

Honey Bee Biology - The Basis of Beekeeping

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Keeping and Managing Honey Bees

What is involved?

How important is biology?

What management practices are used?



Basic Biology of the Honey Bee Colony



Understanding honey bee biology is an important part of beekeeping - it provides the foundation for colony management.

The more one understands about bee behavior and colony organization, the easier are bees to manage.

Occupants of the Honey Bee Hive

Three types of individuals:

Queen:



Normal Colony:

1 Queen

Worker:



200 - 80,000 Workers

0 - 5000 Drones

Drone:

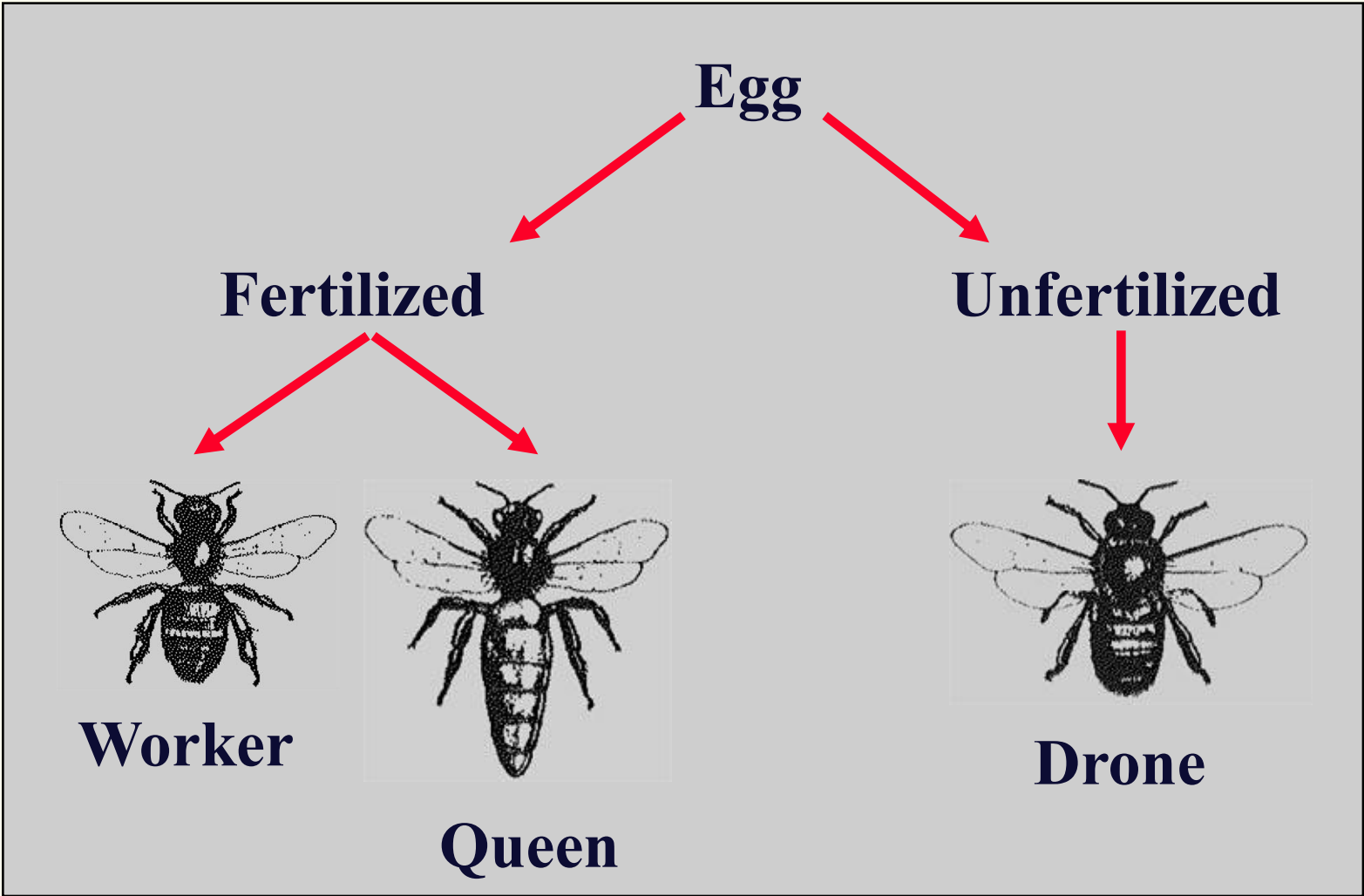


Workers

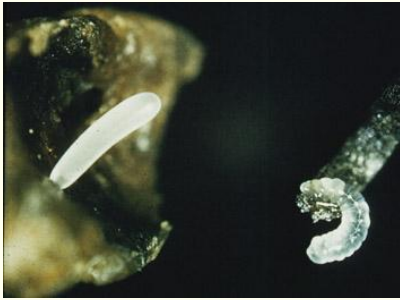
- Form bulk of the population
- Functionally sterile females
- Perform all duties and labor for maintenance of the colony
- Develop from a fertilized egg laid by the queen



Honey Bee Sex Determination System



Life Stages of a Worker Honey Bee

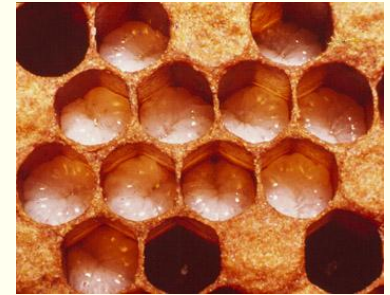


Egg and first stage larva



Larvae of different ages. The white material in the bottom of the cell is food secreted by adult workers.

Older larvae with cells being capped



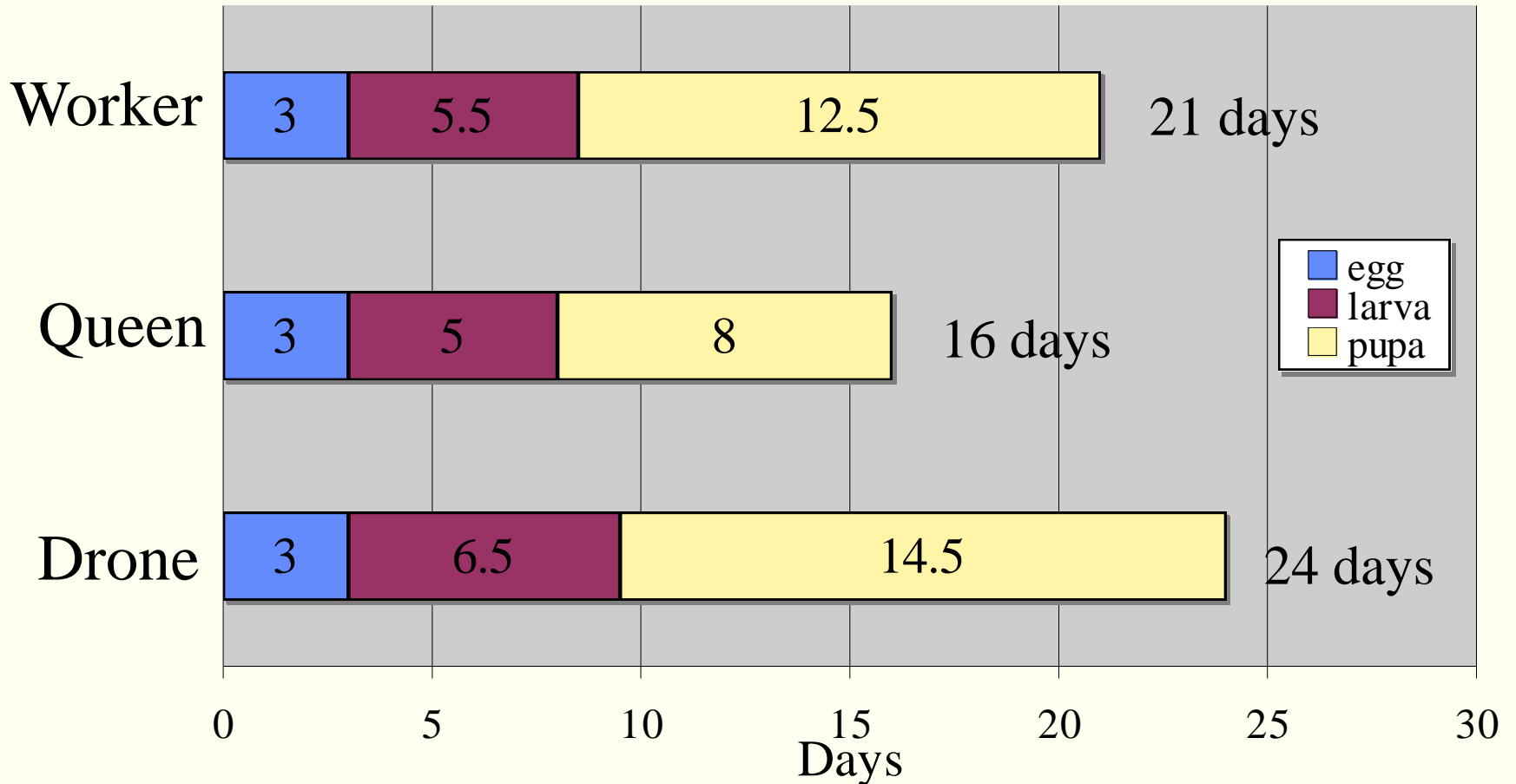
Worker pupae - changing to the adult.



An emerging adult worker



Development Times of Honey Bee Castes from Egg to Adult



Labor Activities of Workers



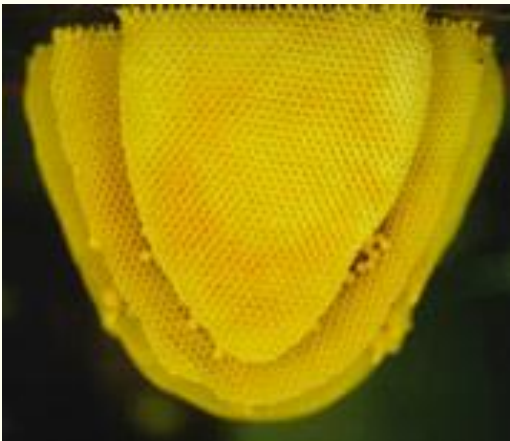
Perform all duties and labor for maintenance of the colony, including:

- feeding, care of the young (nurse activities)
- comb building and nest construction
- protection of the colony
- maintenance of hive, internal environment
- collection and storage of food

Labor Activities of Workers



Brood care: workers provide all of the care and feeding of the larvae. When larval development is complete, workers seal the cell with a wax cap before the larva pupates.



Nest construction: workers build the comb which forms the internal structure of the hive. The comb is made from beeswax, a natural wax secreted from glands on the abdomen of workers.



Labor Activities of Workers



Maintenance of the nest:

Bees are careful about nest hygiene; clean cells before reuse, and remove debris and dead bees.



Workers are responsible for Environmental control.

They will fan at the entrance to circulate fresh air into the hive if carbon dioxide levels get too high or if temperatures rise above acceptable levels.

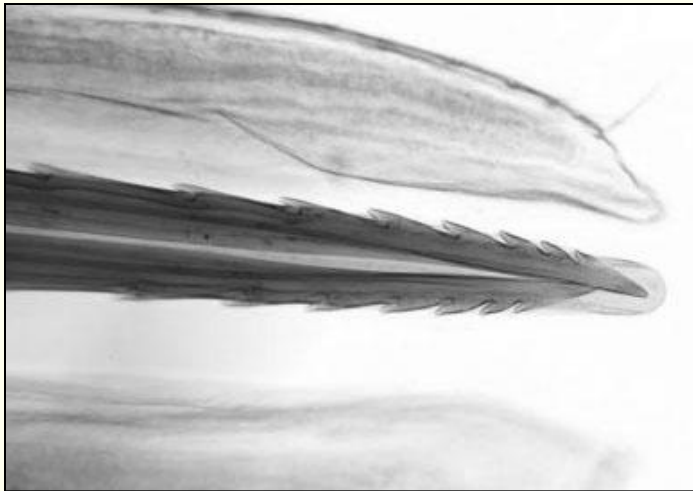


Fanning workers

Labor Activities of Workers



Guard Activities: workers serve as guards at the hive entrance to protect the nest from intruders. Guard bees will attack and sting.



QuickTime™ and a
Cinepak decompressor
are needed to see this picture.

Honey bee sting

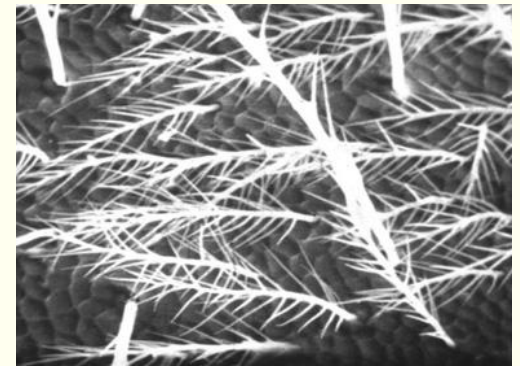
Labor Activities of Workers



Guard Activities: workers serve as guards at the hive entrance to protect the nest from intruders. Guard bees will attack and sting.

Collection, Handling and Storage of Food:

Bees collect nectar and pollen from flowers as food. Nectar is carried internally in the honey stomach. Pollen is picked up by the special body hairs as a bee visits a flower.



Labor Activities of Workers

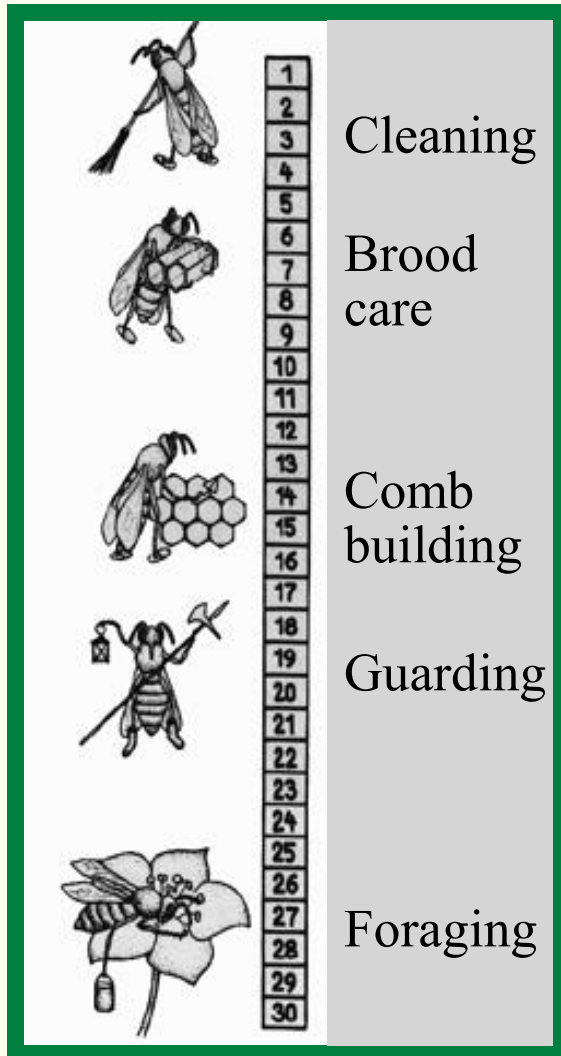
Nectar is converted into honey by workers in the hive. When the honey is ripe and the cells have been filled, the workers cap the cells with a wax capping.



Pollen is carried on the hind legs of the worker when foraging. Pollen is stored in cells and serves as the source of proteins, fats and minerals.



Labor Activities of Workers - How does a Bee know what to do?



Social organization and the division of labor:

- The system is based on age and physiological development; each worker performs in succession the various labor tasks required for the colony to function.
- A worker acts as her own informant, patrolling the hive and responding to labor needs if she is able.

Queen

- Queen is the most important individual in the colony
 - ✓ Responsible for normal functioning of hive
- Quality of the queen which determines the value of a hive



The Queen



- The queen is not the “leader” of the hive
- Her presence is important and a colony cannot function normally without a queen.
- Good queens are an important part of beekeeping; one of the basic goals of good management is to insure the quality of the queens in one’s hives.

Queen Development

- Develops from a fertilized egg or young female larva
- Queens are reared in special cells - hang vertically and extended as larva grows
- Queen larvae are fed a diet of “Royal Jelly”
- Cell capped on day 5, larva spins cocoon

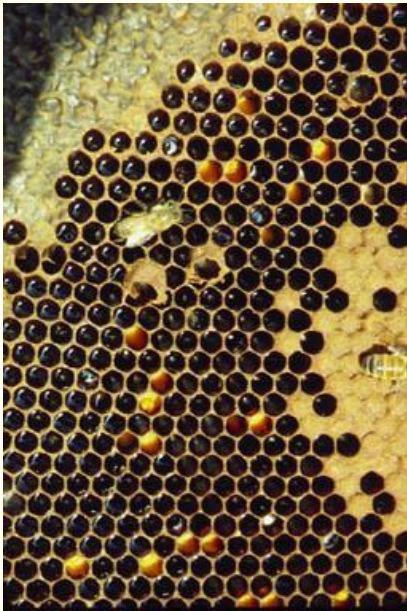


Queen Development

- Completes development and emerges after about 15 1/2 to 16 days after the egg was laid.
- Seeks out rivals and attacks cells or two queens may fight.
- Initiates mating flights at 5-6 days of age



Natural Queen Rearing in the Honey Bee Colony



Emergency

Swarming



Supersedure

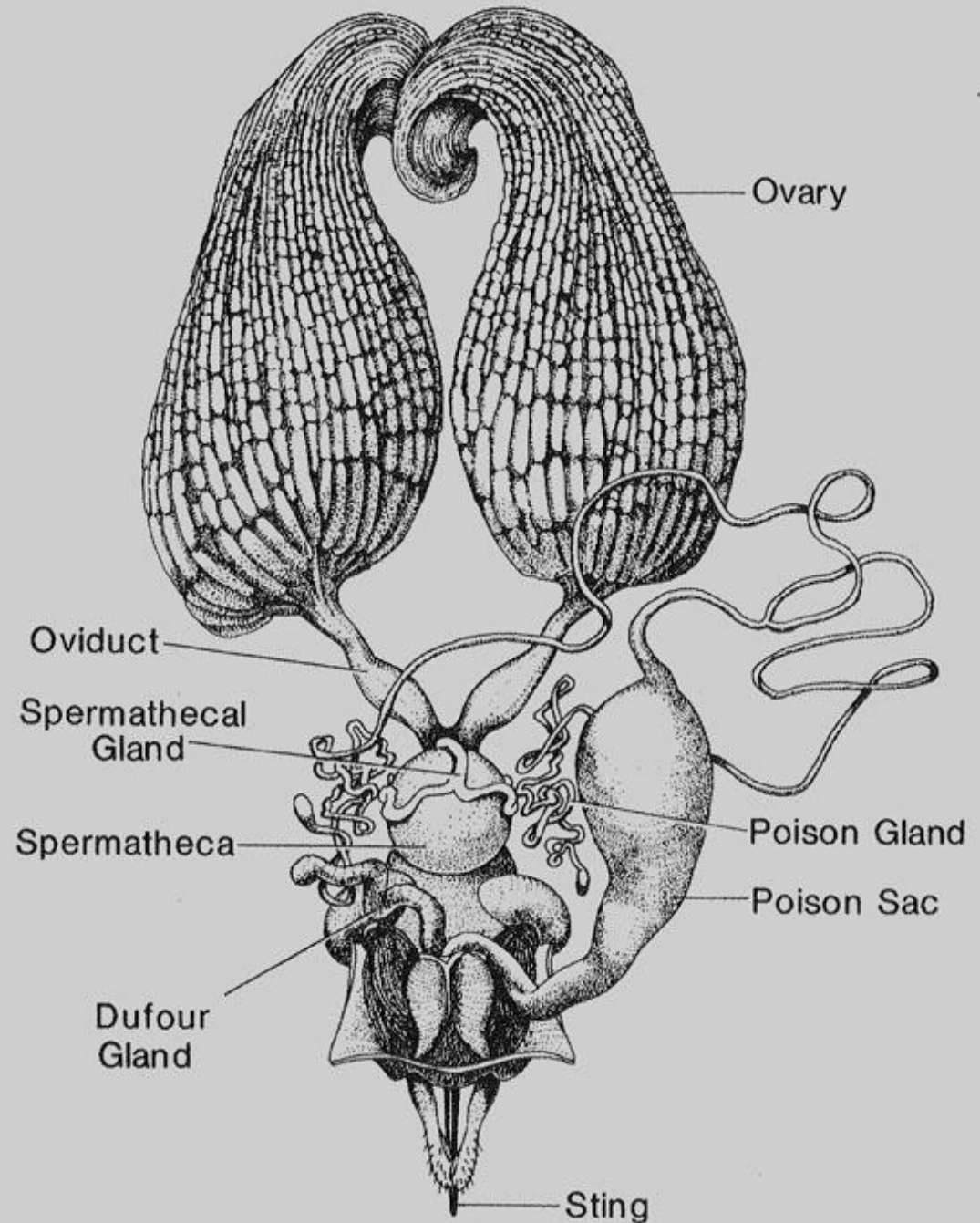
Mating Flight of the Queen



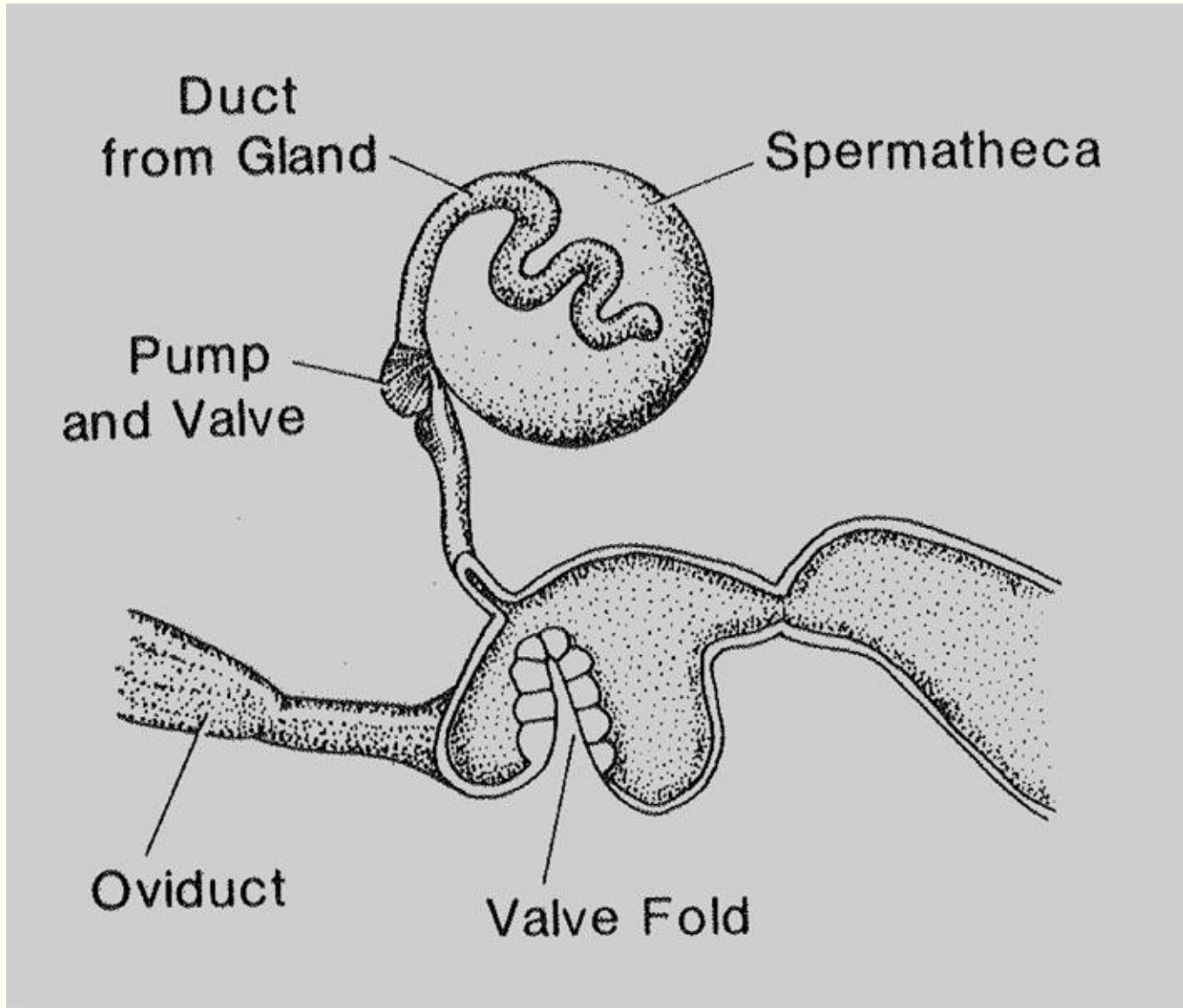
Drones pursuing a caged queen in a drone congregation area.

Queens mate with 10-17 males.

Queen Honey Bee Reproductive Organs



Honey Bee Queen Spermatheca and Valve Fold





Biological Role of the Queen

- Reproduction - egg laying
- Production of pheromones

Pheromones are chemical substances (or blends of substances) secreted by an animal to the outside that affect the behavior or physiology of other animals of the same species.



Biological Role of the Queen

- Reproduction - egg laying
- Production of pheromones
 - ✓ maintain social order and allow workers to determine queen presence
 - ✓ prevent worker ovary development
 - ✓ prevent queen rearing

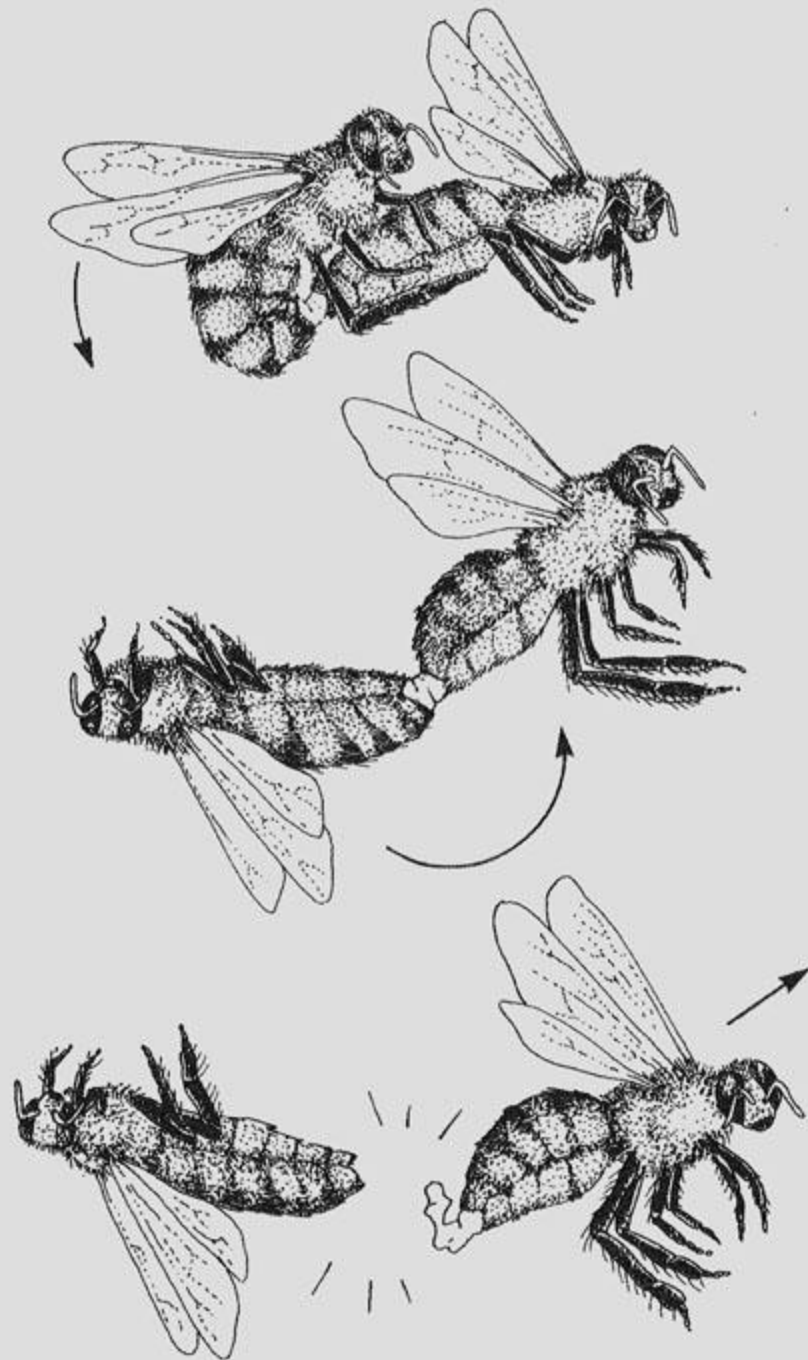


Drones



- Males: larger than workers, large eyes, no sting
- Hatch from unfertilized eggs, reared in larger cells, longer development time (24 days)
- Only function - reproductive
- Reach sexual maturity at about 12 days of age and initiate mating flights





Mating of the Honey Bee

Virgin queens leave the hive to mate, seeking males at drone congregation areas. Mating occurs in flight. Drone congregation areas remain stable over a period of years.

Drone Biology

- Drones not reared all year - only spring and summer
- Number of drones dependent on colony strength and condition
- Drones “kicked-out” in fall - “Fall Drone Massacre”



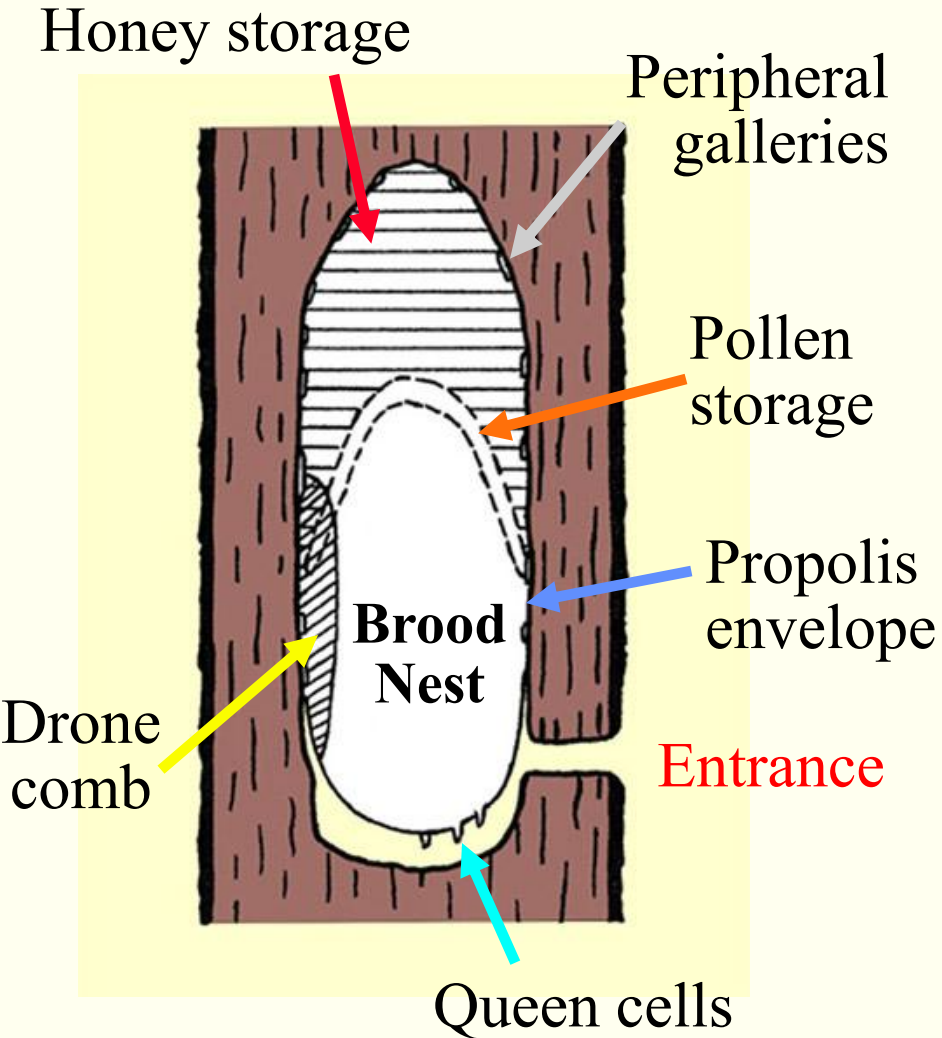
Natural Nest of the Honey Bee



A natural nest of honey bees. The natural nest provides the basis for modern beekeeping

- The nest is generally constructed inside of a cavity
- Consists of a series of parallel beeswax combs.
- Serves as a place for rearing young and storing food.
- Provides protection from pests, predators, and the environment.
- Honey bees choose nest sites carefully, for colony success is often dependent on good site selection.

Diagram of the Natural Nest of the Honey Bee



Nest Structure and Beekeeping



Understanding nest structure is important to proper beekeeping because we utilize the natural nest organization in our beekeeping practices.

The standard hive is managed so that the brood nest is in the bottom of the hive and honey is stored in the upper hive bodies.

The use of several hive bodies and removable frames allows the hive to be inspected and honey to be harvested from the top of the hive.

The Standard Bee Hive

The standard Langstroth bee hive consists of a variable number of hive bodies, wooden frames to hold comb, a bottom board and a cover.

