HYMENOPTERA

Biology and Ecology of Selected groups: Superfamily Apoidea: Bees

Bees are closely related to sphecidae. Most authorities now group both bees and sphecid groups under the same superfamily. Bees feed on nectar like many Hymenoptera (mouthparts are modified to form a tongue for feeding on nectar), but are somewhat unique in that they also visit flowers to collect pollen which they use to provision their nests (most solitary wasps provision with arthropod prey; vespidae: Masarinae—also provision with pollen).

Nonparasitic bees only feed on plant materials. Because of this, bees are major pollinators of many plant species. Some bees (i.e., Apidae, Apinae) have the first segment of hind tarsi enlarged and flattened (corbiculae) for carrying pollen. **Megachilidae** have brushes of hair like setae (scopae) on the ventral abdomen to hold pollen. ***Parasitic bees*** lack pollen collecting structure; "cuckoo bees" (Apidae: Nomadinae) are wasp-like cleptoparasitoids—females enter other bee nests and oviposit, the larvae kill the host's egg or young and are then reared by the host species. Most bees are diurnal.

Sexual dimorphism (two sexes of the same species exhibit different characteristics beyond the differences in their *sexual* organs). E.g. **Males:** 13 antennal segments; 7 visible abdominal terga
Females: 12 antennal segments;6 visible abdominal terga

Only one honey bee species, *Apis mellifera* L. occurs in north America. *A. mellifera* is an introduced species and most colonies are founded in human-made hives. Escaped swarms do occur in the wild which nest in vertical combs. Colonies are perennial; both workers and the queen overwinter in the hive. Queens can live for several years. New queens swarm with males to found new colonies. Worker bees have an elaborate communication system in which they communicate to other workers where good nectar flow is (combination of visual and chemical cues).

Superfamily Vespoidea: Vespidae

Selected subfamilies:

Eumeninae: Mason and potter wasps

Vespinae: yellow jackets and hornets – eusocial, make nests consisting of tiers of hexagonal paper cells; progressively feed insects to larvae.

Polistinae: paper wasps – primitively eusocial, construct open circular horizontal comb of paper cells; Progressively feed larvae.

FORMICIDAE: Ants. Formicidae is a very common, widespread group. Ants occur almost everywhere in terrestrial habitats and outnumber in individuals most other terrestrial animals. Because of the enormous biomass, ants play important roles in the ecosystem (i.e., energy flow and soil mixing). Almost all ants are social insects.

Polymorphism is common within species. In some species, several forms of workers occur, and each performs a different function. Workers form the vast bulk of individuals in a nest. There may be one to several queens per colony; males are few and are often only produced seasonally. Except for a short period prior to swarming, all individuals in a colony are apterous. Winged queens and males are produced in many species to found new nests. Queens mate, lose their wings and begin egg laying; females often do not feed during initial colony establishment, but live on fat body reserves and products of wing muscle degeneration. Once the first brood is established, the queen does little except lay eggs; queens of some species live for two years.

Selected Subfamilies:

Ponerinae: This is the most primitive ant group (most common in tropics) which nests in the ground or in logs. Few structural differences exist between the queen and workers. Workers are monomorphic. Colonies are small and the ants are carnivorous. This subfamily includes the bullet ant, *Paraponera clavata* F. Smith; generally regarded as the insect species with the most painful and debilitating sting.

Ecitoninae: Includes army ants; This group is mainly tropical, highly predacious, and some species form massive columns of workers (>100 m). Queens are wingless.

Large subfamilies that are primarily phytophagous.

Myrmicinae: This is the largest/most common subfamily. Many species are harvester ants which collect and store seeds in the nest. Other species feed on fungi they grow in cells on decaying leaf fragments and ant excreta. The subfamily includes the fire ants, Solenopsis spp.

Formicinae: This is the second largest subfamily. Most species are primarily nectar and honeydew feeders; Workers often have a flexible integument that can stretch as food is imbibed. Honey ants have a form of worker called the replete which spends life in the nest and serves as a living bottle in which food can be stored. Many species have symbiotic relationship with honey-dew producing insects (i.e., some hemipteran families); many other inquilines are also found in

Formicinae nests. Camponotus includes the carpenter ants which make galleries in wood for colonies, but do not eat wood. Workers are fighters, attack other ant colonies, kill the workers, and then carry off pupae which eventually carry out tasks of the colony. The queen may also raid another colony, kill the queen, and subsequently use the workers to raise her larvae until her offspring can totally take over the colony.

Most bees are solitary (individual females make nests and reproduce). *Many species make* nests or cells in the soil but a wide variety of natural cavities are used (i.e., abandoned rodent nests, tree hollows, emergence holes of wood boring beetles, hollow stems of plants). Some species nest singly but in large congregations in the same area (i.e. some halictidae; Adrenidae). Two families have species that are subsocial or social (Halictidae and Apidae).
APIDAE: bumble bees, honey bees (highly social), carpenter bees, cuckoo bees, etc.
Apinae: Bumble bees nest in the ground; in temperate regions, new nests are started each year. Only fertilized queens overwinter. A queen establishes a nest in the spring and the first brood raised by the queen is all workers (smaller sized females, fed honey-pollen mixture in cells). Workers enlarge the nest, care for larvae, gather food, and store food in saclike "honeypots" built of wax and pollen. After the colony is established, later broods contain males and females.