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DIVERSITY OF ANTS: A SMALL CASE STUDY FROM COOCH BEHAR MUNICIPAL AREA

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Abstract: Ants belonging to order Hymenoptera is often thought to be a nuisance in our human life. It is a social insect and can build different nest type. But apart from one Hymenopteran species, *i.e.* bees which are thought to be beneficial to our ecosystem, ants are not looked upon though roughly. People are always concerned about degradation of ecosystem and its effect on large fauna. But these small organisms are often avoided. Ants though thought to be injurious; it do play essential role in day to day life as to the benefit of ecosystem. The present study tries to emphasize on the diversity profile of ants in an urban area, where different anthropogenic activities are now depleting the normal habitat of ants. Diversity study reveals that Cooch Behar is diverse in ant and a checklist of 12 genera of ant with diversity index of four study sites is provided. It also emphasizes on the fact that Site 4 should be properly restored and freed from human interference, as it shows highest ant diversity.
Keywords: Ants, Cooch Behar, Diversity.
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INTRODUCTION

Ants are social insects and are recognized as an important member of ecosystem. It belongs to order Hymenoptera, family Formicidae. Ants are cosmopolitan, except Antarctica, Greenland, Iceland and Hawaiian islands (Ward, 2007). Major habitat of most ants is soil but some may inhabit trees. There are several species of ants that are considered as important household pests. Ants live in colonies with a distribution of castes. Most prominent caste of ant colony is the workers that make ¾ of an ant colony. They are seen out of the colony and can even have sub caste division (Metcalf and Flint, 1951). During mating *i.e.* monsoon, winged male and female ants come out of the nest and perform nuptial flight. These winged castes are only visible during monsoon (Srivastava, 1996). Ants are highly diverse with not less than about 250,000 species (Clark, 2006). As they are social they build nests. Generally these insects prefer moist and warm habitat for nest building (Metcalf and Flint, 1951). Each ant colony has its own nest type. Some build leaf nest, a large population builds nests in soil through burrowing (Clark, 2006). Few prefer crevices of rocks or forest floor (Richard and Davies, 2005). Several surveys are going on to know the diversity of ants throughout the world. Though ants are regarded as a household nuisance and measures are taken to decrease their abundance at home (Drlik, 2006), but it is not known to people about the beneficial role they play in ecosystem. Being a soil fauna they play various roles in Ecosystem. Some genera of ants fill the soil with passages and chambers for their brood without making any mound, while others make mounds either out of surface or of subsoil. This channeling and burrowing in the soil can have a very appreciable effect on the aeration of soil (Cloudforest, 2010). Such activity increases porosity of soil facilitating plant growth. Ants also play an important role in dispersal of seeds. Ants collect food with the help of their antennae and carry them to their

nest. While doing so they disperse seeds of plants that are an important part of their diet (Simberloff and Rejmánek, 2010). Their soil-moving skills make them important in nutrient cycling, and their ability to decompose soil particles releases important nutrients back to the environment (Alam, 2001). They are a good source of food for many animals, including woodpeckers, bears, and fish. Some subfamilies of ants can sting and thus may have some medical importance (Clark, 2006). Recently it is been known that ants can also act as bio- indicators (Anderson, 1997).

The aim of the present study is to survey the diversity profile of ants in Cooch Behar town and neighboring areas. This will help to create a mass appeal about the significance of conservation of ant habitat in this locality and will help to minimize the general phobia for ants.

EXPERIMENTAL

Cooch Behar is the district town of Cooch Behar comprising an area of 800 sq Km of West Bengal. It is a semi-urban township with habitation that has varied floral and faunal diversity. Samples of ants were collected from four sites of Cooch Behar Municipal (26.32419 N and 89.45103 E) area *i.e.* A.B. N. Seal College Campus (Site 1), Gunja Bari (Site 2), Gandhi Colony (Site 3), and Tapurhat (Site 4).

Description of Study sites

Site 1: The A. B. N. Seal college campus is a restricted area; the floral habitat is distinct in having large Teak trees (*Tectona grandis*) and a large area of concrete land mass.

Site 2: Gunja bari, also called Madan Mohan Bari, is a complex area with temple and small gardens. It also harbors a market area and a small water body called Bairagi dighi.

Site 3: Predominantly human habitations with small gardens harboring shrubs, herbs and small trees, the major plant species being rose, china rose, marigold, chrysanthemum etc.

Site 4: This area is distinct in its floral composition; it is a small forest away from the Cooch Behar municipal area and can support diverse life forms. The predominant plant species are *Shorea robusta* (Sal), *Ficus benghalensis* (Banyan), *Tamarindus indica* (Tamarind), *Ficus religiosa* (Peepal) etc.

40 specimens were collected from each site. Specimen collection was done in Feb-March and Oct-Nov 2013. Each specimen was captured live, etherized and individually studied under dissecting binocular (Magnus) at10X x 4X. The identification was done with the help of a standard Key. (Pocock, 1900) The major characters studied were presence or absence of eye, sting, joints in pedicel, gastral demarcation, segments in antennae and pronotal structure. Identification was done up to the Genus level for each ant. Diversity analysis of the studied sites were done using the software PAST. The major diversity indices studied were Shannon-Weiner Diversity Index: This is the most widely used diversity index (Shannon, 1949) and is a measure of the average uncertainty in predicting to what species an individual will belong chosen at random. It is calculated as:

$H = -\sum(ni/N)\ \ln\ (ni/N)$, where ni=Number of individual of a particular species and N=Total number of individual of all species.

Dominance Index (D): It was first proposed by Simpson (1949), which gives the probability those two individuals drawn at random from a population belongs to the same species. Thus more individuals belong to same species, less is the diversity or in other words more the value of D, more is the dominance of a particular species in the region. It is calculated as:

$$\mathbf{D= \sum(ni/N)^2}$$

Where ni=Number of individual of a particular species and N=Total number of individual of all species.

Evenness Index (E): Among different evenness indices, the most common index used by most ecologists is that of Pielou's J (1977). It is the diversity relative to the maximum value it can obtain when all the species in the sample are perfectly even with one individual/species. It is calculated as:

$$\mathbf{J= H'/ \ln S}$$

Where H' is the Shannon index and S is the total number of species.

Margalef's Richness Index (R): Historically most well-known index that reflects the total

number of species in a region proposed by Margalef (1958). It is calculated as:

R= (S-1)/ln (n)

RESULTS

Specimens were identified following a standard Key and 12 different Genus of ants belonging to 5 different subfamilies were identified as presented in Table 1. Diversity analysis of the four sites revealed that Site 4 has highest diversity (1.54) and Site 1 has least (1.16). The Dominance index values are highest in Site 1 (0.38) and low in Site 4 (0.23) as should be the case. The other study sites viz. Site 2 and Site 3 has a similar diversity index value for Dominance, Diversity index and Evenness. Thus it projects that these two sites are more or less similar in both their floral as well as faunal composition. The detail results of four diversity indices were presented in figure 2. Present study also confirmed checklist for identification of Ant species in this region provided in Table 2.

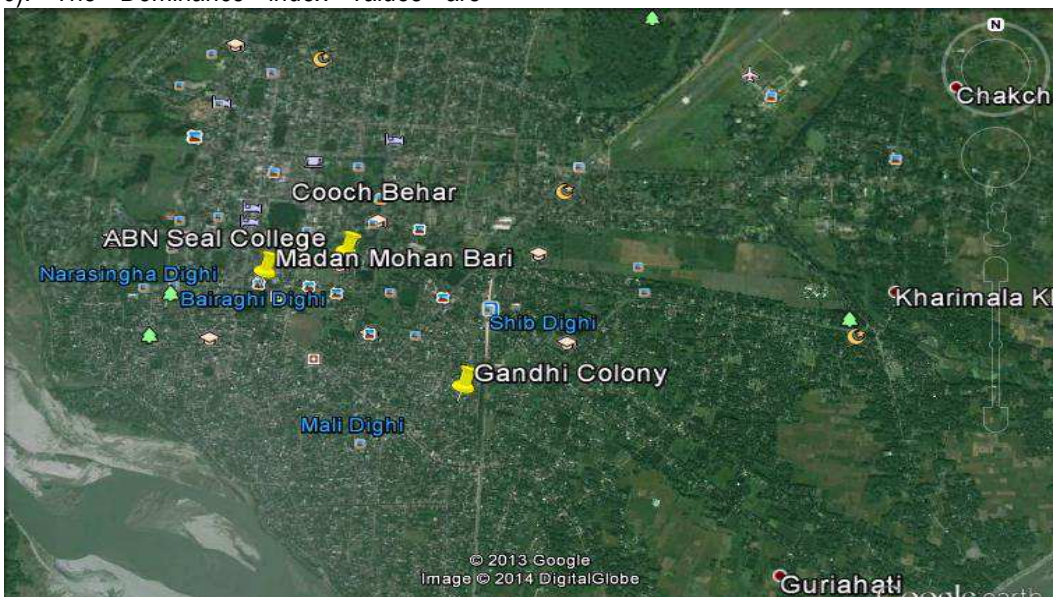

Figure 1. Satellite map of Cooch Behar

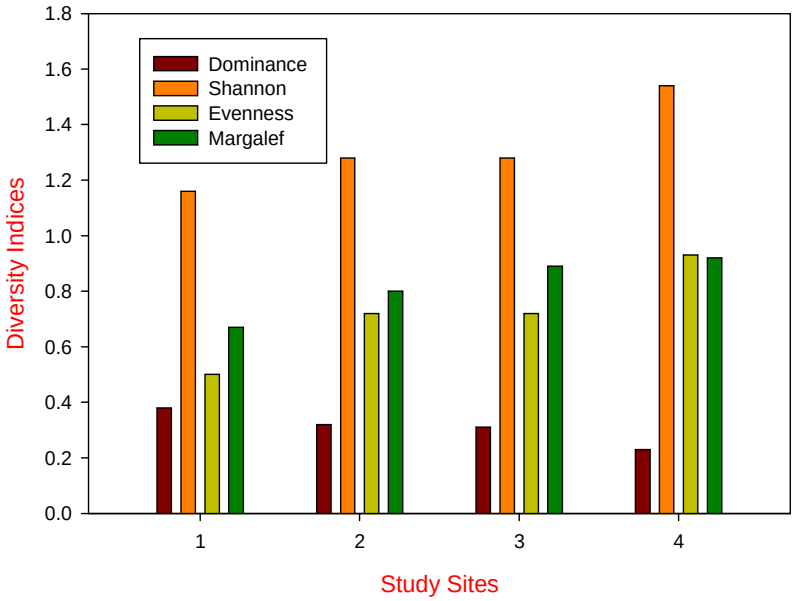

Figure 2. Diversity indices of ant subfamilies of four sites studied in Cooch Behar

Table 1. Checklist of Ants of Cooch Behar Municipal area

S.No.	Genus	Sub-family
1	*Aenictus* sp.	Dorylinae
2	*Diacamma* sp.	Ponerinae
3	*Ponera* sp.	Ponerinae
4	*Brachyponera* sp	Ponerinae
5	*Odontoponera* sp.	Ponerinae
6	*Solenopsis* sp.	Myrmicinae
7	*Phiedole* sp.	Myrmicinae
8	*Crematogaster* sp.	Myrmicinae
9	*Camponotus* sp.	Formicinae
10	*Oecophylla* sp.	Formicinae
11	*Dolichoderus* sp.	Dolichoderinae
12	*Tetraponera* sp.	Pseudomyrmicinae

Table 2. Essential characters used during identification of Ants

Character	Eyes	Antennae	Pedicel	Gaster
Aenictus sp	Absent	10 segment	2- jointed	Long
Diacamma sp	Present	12 segment, filiform	1- jointed, spine 2	Constricted
Ponera sp	Eye small	12 segment, striate	1- jointed, spines	Constricted
Brachyponera sp	Eye large	12 segment, large	1- jointed	Constricted
Odontoponera sp	Eye moderate	12 segment, robust	1- jointed, spineless	Constricted
Solenopsis sp	Present	10 segment, Club 2 segment	2- jointed, globose	Elongated
Phiedole sp	Present	12 segment, Club 3 segment	2- jointed, elongate	Rounded
Crematogaster sp	Present	10 segment, Club 4 segment	2- jointed, round	Heart shape
Camponotus sp	Present	12 segment, long	2- jointed, convex	Acidopore with nozzle
Oecophylla sp	Present	12 segment, long, filiform	2- jointed projections,	Acidopore with nozzle
Dolichoderus sp	Present	12 joints	1- jointed, erect	Acidopore absent
Tetraponera sp	Present	12 joints	2- jointed, long	Sting present

DISCUSSION

The results showed 12 distinct species of ants from four study sites in a span of only four months. Usually ants are easy to collect during spring *i.e.* Feb-Mar or just at the onset of *winter i.e.* Oct-Nov. Diversity indices showed that Site 1 is less diverse and has a high dominance. This can be due to the fact that site 1 is a college campus with only a specific plant species (*Tectona grandis*) which supports the tree ants. Most specimens collected from this area belonged to the subfamily Pseudomyrmicinae and represented by only one Genus *Tetraponera* sp. As this site is dominated by a single species both Evenness and Richness values are low in comparison to

other sites. Site 4 has highest diversity. As discussed earlier, it is a small forest area, with varied habitat that can support the growth and survival of different ant species. As a result the Dominance value is low and the Evenness and Richness values are high. The other two study sites are more or less similar in their habitat composition. Thus the diversity indices show similar values. Most of the ant species of these two sites are of the subfamily Ponerinae and Myrmicinae. Site 2 is a market complex which generally has a ant population that are now accustomed to the market food, especially those from sweet shops and fruit vendors. The richness index is little high in Site 3(0.89) as compared to Site 2 (0.80). This can be explained as Site 3 being a residential area has small gardens that can support more ant species than Site 2. This is a small effort to study the ant diversity in and around Cooch Behar. But a vivid study should be conducted to know the exact population status of this region.

Ants form an important component of ecosystem. They have evolved 120-170 million years back during the Cretaceous Period. Origin of ants is Vespoids. Ants are ecologically significant for their beneficial roles in ecosystem. Thus study of ants in different region will reveal the present status of ant population globally. Being a soil fauna they play various roles in Ecosystem. Some genera of ants fill the soil with passages and chambers for their brood without making any mound, while others make mounds either out of surface or of subsoil (Cloudforest, 2010). This channeling and burrowing in the soil can have a very appreciable effect on the aeration of soil. Such activity increases porosity of soil facilitating plant growth. Ants also play an important role in dispersal of seeds. Ants collect food with the help of their antennae and carry them to their nest. While doing so they disperse seeds of plants that are an important part of their diet. Their soil-moving skills make them important in nutrient cycling, and their ability to decompose soil particles releases important nutrients back to the environment (Alam, 2001). They are a good source of food for many animals, including woodpeckers, bears, and fish. Some subfamilies of ants can sting and thus may have some medical importance (Clark, 2006). Recently it is been known that ants can also act as bio- indicators (Anderson, 1997). Cooch Behar municipal area is diverse in respect to ant. The ants identified in this study area are abundant throughout India, but major incidence is seen in Northern and Eastern parts of India. (Pocock, 1900)

CONCLUSION

Ants though being so significant is not been given much importance. Study Site 4 is now being slowly damaged due to overexploitation of tree, especially *Shorea robusta* for timber. Numerous trees are cut off for utilization of the land area for agriculture. This human infiltration can cause a threat to their population. Proper restoration of their habitats has to be done. Objective of the present study is not only to depict the diversity of ants, but also to create awareness in the mind of common people.

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