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**M.Sc. IV Semester Zoology (Entomology): Paper III (4103) Economic Entomology**

**Social Oraganization of *Apis* (Honey Bees)**

**or**

**Members of the Bee Colony:**

Phylum - Arthropoda

Class - Insecta

Order - Hymenoptera

Family - Apidae

Genus - *Apis*

**Species of Honey Bees:**

There are 8 species of *Apis* in Asia:

*Apis dorsata* ---- Giant rock bee called as Sarang and Bombara (wild)

*Apis florea -----* Little bee (wild)

*Apis laboriosa* ----(wild)

*Apis cerana indica* ----Indian bee (domestic)

*Apis nuluensis*

*Apis nigrocincta*

*Apis koschevnikovi*

*Apis andreniformis*

Out of above these 8 species first four species are found in India. There is only one species of *Apis* in Europe, *Apis mellifera,* which is distributed throughout Europe, Middle East and Africa, and is most commercial species of the world.

The major source of honey is the rockbees, *Apis dorsata* and *Apis laboriosa.* About two-third of the honey in the market is supplied by these wild bee colonies. In some regions like the Kutch area in Gujarat, honey is collected also from wild *Apis florea* colonies. In India, two species, *Apis cerana* and *Apis mellifera* are reared by beekeepers. There are 4 sub species of the Asian bee, viz., *Apis cerana cerana, Apis cerana indica, Apis cerana japonica* and *Apis cerana himalaya.*

The honey bee colony is trimorphic and consists of three kinds of individuals-

1. Queen (Fertile Female) only one per colony
2. Drones (Fertile Male) about 100 per colony

and one sterile member

1. Workers (Sterile Female) about 30-80,000 per colony; may reach upto 1,25,000 in the colony of *Apis dorsata.*
2. **Queen.** There is only one queen in a colony which is the mother of the colony. The only function of the queen is to lay eggs, that is why, she possesses immensely developed ovaries and a large abdomen. It is five times larger and three times heavier than the workers. In other features, she is degenerated having **small wings and poorly developed legs, mouthparts, sting, brain etc. Salivary and wax glands are absent but the mandibular glands are well developed and produce the queen substance (a pheromone, trans-9-keto- 2-decenoic acid).** The queen substance not only inhibits the developments of the workers' ovaries but it also suppresses the building of special queen cells for potential rivals. The queen totally depends upon workers for food. She uses her sting normally for oviposition but is capable to use it for defense. She lives for 3-5 years and lays about 15 lacs of eggs during this period at the rate of about 350- 1500 eggs/day. Egg laying is seasonal.

It is said that the queen gets mated only once in her life but in a single chance of mating, drone releases 2 crores sperms which are sufficient for the fertilization of the eggs at the time of laying by the female throughout her life span.

When the queen in a colony loses it egg laying capacity, another worker of the same colony starts feeding on queen’s diet i.e. **royal jelly** and develops into a new queen and is provided with the facilities of real queen. At the same time old queen may be drivenout but sometimes some workers object that as to why the mother of the colony be drivenout so ultimately they also comeout with the mother. Sometimes when 2 to 3 queens are developed in a colony only one takes the position of queen and others comeout with some workers to establish new colonies.

1. **Drones.** The drones are fertile males of the colony. They are medium sized but stouter than the queen with broader abdomen, longer appendages, and larger wings, brain and eyes. Salivary and wax glands are absent like queen and thus, they are totally dependent on workers for food. The sting is absent and hence they have no defensive organ. During breeding season, they are well-fed by the workers. During non-breeding seasons, they are most neglected member in the colony and may be thrown out of the hive by the workers to die of hunger. The drones survives for about 60 days and their sole duty is to fertilize the virgin queen. At the time of swarming the drone follows the queen, copulates and dies after copulation.
2. **Workers.** The workers are sterile females having smallest size developed from fertilized eggs and have most robust body organisation. Mouthparts and wings arewell developed. Their body is densely covered with hair-like bristles. They survives for 4-6 weeks. The total indoor and outdoor duties of the colony are performed by the workers only. That is why they are provided with some special structures for particular work as stated below-
3. Long proboscis for sucking nectar
4. Strong wings for fanning
5. Pollen basket for collection of pollen
6. Powerful sting to defend the colony against any attack
7. Wax glands for wax secretion

Accordingly, the workers perform several duties such as-

1. Secrete wax
2. Build the honeycomb
3. Collect nectar, pollen and water
4. Convert the nectar into honey
5. Cleans empty brood chambers
6. Defend the hive.

The above duties are age related and accordingly the bees may be classified into following categories–

1. ***Sanitary bees or cleaner bees***:For the first 3 days, each worker bee cleans walls and floors of empty cells of the hive for the reuse.
2. ***Nurse bees***:From days 3 to 10, a worker bee is a nurse; her pharyngeal glands (one pair) become active and secrete **'royal jelly'** or **'bee milk'** which is highly nutritious. The pharyngeal glands, vestigial in queen and absent in drones, are paired cephalic gland in the form of long, coiled chain of follicles and open in the buccal cavity. Workers feed the royal jelly to the young larvae, queen, drones and those older larvae which are destined to develop into future queen. Such workers are called 'feeder bees' or 'nurse bees'. The nurse bees also perform another duty. On entering the hive, the foragers regurgitate the nectar into the mouth of a nurse bee, which deposits the nectar in a cell.
3. ***Builder bees****:* After 10 days, the pharyngeal glands atrophy and **four pairs of abdominal wax glands develop ventrally onto segments 4 to 7.** Below these glands, the stema of these segments show each a pair of large oval polished areas separated by a median space. These are called the **wax plates or wax mirror.** The secretion of the glands is carried through the cuticle and the wax hardens on the outer surface of the wax plates. The wax is then scrapped by the legs and is then taken off by the mandibles and chewed. The builders construct the hive by these wax.
4. ***Off-loader bees***:From about day 16 to day 20, the workers receive pollen loads from returning foragers and place them in the comb into pollen cells.
5. ***Sentinel or guard bees****:* At about day 20 the worker acts as a guard at the entrance of the hive defending the colony from intruders. They sting the intruders, even workers of other hive, to death and push them out of the hive.
6. ***Foragers or field bees or scout bees***:After day 20, the workersperform almost outdoor duties, *i.e.,* they explore new sources of food (nectar, pollen and water) and collect them. A forager usually conducts 7- 15 flights for nectar, somewhat less for pollen, and upto a hundred flights for water per day. About a litre or more of water is required by a colony per day.
7. ***Retinue bees***:There are few workers that always attend thequeen and take all care of her.
8. ***Fanner bees***:Certain workers sitting on the hive near the honey cells, always fan their wings. This activity not only ventilates the hive but also by evaporating the excess of the water from the freshly formed honey make the honey more viscous.

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