

## BEE BEHAVIOUR AND COMMUNICATION

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### ABSTRACT

*Honey bees exhibit highly organized behavioural patterns and sophisticated communication systems essential for colony survival. This article explores key aspects of bee behaviour, including swarming, queen replacement, division of labour, and reproductive regulation. Special emphasis is given to their unique communication mechanisms such as dance language, pheromones, and tactile signals, which enable efficient resource utilization and colony coordination. Understanding these complex interactions provides valuable insights into social organization, ecological adaptation, and pollination biology. Such knowledge is crucial for improving beekeeping practices, ensuring pollinator conservation, and enhancing agricultural productivity in changing environmental conditions.*

**KEYWORDS:** Honey bees, Pheromones, Pollination, Swarming, Waggle dance

### INTRODUCTION

Honey bees are far more than producers of honey and wax; they are highly organized social insects and efficient communicators. To sustain their colonies, forager bees have evolved a sophisticated “dance language” that encodes precise information about the distance and direction of food sources. This remarkable behaviour was first decoded by Karl von Frisch, revealing one of the most advanced non-human communication systems. These behaviours provide deep insights into animal communication, cooperative behaviour, and the evolution of symbolic signalling.

### BEE BEHAVIOUR

#### SWARMING

Swarming is the natural reproductive process of a honey bee colony, in which a large group of bees, led by the old queen, leaves the original hive to establish a new colony. This usually occurs due to overcrowding and rapid colony growth. Worker bees prepare for swarming by constructing queen cells for rearing new queens. Typically, swarming takes place during late spring or early summer.

## **STAGES OF SWARMING:**

1. *Instinct and Preparation:* Strong colonies develop a natural tendency to reproduce through swarming.
2. *Scouting:* Scout bees search for suitable nesting sites before departure.
3. *Departure:* After queen cells are sealed, the old queen leaves with a large group of workers.
4. *Initial Cluster:* Bees temporarily cluster on a nearby surface such as a tree branch.
5. *Final Migration:* The swarm relocates to the selected nesting site and establishes a new colony.

## **EMERGENCY QUEEN REPLACEMENT**

When the queen dies unexpectedly, the colony initiates emergency queen rearing. Worker bees select very young larvae and convert worker cells into queen cells by enlarging them. These larvae are fed royal jelly, which enables their development into queens. Multiple queen cells are formed, but the first emerging queen eliminates rivals. After mating flights, she becomes the new fertile queen responsible for colony reproduction.

## **WORKER POLICING AND REPRODUCTIVE SUPPRESSION**

In queenless colonies lacking suitable brood, some workers develop the ability to lay unfertilized eggs, producing drones. However, other workers often remove these eggs through a process known as worker policing, which maintains genetic stability. Colonies with laying workers usually decline due to lack of proper reproductive organization.

## **DIVISION OF LABOUR**

Honey bee colonies exhibit a well-defined division of labour based on age. Younger workers perform tasks such as cleaning and nursing, while older workers forage for food and defend the hive. The queen regulates colony organization through pheromones that maintain unity and reproductive control.

## **BLOSSOM FAITHFULNESS**

Honey bees exhibit floral constancy, meaning they repeatedly visit the same type of flower until resources are depleted. This behaviour increases pollination efficiency and enhances plant reproduction.

## **SUPERSEDURE (NATURAL QUEEN REPLACEMENT)**

Supersedure is a natural process in which a colony replaces an aging or less productive queen without swarming. Worker bees rear a new queen, who takes over after mating, ensuring continuity and colony stability.

## **BEE COMMUNICATION**

Honey bees communicate through a combination of movement, chemical signals, and physical interactions, enabling efficient coordination within the colony.

## MOVEMENT-BASED COMMUNICATION

Bees perform specific dances to convey information about food sources:

- *Round Dance*: Indicates food sources located nearby (within ~50 meters).
- *Waggle Dance*: Communicates distance and direction of distant food sources using a figure-eight pattern relative to the sun's position.

## CHEMICAL COMMUNICATION (PHEROMONES)

Pheromones play a crucial role in regulating colony behaviour, including reproduction, alarm signalling, and foraging. These chemical signals help maintain colony organization and social cohesion.

## TACTILE COMMUNICATION (TOUCH)

Bees use antennae and body contact to recognize nestmates and exchange information. Touch also helps in sensing environmental changes and coordinating activities within the hive.

## VIBRATION AND SOUND

Bees produce vibrations and buzzing sounds that serve as signals for mating, alarm, and colony coordination. These signals are particularly important in maintaining social interactions within the hive.

## TYPES OF BEES IN A COLONY

- *Queen*: The single reproductive female responsible for laying eggs and producing pheromones.
- *Worker*: Sterile females that perform all essential tasks such as foraging, nursing, and hive maintenance.
- *Drone*: Male bees whose primary role is to mate with a queen; they do not participate in other colony activities.

## HOW HONEY BEES LOCATE FLOWERS?

Honey bees perceive light differently from humans and can detect ultraviolet patterns on flowers. These patterns act as visual guides, directing bees to nectar and pollen sources efficiently. This adaptation enhances foraging success and improves pollination efficiency.

## CONCLUSION

Honey bees represent highly advanced social organisms with complex behavioural and communication systems. Their dance language, pheromonal signalling, and cooperative interactions ensure efficient resource utilization and colony survival. Understanding these mechanisms is essential for improving beekeeping practices, conserving pollinators, and supporting sustainable agriculture. As research continues, deeper insights into bee communication may further reveal the sophistication of their social systems, reinforcing their ecological importance and their vital role in global food security.



### **SUGGESTED READINGS:**

Kumari, M. (2019). Social behaviour of honey bees. In Biological aspects of insects.

Singla, A. (2020). Dancing bees speak in a code: A review. *Emerging Life Sciences Research*, 6(2), 44–53.

Suwannapong, G., Eiri, D. M., and Benbow, M. E. (2012). Honeybee communication and pollination. In *New perspectives in plant protection*.

Von Frisch, K. (1967). *The dance language and orientation of bees*. Harvard University Press.

Wario, F., Wild, B., Rojas, R., and Landgraf, T. (2017). Automatic detection and decoding of honey bee waggle dances. arXiv.

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### **How to cite:**

Jena, S. (2026). Bee behaviour and communication. Leaves and Dew Publication, New Delhi 110059.  
*Agri Journal World* 6 (1): 5-8.

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