

# Abundance of Ants (Hymenoptera: Formicidae) during Pre-monsoon and Post-monsoon Seasons in the Mangrove Patches of Indian Sundarbans

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## ABSTRACT

Ants are a social insects that are widely varied and abundant. Although they play a significant role in the mangrove environment, little is known about ants in the Indian Sundarbans. Understanding ant abundance in the Indian portion of the Sundarbans during the pre- and post-monsoon is the goal of this study. 35 species and 21 genera of ants from 5 subfamilies were discovered from five different locations of Sunderbans. Myrmeciinae is the subfamily with the highest number of species (16) followed by Formicinae (8). In the current investigation, five invasive species were discovered: *Monomorium floricola*, *Solenopsis geminata*, *Paratrechina longicornis*, *Tapinoma melanocephalum*, and *Trichomyrmex destructor*.

**Keywords:** *Sunderbans; Mangrove; Pre-Monsoon; Post-Monsoon*

## Introduction

Ants are eusocial hymenopterous insects of the family Formicidae found all over the world, except in the Polar Region. The diversity of ants, as seen by the enormous number of species, subspecies, and variants, and by their tremendous geographic ranges, demonstrates their abundance and ecological dominance. Significant contributions are made to soil aeration, nitrogen deposition, and ecosystem structure. In addition to spreading seeds, they are effective decomposers. Despite its manifold importance, the ant fauna of West Bengal especially the Sunderbans is poorly studied. The author's initial effort was to report 64 species from 30 genera from the Indian portion of the Sunderbans (Bakra, Sheela & Bhattacharyya, 2022). The objective of this study is to find out the abundance of ant species in the mangrove patches of selected localities in the Indian part of the Sunderbans during the pre-monsoon and post-monsoon seasons. Further, the study will be the baseline for future studies in this region.

## Methodology

Site 2: Bakkhali (88°17'30'E/21°34'45'N),

Site 3: Pathar Pratima (88°18'40'E/21°43'25'N),

Site 4: Gosaba (88°50'32'E/22°07'53'N), and

Site 5: Hingaljanj (88°58'18'E/22°20'4'N)

Sites 1, 2, and 3 are located in the western sector of the Sunderbans, Sites 4 are in the centre and Site 4 is in the eastern sector of the Indian Sunderbans.

### Collection of Ants

The "all- out search' method was used to collect ants. Collection took place during the pre-monsoon (April–June) and post monsoon (October-November) seasons in 2019–2020.

### Identification

The ants were identified up to genus level using taxonomic keys by Bolton (1995) and species identification done by using Bingham (1903).

### Calculation of Relative Abundance (RA)

The relative abundance of species refers to the number of individuals per species. The relative abundance of ants was calculated using the following formula:

Relative Abundance (%) =

Total number of individuals of the species/Total number of Individuals of all species×100

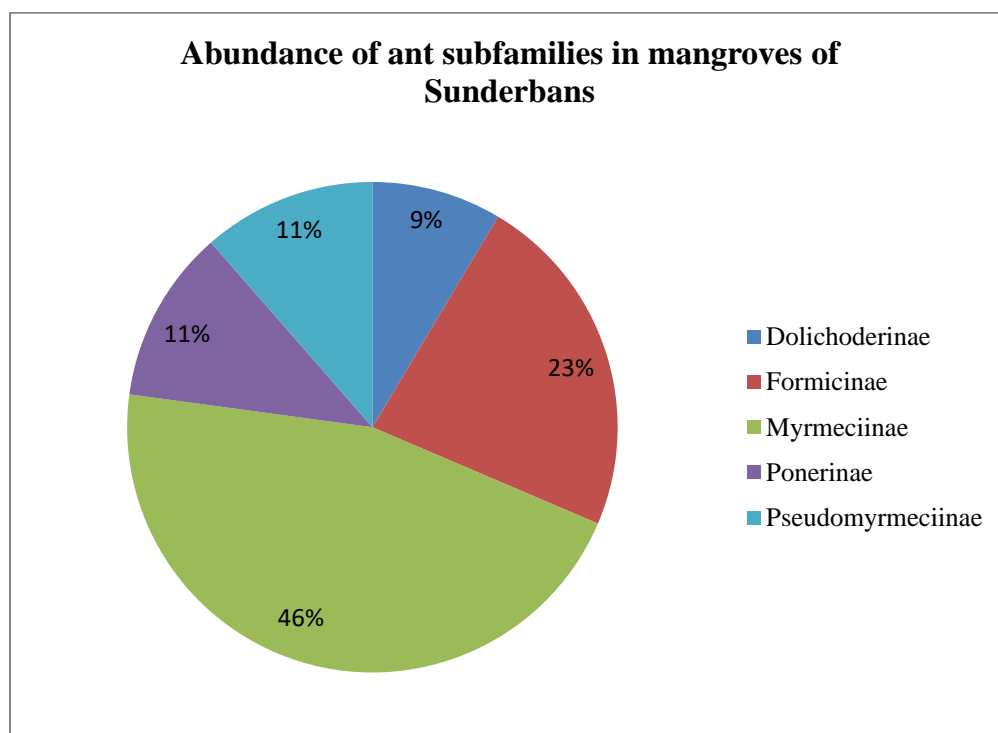
### Results

Ants were found in the mangroves of the Indian Sunderbans in a total of 35 species, 5 subfamilies, and 21 genera (Table-1). Myrmeciinae is the subfamily with the highest number of species (16) followed by Formicinae(8), Ponerinae(4), Pseudomyrmecinae(4) and Dolichoderinae(3). The subfamily Myrmeciinae had the highest abundance (46%) followed by Formicinae (23%),Ponerinae (11%), Pseudomyrmecinae (11%), and Dolichoderinae (9%) (Fig.-1). Pre-monsoon and post-monsoon ant species composition were compared, and it was found that post-monsoon ant species richness was comparatively high (30 species) (Table-2). A total of 30 ant species were discovered during the post-monsoon season but only 23 different ant species detected during the pre-monsoon (Table-2). During pre-monsoon, the highest abundance was found in *Crematogaster rogenhoferi* (24.8%), followed by *Camponotus compressus* (14.37%), *Monomorium indicum* (11%), *Paratrechina longicornis* (9.5%), and *Tetraoponera rufonigra* (8.68%). But during the post-monsoon season, the most prevalent species was *Paratrechina longicornis* (27.4%), followed by *Monomorium floricola* (7.8%), *Lepisiota sericea* and *Tapinoma melanocephalum* (both 7.6%) (Fig.-2). There were 5 invasive species: *Monomorium floricola*, *Solenopsis geminata*, *Paratrechina longicornis*, *Tapinoma melanocephalum*, and *Trichomyrmex destructor*(Acc. to IUCN GISD) in the mangrove patches of Sunderbans (Table-3).

**Table 1: List of The Ant Fauna of Mangroves in Sundarbans**

Subfamilies	Genera	No. of species
Dolichoderinae	<i>Iridomyrmex</i>	1
	<i>Tapinoma</i>	2

Formicinae	<i>Camponotus</i>	2
	<i>Paratrechina</i>	1
	<i>Nylanderia</i>	1
	<i>Lepisiota</i>	2
	<i>Oecophylla</i>	1
	<i>Polyrachis</i>	1
Myrmeciinae	<i>Crematogaster</i>	3
	<i>Carebara</i>	1
	<i>Dilobocondyla</i>	1
	<i>Monomorium</i>	4
	<i>Meranoplus</i>	1
	<i>Trichomyrmex</i>	2
	<i>Pheidole</i>	3
	<i>Solenopsis</i>	1
Ponerinae	<i>Anochetus</i>	1
	<i>Diacamma</i>	1
	<i>Leptogenys</i>	1
	<i>Pseudoneoponera</i>	1
Pseudomyrmecinae	<i>Tetraponera</i>	4
<b>Subfamilies- 5</b>	<b>Genera-21</b>	<b>Species-35</b>

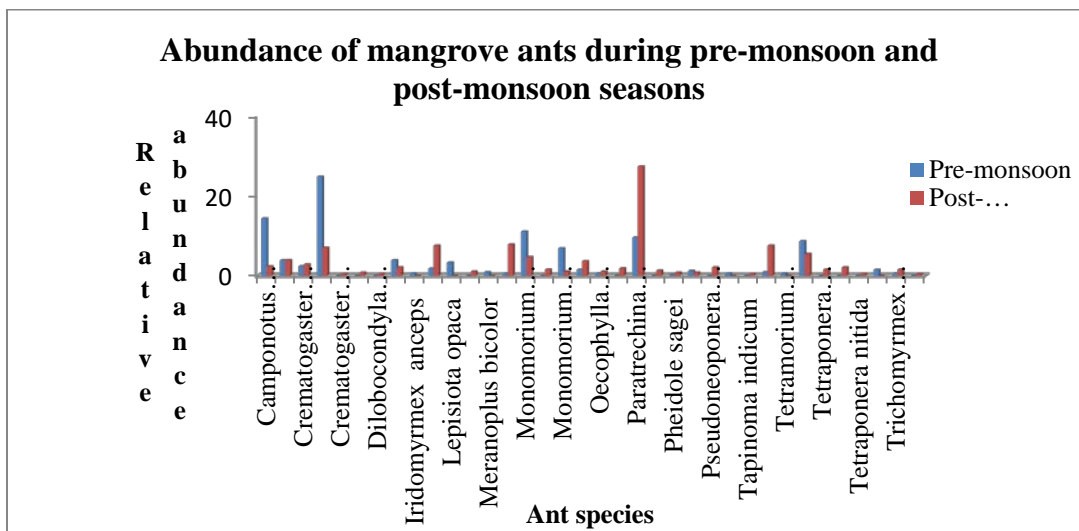


**Figure 1: Abundance of Ant Subfamilies in Mangroves of Indian Sunderbans**

**Table 2: Comparison of Ant Species Abundance during Pre-monsoon and Post-monsoon Seasons of Sundarbans**

<b>Ant Species</b>	<b>RA during Pre-monsoon</b>	<b>RA during Post-monsoon</b>
<i>Camponotus compressus</i> Fabricius	<b>14.37126</b>	2.349869
<i>Camponotus sericeus</i> Fabricius	3.892216	3.916449
<i>Crematogaster anthracina</i> Smith	2.39521	2.872063
<i>Crematogaster rogenhoferi</i> Mayr	<b>24.8503</b>	7.049608
<i>Crematogaster aberrans</i> Forel	0	0.522193
<i>Carebara affinis</i> Jerdon	0	0.78329
<i>Dilobocondylagastroreticulatus</i> Bharti & Kumar	0	0.522193
<i>Diacamma rugosum</i> Le Guilou	3.892216	2.088773
<i>Iridomyrmex anceps</i> Roger	0.598802	0
<i>Lepisiota sericea</i> Forel	1.796407	<b>7.571802</b>
<i>Lepisiota opaca</i> Forel	3.293413	0
<i>Leptogenys histerica</i> Forel	0	1.044386
<i>Meranoplus bicolor</i> Guerin-Meneville	0.898204	0
<i>Monomorium floricola</i> Jerdon	0.598802	<b>7.832898</b>
<i>Monomorium indicum</i> Forel	<b>11.07784</b>	4.699739
<i>Monomorium atomum</i> Forel	0	1.56658
<i>Monomorium latinode</i> Mayr	<b>6.886228</b>	1.044386
<i>Nylanderia indica</i> Forel	1.497006	3.655352
<i>Oecophylla smaragdina</i> Fabricius	0.5988024	1.0443864
<i>Solenopsis geminata</i> Fabricius	0	1.827676
<i>Paratrechina longicornis</i> Latreille	9.580838	<b>27.41514</b>
<i>Pheidole parva</i> Mayr	0	1.305483
<i>Pheidole sagei</i> Forel	0.299401	0.78329
<i>Pheidole watsoni</i> Forel	1.197605	0.78329
<i>Pseudoneoponerarufipes</i> Jerdon	0	2.088773
<i>Polyrachis rastellata</i> Latreille	0.598802	0
<i>Tapinoma indicum</i> Forel	0	0.522193
<i>Tapinoma melanocephalum</i> Fabricius	0.898204	<b>7.571802</b>
<i>Tetramorium lanuginosum</i> Mayr	0.598802	0
<i>Tetraoponerarufonigra</i> Jerdon	<b>8.682635</b>	5.483029

<i>Tetraponera allaborans</i> Walker	0	1.56658
<i>Tetraponera nigra</i> Jerdon	0	2.088773
<i>Tetraponera nitida</i> Smith	0	0.522193
<i>Trichomyrmex destructor</i> Jerdon	1.497006	0
<i>Trichomyrmex scabriceps</i> Mayr	0.598802	1.56658
<i>Anochetus madaraszi</i> Mayr	0	0.522193



**Figure 2: Abundance of Ant Species during Pre-monsoon and Post-monsoon Seasons in the Mangrove Habitat of Sundarbans**

**Table 3: List of Invasive Species Sampled and Their Subfamilies**

Subfamily	Genera	Species
Myrmeciinae	<i>Monomorium</i>	<i>Monomorium floricola</i>
	<i>Solenopsis</i>	<i>Solenopsis geminata</i>
	<i>Trichomyrmex</i>	<i>Trichomyrmex destructor</i>
Dolichoderinae	<i>Tapinoma</i>	<i>Tapinoma melanocephalum</i>
Formicinae	<i>Paratrechina</i>	<i>Paratrechina longicornis</i>

## Discussion

There has been a lot of study done on the diversity and distribution of ants from throughout the world. The ant fauna of a mangrove community in Darwin Harbour was reported by Clay and Andersen in 1996, and they contrasted it with the local savanna and rain forest fauna. In mangroves, they found 16 different ant species, including 3 savannah species, 6 rain forest species, 5 habitat generalists, and 2 species that are only found there. According to Hashim, Jusoh & Nasir (2010), mangrove forests and oil palm plantations are home to a total of 9 species. Fitri *et al.* (2021) reported 11 species of ants belonging to 3 subfamilies and 10 genera from mangrove forest of Pariaman. From West Bengal, Roy *et al.* (2018) first report on mangrove inhabiting ants. They reported total 12 species of ants under the subfamilies Formicinae, Myrmeciinae, Pseudomyrmecinae and Dolichoderinae. The results of the current study showed that the ant community in the Sunderban mangrove is more diverse than other mangroves of the world.

The presence of invasive ants, such as *Paratrechina longicornis*, *Tapinoma melanocephalum*, *Monomorium floricola*, *Trichomyrmex destructor* and *Solenopsis geminata* which are highly adaptable to disturbed habitats, also can cause the loss of other ant species from a habitat due to competition. (Siddiqui *et al.* 2021). Early detection through surveys may target those invasive species (Reaser *et al.* 2020).

## Conclusion

Therefore it can be concluded that a wide range of varied species of ants are sustained by the mangrove habitat in Indian Sunderbans. For the purpose of preserving biodiversity, it is therefore strongly advised to expand and create a sustainable mangrove forest to assess ant diversity and abundance in Sunderbans. Non-native species, however, raise problems, especially given how quickly their abundances are growing. As a result, their role in mangrove environments to be discussed, and the variables that promote their occurrence and have a negative impact on native species should be investigated.

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