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Distribution of ant fauna in different terrestrial ecosystem in and around Nagpur city, Maharashtra India

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Abstract

Hymenoptera is the most promising group which makes its first position to show social behaviors with its foremost representative such as honey bees, wasps and ants. Hymenoptera as a whole about 5% of an estimated 1, 00,000 species among entomofauna. True insect socialism probably had its beginning when the colony founding female occasionally began to live long enough to see her young not only matures but stimulated by hormonal community bonding secretion remain in the insect to care for a next generation. The distribution and abundance of ant's species across different biotypes were studied with respect to disturbance gradient in and around Nagpur city. Thirteen different sites were sampled with different floral and host abundance and these represented a gradient of urban land use that ranged from highly disturbed to comparatively less disturbed areas. A checklist has been prepared to understand the impact of increasing human induced disturbance for the first time reported by us on ants. Total numbers of 25 genera of ants belonging to five subfamilies were recorded. Monitoring ants can provide information over the short-term on topics such as the status of invasive or keystone species, as well as over longer time frames, for instance the impact of climate change.

Keywords: Myrmecofuana, Keystone species, Conservation.

1. Introduction

Ant is social insect belongs to order – Hymenoptera offamily-Formicidae. Distribution of ants occurs from our kitchen to deep forest but is generally found in forest grassland, wetland, and rock, bark of tree, dead organic matter and human habitats. Insects are particularly useful in the evaluation of biodiversity and ants have been used extensively as indicators of disturbance [3, 10, 13, 14]. Ants are diverse, abundant, easily found, and can be reliably sample and monitored [3, 18]. According to Andrewartha and Birch (1954), the environment of an individual organism may be analyzed into four components like weather, other organism, food and a place in which to live. The four components were said to comprise everything that might influence an organisms chance to survive and multiply. They are relatively sedentary with restrictive ranges and are responsive to small-scale changes in both space and time [3, 10, 14, 18]. The great majority of bees and wasps are either solitary or semi social lacking a worker caste but often giving indication of a progression towards the end stage. One basic difference between ants and other Hymenopteran is that ants have more or less dispensed with flight as an aid to foraging. Litter and ground dwelling ants are useful in terms of biodiversity and conservation [11, 12, 1, 20]. According to Andersen (2000) nest site availability, food supply, microhabitat structure, resource capture and low temperature are particularly important for ants.

Ants shows peculiar social behaviors among different castes worker ants are invariably wingless and even queen and male possess wings only during a short courtship or nuptial flight, the queen subsequently bite or rub them off, resigning themselves to a totally nest bound, egg-laying existence. A mated queen ant receives numerous amounts of sperms from one or two males to last a lifetime of egg lying during which she produces several million eggs.

Ant plays key role in different trophic levels [1, 20] and ecological roles in soil ecosystem turnover and structure [9, 5], nutrient cycling [17, 16] plant protection measures [5, 6, 7]. In the ground of tropical forests, the litter that covers the soil plays a key role in governing ant species diversity and colony survival pointed that ant shows mutualism with certain tropical plants [11, 12].

In order to find out different species abundance intensive survey were made indifferent habitats in and around Nagpur to prepare checklist of entomofauna of ant species richness in various biotypes.

2. Material and Methods

2.1. Study Area

Nagpur city is the second capital of Maharashtra state and the geographical location of Nagpur is 79°7' east longitude and 21° 7' north latitude. Nagpur is situated at a height of 312.42 meters above sea level. It has tropical dry equable climate having three main seasons: June/July wet Monsoon and its after month from June till October, the cool dry winter from October/November to February/March and the hot dry season from April till the onset of rains. Temperature of city ranges from minimum of 12-25 °C to maximum 30-45 °C with a relative humidity minimum 15-25% to maximum 60-95% (RH).

The samplings were done collected from different selected localities such as:

Study Site 1. Nagpur University Campus, Nagpur.

Study Site 2. Bull rearing center, Nagpur.

Study Site 3. Futala Lake Reserve, Nagpur.

Study Site 4. Ambazari Lake Reserve, Nagpur.

Study Site 5. Gorewada Lake Reserve, Nagpur.

Study Site 6. Civil line Water Purification Plant area, Nagpur.

Study Site 7. N.R.C.C. Nagpur.

Study Site 8. Satpura Botanical Garden, Nagpur.

Study Site 9. Central Fuel Research Institute, Nagpur.

Study Site 10. V.C.A. stadium area, Nagpur.

Study Site 11. Nag river, Nagpur.

Study Site 12. MIDC industrial areas, Butibori, Nagpur.

Study Site 13. Dr. Ambedkar International Airport, Nagpur.

2.2 Methodology

Ants were hand collected using a brush and forceps during day time from study site. All the collected specimens were

preserved in 70% alcohol. Ants up to the genus level by using Zeiss Axio cam ERc5s Stereo microscope and software version stereo Axio Vision Documentation by ZEN based on taxonomic keys of [10] were identified and documented.

2.3. Occurrence of Insect

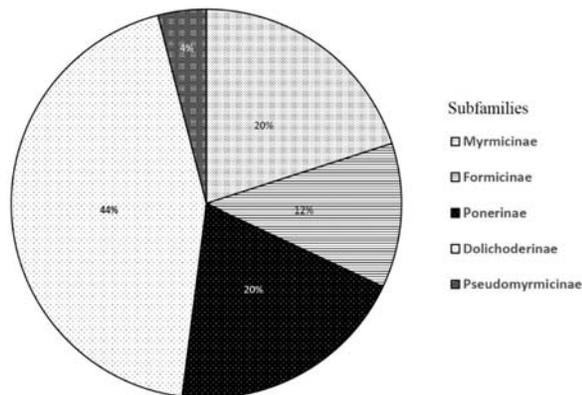
The ant species that were recorded in almost all visits in all the three season were designated as 'common' species, whereas the species which were recorded in 1 or 2 seasons were considered as 'Seasonal' species. The species which were recorded only during one or visits were considered as 'occasional'.

3. Results and Discussion

During the survey were recorded ant fauna from thirteen sites in and around Nagpur city it consisted of 25 genera belonging to five subfamilies. Most common species found in abundance are *Camponotus compressus*, *Oecophylla smaragdina*, *Paratrechina lognicornis* and *Polyrachus* species were most abundant belonging to subfamily Formicinae. Among Myrmicinae *Solenopsisgeminata*, *Crematogaster sp*, *Tetramorium pacificum* high in number at dry deciduous, dry shrubs and semi evergreen. Species such as *Oecophyllasmaragdina* and *Paratrechinalongicornis* were commonly found in all the sites and they all belong to the subfamily Formicinae. During the present study, we recorded 25 genera of ants representing five subfamilies-Dolichoderinae, Formicinae, Myrmicinae, Ponerinae and Pseudomyrmicinae. The highest diversity was by the subfamily Myrmicinae with eleven genera. The ants belonging to *crematogaster* generaexhibited the highest diversity, represented by four species. This was followed by Formicinae with 20% contribution and represented by five genera including the Invasive ants, Black crazy ants, Red fire ants and Yellow crazy ants. During the study, twenty five genera were recorded from different site represented in the (Table 1 and Graph 1).

Table 1: Myrmecofauna in different forest ecosystem

Subfamily	Genus	Moist deciduous	Dry deciduous	Scrub jungles	Buffer forest	Deep forests
Ponerinae	<i>Leptogenys</i>	+	+	+	+	-
	<i>Pachycondyla</i>	-	+	+	-	-
	<i>Diacamma</i>	+	+	+	+	-
	<i>Platythyrea</i>	+	+	-	+	-
	<i>Odontoponera</i>	-	-	-	+	+
Dolichoderinae	<i>Iridomyrmex</i>	-	+	+	+	+
	<i>Tapinoma</i>	+	-	-	+	-
	<i>Dolichoderus</i>	+	+	+	-	-
Formicinae	<i>Camponotus</i>	-	+	+	+	+
	<i>Oecophylla</i>	+	-	-	+	+
	<i>Paratrechina</i>	+	+	+	-	-
	<i>Polyrachus</i>	+	-	+	+	+
	<i>Plagiolepis</i>	-	+	-	+	+
	<i>Tetramorium</i>	+	+	+	+	-
Myrmicinae	<i>Aphaenogaster</i>	+	+	+	+	-
	<i>Monomorium</i>	+	-	-	+	-
	<i>Myrmecaria</i>	+	+	+	+	+
	<i>Cardiocondyla</i>	-	-	-	-	-
	<i>Pheidole</i>	+	+	+	+	+
	<i>Crematogaster</i>	-	+	+	-	-
	<i>Pheidologeton</i>	+	+	+	+	+
	<i>Solenopsis</i>	+	-	+	-	-
	<i>Meranoplus</i>	+	+	+	+	-
	<i>Lophomyrmex</i>	+	+	+	+	-
Pseudomyrmicinae	<i>Tetraponera</i>	+	-	+	+	-



Graph 1: Percentage of ant distribution of subfamilies

Ten ant species were commonly observed at four species of Myrmicinae, four of Formicinae and one each from Dolichoderinae and Pseudomyrmicinae. It is noteworthy that *Oecophylla smaragdina* and *Camponotus compressus* (Family: Formicinae) were the common species. *Camponotus compressus*, is a general predator and is common in variety of habitats including gardens and litter. *Polyrhachis lacteipennis* (Family: Formicinae) is an invasive species, indicating disturbance in the habitat. Common occurrence of *Tetraponera* spp. (Family: Pseudomyrmicinae) an arboreal species, at Botanical garden, Ambazari lake, Futral lake and Gorewada forest zone indicates availability of suitable trees providing microhabitats for the species at these sites. *Solenopsis geminata* (Family: Myrmicinae) occurs in urban region, domestic homely areas. It can be present only in undisturbed environment [19]. Occasional presence of this species is significant. Three species of *Crematogaster* ants were common in this area. *Crematogaster* species have been reported as being able to tap the high productivity of canopy foliage by feeding on plant and insect exudates [8] this can be the reason for their common occurrence during the present study (Table 2).

Table 2: List of recorded Myrmecofouna in different habitat

Subfamily	Genus across Forest types	Habitat
Ponerinae	<i>Leptogenys</i>	ground
	<i>Pachycondyla</i>	ground
	<i>Diacamma</i>	ground
	<i>Platythyrea</i>	tree and ground
	<i>Odontoponera</i>	ground
Dolichoderinae	<i>Iridomyrmex</i>	ground
	<i>Tapinoma</i>	trees
	<i>Dolichoderus</i>	tree and ground
Formicinae	<i>Camponotus</i>	tree and ground
	<i>Oecophylla</i>	trees
	<i>Paratrechina</i>	trees
	<i>Polyrhachis</i>	trees
	<i>Plagiolepis</i>	trees
Myrmicinae	<i>Tetramorium</i>	tree and ground
	<i>Aphaenogaster</i>	ground
	<i>Monomorium</i>	ground
	<i>Myrmecaria</i>	ground
	<i>Cardiocondyla</i>	ground
	<i>Pheidole</i>	ground
	<i>Crematogaster</i>	trees
	<i>Pheidologeton</i>	ground and tree
	<i>Solenopsis</i>	ground
	<i>Meranoplus</i>	ground
	<i>Lophomyrmex</i>	ground
Pseudomyrmicinae	<i>Tetraponera</i>	trees

4. Nesting

During our survey, nests of 25 genera were observed. *Tetraponerarufonigra*, the arboreal bicolored ant is reported to nest in dead wood of trees and posts [19]. During this study, it showed lignicolous nests in Gorewada national park, especially on *Ficustsiela* species. Similar observations were recorded by Arnarasinghe, (2006). Kumar and Mishra (2008) observed its nesting on *Caesalpinia crista* at Vadodara. Nesting of *Crematogaster subnuda* was recorded on *Barringtonia* even as *Catazrlacustaprobanae* preferred *Ficus arnottiana* for its colony at Botanical garden. (Narendra and Kumar, 2006) [19] stated that feathers are taken for nests decoration. However, these feathers contrary to the observation of Narendra and Kumar (2006) [19] were not being used for decoration of the nest entrance to act as visual signal but the feathers were taken inside the nest, the reason is unknown and needs further study.

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