



# STUDY ON DIVERSITY AND DISTRIBUTION OF ANTS (HYMENOPTERA: FORMICIDAE) UNDER DIFFERENT HABITATS IN DISTRICT BHANDARA, MAHARASHTRA, INDIA

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The study of ant diversity and species richness of the ant population shows considerable economic importance due to its cosmopolitan distribution. Bhandara district is well known for its large production of rice and Brass industries. The species richness of ant fauna was first time studied in the Bhandara district showing the wide population of six subfamilies, Myrmicinae(38%), Formicinae(23%), Ponerinae(14%), Dolichodorinae(14%), Dorylinae(6%), and Pseudomyrmicinae(6%). The relative abundance of ants was recorded in different agricultural rural habitats as cultivated regions as compared to the domestic habitat in urban localities followed by industrial areas in the Bhandara district. Some regions of the Bhandara district are under-sampled, so the partial checklist shows regional diversity and distribution in different habitats. The present study recorded the species richness of some ecologically important ants such as *Crematogaster*, *Solenopsis*, *Camponotus*, *Aphaenogaster*, and *Leptogenys* in different regions, of the Bhandara district such as Bhandara city, Tumsar, Sakoli, Mohadi, Lakhani, Pauni and Lakhandur.

**Keywords:** *Bhandara, Subfamily, Hymenoptera, Checklist, Richness.*

## INTRODUCTION

Ants belong to the family Formicinae order Hymenoptera which is the third largest insect order of phylum Arthropoda. They have variable habitats like forests and wetlands, bark of trees, dead organic matter, soil, rocks, human habitats and leaf litter. There are 17 valid subfamilies 337 genera, and over 13,837 species of ants have been described all over the world (Bolton, 2020). Ants are omnipresent in distribution and occupy almost all terrestrial ecosystems (Holldobler and Wilson, 1990). The ants are the Hymenopterans invertebrates that also play a significant role in the delivery of the ecosystem also participate actively in the



interactions that develop the quality of soil by physical, chemical and biological processes. Ants are cosmopolitan, an important part of animal biomass, and present at almost all levels of the terrestrial food web (Andersen, 1997; Pfeiffer *et al.*, 2013). The total ant species recorded in 828 species and 100 genera grouped in 10 subfamilies (Bharti *et.al.*, 2016). However, the Vidarbha region is well known for its sustainable insect fauna habitats, seasonal environment, and biodiversity. Distribution and diversity of ants around Gautala Autramghat Sanctuary, Aurangabad Maharashtra has recorded a total of 17 species of ants belonging to 13 genera and 6 subfamilies (Sonune and Chavan, 2016). However, in the Vidarbha region 35 species of ant species under 22 genera belonging to the six subfamilies i.e, Formicinae, Myrmicinae, Ponerinae, Dorylinae, Dolichoderinae and Pseudomyrmicinae. were first time recorded in Nagpur city (Kadu, 2016). The present study focuses on the threats to native ants diversity under different subfamilies due to anthropogenic activities and industrialization (Kadu, 2016; 2021). The aim of the present study is to document an initial checklist of ant species in relation to diversity and species richness in the agricultural area(rural), grassland area, domestic habitat (urban) and industrial sites to understand the behavioral pattern of ant species under a sustainable ecosystem in Bhandara district of Maharashtra.

## **Material and Method**

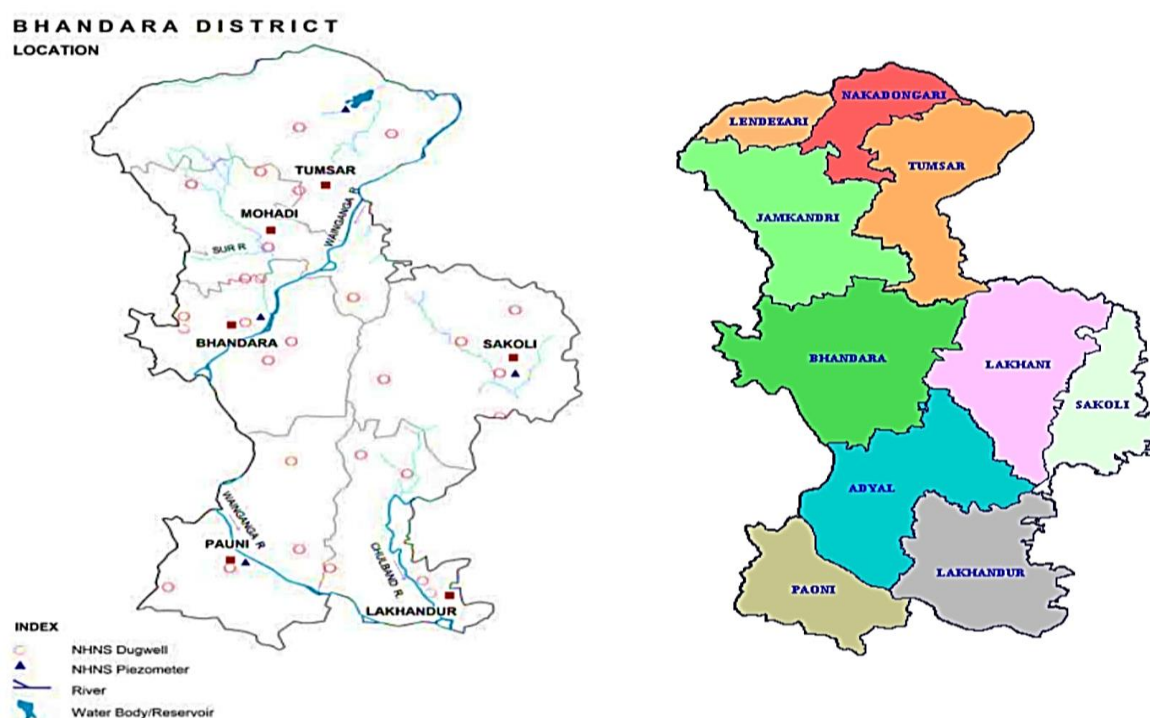
### **Study Area**

Bhandara District is subdivided six tahsil places namely Tumsar, Sakoli, Mohadi, Lakhani, Pauni, Lakhandur and Bhandara City having 541 Gram Panchayats and 870 villages. The present study area lies between latitude 20<sup>0</sup> 39" to 21<sup>0</sup> 38" North and longitudes 77<sup>0</sup> 80" from East. The district is surrounded by agricultural and industrial field with annual temperature ranges from 26 to 36°C daytime humidity 45% to 48% with average rainfall of 700 – 800 mm. Bhandara town is also known as "Brass City" owing to the presence of a large brass products industry. Present study was carried out during the years 2021 to 2023 in agricultural area(AH, rural area) and domestic habitats (DH, urban area) to understand the behavioral pattern of ant species under a sustainable ecosystem in the Bhandara district (Figure-1).

### **Collection and Identification of Ants**

Samples are collected from different sites in Bhandara District is by random visits. Different ecological habitats such as agricultural areas (rural), grassland areas, domestic habitats (urban) and industrial sites were chosen for survey and sampling. Samples were

collected by hand picking collection method and honey trap method using brush and forceps. The collected species were preserved in 70% alcohol in air-tight vials for further investigation. The ants were identified up to the genus level by using the Stereoscopic Binocular microscope and identification key (Bolton, 1994) and confirmed by the checklist of the ants of India (Bharti *et, al.*, 2016, Appendix-I)



**Fig.1. Geographical locations of selected study sites in Bhandara district**

## Result and Discussion

In the present study, total of 37 species of ants belonging to 06 subfamilies with 23 genus were recorded from the study area under the district Bhandara, which is, Myrmicinae, Formicinae, Dolichoderinae, Dorylinae, Ponerinae, and Pseudomyrmicinae. Among these six subfamilies, Myrmicinae is found to be the most abundant with eight genera and fourteen species followed by subfamily Formicinae having ten species studied under five genera. In Subfamily Dolichoderinae with six species under four genera while the subfamily Ponerinae shows four species under four genera. The subfamily Dorylinae and Pseudomyrmicinae with one species under each genus have been reported (Table I)

**Table 1. Checklist of Ant Genus and Species in Bhandara district.**

Subfamily	Genus	Species
Myrmicinae	<i>Aphaenogaster</i>	<i>A. longicep</i> (Smith, F., 1858)
	<i>Cardiocondyla</i>	<i>C. wroughtonni</i> (Forel, 1890)
		<i>C. carbonaria</i> (Forel, 1907)
	<i>Crematogaster</i>	<i>C. diffusa</i> (Jerdon, 1851)
		<i>C. aberrans</i> (Forel, 1892)
		<i>C. rothney civa</i> (Forel, 1902)
	<i>Monomorium</i>	<i>M. indicum</i> (Forel, 1902)
		<i>M. indica</i> (Weber, 1950)
	<i>Pheidolegeton</i>	<i>P. noda</i> (Smith, 1874)
		<i>P. indica</i> (Mayr, 1879)
	<i>Solenopsis</i>	<i>S. geminata</i> (Fabricius, 1804)
		<i>S. molesta</i> (Buren, 1972)
	<i>Tetramorium</i>	<i>T. mayri</i> (Forel, 1912)
	<i>Trichomyrmex</i>	<i>T. wroughtoni</i> (Forel, 1902)
Formicinae	<i>Camponotus</i>	<i>C. criniceps</i> (Mayr, 1879)
		<i>C. compressus</i> (Fabricius, 1798)
		<i>C. angusticollis</i> (Jerdon, 1851)
		<i>C. sericeus</i> (Fabricius, 1798)
		<i>C. rufoglaucus</i> (Jerdon, 1851)
		<i>C. irritans</i> (Smith, 1857)
	<i>Lepisiota</i>	<i>L. sericea</i> (Forel, 1892)
	<i>Oecophylla</i>	<i>O. smaragdina</i> (Fabricius, 1775)
	<i>Paratrechina</i>	<i>P. rastellata</i> (Latreille, 1802)
		<i>P. longicornis</i> (Latreille, 1802)
	<i>Polyrachis</i>	<i>P. rastellata</i> (Latreille, 1802)
Dolichoderinae	<i>Iridomyrmex</i>	<i>I. anceps</i> (Roger, 1863)
	<i>Tapinoma</i>	<i>T. indicum</i> (Forel, 1895)
		<i>T. melanocephalum</i> (Fabricius, 1793)
	<i>Technomyrmex</i>	<i>T. brunneus</i> (Forel, 1895)
		<i>T. albipes</i> (Smith, 1861)



	<i>Dolichoderus</i>	<i>D. sundari</i> (Mathew and Tiwari, 2000)
Dorylinae	<i>Dorylus</i>	<i>D. orientalis</i> (Westwood, 1853)
Ponerinae	<i>Diacamma</i>	<i>D. rugosum</i> (Le Guillou, 1842)
	<i>Leptogenus</i>	<i>L. processionalis</i> (Jerdon, 1851)
	<i>Mesoponera</i>	<i>P. manni</i> (Viehmeyer, 1924)
	<i>Odontoponera</i>	<i>O. denticulata</i> (Smith, 1858)
Pseudomyrmecinae	<i>Tetraponera</i>	<i>T. nigra</i> (Jerdon, 1851)
		<i>T. rufonigra</i> (Jerdon, 1851)
#6	# 23	#37

**Table 2. Distribution and richness of Ant gen in different sites in the Bhandara district (AH-Agriculture habitat, DH-Domestic habitat)**

Subfamily	Genus	Bhandara City		Tumsar		Sakoli		Pauni		Lakhandur		Mohadi		Lakhani	
		AH	DH	AH	DH	AH	DH	AH	DH	AH	DH	AH	DH	AH	DH
Myrmicinae	<i>Aphaenogaster</i>	+	+	++	-	+	-	+	+	+	-	+	+	+	-
	<i>Cardiocondyla</i>	+	-	+	+	++	-	++	+	++	+	++	-	-	-
	<i>Crematogaster</i>	+	+	++	+	+	+	++	-	+++	+	++	-	+	-
	<i>Monomorium</i>	++	+	++	+	+++	+	+++	+	+++	+	++	+	+++	++
	<i>Pheidolegeton</i>	++	-	+	-	++	+	++	+	++	+	++	+	+	++
	<i>Solenopsis</i>	+	++	+++	+	++	+	+++	+	+++	+	++	+	+++	++
	<i>Tetramorium</i>	+	-	++	+	+	+	++	+	+	+	++	+	+	-
<i>Trichomyrmex</i>	++	+	++	+	++	+	+++	+	+++	+	++	+	+++	-	
Formicinae	<i>Camponotus</i>	++	-	+	-	++	+	++	+	++	+	++	+	+	++
	<i>Lepisiota</i>	++	+	++	+	++	+	++	+	+++	+	++	+	+++	++
	<i>Oecophylla</i>	++	-	++	+	++	+	++	+	++	+	++	+	++	+
	<i>Paratrechina</i>	++	-	+++	-	++	+	+	+	++	+	++	+	++	++
	<i>Polyrachis</i>	++	-	++	-	++	+	+	+	++	+	++	+	+++	++
Dolichode	<i>Iridomyrmex</i>	++	-	+++	-	++	-	+	+	++	+	+++	+	+++	++
	<i>Tapinoma</i>	++	-	++	-	++	+	+	+	++	+	++	+	+++	++



rinea	<i>Technomyrmex</i>	++	-	++	+	++	+	+++	+	++	+	++	+	+++	++
	<i>Dolichoderus</i>	++	+	++	+	++	+	++	+	+++	+	+	+	++	-
Dorylinae	<i>Dorylus</i>	+	-	+	-	+	+	+	+	+	+	++	-	++	+
Ponerinae	<i>Diacamma</i>	+	+	+++	+	++	+	+++	+	+++	+	++	+	+++	++
	<i>Leptogenys</i>	++	-	++	+	++	-	+++	+	+++	-	++	+	++	+
	<i>Mesoponera</i>	+	+	++	+	++	+	+++	+	+++	+	++	+	+	++
	<i>Odontoponera</i>	+	-	-	+	++	-	++	+	+	-	++	-	++	+
Pseudomyrmicinae	<i>Tetraponera</i>	++	-	++	-	++	+	+	+	++	+	++	+	++	++

Where: indicates presence of ant +++= Abundant; ++ = Maximum, + = Moderate; - = indicates absence of ants (Site/ species = 10)

\*\*\* P<0.001. \*\* P<0.05, \* P<0.01

The present study recorded maximum distribution and richness of ant fauna in district Bhandara where, Myrmicinae represents the highest percentage of species (38%) followed by Formicinae (23%), Ponerinae(14%), Dolichodorinae(14%), Dorylinae(6%), and Pseudomyrmicinae(6%). (Table-I). During the present study it was found that species richness and distribution of 37 species under 23 genera was recorded maximum in agricultural habitat (AH) under the rural areas than the domestic habitat under different tahsil places in District Bhandara. The present study is initially recorded the maximum species richness and distribution of ant species with 23 genera in Bhandara. district (Table 2). In all the selected study sites at different tahsil places under district Bhandara, most commonly genera found were *Camponotus*, *Crematogaster*, *Pheidole*, *Monomorium*, *Lepisiota* and *Tetraponera*. In urban and residential area *Camponotus* *Solenopsis* *Crematogaster*, *Tetraponera*, *Cardiocondyla* and *Crematogaster* are mostly found in all habitats mostly found in the agricultural habitats. present also focus on some predator ant species like *Oecophylla*, *Pheidole*, *Solenopsis*, *Tapinoma* genera feed on caterpillar and aphids, jassids and larvae of other insects pests. Also ground-dwelling ants, *Camponotus* *Solenopsis* *Crematogaster*, *Tetraponera* and, *Cardiocondyla* plays important roles as soil turners which increases soils nutrients (Kadu, 2021).



## **Conclusion**

The richness of ant fauna in tropical regions like Bhandara district in the Vidharbha region is recognized as a global hotspot. It is necessary to preserve global diversity in the strategic conservation of beneficial ant species in the Maharashtra state that are designed to engage public policy and concerns affecting local, regional and global scales of communities, ecosystems, and cultures (Amarasinghe, 2010; Chavan and Pawar, 2011). During the present study it was observed that some ants species are biological agent in agricultural cropping systems (Choate and Drummond, 2011). Present study concludes that regions in Bhandara district is rich in ant fauna. During present study it was noticed that the distribution of ant fauna is richest in agricultural regions and rural areas such as Sakoli, Lakhandur, Plandur, Mohadi, Paoni, Lakhani comparatively followed by Bhandara city where the residential and urban areas shows minimum richness because of disturbed habitats areas and urbanization, industrialization (*Simpson and Shannon, 1949*). The anthropogenic activities in some domestic habitats also decreases the ant species richness and vegetation disturbing ants habitats. It is really unfortunate in present scenario that much emphasis has been laid on those natural resources which are of direct importance to humans and to look for alternative resources in the wake of exhaustion of natural resources. Ants provide many services free of cost which ensure the survival of our race. They are the major soil turners, channels of energy, pollinators, scavengers (*Del et al., 2012; Guenard, 2013*) biological control agents and to sum up the ants are important component of food chain. More recently they are being used as indicator organisms which provide us cues regarding our deteriorating ecosystems (*Kadu, 2021*).. We conclude that while ant species richness generally increases with an increase in vegetation (*Lach et al., 2010*) and declines with increase in industrialisation and urbanisation in cities. The present study reveals the importance of a diverse group of ants in the Bhandara district as they are an important component of our food chain.

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