

# Ant Species Diversity With Reference To Sampling Methods In Elayirampannai, Virudhunagar District-Tamil Nadu

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**Abstract-** This is the preliminary study of diversity of ants with reference to sampling methods in Elayirampannai, Tamil Nadu. The study was conducted during November 2017 to November 2018. Ant samples were collected from the study area using all out search method, hand picking method, pitfall traps, opportunity method and bait trap. The seasonal patterns changes were observed in three different seasons are Pre monsoon, monsoon and Post monsoon season. In the current study we obtained about 20 species belonging to five subfamilies namely Formicinae, Dolichoderinae, Myrmicinae, Pseudomyrmicinae and Ponerinae. The results concluded that the ants more abundant in the monsoon season. The seasonal diversity changes reveal the Pre-monsoon, monsoon seasons are highly preferred by most of the ant species Elayirampannai.

**Keywords-** Sampling methods, Diversity, Abundance, Seasons and Formicidae.

## I. INTRODUCTION

Insects are wide diverse species of the ecosystem. It is estimated that of 10 million species on Earth about 8 million are insects. Among insects the insects belong to the order Hymenoptera important components of ecosystems not only because they constitute a great part of the animal biomass but also because they act as indicators of climate change and also being an ecosystem engineers (Borror et al., 1989). Hymenoptera is a large order comprising of great many insects which are beneficial to man. Ants shows tremendous diversity, numerical and biomass dominance in almost every habitat throughout the world (Fittkau and Klinge, 1973). The social insects like ants play a major role in almost every part of the terrestrial ecosystem, but rarely noticed. They rule much of the terrestrial ecosystem as the premier soil turners, scavengers, biological indicators of climate and anthropogenic activities, channelers of energy and dominators of the insect fauna (Selvam et al., 2013).

The known living ants comprises of 11 subfamilies, 303 genera, and approximately 8,800 species in worldwide. The ant fauna of India remains relatively unexplored (Rastogi

et al., 1997). Ants are one of the ideal model organisms for measuring and monitoring biodiversity for many reasons. It is abundant and dominant in ecological systems as a predator and symbiotic for plants and other organisms. These are relatively easy to collect in a standardized way, reasonably diverse at the site, identifiable and so on (Holldobler & Wilson 1990 and Agosti et al. 2000). All the ant species fall into the single family Formicidae. This family is included in the super family Vespidae of the order Hymenoptera, which is placed in the class Insecta. The Myrmicinae is the largest subfamily of the Formicidae, with 138 genera, followed by Formicinae that have 39 genera and Ponerinae which have 25 genera. Ants in India, occupy a variety of habitats such as leaf litter, trees, soil and dead logs, while tramp species prefer human-modified habitats (Sonune and Chavan, 2016.).

The objective of this study was to find out ant diversity with reference to different sampling methods throughout the year in Elayirampannai.

## II. MATERIALS AND METHODS

### Site Description:

The present study was carried out in Elayirampannai, Virudhunagar district in Tamil Nadu. The collection was conducted in crop plantation, Tree plantations and Seasonal plantation fields in the Elayirampannai located at 9.270 N and 77.830 E. The climate of Elayirampannai is hot and dry. Annual rainfall has ranged from 964 mm to 228 mm.

### Sampling Methods

Ants were collected from November, 2017 to November, 2018 from Elayirampannai. Collections were carried out in whole year. Species were collected by five techniques as follow as all out search method, hand picking method, pit fall traps, opportunistic method and by baiting method. All the collected samples were brought back to the lab and they were separated them from other invertebrate material. They are then mounted on cards then dried.

### Preservation and Identification

For each sample, ants were sorted from debris and identified to genus. Sorted specimens were placed in glass vials contains 70% alcohol with proper labels noting locality, date, collection method, ecological information. Species were identified under Microscope. Genus level identification was carried out using the keys of Bolton, 1994 and species level identification was done using the keys of Bingham, 1903.

### III. OBSERVATION AND RESULTS

#### Diversity and abundance of ant species

A total of 2381 ants were collected, with 20 species belonging to 10 genera, that spreads over 5 subfamilies (Table

1) were recorded. Of the 5 subfamilies, The Myrmicinae was the most dominant subfamily in terms of species richness with 9 Species and 5 genera. The most diverse subfamily was Myrmicinae followed by Formicinae, Pseudomyrmicinae and least number of Dolichoderinae and Ponerinae. During the present investigation the sampling methods and the occurrence of species, it was possible to observe the following patterns: in the baiting method 725 individuals were collected, corresponding to 31% of the total ants captured in the survey, the case being that 724 (30%) of the individuals were collected only with all out search method, while 427 (18%) were collected only in hand picking method, and 258 (11%) in pitfall trapping, and lastly 247 (10%) individuals were collected in opportunistic method (Figure 1).

Table 1: Subfamily wise distribution of ant and species

| Subfamilies    | Species                        | AO<br>S | HP | PT | OM | BM  | Abundance |
|----------------|--------------------------------|---------|----|----|----|-----|-----------|
| Myrmicinae     | <i>Monomorium minimum</i>      | 56      | 25 | -  | 72 | 127 | 280       |
|                | <i>Monomorium pharaonis</i>    | 43      | 18 | 23 | 39 | 58  | 181       |
|                | <i>Crematogaster sp</i>        | 29      | 35 | 28 | 9  | 21  | 122       |
|                | <i>Tetramorium sp</i>          | 42      | 13 | 41 | 12 | 45  | 153       |
|                | <i>Pheidole sp 1</i>           | 36      | 62 | -  | -  | 10  | 108       |
|                | <i>Pheidole sp 2</i>           | 8       | 6  | -  | 14 | -   | 28        |
|                | <i>Solenopsis invicta</i>      | 67      | 41 | 20 | -  | 91  | 219       |
|                | <i>Solenopsis xyloni</i>       | 75      | 27 | -  | 16 | 40  | 158       |
|                | <i>Solenopsis geminate</i>     | 63      | 20 | -  | -  | 84  | 167       |
| Formicinae     | <i>Camponotus compressus</i>   | 153     | 19 | 31 | -  | 72  | 275       |
|                | <i>Camponotus sp 1</i>         | 40      | -  | 28 | -  | -   | 68        |
|                | <i>Camponotus sp 2</i>         | 21      | 36 | -  | 14 | 37  | 108       |
|                | <i>Camponotus sp 3</i>         | 07      | 15 | 32 | -  | 44  | 98        |
|                | <i>Camponotus sp 4</i>         | -       | 09 | 27 | 12 | -   | 48        |
|                | <i>Camponotus mitis</i>        | 23      | 28 | -  | 10 | 05  | 66        |
|                | <i>Lasius niger</i>            | -       | 07 | 18 | 17 | -   | 42        |
| Dolichoderinae | <i>Tapinoma melanocephalum</i> | -       | 29 | -  | 10 | 62  | 101       |

|                         |                                |     |     |     |     |     |      |
|-------------------------|--------------------------------|-----|-----|-----|-----|-----|------|
| Ponerinae               | <i>Odontomachus haematodus</i> | -   | 13  | 10  | -   | 17  | 40   |
| Pseudomyrmicinae        | <i>Tetraoponera rufonigra</i>  | 32  | 15  | -   | -   | 12  | 59   |
|                         | <i>Tetraoponera sp 1</i>       | 29  | 09  | -   | 22  | -   | 60   |
| <b>Total no of ants</b> |                                | 724 | 427 | 258 | 247 | 725 | 2381 |

Sampling methods- AOS- All out search method, HP- Hand Picking method, PT- Pitfall trapping method, OM- Opportunity method and BM- Baiting method.

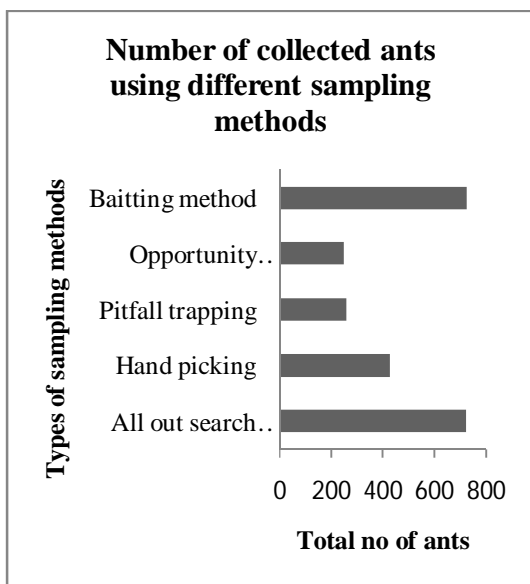


Figure 1: Number of ants collected by different sampling methods

**Seasonal patterns of ant species**

In Pre monsoon period comparatively lower species in pitfall trap method (No of species: 10) was observed and high no of species recorded in hand picking method (No of species: 19) was noticed. In Monsoon period 16 number of species recorded in all out search method and low number of species (No of species: 15) captured in baiting method. In Post monsoon period high number of species i.e., 18 species recorded in all out search method and 16 species recorded in the pitfall trap method. With reference to abundance of species in different sample collections, all out search method in Monsoon period showed the maximum abundance than Pre monsoon and Post monsoon periods (Figure 2).

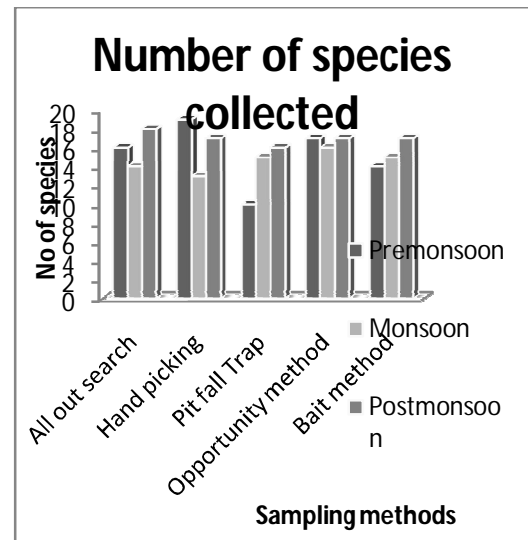


Figure 2: Number of species recorded in the different sampling methods

**IV. DISCUSSION**

Ants collected from Elayirampannai were mostly represented by five sub-families viz., Myrmicinae, Formicinae, Dolichoderinae, Ponerinae and Pseudomyrmicinae. The density of ants species represented by these sub-families proportionately varied with the periods of observations and in descending order of their abundance, the sub-families were recorded as Myrmicinae (9 species) > Formicinae (7 species) > Pseudomyrmicinae (2 species) > Ponerinae and Dolichoderinae (one species each) the corresponding periods, respectively. A total of 20 species of ants have been documented from the samples collected from different sampling methods and seasons.

Improving the methods for collecting ants is a constant concern for myrmecologists, who aim for a more reliable species estimation method, so that they can attain high standards in richness, diversity, and other potential estimates, in order to better understand the environmental characteristics of a given form and compare them with those set by other forms of collection previously defined (Olson, 1991).

The present studies evidenced that various species prevailed differently depending upon the climatic conditions.

The population of *Monomorium minimum* and *Solenopsis invicta* were appreciable in monsoon, while *Monomorium pharaonis* and *Solenopsis xyloni* predominated during pre monsoon and post monsoon months. Bharti (2012) indicated that the Myrmicinae ants form the bulk of Indian ant diversity (45%) with Pheidole and Crematogaster having the most species, while the subfamily Formicinae is the second largest ant group (25% of species) with *Camponotus* and *Polyrhachis* constituting the majority of the diversity. The Ponerinae ants like *Diacamma* spp. And *Pachycondyla* spp. were most common in coastal Odisha with the former species being observed invading both the habitats (urban garden & residential premises) during summer and confined to indoor habitats during post-monsoon months. However, *Pachycondyla* spp. invaded both outdoor and indoor habitats during summer and post-monsoon months. The predominance of above two Ponerinae ant species in coastal habitats was in conformity with earlier findings of Patnaik et al. (2014), who reported that of the five species recorded at Bhubaneswar (Odisha), *Pachycondyla sulcata* and *Diacamma rugosm* constituted the major proportion.

#### V. CONCLUSION

Ants (Formicidae) are the largest family under the order Hymenoptera. They act as ecological indicators and ecosystem engineers. A total of twenty species represented by ten genera and five subfamilies have been recorded from Elayirampennai, Tamil Nadu. During this study, out of five subfamilies, the Myrmicinae was the most dominant subfamily in terms of species richness followed by Formicinae, Pseudomyrmicinae, and Dolichoderinae. The ant *Camponotus* was the most species-rich genera with six species followed by *Solenopsis* with three species. Ant performs many ecological roles, which are beneficial to a human being, including the suppression of insect populations. The present study will yield valuable information on ant species availability in this region. Finally, to sum up, this study provides a significant contribution in the field of Ecology.

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