



ISSN : 0973-7057

Check list and species diversity of ant population sampled from Patna district urban area (south), Bihar, India

Ranjeeta Sinha^a & C. V. Singh^{a*}

^aDepartment of Zoology, B. D. College, Magadh University (Bodh Gaya) Patna, Bihar, India

Received : 28th May, 2016; Revised : 21st November, 2016

Abstract : The paper deals with the preliminary survey and documentation of different varieties of ant species population sampled from 16 different pockets of southern Patna urban area encompassing the localities of Kankarbagh, Patna Gaya Road, Karbigahia, outer bypass etc. Ant population expected to be well diversified in terms of species richness and abundance has been sampled from Southern urban zones of Patna situated at latitude and longitude of 8802'N - 2303'E & 22055'S - 88010'E, having tropical characteristic. The results of application of these species diversity indices as information statistics tools for different ant species sampled have been discussed in this paper which can explain the causes of ant species diversity in this area in relation to other biotic and abiotic factors.

Key words: Species diversity indices, S-W diversity, Abundance, Evenness, Similarity index, Dominance, Ant population.

INTRODUCTION

Ants belonging to the order Hymenoptera constitute the largest chunk of the insect community. Hence, unprecedented ecological success and dominance in tropical ecosystems have been achieved by them. In a Brazilian tropical forest ants have been estimated to have a biomass four times that of all vertebrates^{1,2}. Being such dominant and successful components of ecosystems, it is likely that ants would turn out to be good indicators of the well being of ecosystems³. And yet methods reliable for sampling of ants are entirely inadequate⁴. More surprising is the fact that very little information exists regarding the ant fauna, and even less regarding its success and dominance in the tropical forests of Asia^{5,6}.

Starting from agriculture field to the edible sweet material kept in our kitchens, varieties of ant populations can be easily found thriving on the wide range of both living and non-living materials. Due to having greatest power of metabolizing sugar molecules ant producing pungent formic acid the ants have also been taxonomically regarded as Formicides belonging to the family Formicidae.

Most of the tropical, warm and temperate genera of ants belong to the subfamilies, ponerinae and camponotinae in which the Indian ants as well as that of Patna, Bihar also fall in considerable number.

Understanding the vast unexplored field of mapping of Bihar ants, the present investigation has been carried out as the continued step in a selected areas of Southern Zones of Patna.

*Correspondent author :

Phone : 9308030846

E-mail : cvs.mu@gmail.com

MATERIALS AND METHODS

Selection of sampling sites as follow up schedule of our study was done randomly and the sites were located in the southern zones of Patna urban area alongside Patna-Gaya outer bypass road, Kankarbagh, Karbigahia etc. The names of the sampling sites are- Elahibagh, Brahmipur, Zero mile, Parsa Bazar, Dhannu Chak, Jakkanpur, Purandarpur & Mithapur. The land vegetation of the area had been also recorded for the description of physiography of the sampling sites through quadrat method. Zigzag area lying beyond the quadrates had been ignored.

Sampling Methods :

Highly infested land quadrates showing powdered soil were sampled through specially fabricated glass aspirator with suction funnel attached to a reservoir bottle and pump in which active and tiny ants were sucked.

Quadrates with low infestation showing thick muddy soil were sampled by hand picking method.

All Out Search (AOS) method had been overall practiced to collect all the representatives of as any species of ants as possible showing visible morphological variations.

Sampling Schedule:

Two hour morning from 7.00 to 9.00 AM and two hour evening from 4.00 to 6.00 PM. sampling schedule were maintained in order to have the best samples. The mid day sampling was avoided because ants were found to disappear during this period. A full day was devoted to each quadrat and attempt was made to collect individuals of all the representatives in the population.

Taxonomic Identification :

The morphologically different individuals and representative of ants had been classified following the standard BOLTON'S KEY⁷ of world tropical ant's taxonomy.

Preservation and Data Collection:

All the individuals of the sample were preserved in 70% alcohol in different vials bearing appropriate tags. The quadrat wise number of sampled individuals according to their genus and species had been recorded in tabular form. (Table1)

Statistical Analysis:

Analysis of collected data had also been done by using

following statistical indices within the habitat :

a) Alpha (α) diversity Shannon Weiner index: -

$$H = \sum p_i \log p_i$$

Where,

H = species diversity,

P_i = mean of individual species procured by the formula n/N,

log p_i is the log product of p_i (mean of individual species).

b) Relative abundance = ni/N x 100

Where,

N_i = number of individuals of a species.

N = number of individuals of total number of species

c) Evenness = H/log2S

Where,

S = number of species, H= diversity.

d) Simpson's dominance $D = 1/D_s$,

$$D_s = \sum_{i=1}^s \frac{n_i(n_i-1)}{N(N-1)}$$

Where,

s= No. of species present

i= ith no. of species (1 to ∞)

n_i = number of individuals of ith species,

N = Total number of individuals of all the species.

OBSERVATIONS

The intensive "all out search" (AOS) sampling of ant's in different sites and quadrates of the selected Patna ponds area locality has given exciting findings as recorded following table.

The table is record of eight different varieties of ants belonging to four different sub families as identified by Indian Institute of Science (Center of Ecological Studies) with their respective common names. The largest no.(412) of sampled individuals was of small size *Pheidole parasitica* Wilson, commonly called medium size red ant belonging to the family Camponotinae followed by *Pheidole minor* Jerdon, commonly called small/minor red ant, The lowest no. (39) of *Camponotus variegatus*, Smith, commonly known as carpenter ant belonging to the family Camponotinae, The small black sugar ant slightly bigger than primitive ant but smaller than spotted sugar ant numbered next in the sampling record after spotted sugar

Sinha & Singh:- Check list and species diversity of ant population sampled from Patna district urban area (south), Bihar, India

ant and has been identified as *Acantholepis capensis*, Mayr. The population dens of collected sample also recorded 230 individual slender ants identified as *Sima clypeata*, Emery belonging to the family Myrmecinae and 130 of drive ants known as *Dorylus helvolus*, Linn, of family Dorylinae. The cocktail-, brown house- and bearded ants have also figured significantly in the ant population survey of the locality. Interestingly the population counts of the black sugar ant and the brown sugar ant was almost same (39 & 40). The most debated variety was of family Dolichoderinae identified as *Iridomyrmex humilis* Mayer and commonly recognized by European Scientist as Argentine ants.

The site-specific sampling fetched exciting results as recorded in table. However, the ant hill of another (site IV) was the most populated area giving largest no. of individuals followed by sites- plain ground, plain orchid, damaged tree base and underground tunnels.

DISCUSSIONS

The present investigation has developed a preliminary sampling based checklist of eight different species of ants and computed significant values of diversity and abundance of them from the selected locality of southern zones of Patna alongside the Patna-Gaya bypass road. The results provide first hand similarities with that of Western Ghats (Karnataka) ant population, assessed by Gadagkar *et.al*.

The resemblance of results in these selected areas is due to the prevailing tropical conditions even on such a long stretch from Bihar to Western Ghat.

Although the observation is very restricted to a selected locality which prevents from drawing any firm conclusion regarding the possible causes of variation in ant species diversity from locality to locality of Patna, Bihar, yet specific trends are quite evident. The first is that man disturbed sites show lower richness and diversity while the undisturbed sites with rich vegetation encourages better population growth of any species. This is also perhaps related with monoculture plantation like specific tree around which the particular ant species, *P.minor* & *P.Parasitica* grew vigorously. The cause of significant reduction in ant species richness and diversity in less vegetational shore of dam has been due to the slashing and landslide of the trees. On the other hand, the polyculture vegetational area like orchid and grassy land could not support much population build up of various ant varieties.⁸

Withstanding to previous discussion and also assessed by the values of alpha diversity “Shannon Weiner” index, relative abundance, evenness calculated statistically, the variety of ants species sampled in this project has clearly established the relative abundance of spotted sugar ant, *C.maculatus* amongst all the remaining species and hence make it a dominant variety in the locality.⁵

Table I: Check list, taxonomy and S-W species diversity of different ant species sampled from five selected sites-Elahibagh(sp.-1,2), Brahmipur(sp.- 3), Dhannuchak(sp.-4,5), Purandarpur (sp.6) & Mithapur(sp.-7,8) of Patna district urban area (south) during January, 2016 to December, 2016.

Sl. No.	Scientific & common names of the ant species	Sub family	No. of individuals collected	Relative Abundance RA	S-W Diversity \bar{H}	D=1/DS	Evenness
1.	<i>Pheidole indica</i> , Mayr (spotted sugar ant)	Componotinae	72	6.4748	0.2791	0.17295	0.006517
2.	<i>Formica gagates</i> , Latreille (black stone ant)	Formicinae	60	5.3956			0.004715
3.	<i>Crematogaster himalayana</i> , Forel (rocky acrobat black ant)	Myrmicinae	150	13.4892			0.015751
4.	<i>Iridomyrmex/Ochetellus glaber</i> , Mayr (black house ant)	Myrmicinae	20	1.7985			0.003212
5.	<i>Camponotus variegatus</i> , Smith (carpenter ant)	Componotinae	39	3.5071			0.004589
6.	<i>Camponotus wasmanni</i> , Emery (hairy black ant)	Componotinae	40	3.5971			0.006421
7.	<i>Pheidole minor</i> , Jerdon (small red ant)	Componotinae	319	28.6870			0.031756
8.	<i>Pheidole parasitica</i> Wilson. (medium red ant)	Componotinae	412	37.0503			0.042517
	Total		1112				

Photo plates of ants species sampled from southern Patna zone, Bihar



1. *Pheidole indica*, Mayr (spotted sugar ant)



4. *Iridomyrmex/Ochetellus glaber*, Mayr (black house ant)



2. *Formica gagates*, Latreillie (black stone ant)



5. *Camponotus variegatus*, Smith (carpenter ant)

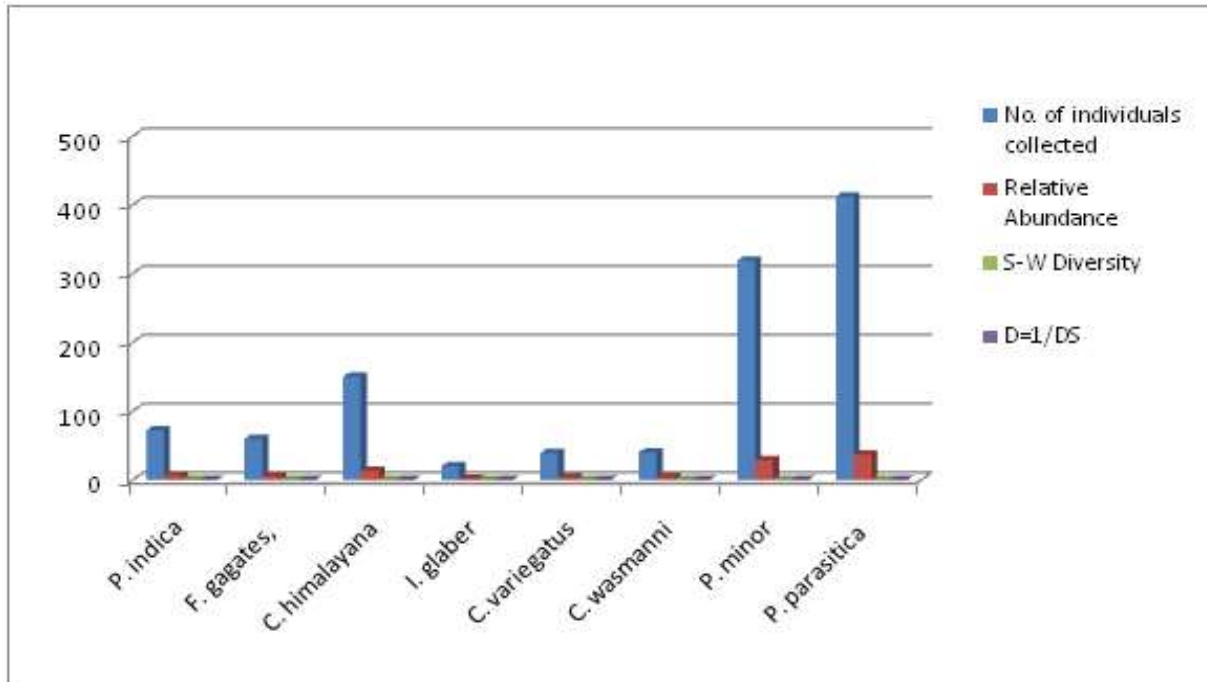


3. *Crematogaster himalayana* (rocky acrobat black ant)



8. *Pheidole parasitica* Wilson.(medium red ant)

Graph of ants species sampled from southern Patna zone, Bihar



ACKNOWLEDGEMENTS

The authors are extremely thankful to Prof. R. Gadagkar, Chairman, Centre of Ecological Sciences (CES) and Dr. T.Varghese, Senior Scientist, CES, Indian Institute of Science, Bangalore for their extraordinary support in the identification and diversity studies of ants.

REFERENCES

1. **Wilson E O, Success and dominance in Ecosystems,1990:** The case of the social insects. O.Kinne (Ed.) Ecology Institute, D-2124 Oldendor/Luhe, Federal Republic of Germany.
2. **Major J D and MVB, Querioz,1990.** The composition of ant communities in Brazilian Atlantic rainforests. In: *Social Insects and the Environment*.
3. **Daniels RJR, 1991.** Ants as biological indicators of environmental changes. *Blackbuck*, 7 (51).
4. **Romero H and K Jaffe,1989.** A comparison of methods for sampling Ants (Hymenoptera, Formicidus) in Savanna, *Biotropica*, 21 (348).
5. **Gadagkar R, K, 1990.** Chandrasekara and P Nair. Insect species diversity in tropics : sampling methods and a case study *J.Bombay Nat.Hist.Soc.*, 87 (337).
6. **Wilson E O.** Some ecological characteristics of ants in New Guinea rain forests. *Ecologia*, 40 (1959)- 437.
7. **Bolton, B. 1994.** *Identification Guide to the Ant Genera of the World*, Harvard University Press.
8. **Room P M, 1971.** The relative contribution of ants species in the Ghanian polyculture Cocoa farms. *J.Anim. Ecol.* 40(735).

