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Biodiversity of Ants from Marathwada Region, Maharashtra, India

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Abstract - Because of their widespread distribution, ants are the most important elements of the terrestrial ecosystem and account for a larger portion of biomass. Ants are the most diverse group of social insects and make up a significant portion of the terrestrial biosphere. These play the role of ecosystem engineers. They contribute significantly to the ecosystem by enhancing the soil and contributing in the decomposition process, and because of their mutualistic interactions with both flora and fauna, they are regarded as reliable biological indicators. In this article, the biodiversity of ants in Maharashtra's Marathwada area is reviewed.

Keywords - Biodiversity, Ants, Marathwada region, Ecosystem.

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INTRODUCTION

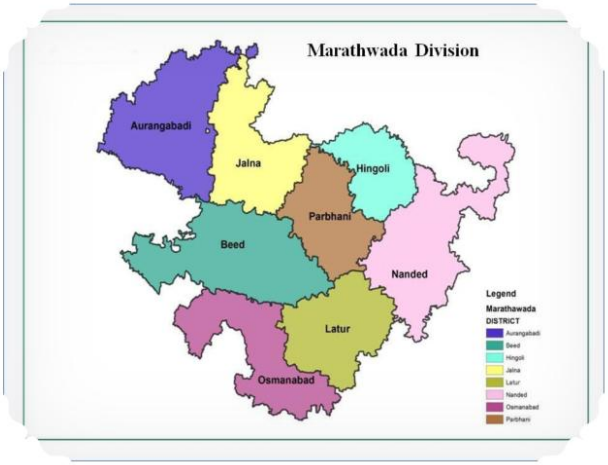
India is a great area to see a wide variety of animals because to the country's many protected ecosystems, including the Indian Ocean to the south, the Arabian Sea to the west, and the Bay of Bengal to the south and east. Dreeze and Sen (1995) claim that India has advanced considerably in terms of both human development and modernity. India is a megadiverse nation, with approximately 45,000 plant species and 91,000 animal species on only 2.4% of the Earth's surface area. India is one of 17 megadiverse countries, and its 10 biogeographic regions are home to 8.58 percent of the world's known mammalian species, Seventy-five to eighty percent of all known plant species, 13.66 percent of all recognized bird species, 4.66 percent of all known amphibian species, 11.72% of all known fish species, 11.8 percent of all known insect species. India is home to four of the world's 34 biodiversity hotspots, including the Himalaya, Indo-Burma, Western Ghats-Sri Lanka, and Sundaland. There are hundreds of different varieties of rice, wheat, maize, millets, etc., growing throughout India, making the country a potential center of agricultural variety. Due to the country's varied topography and climate, it is home to many different types of ecosystems, including forest, desert, wetland, grassland, marine, and coastal habitats, all of which support rich biodiversity and ultimately benefit humans.[1]

Gaston and Spicer (2004) argue that biodiversity encompasses a broad range of biological complexity, from changes in individual genes and species to whole ecosystems.Scientists from ZSI (1983) and elsewhere have described well over 67,000 different species of insects found in Indian forests. The many species of woodland insects. He looked at 3,378 insects from the orders Collembola, Thysanura, Ephemeroptera, Odonata, Orthoptera, Anaplura, Dermaptera, Isoptera, Coleoptera, Hemiptera, Thysanoptera, Hymenoptera, Lepidoptera, Neuroptera, and Diptera. It was estimated that there are 680 different species of parasitoids that serve as real enemies of insects.[2]

Biodiversity refers to the wide range of observable differences between organisms within a given environment, including those at the morphological, anatomic, physiological, embryological, cytological, genetic, and molecular levels. Research into biodiversity is crucial for making sense of the world's flora and fauna in terms of its prevalence, quantity, and value to humanity and the environment. The order Hymenoptera is very important because of its prevalence, size, and ecological footprint. The Formicidae family is representative of the significance of insects & biodiversity in general. It was found that ants have a major impact on the efficiency of ecosystems. Ants alter the biotic and abiotic matrices of community interactions by their huge biomass, manipulation of species composition, effect of trophic interactions, abundance of mutualistic and symbiotic connections.[3]

Marathwada refers to a region in the Indian state of Maharashtra that consists of seven different districts: Aurangabad, Beed, Osmanabad, Nanded, Parbhani, Latur, and Jalna. Marathwada has a hot, dry climate, although it's not as extreme as Vidarbha's. The rain that does fall tends to be brief and light. We can't expect much from the soil because of its gravelly texture. However, alluvial soil may be found along the Godavari river's banks. In certain areas it is more fruitful, and the vegetation is different from what you'd find elsewhere. Marathwada's flora is characteristic of trap soils; they get between 500 and 600 millimeters of rain annually, and its elevations range from low to somewhat forested hills. In the arid regions of Maharashtra, this is a common

occurrence. Because exotic ephemerals or weedy plants are sometimes introduced to the Marathwada region, There seems to be a major difference between the monsoon and non-monsoon vegetation of the area.[4]



The ant family (Hymenoptera: Formicidae) is a group of eusocial insects that diverged from wasp-like predecessors some 110–130 million years ago, around the time when flowering plants began to spread throughout the planet. To far, more than 12,500 species have been categorized, out of an estimated 22,000 total.[5]

The Formicidae family is the one that contains ants. The family Formicidae is among the biggest in the order Hymenoptera, which is part of the class Insect. It has people all across the world as members. There are around 10,000 known ant species throughout the globe, classified into 16 subfamilies, 59 tribes, and 404 genera or 15162 species. Myrmicinae, Formicinae, Ponerinae, Dolichoderinae, and Pseudomyrmecinae are the most diverse ant subfamilies. From India alone, 176 different genera and 684 different species of ants were documented. There are 227 different ant genera known to inhabit the Oriental area. Approximately 2,480 species are known to exist in the Orient, whereas 1,709 live in the Indo-Australian area.[6-8]

Antennae that are bent at the elbow are a telltale sign of an ant, as is the node-like structure that creates their slim waists. Colonies formed by ants may include anything from a few hundred predatory individuals residing in tiny natural holes to millions of individuals living in highly organized colonies that might cover vast territories. Larger colonies, wingless, sterile females who organize themselves into castes of "workers," "soldiers," and so on. The majority of ant colonies will also include drone males and queen females.[9]

Ants are widespread and may be found on almost every continent. Antarctica and other uninhabited islands are notable exceptions. Ants might account for 15-25% of the total terrestrial animal biomass due to their prevalence in so many environments. Their capacity for social structure, habitat modification, dependency against attackers, and resource exploitation have all contributed to their survival in a wide variety of situations. Long periods of coevolution have resulted in partnerships that are mimetic, commensal, parasitic, or mutualistic.[10]

Ants are able to divide up tasks and work together to overcome difficult challenges. Ants are used in a variety of ways throughout many human societies, including in food, medicine, and ceremonies. Certain organisms are used as biocontrol agents. Herbivores, carnivores, and scavengers, ants can do it all. They may be found in a variety of habitats. While the vast majority of animals are able to consume a wide variety of foods, others have adapted to eat just certain types of organisms. The largest ant species ever was the extinct Titanomyrmagiganteum, with a body length of 52 millimetersL. or its queen, which reaches 6 cm (2.4 in) in length and has a wingspan of 15 centimeters.[11]

Ants come in a wide range of colors. Some ant species are green, and some tropical species even have a metallic sheen, but red and black make up the vast majority of ant coloration. There are four different phases in an ant's life cycle: egg, larva, pupa, and adult. If an egg is fertilized, it will result in a female. Because of its immobility, the larva relies on the caretakers for food and sustenance. Solid food, such prey pieces, trophic eggs, and seeds, may also be carried to the larvae by the workers, particularly in the later stages. There are often 4 or 5 moults before the larvae reach the pupal stage. This pupa is of the exarate type, meaning that the appendages are not united to the body. Queen bees have a lifespan of 13 years, but worker bees only make it 1–3 years. Males, who have an average lifespan of only a few weeks. Ants may communicate by pheromones, sound, and touch. Ants have a more refined pheromone system for communicating chemically. The ants' long, slender, and highly agile antennae allow them to detect odors. Using their pair of antennae, animals can determine the location and strength of odors.[12]

Ants fight and defend themselves in a number of methods, including biting, stinging, injecting, & spraying chemicals such as formic acid , alkaloids and piperidines , and a range of protein components. The sting of the Central and South American bullet ant is among the most excruciating ever recorded, yet it seldom proves lethal to humans. A bullet ant's sting is the most excruciatingly painful there is, according to the Schmidt Sting Pain Index. Jack jumping ants have a potentially lethal sting, however an antivenin has been created to counteract the effects of the venom. Piperidine alkaloids are only found in the venom sacs of fire ants. Their stings hurt and, in extreme cases, may be fatal.[13-15]

There are several types of ants, some of which build elaborate nests and others of which are migratory and do not construct nests at all. In addition to

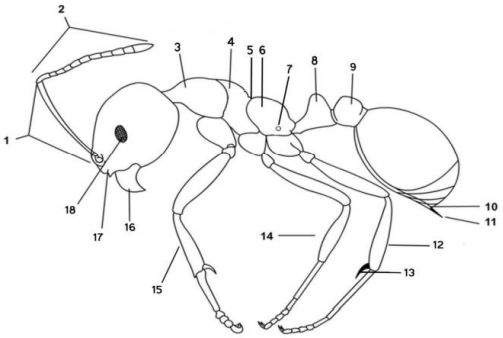
making nests underground, ants may also construct them in tree hollows. Nesting areas for ants include the soil, logs, hollow stems, stones, and even acorns. Soil and plant material are utilized to create the nest. Ants are selective about where they build their nests, with Temnothoraxalbipennis C. avoiding areas where there have been dead ants due to the risk of illness and pests.[16]

Most tropical tree species rely on ants to help spread their seeds. In grassland ecosystems prone to wildfires, ants play a crucial role in the survival and spread of some plant species by carrying their seeds to a more secure location underground. Elaiosomes are specialized outer structures found on many ant-dispersed seeds. The aeration of soil and the reduction of insect populations are only two of the numerous ecological services provided by ants that are useful to humans. However, ants may become a problem when they penetrate structures and cause damage that costs money to fix. Army ants are utilized as sutures in several medical procedures. Army ants are put in a bandage along the cut, and the incision is pushed together.[17]

Ants are ubiquitous, yet they have disproportionate influence on the terrestrial biosphere due to their roles as primary soil aerators, energy conduits, and top predators among insects. They use the most sophisticated chemical signals of any known animal, and their social structure serves as an instructive counterpoint to our own. Ants have evolved tremendously since the Cretaceous, when they first appeared. The ant family, Formicidae, is the biggest in the Hymenoptera order. There are 14,711 legitimate species and 428 valid genera in the Formicidae family, 152 of which are on the IUCN red list. There are 87 genera and 652 species that may be found in India. Their energy consumption and biomass are more than that of all vertebrate species put together, and they have a direct effect on ecosystems and tropic interactions.[18]

More than 465 species of plants in 52 families, thousands of arthropod species, and an unknown number of fungi and microorganisms are known to have symbiotic relationships with ants.Ants have developed extraordinary specialized techniques for survival. It is for these reasons that ants have become one of the most widely used and reliable bio-indicators of insect diversity and abundance. Ants may be found in almost any terrestrial ecosystem on Earth.[19]

Ants' morphological characteristics



1. Scape.
2. Flagellum
3. Pronotum
4. Mesonotum
5. Metanotum
6. Propodeum
7. Metapleuran gland,
8. Petiole
9. Post petiole
10. Pygidium
11. Sting
12. Hind leg,
13. Tibial Spur
14. Mid leg
15. Fore leg
16. Mandibles
17. Clypeus 18.Eye.

The size and form of an ant's head may vary greatly. Hard, extensively sclerotized, smooth, or sculpted, it has a concave or rounded shape. The setae or hairs on their heads come in a wide variety of colors, from yellow to brown to black to red to metallic green to blue. In workers, three ocelli is a very unusual occurrence. Eyes, clypeus, frons, genae, vertex, oral parts, and antennae are all components of the head. Eyes may vary in size and placement. Eyes either pointing down or up on the head. Complex, well-developed eyes, yet other species lack eyes altogether.[20]

Antennae play a crucial role and show tremendous diversity among different animals. Workers have geniculate (4-12 segmented) antennae (Fig.25). The scapula is the first section of the antenna to articulate from the socket. The pedicel and flagellum each consist of three to eleven relatively small segments, while the scape is wide and relatively long. The antenna looks crooked because the scape & flagellum meet at an acute angle.[21]

The legs are robust, and there are three pairs total: the forelegs, the middle legs, and the hindlegs. The front and middle legs have been adapted for walking, while the back legs have been adapted for sprinting, leaping, etc. (Figure 26) The hind legs are noticeably longer than the forelegs. The ants' legs are made up of a coxa, the initial basal piece of any leg, which articulates inside a coxal chamber in the ventral

thorax. The trochanter is a little bone that connects the coxa with the femur.[22]

There are seven separate abdominal compartments. The propodeum is the first abdominal segment that joins the thoracic cage with the pelvis. The second abdominal segment is cut down and detached from the rest of the abdominal segments to form a narrow waist with one or two nodes, which is the petiole. The third segment, which is likewise shortened, is split off to become the post-petiole. Narrow constriction separates petiole and post-petiole from abdominal segment. The remaining parts form the gaster. It's a good size and rather wide. The sclerites dorsal tergite or ventral sternite make up this body part. The pygidium is the name for the worker's last abdominal tergite, whereas the hypopygium is the name for the final visible sternite.[23]

Leg-bearing portions of the thorax are called the prothorax, mesothorax, and metathorax in ants. The thoracic lateral sclerites are called propleuron, mesopleuron, and metapleourn. A gland known as the metapleuron is part of the pleura. However, the first abdominal segmentation tergite is joined to the thorax region in all ants, making a total of four tergites. The true thorax is called the propodeum, which is also known as the alitrunk or the mesosoma. The torso is much wider than the skull. Variation in size, shape, and coloration occurs among species, sexes, and social classes.

Many of the variety of ants found in the Marathwada region are unique to that area. The Marathwada area is home to a wide variety of insects, including 350 species of ants. Many significant species and groupings of species were identified. [24]

Table 1: Highlights the species-by-species variety of ants.

Sl.No	Scientific name	Common Name	Ecological Status
1	*Camponotus compressus* (Fabricius, 1787)	Carpenter ant	Common
2	*Camponotus* sp.2		Common
3	*Camponotus* sp.3		Common
4	*Camponotus sericeus* (Fabricius, 1798)		Common
5	*Oecophylla smaragdina* (Fabricius, 1775)	Weaver ant	Common
6	*Polyrhachis* sp.1	Spiny ant	Common
7	*Polyrhachis* sp.2		Rare
8	*Crematogaster* sp.1		Rare
9	*Crematogaster* sp.2		Common
10	*Meranoplus bicolor* (Guerin-Meneville, 1844)	Shield ant	Common
11	*Myrmicaria brunnea* (Saunders, 1842)	Harvester ant	Rare
12	*Pheidole* sp.	Big headed ant	Rare
13	*Pheidole watsoni* (Forel, 1902)		Rare
14	*Solenopsis geminate* (Fabricius, 1804)	Fire ant /thief ant	Common
15	*Anochetus* sp.	Trap jaw ant	Common

The Marathwadaarea of Maharashtra is home to several distinct types of agricultural and forest environments. The Marathwadaarea is recognized as a prime location for plant and animal life. The current subject was chosen by taking into account the adaptability of ants and the numerous economic responsibilities.

CONCLUSION

Ants are ubiquitous invertebrates that live in human-created and natural environments alike. They are seen as threats to crops, gardens, and forests and are used as part of biological pest management. The management of ant populations, as well as their use in biological pest control & protecting biodiversity, would benefit greatly from a deeper The diversity of ants, their seasonal distributions and abundances, and the hosts they use are all topics that may be better understood with more data. As this article on the ant variety of the Marathwada region of Maharashtra demonstrates, the area is home to a plethora of unique species. The Marathwada area, which has seen a number of shifts throughout the years, is representative of ant variety and may serve as a simplistic example of habitat persistence among ant species. Data gleaned from this research on the prevalence of ants in the area will be invaluable.

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