

RESEARCH ARTICLE

DIVERSITY AND DISTRIBUTION OF ANTS (HYMENOPTERA: FORMICIDAE) IN KATANCHIMALAI REGION OF COIMBATORE DISTRICT, TAMIL NADU

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ABSTRACT

The study examined the diversity of ants in the Kattanchimalai region, Coimbatore District, Tamil Nadu, as there is no adequate information pertaining on ant diversity of this region. The present study was carried out during November 2020 to February 2021. We have sampled ants by employing intensive all out search method. The sampled specimens representing 35 species belonged to 12 genera and five subfamilies. The most diverse subfamily was Formicinae (4 genera with 16 species), followed by Myrmicinae (5 genera with 12 species), Pseudomyrmicinae (1 genera with 4 species) followed by Dolichoderinae (2 genera with 2 species). The smallest number of species belonged to the Ponerinae (1 genus with 1 species). Among the sampled genera, the highest number of species representation was *Camponotus* with 4 species. Few ant genera as *Crematogaster* and *Pheidole* of Myrmicinae, *Camponotus* of Formicinae and *Leptogenys* of Ponerinae were mostly found everywhere. Some genera viz; *Oecophylla*, *Anoploopsis*, *Paratrechina* of Formicinae subfamily and *Tetraponera* of Pseudomyrmicinae are represented by one species each.

Keywords: Ants, Formicinae, Myrmicinae, Camponotus, Periyanaickenpalayam

1. INTRODUCTION

Ants are found everywhere, except in Iceland, green-land and Antarctica [1], In India, Himalaya and the Western Ghats harbor a large number of ant species, 656 species from 88 genera were recorded from Himalaya, and 455 species from 75 genera were recorded from the Western Ghats, especially in Tamil Nadu, 184 species from 51 genera were recorded. But the number of species declines with increasing latitude, altitude and aridity [2]. Currently, they are 15,983 extant and species are subspecies as per the recent classification [3]. They are grouped in to 20 subfamilies, with 464 genera. Ants are conspicuous and important parts of virtually all terrestrial ecosystems [1,4,5]. Toward understanding the function of ant communities, ecologists have often used single linear measures of size [6]. India, a few reports on ant ecology Ants diversity exit [7]. The Kattanchimalai region is

semi forest area and part of the Western Ghats in Coimbatore district, it is near to the Karamadai region, and the study area is full of fertile area.

The ants are everywhere except polar region and these are sub-terrestrial or ground insects mainly. The literature on ant ecology suggests that there are 11000 plants on the earth that depends on ants for pollination, seed dispersal and soil recycling to increase the soil fertility.

A significant focus for present-day myrmecologists is the assessment of biodiversity, community composition, biogeography, and other basic investigations of the ecology of a regional ant biota. The Myrmicinae is the largest subfamily of the Formicinae, With 138 genera followed by Formicinae that have 39 genera and Ponerinae which have 25 genera [8]. Indian ants fauna, represent diversity, includes 12 known subfamilies like; Aenictinae, Amblyoponinae,

Cerapachyinae, Dolichoderinae, Dorylinae, Ectatomminae, Formicinae, Leptanillinae, Myrmicinae, Poneriae, Porceratiina and Pseudomyrmicinae. Rothney [9] worked on Indian ants and later on Forel [10] contributed comprehensive work on Formicidae of India and Ceylon.

Bingham [11] published his valuable work in Fauna of British India, Hymenoptera, and Vol. 2, including Burma and Ceylon and gave details about distribution of species included. Successive workers like Ali [12], Brown Jr [13], Bolton [14], Baroni Urbani [15], Chapman and Capco [16], Chhotani and Maity [17], Collingwood [18], Dutta and Raychaudhuri [19], Devi and Singh [20], Donisthorpe [21, 22], Ghosh [23], Imai et al. [24], Jerdon [25], Kugler [26], Kurian [27], Karavaiev [28], Mathew and Tiwari [29], Reddy et al. [30], Roonwal [31], Ramdas et al. [32], Saunders [33], Smith, F. [34], Smith, M. R. [35], Sykes [36], Sheela and Narendran [37], Shivashankar [38], Taylor [39], Tiwari [40], Verghese et al. [41], Veeresh et al. [42] recorded 12 species under 10 genera from Orissa. No comprehensive work on Ants fauna of Coimbatore has been done since then, except a few scattered works. Recently, these subfamilies Martialinae has been added to the family Formicidae. All the ant species fall into the single family Formicidae. This family included in the super family vesipedae of the order hymenoptera, which is placed in the class insect.

Ants can build their nests in leaf litter, rotting logs, underneath the soil, within woody stems or under the rocks and they can also establish fungal gardens in the soils. During activities associated with gallery building of nests by ants favor the mixing of organic matter in the soil, as well as increase the aeration properties of soils. The aim of the study is biodiversity richness of the ants in the biogeographically and size of the ants were observed.

2. MATERIALS AND METHODS

2.1. Study area

The field work was conducted in the Kattanchimalai region, Coimbatore district, Tamil Nadu. Coimbatore lies at 11°1'6"N, 76°58'21"E, in

south India at 411 meters (1349 ft) above sea level on the banks of the Noyil River, in south western Tamil Nadu. The average annual rainfall is around 700 mm (27.6 in) with the northeast and the southwest monsoons contributing to 47% and 28% respectively to the total rainfall. Periyanaickenpalayam is a neighborhood in Coimbatore in the Indian state of Tamil Nadu. It is located along National Highway NH 67, Mettupalayam road, an arterial road in Coimbatore.



Fig 1 shows the study area map of Kattanchimalai region.

2.2. Collection method

We employed all out search method for the collection of ants in November 2020 to February 2021. Ants were collected using a brush and forceps during day time in between 11am to 4 pm twice in every month. 2.3 Preservation method Ant's species were preserved in 70% ethanol in

plastic vials at the Department of Zoology, Kongunadu College of arts and science. The stored ant specimens were then counted and identified up to genus level (some to species level) using microscope. Species identification was carried out under the help of the keys of "Ants identification guide" [54], collected ants were identified up to the genus level by using based on literature [29, 14, 11, 1]. Identified specimens will be kept in the air tight insect wooden box. Ant species were listed and each species was counted to calculate and compared composition, richness, species diversity, trees association, habitat type and identification of ants.

2.3. Statistical analysis

Relative density of the species was calculated by the formula,
 Relative Density (%) = (Number of individuals of one species / Number of individuals of all species) X=100.

(SDI), and Shannon-Wiener index. SDI is a measure of diversity which takes into account the number of species present, as well as the relative abundance of each species.

SDI is calculated using the formula,

Where, $D = \sum (n-1) / N (N-1)$

n=total number of organisms of a particular species and N=total number of organisms of all species. Subtracting the value of Simpson's index from 1, gives Simpson's Index of Diversity (SID). Shannon-Wiener index (H') is another diversity index and is given as follows $H' = - \sum P_i \ln (P_i)$, Where, $P_i = S/N$; S=number of individuals of one species, N=total number of all individuals in the sample, ln=logarithm to base e. Dominance index is a measure of how dominants (or similar), (D) follows the formula $D = n (100/N)$, where n=individual number, N=total number of species.

3. RESULTS

Ant diversity in the Kattanchimalai region, Coimbatore district, Tamil Nadu has been analyzed in this study. During this study a total of 35 ant species are belonging to 12 genera and five

subfamilies. Subfamily Formicinae were represented by 16 species and 4 genera followed by Myrmicinae were 12 species and 5 genera, Subfamily Pseudomyrmicinae consists of 4 species and 1 genera and Dolichoderinae represented by 2 species and 1 genus. The most number of genus was *Camponotus* with 13 species were observed.

Among these species *Camponotus compressus* was high compare to other species and noticeably found in everywhere in study site. The species of *Oecophylla* and *Crematogaster* were dominant on tree trunk which nested on trees. Few ant genera as *Crematogaster* and *Pheidole* of Myrmicinae, *Camponotus* and *Polyrhachis* of Formicinae and *Leptogenys* of Ponerinae are mostly found everywhere. The Table 1 (Figure 1) shows detailed distribution of diversity of ants. A number of factors seem to be involved in the increased diversity. It includes food resources, nesting habit etc. The environs of the study area are rich in ant species deserve. To date, no research has been conducted on the diversity of ants.

The above information will be useful for the preparation of a management plan for the myrmecologists. Total 35 ant species were recorded in the study area during this study. Among them *Polyrhachis spp*, *Crematogaster spp*, Myrmicinae, *Pheidole spp.*, (Forel 1902), *Leptogenys sp.* 3 and *Tetraoponera sp.* 2 are rarely found the study area are represented in the list.

4. DISCUSSION

In the present study, 35 species of ants in 12 genera representing five subfamilies namely Formicinae, Myrmicinae, Ponerinae, Dolichoderinae and Pseudomyrmicinae were recorded. Out of five subfamily, Formicinae is the most abundant having 16 species in 3 genera. This subfamily is widely distributed in all geographic regions. This correlated with the present study, because, we similarly collected the utmost number of ant species from Formicinae subfamily in Kattanchimalai region. The Formicinae and Myrmicinae are the largest ant subfamilies in the world and the dominant groups in most terrestrial

habitats. The prevalence of these subfamilies has been reported to increase with increasing aridity [44, 45].

The Formicinae were the most abundant in the study area. The extreme dominance exhibited by Formicinae sub family with seven species in this study. Formicinae show a significant

difference between the seasons. Humidity may influence the nest building. The genus *Camponotus* were record of four species. *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" [46].

Table 1. Showing the list of identified ant species and their distribution in Kattanchimalai region, Coimbatore district

Family	Genus	Species	Common Name	Size
Formicinae	<i>Camponotus</i>	<i>radiates</i>	Carpenter ant	1 cm and 0.5 cm
	<i>Camponotus</i>	<i>compressus</i>	Common godzilla ant	1.2 cm and 0.4 cm
	<i>Camponotus</i>	<i>irritans</i>	Giant honey ant	1 cm and 1.5 cm
	<i>Camponotus</i>	sp.	Carpenter ant	1 cm and 1.2 cm
	<i>Camponotus</i>	sp.	Carpenter ant	1.2 cm to 1 cm
	<i>Camponotus</i>	<i>parius</i>	Common black ant	1.2 cm
	<i>Camponotus</i>	<i>sericeus</i>	Ant	1.0 cm
	<i>Camponotus</i>	<i>maculatus</i>	Corpenterant	1.2 cm to 1 cm
	<i>Camponotus</i>	<i>sp. (flying)</i>	Corpenterant	1.2 cm to 1.0 cm
	<i>Camponotus</i>	<i>fabricius</i>	Ant	1.2 cm to 1.5 cm
	<i>Camponotus</i>	sp.	Corpenterant	1.2 cm to 1.0 cm
	<i>Camponotus</i>	sp.	Corpenterant	1.1 cm
	<i>Camponotus</i>	sp.	Corpenterant	1.2 cm
	<i>Oecophylla</i>	<i>smargdina</i>	Weaver ant,	1.2 cm to 1.0 cm
	<i>Anoplolepis</i>	<i>gracillipes</i>	Yellow crazy ant	1.2 cm 1.0 cm
	<i>Paratrechina</i>	<i>logicornis</i>	Longhorn crazy ant	1.2 cm, 0.2 cm, 1.2 cm and 1.0 cm
Myrmicinae	<i>Monomorium</i>	<i>minimum</i>	Little black ant	1.2 cm, 1 cm, 0.5 cm
	<i>Monomorium</i>	<i>pharaonis</i>	Pharaoh ant	1.2 cm, 1.0 cm, and 1.3 cm
	<i>Monomorium</i>	<i>destructor</i>	Distructive trilling ant	1.2 cm and 1.3 cm
	<i>Tetramorium</i>	sp.	Pavement ant	1.3 cm, 1.2 cm, 1.0 cm
	<i>Crematogaster</i>	<i>subnuda</i>	Crematogaterini	1.3 cm, 1.2 cm, 1.0 cm
	<i>Crematogaster</i>	sp.	Crematogaterini	1.2 cm, 1.0 cm, 1.3 cm
	<i>Crematogaster</i>	sp.	Crematogaterini	1.2 cm, 1.0 cm, 1.2 cm
	<i>Solenopsis</i>	<i>invicta</i>	Red imported fire Ant	1.2 cm, 1.0 cm, 0.5 cm, and 1 cm
	<i>Solenopsis</i>	<i>germinate</i>	Tropical fire ant	1.2 cm, 1.0 cm, 1.2 cm
	<i>Solenopsis</i>	<i>diplophptom</i>	Thief ant	1.3 cm, 1.0 cm, 1.2 cm
	<i>Phediole</i>	<i>magacephala</i>	African Big Headed ant	1.2 cm, 0.5 cm, 0.3 cm
<i>Phediole</i>	sp.	Big Headed ant	1.5 cm	
Dolichoderinae	<i>Tapinoma</i>	<i>indicum</i>	Odour ant	1.2 cm, 0.5 cm
	<i>Tapinoma</i>	<i>sessile</i>	Ant	1.3 cm
Ponerinae	<i>Lepitogenys</i>	<i>processionalis</i>	Processionant	1.3 cm, 1.0 cm
Pseudomyrmicinae	<i>Tetraoponera</i>	<i>nigra</i>	Ant	1.3 cm
	<i>Tetraoponera</i>	<i>nigra (male)</i>	Ant	1.2 cm; 1.0cm
	<i>Tetraoponera</i>	<i>rufonigra</i>	Bicoloured arboreal ant	1.2 cm, 0.5 cm
	<i>Tetraoponera</i>	<i>allaborans</i>	Ant	1.2 cm ,0.5 cm

The subfamily Myrmicinae, having 12 species in five genera, subfamily Dolichoderinae and Pseudomyrmicinae were recorded only the one genera for each with two and four species respectively, while the subfamily Ponerinae subfamily were one genera and one species reported in Kattanchimalai region. Overall abundance pattern in different sites varied considerably due to their habitat - heterogeneity and species composition. This was evident in certain sampling sites 1, 11 and 14 were common species viz., Dolichoderinae, *Camponotus variegates*, *Myrmicaria brunnea*, *Pheidole spp* dominated. As observed by many workers [47] species abundance pattern indicated a relatively small proportion of abundant species against large number of rare species. Secondly, the subfamilies such as Myrmicinae, Ponerinae, Formicinae were dominant. As observed by many workers [48] species abundance pattern indicated a relatively small proportion of abundant species against large number of rare species. Species richness is typically recorded to change across tropical forest disturbance gradients [49-51]. In Kattanchimalai region, four types of habitats were surveyed to find out the suitable area for ant species. Few ant genera as *Crematogaster* with most abundant record of seven species and genera *Aphaenogaster*, *Myrmicaria* and *Monomorium* of Myrmicinae, *Camponotus* and *Polyrchis* of Formicinae and *Leptogenys* of Ponerinae are mostly found everywhere, commonly found in all the habitats and most localities.

The workers of *L. umbratus* live entirely subterranean in symbiosis with root aphids [52] and *S. debile* forages mostly underground or in the litter layer with a small home range [53]. Subfamily Formicinae under genera *Camponotus, spp* which contains 37.14%, *Oecophylla, spp* which contains 2.85%, *Paratrechina spp* among with 2.85% and *Anoplolepis spp* contains 2.85%. In Formicinae subfamily, genera *Camponotus* was maximum in Kattanchimalai region followed by Myrmicinae subfamily into five genera including *Monomorium spp* with 8.57%, *Tetramorium spp* with 2.85%, *crematogaster spp* consists of 8.57%, *Solenopsis spp* with 8.57% and *phediole spp* with consists of 5.27%. In Dolichoderinae and Pseudomyrmicinae

subfamily, genera were *tapinoma spp* with 5.71% and *tetraoponera* constitute 11.42%. *Tetramorium spp, Lepidogenys spp* also noted in minimum level. During comparison of *tapinoma* and *tetraoponera* species *tetraoponera* species were rich in Kattanchimalai region. Ponerinae subfamily, genera *lepidogenys spp* which contains 2.85% was observed during the present study. Sornapriya J et al., 2018, in Periyanaickenpalayam we observed thirty five species observed [55]. In 2019 we revealed the higher abundance of butterflies and ants among the insects were noted and the total 28 number of different types of insects were recorded in KonguNadu Arts and Science college campus [56]. Individual ant species was noted in Periyanaickenpalayam area during the year of 2019 [57]. Twenty three species were identified among the 4 subfamilies reported were subfamily Formicinae was dominated with 10 species followed by Myrmicinae with 9 species, Dolichoderinae and Pseudomyrmicinae with 2 species each was noted in Karamadai region [58].

5. CONCLUSION

The present investigation on diversity of ants in the Kattanchimalai region, Coimbatore district clearly indicated that the richness of ants fauna in the city. The present study showed that the 35 species of ants belonging under the 5 subfamilies and 12 genera of Ants species and also large number of *Camponotus* and *Monomorium* genera were observed in Kattanchimalai region, Coimbatore district, Tamil Nadu. The Kattanchimalai, region mostly affected by anthropogenic pressure like deforestation, human population and vehicles pollution causing the diversity of ants in our area.

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