Diversity of Ants in two different Sites at Contai Municipality, Purba Medinipur,West Bengal,India

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Abstract:
Ants are animals belonging to the family Formicidae of Order Hymenoptera under the Class Insecta. There are more than 12000 ant species which are known it in this world. Ants show tremendous diversity, numerical and biomass dominance in almost every habitat throughout the world. Ants are one of the most diverse and ubiquitous groups of social insects. They act as ecological indicators and ecosystem engineers. In this study, Ant species diversity at Contai Municipality, Purba Medinipur West Bengal , India has been discussed. Present study reveals the distribution of ant fauna in human habitats located around Contai town. During study, 15 species of ants has been identified. The recorded ants belonging to five subfamilies: Formicinae, Myrmicinae, Ponernae, Dolichoderinae and Pseudomyrmicinae. In the studied area, totally 15 species belonging to 5 subfamilies of ants were recorded. Out of the five subfamilies, the Formicinae was the most dominant subfamily in terms of species richness followed by Myrmicinae , Pseudomyrmicinae, Dolichoderinae and Ponernae.

Key Words: Ant, Ecology, Formicinae, Species diversity and Importance.

Introduction:

Ants are regarded as a most important fauna of terrestrial ecosystem. These are most adaptive in harsh environmental condition. All the known species of ants are regarded as eusocial group of animal. Ants are such an important invertebrate which plays an important role in the alteration of soil ecosystem diversity. Ants are highly variable in their morphology, measuring anywhere between less than 1 mm to 40 mm. Ants exhibit a high degree of variability in their feeding habits, reflecting their temperament, which are docile to highly aggressive. They survive on both animal and vegetable matter and there are very few of those ants that are highly specific in their diet.

They also participate actively in the community interaction that develop quality soil ecosystem. It take part in underground ecological processes and alter the physical, chemical and biological environment leading to effect on plants, soil micro and macro organisms.

Every species of ant exert an immense impact on the environment. It directly or indirectly influences the development and destruction of flora and fauna of its surrounding environment.

Ants are ubiquitous in distribution and occupy almost all terrestrial ecosystems. There are about 15000 species of ants (Andrade, 2007); only 11,769 species have been described (Agosti, 2004). The family Formicidae contains 21 subfamilies, 283 genera and about 15000 living ant species of which 633 ant species belonging to 82 genera, 13 subfamilies are reported from India. About 226 species of ants belonging to 63 genera and 11 subfamilies are estimated from Karnataka state (Varghese, 2009).

The main aim of the present study was to conduct survey, to document the ant species diversity in Contai Municipality at two study sites. and measure a diversity regarding species and also population.

Methodology-

Study site- Kanthi is a small town,situated near the coastal area of Purba Medinipur district the distance from Kolkata to Kanthi is 150 km.The latitude and longitude of study site is 21050' N and 87048' E.

Sampling:

Two different zones has been chosen for specimen sampling particularly on Ward no. 06 under Contai Municipality. Ant species were collected during the morning and evening time using different methods as described by Gadagkar and Alonso . Fried coconut, honey, un-boiled rice, millet and dead insects were used and placed in zone- I, zone- II of human habitat near Krishnakanta pond for sample collection.

Experiment

Actually collection of ants sample was done from March-2017 to Feb- 2018 for 12 months. Ants were collected by hand using a forceps and brush during day time (9am to 4pm) and preserved in alcohol (70%) .

Identification of Ants

The collected ant species were identified up to genus and for few, species level identifications were done with the help of keys given by Ali (1992),Bingham (1903),Bolton (1994),Rastogi (1997)Tiwari (1999),Varghese (2003). . Identification is done with the help of Olympus Binocular microscope

Result:

After collection, identification and counting of ants, diversity measurement is too much essential. So measurement of diversity on different types of ants in two sites was done and ***Simpson's diversity indices is applied.***

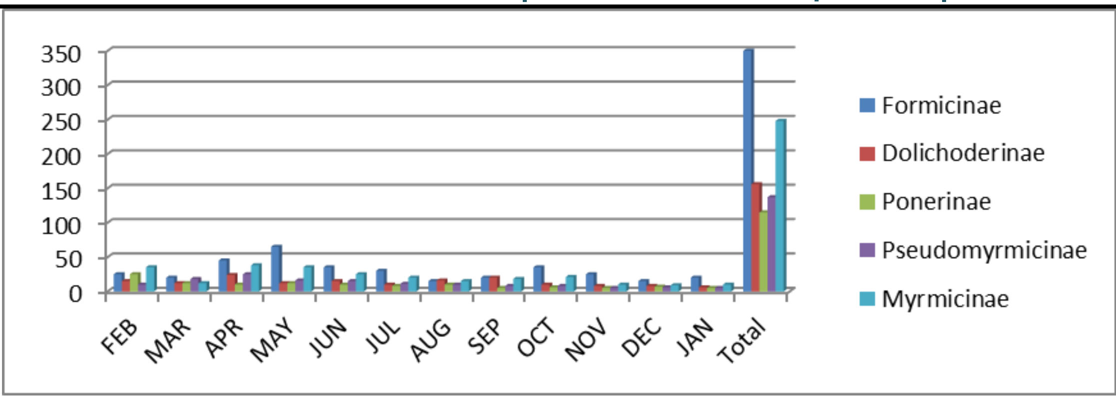
OBSERVED ANT SPECIMEN(Sub families)

No. of Sub families month wise (Zone-I)

Table –I

Month	Formicinae	Dolichoderinae	Ponerinae	Pseudomyrmicinae	Myrmicinae
FEB	25	15	25	10	35
MAR	20	12	12	18	12
APR	45	24	10	25	38
MAY	65	12	12	16	35
JUN	35	15	10	15	25
JUL	30	10	8	11	20
AUG	15	16	10	10	15
SEP	20	20	5	8	18
OCT	35	10	6	8	21
NOV	25	8	5	5	10
DEC	15	8	7	6	9
JAN	20	6	5	5	10
Total	350	156	115	137	248

Chart –I (Zone-I)

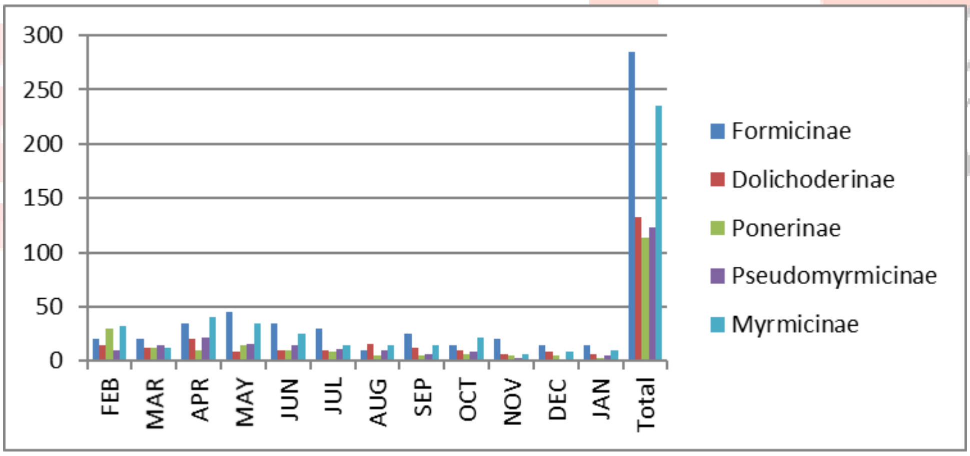


No. of Sub families month wise (Zone-II)

Table -II

Month	Formicinae	Dolichoderinae	Ponerinae	Pseudomyrmicinae	Myrmicinae
FEB	20	15	30	10	32
MAR	20	12	12	15	12
APR	35	20	10	22	40
MAY	45	8	15	16	35
JUN	35	10	10	15	25
JUL	30	10	8	11	15
AUG	10	16	5	10	15
SEP	25	12	5	6	15
OCT	15	10	6	8	21
NOV	20	6	5	3	6
DEC	15	8	5	2	9
JAN	15	6	3	5	10
Total	285	133	114	123	235

Chart –II (Zone-II)



Sub family wise distribution of Ant specimen(Zone-I & II)

Table -III

Subfamily	Scientific Name	Common name	Ecological position
Formicinae	*Camponotus compressus*	Carpenter Ant	Common
	Camponotus irritans	Carpenter Ant	Common
	Camponotus parius	Giant Honey Ant	Common
	Paratrechina longicornis	Black Crazy Ant	Common
Dolichoderinae	*Tapinoma indicum*	Odorous house ants	Common

Ponerinae	*Leptogenys dentilobis*	Long legged ant	Rare
	Leptogenys diminuta		Rare
Pseudomyrmicinae	*Tetraponera nigra*		Rare
	Tetraponera rufonigra	Arboreal ant	Common
Myrmicinae	*Crematogaster diffusa*	Acrobat Ant	Rare
	C. brunnea contemta		
	C. ebenina		
	Solenopsis invicta	Fire ants	Common
	Pheidole sp	Big Headed Ant	Rare
	Monomorium pharaonis	Pharaoh ants	Common

MEASUREMENT OF DIVERSITY :

USING SIMPSON'S INDEX TO MEASURE BIODIVERSITY :-

Table-IV

Subfamilies	Zone-I	Zone-II
Formicinae	350	285
Dolichoderinae	156	133
Ponerinae	115	114
Pseudomyrmicinae	137	123
Myrmicinae	248	235

The formula for calculating Simpson's indices :

$$D = 1 - \left(\frac{\Sigma\, n(n-1)}{N(N-1)} \right)$$

n = the total number of organisms of a particular species

N = the total number of organisms of all species

Data sheet for calculation of simpson's indices in Zone -I

Table-V

Subfamilies	Zone-I	(n-1)	n(n-1)
Formicinae	350	349	122150
Dolichoderinae	156	155	24180
Ponerinae	115	114	13110
Pseudomyrmicinae	137	136	18632
Myrmicinae	248	247	61256
Total=1006			∑ n(n-1)= 239328

So for community analysis in Zone-I:-

$$D = 1 - \left(\frac{\Sigma\, n(n-1)}{N(N-1)} \right)$$

$= .236$

Data for calculation Simpson's indices in Zone-II

Table-VI

Subfamilies	Zone-II	(n-1)	n(n-1)
Formicinae	285	284	80940
Dolichoderinae	133	132	17556
Ponerinae	114	113	12882
Pseudomyrmicinae	123	122	15006
Myrmicinae	235	234	54990
Total= 890			∑ n(n-1)=181374

So for community analysis in Zone-II:-

$$D = 1 - \left(\frac{\Sigma\, n(n-1)}{N(N-1)} \right) = .22$$

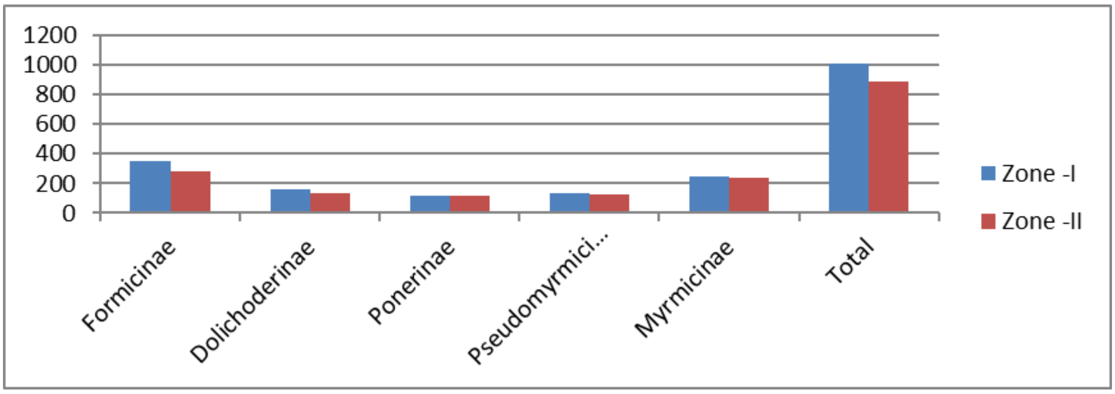
Diversity of ants representing Subfamily

Subfamily wise distribution of ants found at study area

Table-VII

Subfamilies	Zone -I	Zone -II
Formicinae	350	285
Dolichoderinae	156	133
Ponerinae	115	114
Pseudomyrmicinae	137	123
Myrmicinae	248	235
Total	1006	890

Chart –III



DISCUSSION :-

The ant specimens from two Zones for a period of FEB 2017 to JAN 2018 were collected .During the study period total 1896 ant sampled specimen were observed. Out of which 15 species are noticed belonging to five subfamilies. Out of the total **15** species observed, six species were found only in human locality areas, whereas four species found on road sides and 5 species were observed in both the habitats. All these data regarding study are mentioned from **Table I - Table- VII** .

They nested in soil humus, in hollow twigs, under bark, inside galls or in nuts of woody plants. It is therefore not surprising that we collected them in greater numbers. These ants were more specific due to availability of food and nesting sites. These are also the exclusively arboreal and terrestrial taxa.

From the table**(I- VII)** it is said that different types of ants are found which were observed frequently. Few ant genera as *Crematogaster and Pheidole* of **Myrmicinae,** *Camponotus and Polyrhachis* of **Formicinae** and *Leptogenys* of **Ponerinae** are mostly found everywhere. Among them *Pheidole sp* nested in soil,*Crematogaster sp* nested in dead wood on trees, *Solenopsis* sp nested under rock and rotten logs.

Out of 15 species belonging to five subfamilies, Formicinae is the highest recorded subfamilies. Further it is said that *Camponotus compressus* and *Solenopsis invicta* are widely distributed species between two zones but *Camponotus compressus* is the largest one on the basis of number .

Myrmicinae were the most abundant in numbers of ants and the most diverse group (6 Species) . This family showed a significant difference between seasons (Watanasit *et al.,* 2000) . *Camponotus* was a frequently occurring species in everywhere. The *Camponotus* had the greatest individual numbers. These ants are called as carpenter ants because of their "Nesting behaviours" (Chavhan et al., 2011).

From the Charts (I-III) and from the Simpson's diversity index it is clearly said that diversity of ants in two zones (**Zone-I & II**) are more or less similar . A number of factors seem to be involved in the increased diversity. It includes food resources, nesting habit etc. This study revealed that the dominancy exhibited by the Formicinae subfamily among two study sites is due to their ability to adapt with different niches with a variety of feeding habits.. The measurement indicates that habitat of two zones of ant species are similar.. It also depicts that highest number of ant species(Formicinae) are present in both habitat and also indicate that both habitats consist of similar microclimatic condition. It is noted that maximum no. of ant species are common ,some are rarely found. Sunil Kumar *et al*. reported that the ant diversity is directly proportional to the diversity of vegetation.

CONCLUSION

Ants perform much ecological function which is beneficial for mankind such as control of pest population, plant pollination and soil erosion. Present study reveals important information on and ant diversity of the study region will certainly be helpful for future researchers to study on the group.

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