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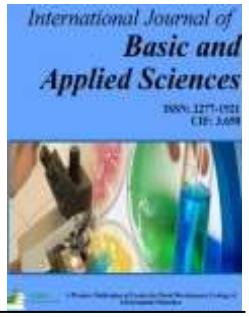

Full Length Research Paper

A Study of Ant Diversity in Selected Sites of Aralam Wildlife Sanctuary, Kerala, India

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ABSTRACT

The study examined the diversity of ants in selected areas of Aralam Wildlife Sanctuary, Kannur district, Kerala. This study showed 19 species of ants in the selected study area using standard collection protocols and techniques. The sampled specimens represented 19 species under 4 subfamilies. Among those, the most diverse subfamily was Formicinae followed by myrmicinae, Ponerinae and dolichoderinae. The smallest number of species belonged to the dolichoderinae. A total of 1470 organisms belonging to 12 genus and 19 species were observed from 3 different ecosystems. Among the sampled genera, one which showed the highest number of species representation was Camponotus with 6 species. Three species were found only in forested areas and four species found only in agricultural area. However 11 species were observed from both the habitats. The present study provides valuable information of ant diversity in this region and also revealed that the Aralam Wildlife Sanctuary has a rich diversity of ants in spite of regular alteration in habitat of these ants. This study shows that the ants could survive against the odds and this study area served as a mini model to examine the persistence of ant species in a locality.

Introduction

Insects are virtually everywhere on the Earth's surface; excluded only the extremes of climate at the poles and on the peaks of highest mountains; just a few species live in the sea .They have a strong hold in most ecosystem processes as they are pollinators and nutrient cyclers. A large number of them act on insect predators and mutualist of all of which require conservation. They have lived on Earth about 300 million years compared with less than 1 million for man and during this time they have evolved in many direction to become adapted for life in almost every type of habitat. Ants are ubiquitous, diverse, abundant, and fairly well described (Alonso and Agosti 2000). Ants (Hymenoptera: Formicidae) are eusocial cosmopolitan insects with about 13,262 species and 1941 subspecies, classified into 333 genera and 17 subfamilies (Bolton 2017). Ants respond to a variety of disturbances and have served as bioindicators to assess effects of forest clearing (King et al. 1998; Gascon et al.1999) and agriculture (Perfecto and Snelling1995; Philpott et al. 2006).

Ants comprises of great many insects which are beneficial to man .They play important role within the terrestrial ecosystems because they have numerous interactions with different plant species, including seed dispersers, leaf- and seed- predators, and in some cases, as pollinators. Ants are found everywhere, except in Iceland, Green- land and Antarctica, but the number of species declines with increasing latitude, altitude and aridity. Currently, there are 15,983 extant ant species or subspecies as per the recent classification. They are grouped into 20 subfamilies, with 464 genera. All of these belong to a single family called Formicidae included in the super family Vespoidea of the order Hymenoptera, which is placed in the largest class Insecta in the animal kingdom. A total of 828 valid species and subspecies names belonging to 100 genera are listed from India. Most of the ants have either a direct or indirect relationship with vegetation. Some of these are highly specific to the habitat in which they occur, depending on the maximum benefits they attain for the nesting, mating and food availability. They are widely used to assess landscape disturbance and species diversity (Paknia & Pfeiffer 2011). Using insects to study how creation of mosaics, fragmentation of land, deforestation and creation of monocultures have an impact on diversity and stability of an ecosystem is a challenging and interesting task as it not only involves the taxonomy of concerned group but is also related to the behavioural aspects of the taxa under study.

Hence the present study investigates the diversity of Hymenopterans (Formicidae) in the Aralam forest, to assess the habitat preference of ant species in different vegetation types of agricultural and forest ecosystems,to assess to distribution and

abundance of ants in forest and agricultural ecosystems. The study is important as there is no adequate information pertaining to ant diversity of this region.

Materials and methods

Study area

Aralam forest located in southeast part of Kannur district is one of the major ecotourism centre in Kerala. The forest area is at 55 km2 and the vegetation consists of semievergreen forest, riverine ecosystem and rock patches. It is situated between 11°52.44' North latitude and 75°53.19' East longitude. The major flora in Aralam forest are *Theobroma cacao, Tectona grandis,Terminalia tementosa, Bambusa arundinaria, Terminalia myriocarpa* etc. Agricultural area considered for the study was in Peravoor Panchayat in Kannur district. Vegetation in the agricultural area comprises of banana plantation, rubber plantation and pineapple plantation. The predominant type of cultivation in Peravoor Panchayath is rubber. A notable feature of Peravoor Panchayath is that one side of the area is of forest and the other side is of agricultural area.

Sample collection

During the study period, ants were collected from different habitats such as semi evergreen patches and riverine areas from Aralam forest. Specimens were also collected from different types of agricultural plantation in Aralam farm namely pineapple, rubber, and banana plantation.Ants were collected during morning and evening time using different methods as described by Gadagkar *et al.,* (1993). The specimens were collected using five different methods which includes pitfall trap, quadrate method, opportunistic observation method, hand picking and scented trap methods.

Preservation and identification of specimens

Samples mixed with debris were separated from debrisand were washed with alcohol before preserving them.Immediately after collection, all the specimens were sorted out based upon similar groups. The specimens were sealed and kept in separate vials in 70% alcohol with appropriate labels for further identification. The collected ants were identified up to genus and for few, species level identification was done with the help of keys given by Ali (1992); Bingham (1903); Bolton, B.(1994); Rastogi *et. al.* (1997); Tiwari (1999); Varghese (2002 & 2003).

Results and discussion

A total of 19 species of ants were collected and identified during the study period of which all belongs to the family Formicidae. High species richness was observed from subfamily Formicinae (57%) while there were representatives from myrmicinae (21%),Ponerinae (16%) and dolichoderinae (6%). High species diversity was observed in the agricultural ecosystem with 17 genera with 604 organisms, semi evergreen forest patch comprising of 14 genera with 798 organisms and riverine ecosystem represented only a single genus with 68 organisms.

Table 1: Showing the species diversity from the study area

Sl. No	Family	Subfamily	Genus	Species
1	Formicidiae	Formicinae	Camponotus	angusticollis
2	Formicidiae	Formicinae	Camponotus	carin
3	Formicidiae	Formicinae	Camponotus	compressus
4	Formicidiae	Formicinae	Camponotus	parius
5	Formicidiae	Formicinae	Camponotus	mitis
6	Formicidiae	Formicinae	Camponotus	rufoglaucus
7	Formicidiae	Formicinae	Leptogenys	dentilobis
8	Formicidiae	Formicinae	Oecophylla	smaragdina
9	Formicidiae	Formicinae	Paratrechina	longicornis
10	Formicidiae	Formicinae	Polyrhachis	rastellata
11	Formicidiae	Formicinae	Polyrhachis	tibialis
12	Formicidiae	Myrmicinae	Monomorium	pharaonis
13	Formicidiae	Myrmicinae	Meranoplus	bicolor
14	Formicidiae	Myrmicinae	Myrmicaria	brunnea
15	Formicidiae	Myrmicinae	Solenopsis	geminata
16	Formicidiae	Ponerinae	Diacamma	assamense
17	Formicidiae	Ponerinae	Diacamma	sculptum
18	Formicidiae	Ponerinae	Odontomachus	haematodus
19	Formicidiae	Dolichoderinae	Technomyrmex	albipes

Table 2: Showing the diversity and distribution of ants in different ecosystems

Genus	Species	Agricultural ecosystem	Riverine ecosystem	Semi evergreen Forest ecosystem
Camponotus	angusticollis	Nil	Nil	30
Camponotus	carin	34	Nil	Nil
Camponotus	compressus	4	Nil	Nil
Camponotus	parius	17	Nil	34
Camponotus	mitis	13	Nil	Nil
Camponotus	rufoglaucus	6	Nil	44

Leptogenys	dentilobis	11	Nil	45
Oecophylla	smaragdina	120	Nil	200
Paratrechina	longicornis	8	Nil	20
Polyrhachis	rastellata	Nil	Nil	35
Polyrhachis	tibialis	60	Nil	152
Monomorium	pharaonis	68	Nil	Nil
Meranoplus	bicolor	7	Nil	14
Myrmicaria	brunnea	22	Nil	63
Solenopsis	geminata	55	Nil	67
Diacamma	assamense	20	Nil	24
Diacamma	sculptum	24	Nil	29
Odontomachus	haematodus	16	Nil	41
Technomyrmex	albipes	120	68	Nil

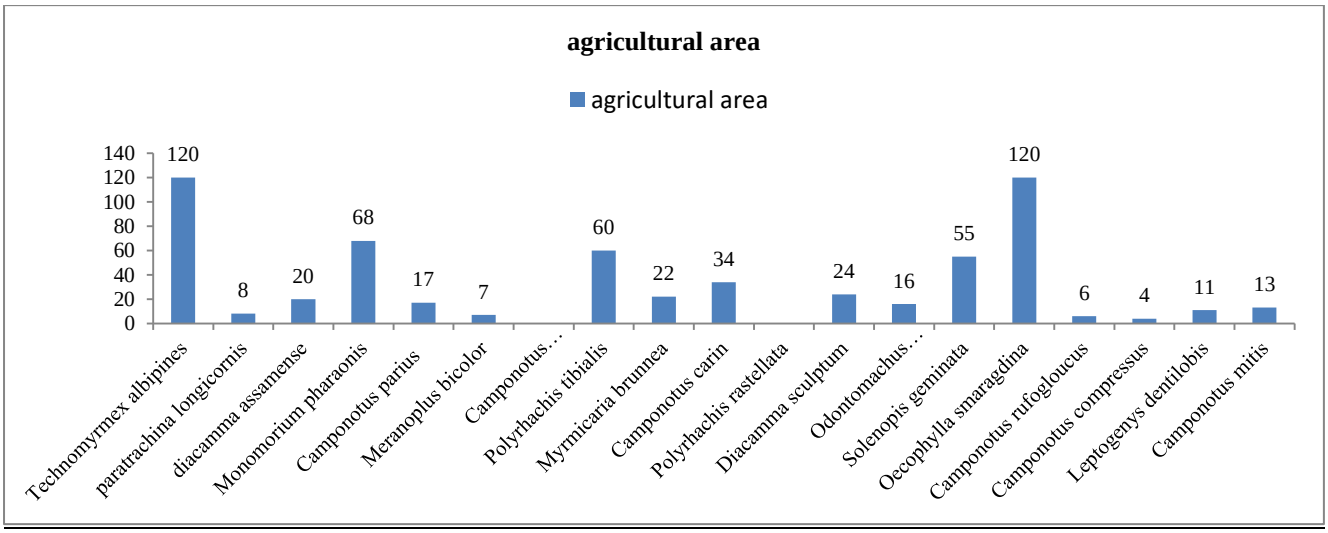

Fig 1: Graphical representation of ant species present in the agricultural plantation area

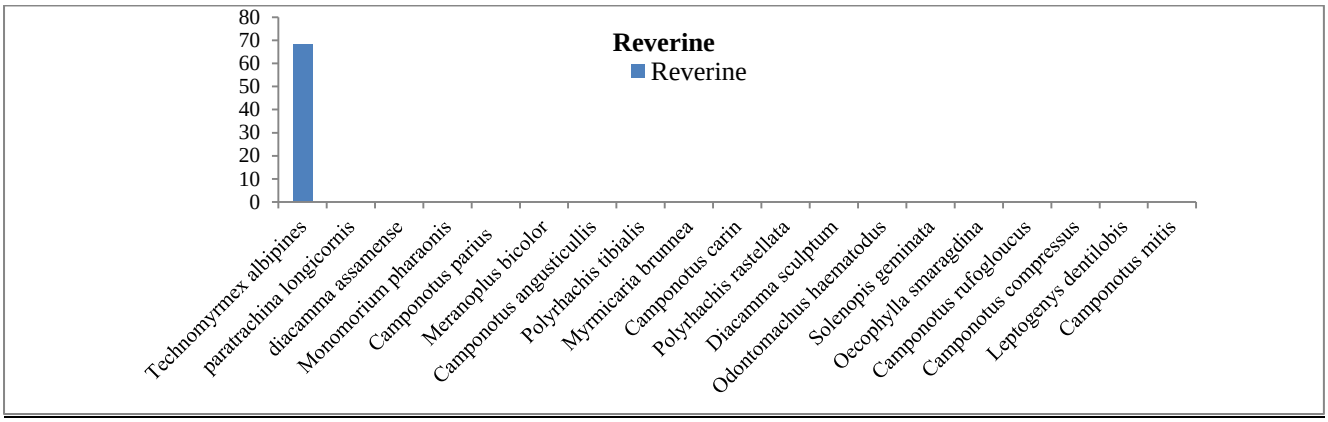

Fig 2: Graphical representation of species present in the riverine ecosystem

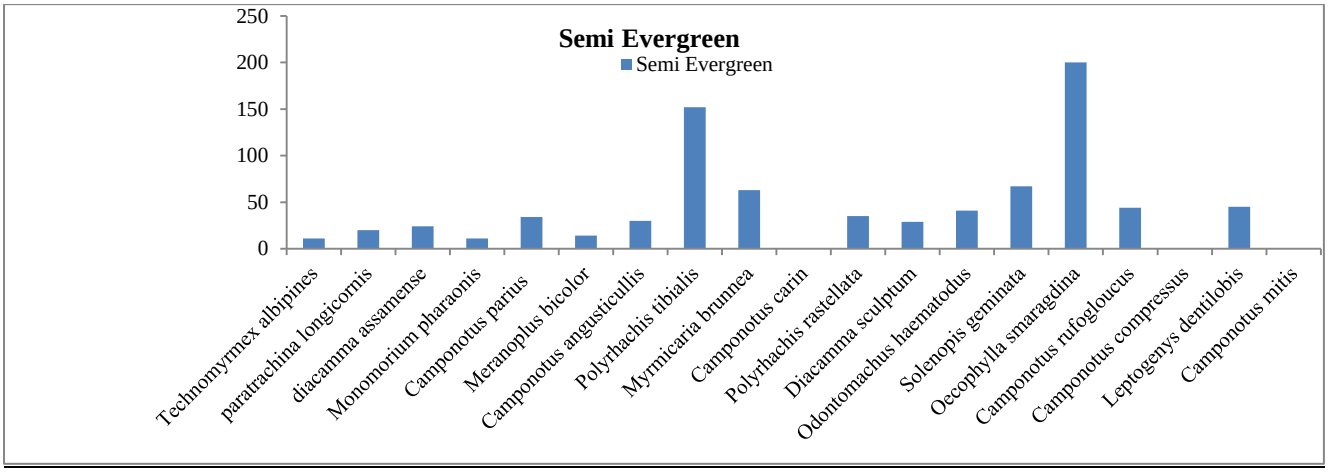

Fig 3: Graphical representation of different species present in the semi evergreen forest patch in Aralam forest area.

The most dominant genus observed was Camponotus. There were 6 different species of Camponotus observed in the agricultural ecosystem and three species were observed in the semi-evergreen forest patch, but none of it was observed in the riverine ecosystem. The lowest species richness among all the ant species was observed for *C. compressus* with a total of 4 organisms observed in the agricultural ecosystem. *C. angusticullis* and *P. rastellata* were found only in the semi-evergreen forest patch whereas *C. mitis, C. compressus* and *C. carin* were observed only in the agricultural ecosystem.

In agricultural ecosystem as well as semi-evergreen forest patch, there was high species richness of *O. smaragdina*. It also represented the highest number of organisms with a total of 320 in 2 ecosystems studied, but it was absent in the riverine ecosystem. The weaver ant, *O. smaragdina*, is a well-known predator which is used as a biological control agent against various agricultural pest species (Way & Khoo, 1991; Paulson & Akre, 1992; Way *et. al.*, 2002).

Technomyrmex albipes was the only species observed in the riverine ecosystem. *T. albipes* is a scavenger that tramps/exploits forests and open habitats. Tent-like nests made from debris (Tenbrink & Hara, 2002) are found in dry places above the ground, mainly in trees, bushes, under palm fronds, in loose mulch, leaf litter, (Warner *et al*., 2002) rotting logs, under loose bark, and sometimes under stones (in soil).

Conclusion

Ant species composition and their diversity patterns at the Aralam forest and its agricultural areas have been analysed in this study. This study emphasizes the dominancy exhibited by the subfamily Formicinae and Myrmicinae, due to their ability to adapt to different niches with a variety of feeding habits specific niche and food requirements. Habitats providing these specific niches were less frequently present. From the present study it can be concluded that diversity of ants is different in these habitats in terms of species richness, abundance and composition. Ants can be effectively used in indictor studies because they immediately respond to any alteration in the surrounding environment. When assessing different taxa as disturbance indicators ants were better performed as compared to other invertebrates such as spiders and hemipterans. The findings can be used to understand the ecological sensitivities of ants at different regions and can be helpful for future conservation programmes. Detailed studies of disturbed habitats are urgently needed according to extent of disturbance, type of disturbance, physicochemical properties of soil, climatic factors, exotic flora and fauna etc.

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