bees in the genera *Hoplitis* and *Chelostoma* have similar nesting habits.

The wool sower bees (*Anthidium* spp.) nests in existing holes/cavities. The nest area is lined with plant hairs. They are most often observed in the vicinity of *Stachys* (lamb's-ear) plantings, which are used as a source of nectar (flowers) and plant hairs (leaves).

Leafcutter bees and mason bees can be encouraged by providing suitable nesting sites. Often these are in the form of predrilled "bee boards". Hole size varies for the different species; about 5/8-in diameter is suitable of orchard mason bees (*Osmia* species) and somewhat narrower for leafcutter bees (*Megachile* spp.). Tunnels should be approximately 5-8 inches long. Paper straw liners are sometimes used for species that prefer a smooth interior.

Life Cycle: Leafcutter bees have an annual life cycle, with one generation produced per year. Winter is spent as a full-grown larva in the cell. They pupate in spring and emerge in early summer.

Feeding Habits: Nectar and pollen.

Sting: Female leafcutter bees can sting, but are very non-aggressive and rarely do. The stinger is not barbed and is slightly painful.

THE "GROUND NESTING" BEES

Scientific Classification:

Acute-tongued burrowing bees: Family Andrenidae

Digger bees: Family Apidae (Subfamily Anthoporinae)

Sweat bees: Family Halictidae

Note: The following biology for these families is generalized

Social Structure: Solitary insects, but many individuals often nest in close proximity where soil conditions are favorable. Fertile females and males are produced.

Nest Construction: Nesting is done alone by the female; overwintering stage is a larva within the nest cell. Nests are constructed by digging in soil. Depending on the species the excavated tunnels are lined with oily, waxy or shellac-like material produced by the bees, which seal and waterproof the tunnels. Some species may have multiple females using the same nest entrance, although these individually construct and maintain their own nest cells that branch from the main tunnel. Most nest alone. The females provision the nest cells with pollen and nectar.

Life Cycle: The various ground nesting bees have an annual life cycle, with one generation produced per year. Winter is spent as a full grown larva in the cell. They pupate in spring and emerge in early summer.

Feeding Habits: Nectar and pollen. Some species have highly specialized habits, e.g., certain digger bees solely visit cucurbits.

Sting: Female bees can sting, but are very non-aggressive and rarely do. The stinger is not barbed and is slightly painful. Occasional problems with sweat bees do occur, primarily related to their habit of visiting moisture, including sweat. This may cause them to sting when humans attempt to deter; the sting is momentarily mildly painful.

WASPS/SOCIAL

YELLOWJACKETS

Scientific Classification: *Vespula* species (Predominant nuisance species is the western yellowjacket, *V. pensylvanica*; the prairie yellowjacket, *V. atripilosa*, is also common) Family: Vespidae

Social Structure: Social insects with castes including queens (fertile females), workers (non-fertile females), drones (males). There is wide range in size of workers, sometimes described as being minor or major workers.

Nest Construction: Nests are constructed of a papery material made primarily from macerated wood paste. Nest cells are housed within a papery cover. Nests of yellowjackets are usually produced in belowground hollows, particularly abandoned rodent burrows; wall voids or similar hollows may also be used.

Life Cycle: Colonies are annual. Fertilized queens are the only overwintering stage. Nest construction begins in spring. Since all rearing is done by the queen at this time the first yellowjackets are almost all minor workers, quite small in size. After they emerge, the workers assist with colony functions and colonies increase rapidly. By late summer several hundred workers may be present and some fertile queens and drones are produced. These new queens mate and disperse, wintering in protected locations away from the nest. Drones and workers die at the end of the season and the colony dies out.

Feeding Habits: Early in the season the diet of the western yellowjacket is usually scavenged protein materials, e.g., dead insects, earthworms, carrion. Sweet materials, such as honeydew

and sugary drinks, are also used and are the primary diet late in the season, after brood rearing is completed. The prairie yellowjacket is a predator of live insects.

Sting: Queens and workers can sting, but the stinger is not barbed. Sting is quite painful and yellowjackets are aggressive when defending the nest, which is often difficult to detect. Also the nuisance habits of the western yellowjacket, visiting garbage and outdoor foods, frequently produce stings. Yellowjackets likely cause over 95% of all the "bee stings" that occur in Colorado.

HORNETS

Scientific Name: *Dolichovespula* species. Two species occur in Colorado, the **baldfaced hornet** (*D. maculata*) and the **aerial yellowjacket** (*D. arenaria*). Family: Vespidae.

Social Structure: Social insects with castes including queens (fertile female), workers (non-fertile female), drones (males). There is wide range in size of workers, sometimes described as being minor or major workers.

Nest Construction: Nests are constructed of a papery material made primarily from macerated wood paste. Nest cells are housed within a papery cover. Hornets (baldfaced hornet, aerial yellowjacket) nest above ground in trees, shrubs and under overhangs, such as eaves.

Life Cycle: Colonies are annual. Fertilized queens are the only overwintering stage. Nest construction begins in spring. Since all rearing is done by the queen at this time the first hornets are almost all minor workers, quite small in size. After they emerge, the workers assist with colony functions and colonies increase rapidly. By late summer several hundred workers may be present and some fertile queens and drones are produced. These new queens mate and disperse, wintering in protected locations away from the nest. Drones and workers die at the end of the season and the colony dies out.

Feeding Habits: Hornets are primarily predators, feeding on live insects, and can be important controls of certain caterpillars and other insect pests. They occasionally scavenge freshly dead insects. Sweet materials make up a very minor part of the diet and are mostly used by males.

Sting: Queens and workers can sting, but the stinger is not barbed. Sting is quite painful and hornets can be aggressive when defending the nest. However, nests are often obvious and they do not have the scavenging habits of yellowjackets so stings are rare.

PAPER WASPS

Scientific Classification: *Polistes* species are most common throughout North America. The **western paper wasp** (*Mischocyttarus flavitarsus*) locally is often most common but recently a new species, *Polistes dominula*, a.k.a. the **European paper wasp**, has become very abundant in some areas. Family: Vespidae

Social Structure: Similar to other social wasps with castes including queens (fertile females), workers (non-fertile females), drones (males). There is a range in size of workers, although not as dramatic as with some of the other social insects.

Nest Construction: Nests are constructed of a papery material made primarily from macerated wood paste. A small attachment connects the nests, which are oriented downward and *are not* housed within a papery cover. Nests are established above ground, usually under an overhang of some sort.

Life Cycle: Colonies are annual. Fertilized queens are the only overwintering stage. Nest construction begins in spring and consists of a small nest with a dozen cells or so within which the first young are reared. Colony size does increase through summer but does not reach the size of yellowjackets/hornets - ultimately consisting of less than one hundred individuals. Sexually mature females (potential queens) and drones are produced toward the end of the season.

Feeding Habits: Paper wasps develop as predators. Adults feed on a wide variety of insect prey that they macerate and feed to the developing larvae.

Sting: Queens and workers can sting, but the stinger is not barbed. Sting is quite painful and paper wasps are aggressive when defending the nest, which is often difficult to detect and may be hidden.

WASPS/SOLITARY-HUNTING

POTTER WASPS

Scientific Classification: Family: Vespidae/Subfamily: Eumeninae)

Social Structure: Solitary insects with the female doing all nest construction and maintenance. Fertile females and males are produced.

Nest Construction: Nests may be constructed in several different manner. Some nest in cavities, others in soil. The most conspicuous are those that create mud "pots", usually on twigs.

Life Cycle: Colonies are annual with one generation completed in a year. Full grown larvae and/or pupae are the wintering form, found within the nest. Adults are usually active in late spring and early summer. After nesting sites are produced the females capture and paralyze specific kinds of prey; most potter wasps capture caterpillars. These are returned to the nest and an egg is laid. The developing wasp larva subsequently consumes the provisioned insects.

Feeding Habits: Larvae develop on paralyzed insects captured by the female. Adults feed on nectar and pollen, perhaps some insect blood.

Sting: Females can sting, but the stinger is not barbed and the sting is mild.

SPHECID WASPS

Scientific Classification: Family: Sphecidae

Nest Construction: Nesting is done alone by the female and can take many forms, unique to each species. Some tunnel belowground nests that may extend a foot or more (e.g., cicada killers, *Bembix* spp., *Ammophila* spp.). Others excavate pith from plants or utilize natural channels in wood (e.g., *Pemphredon* spp. wasps). Some (e.g., mud daubers) create nests of mud.

Life Cycle: Colonies are annual with one generation completed in a year. (A few that nest in canes above ground may produce two generations.) Full-grown larvae and/or pupae are the wintering form, found within the nest. Adults are usually active in late spring and early summer. After nesting sites are produced the females capture and paralyze specific kinds of prey. Sphecids wasps are a very large family, with more than 1100 North American species, and most specialize in capturing specific families, genera or, sometimes, species of insects as prey. Some of the smaller species that are common in the area develop on leafhoppers or aphids. The largest, the cicada killer (*Sphecius grandis*), attack and kill the large 'dog-day' cicadas (*Tibicen* spp.) and the

steel-blue cricket killer (*Chlorion aeraerium*) specializes in field crickets. A few species, notably mud daubers (*Sceliphron caementarium*), utilize spiders for rearing young.

Feeding Habits: Larvae develop on paralyzed insects captured by the female. Adults feed on nectar and pollen.

Sting: Females can sting, but the stinger is not barbed and the sting is mild.

SPIDER WASPS

Scientific Classification: Family: Pompilidae

Nest Construction: Nesting may consist of the female constructing a cell in soil, utilizing existing crevices, or within existing tunnels of spiders that are attacked.

Life Cycle: Colonies are annual with one generation completed in a year. Full grown larvae and/or pupae are the wintering form, found within the nest. Adults are usually active in late spring and summer, coincident with the spider prey that they attack. All spider wasps in Colorado develop on spiders. The largest (*Pepsis* spp., *Hemipepsis* spp.) attack tarantulas.

Feeding Habits: Larvae develop on paralyzed spiders captured by the female. Adults feed on nectar and pollen.

Sting: Females can sting, but the stinger is not barbed. However, the sting is very painful. Fortunately spider wasps are not aggressive and sting only if confined/handled.

PARASITIC WASPS

Scientific Classification: Families: There are several families of parasitic Hymenoptera. Braconidae, Ichneumonidae, Chalcidae, Pteromalidae, Encyrtidae, and Eulophidae are among the most common.

Nest Construction: No nests. Eggs are laid in or on a living host insect.

Feeding Habits: Larvae of the great majority of species develop as internal parasites. Some develop on the exterior of the host. All are lethal to their host. Adults feed on nectar, pollen, honeydew, and/or blood of their host.

Sting: Most species are too small to sting and they are not aggressive. Stingers of some can be felt as a small pinprick but are not associated with venom glands.

Comparison of Habits of Some Common Bees and Wasps

Feature	Honey bee	European paper wasp	Western yellowjacket
Nest construction	Wax comb	Paper comb, no envelope	Paper comb covered with paper envelope ¹
Nest location	Large hollows, hives	Under eaves, in small voids	Usually underground, rarely wall voids
Colony permanence ²	Perennial	Annually produced	Annually produced
Peak colony size	> 10,000	< 100	100s
Food habits	Nectar, pollen, some sweet foods	Live insects	Dead insects, garbage, meats, sweet foods
Stinger	Barbed, left during stinging	Not barbed	Not barbed
Attraction to wasp trap	Not attracted	Not attracted	Attracted

¹ Large paper covered nests produced in trees, shrubs, and other eaves are produced by a different species, the baldfaced hornet (*Dolichovespula maculata*).

² Perennial colonies of honey bees persist from season to season intact, with egg laying suspended during fall and early winter. Annual colonies are abandoned at the end of the season and fertilized females scatter to protected locations for winter. Colonies are initiated anew each spring.

Physical Description

Honey bee (*Apis mellifera*) - Very hairy. General color orange or yellow orange, sometimes with dark gray. Individuals collecting pollen will pack it into clumps in special structures on the hind legs (pollen baskets).

European paper wasp (*Polistes dominula*) - Not hairy. General color black and bright yellow. Overall body form more elongate than the other species. Hind pair of legs long and trail conspicuously when flying.

Western yellowjacket (*Vespula pensylvanica*) - Not hairy. General color black and bright yellow. Overall body form slightly more compact than European paper wasp, closer approximating honey bee.

Aggressiveness/Likelihood of Stinging

Honey bee - Bees around nest entrance may sting if colony is very closely approached or directly disturbed. However, colonies are large and activity about them is conspicuous so this rarely occurs. Honey bees during foraging are not aggressive and only sting when accidentally trapped or handled.

European paper wasp - Not aggressive although wasps may sting if colony is very closely approached and/or disturbed. However, because nests occur in many locations and are often not noticeable accidental disruption of colonies is common.

Western yellowjacket - Aggressively defends colony, which is often inconspicuous (e.g. belowground). Commonly visits garbage and outdoor dining areas where stinging can occur. The cause of the great majority of 'bee stings' that occur in Colorado.