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SIGNIFICANCE OF FOREST ANTS AS A KEYSTONE SPECIES

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Forest ants are a keystone species on earth, act as decomposers and predators by feeding on organic wastes, insects, or other dead organisms. They comprise a quarter of animal biomass in today's tropical forest, and their profusion permeates the temperate zone where they are similarly integral. Briefly put, forest ants are ecosystem engineers, shaping forest community structure in innumerable ways. As a keystone species, the activities of the forest ants determine the community structure. They can create or modify habitats and can influence the interspecific interactions among the community. Nutrient requirements are crucial for the survival, growth, and reproductive success of organisms. Therefore, sharing food could be the key success of forest ants.

Foraging strategies of forest ants

Forest ants are important components of forest ecosystems. They have specific nutritional needs and strategies to sustain their life and to fulfil their ecological roles. They are social insects that live in colonies or nests. They have evolved a variety of foraging strategies that enable them to gather food efficiently and effectively. One of the common strategies used is "trail following", a type of collective behaviour that is used by many ant species. The trail-following behaviour of ants is an example of swarm intelligence, in which individual ants work together to accomplish a task. Ants can follow trails by detecting chemicals called pheromones that are left behind by other ants.

The pheromones act as a sort of map that guides the ants along the trail, allows the colony to efficiently locate and exploit their food sources.

Forest ants also have evolved specialised foraging strategies called "area-restricted search" that enable them to efficiently exploit resources within their natural habitat. Individual ants systematically search small patches of their environment before moving on to the next area, allowing them to thoroughly explore localized regions and locate hidden or dispersed food sources. Forest ants also exhibit a behaviour known as "trunk-trailing", where they follow specific routes along tree trunks or branches. When ants engage in trunk trailing, they navigate along by pheromone trails, allowing them to maximize their chances of encountering aphids, scale insects, or other honeydew-producing insects that dwell in the tree canopy. Some forest ants engage in "cooperative foraging", where group-based workers coordinate their efforts to collectively transport large or heavy food items back to the colony. By utilizing a combination of area-restricted search, trunk-trailing, and cooperative foraging, forest ants optimize their resource exploitation within the complex and diverse environment of the forest.

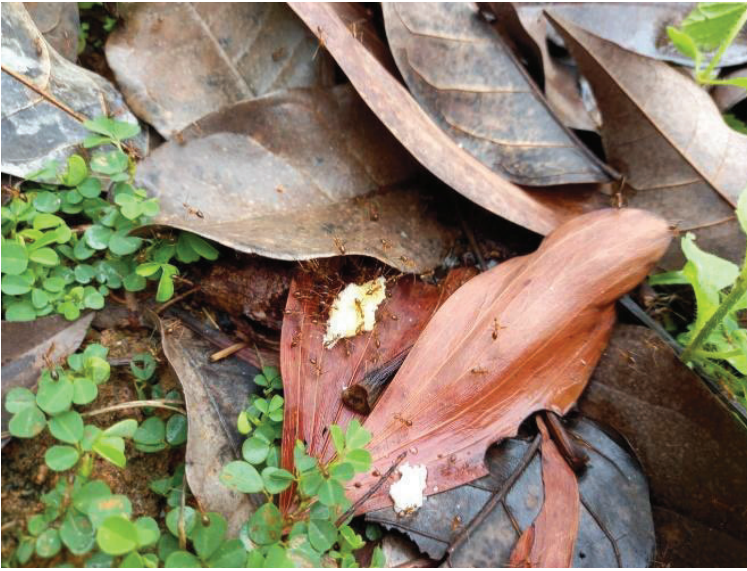


Figure 1: Collective behaviours in forest ants.

Foraging behaviours of forest ants

The foraging behaviour of forest ants can be described as a sum of complex behaviours that can be broken in several chronological sequences: (i) territory exploration to find food resource, (ii) food resource localization, (iii) identification of food resource, and (iv) the attack or collection of food resource. Generally, three phases are recognized in forest ants during foraging activity: exploration, recruitment, and exploitation. The foraging activity can be explained by their natural behaviours and responses to environmental factors (such as temperature, light intensity, and predator avoidance). The three distinct phases of foraging activity reflect a sequential process that ants employ to efficiently locate, communicate, and gather food resources.

During the exploration phase, individual ants actively explore their environment, utilizing their sensory capabilities to detect potential food items and identify of suitable foraging trails. Once an ant discovers a food resource, it can communicate the location and desirability of the resource to other colony members. This second phase called recruitment phase, which typically involves the use of chemical pheromones that guide and attract other forest ants to the food resource. The recruitment phase always characterised by increasing activities as more individuals were recruited to exploit the discovered food resource efficiently. During the exploitation phase, forest ants actively and collectively carry a big chunk of food back to the nest and distribute food to each member of the colony. Forest ants may establish well-defined foraging trails characterized by scent markers that facilitate efficient movement between the nest and food resources. The exploitation phase is crucial for maximizing resource acquisition and meeting the colony's nutritional needs.

Forest ants are ecologically beneficial

Forest ants play an important role in their ecosystem because they assist in a wide range of ecological processes. Forest ants' foraging activity is one of the most important ways of how they influence their ecosystem. They are recognized for their ability to seek for food resources over large regions, which aids in seed dispersal and plant pollination. This mechanism is essential for plant regeneration and diversity in an ecosystem. Forest ants may transfer seeds across vast distances, aid in the burying of seeds, shielding them from harsh conditions and improving the potential of germination and seedling survival.

Forest ants' role as predators of a diverse range of insects including aphids, scale insects, and other pests, which aids in pest population limitation and plant protection. Predation of insect pests help to regulate pest populations and reducing the needs for chemical insecticides. This natural pest control service provides by forest ants can be particularly beneficial in organic farming practices and integrated pest management strategies. Furthermore, forest ants also help with soil aeration and nutrient cycling. Their underground tunnels and excavations increase soil structure and water retention by aerating the soil. Forest ants may transport nutrients such as phosphorus and nitrogen throughout their ecosystem, assisting in the fertilization and help forest plants to better recover nutrients.

Forest ants decompose organic wastes, thus accelerating decomposition processes and nutrient cycling. This activity aids in the recycling of organic matter, returning nutrients back to the environment and minimizing potential disease risks associated with decaying organic wastes. Forest ants as "ecosystem engineers" are small insect with unique characteristics and show highly complex adaptive behaviours. They live in complex colonies which have ability to modify and shape their surrounding environments. As they forage and construct their nests, forest ants have profound effects on various ecosystem processes and community dynamics.