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Diversity of Ants (Hymenoptera: Formicidae) Fauna from Mandian, Abbottabad - Pakistan

Neha Fatima¹, *Maryam Khan¹, Firyal Zahoor¹, Ifra Nawaz¹, Azaz Ahmad²

¹ Government Postgraduate College for Women Mandian Abbottabad, Pakistan

² Department of Entomology, The University of Agriculture, Peshawar, Pakistan

*Corresponding Author's Email: marviamkhanmano933@gmail.com

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Abstract

Pakistan has diverse ants fauna but very limited work has done on this group so far. Based on the recently collected specimens of Formicidae from Government Postgraduate College for Women Mandian-Abbottabad, fifteen (15) genera were reported in the sub-families Dorylinae, Dolichoderinae, Formicinae, Myrmicinae, and Pseudomyrmecinae. Formicinae was found the most abundant with 57% abundance. Among the genera, *Gesomyrmex* was the most abundant with 6 individuals, representing 18.1% of the total collected ants.

Key Words: Ants, Formicinae, *Gesomyrmex*, Abbottabad, Pakistan.

Introduction

Ants are eusocial insects that belong to family Formicidae of the order Hymenoptera. They are said to be present on earth about 120 million years ago (Ward, 2007). They are one of the most diverse and pervasive group of the social insect within order Hymenoptera (Bolton, 2011). Ants are further classified into 26 subfamilies with about 16,318 described species in 482 genera (Bolton, 2021). There are 103 ant species in 35 genera and 7 subfamilies reported from Pakistan (Rasheed *et al.*, 2019). Ants are taxonomically placed in the family Formicidae, within the superfamily Vespoidea of the order Hymenoptera. They are distinguished from the other members of the order by a node that may have one or two segments and joins the mesosoma with the gaster, geniculate antennae, and the metapleural gland that is always present in ants (Wilson, 1971).

Material and Methods

The present was conducted to explore the fauna of ants (Formicidae). The specimens were collected from different locations of Government Postgraduate College for Women Mandian, Abbottabad. Collection was done by using sweep net, suction trap, camel-hair brush and Aspirator. The specimens were observed under Stereomicroscope with camera lens(60x) and identified up to genera level with the help of available literature.

Results and Discussion

Ants Diversity

In the present study, fifteen (15) genera via *Sphinctomyrmex*, *Cerapachys*, *Dorylus*, *Tapinoma*, *Acropyga*, *Componotus*, *Gesomyrmex*, *Lepisiota*, *Myrmoterias*, *Paratrechina*, *Plagiolepis*, *Crematogaster*, *Myrmecia*, *Strumigenys*, *Tetraponera* under 5 subfamilies Dorylinae, Dolichoderinae, Formicinae, Myrmicinae, and Pseudomyrmecinae of family Formicidae were identified as given in table 1.

Table 1. Diversity of Ants collected from different localities.

Family	Sub-family	Genus
Formicidae	Dorylinae	<i>Cerapachys</i>
		<i>Dorylus</i>
		<i>Sphinctomyrmex</i>
	Dolichoderinae	<i>Tapinoma</i>
	Formicinae	<i>Acropyga</i>
		<i>Componotus</i>
		<i>Gesomyrmex</i>
		<i>Lepisiota</i>
		<i>Myrmoterias</i>
		<i>Paratrechina</i>
		<i>Plagiolepis</i>
	Myrmicinae	<i>Crematogaster</i>
		<i>Myrmecia</i>
		<i>Strumigenys</i>
	Pseudomyrmecinae	<i>Tetraponera</i>

Sampling Sites

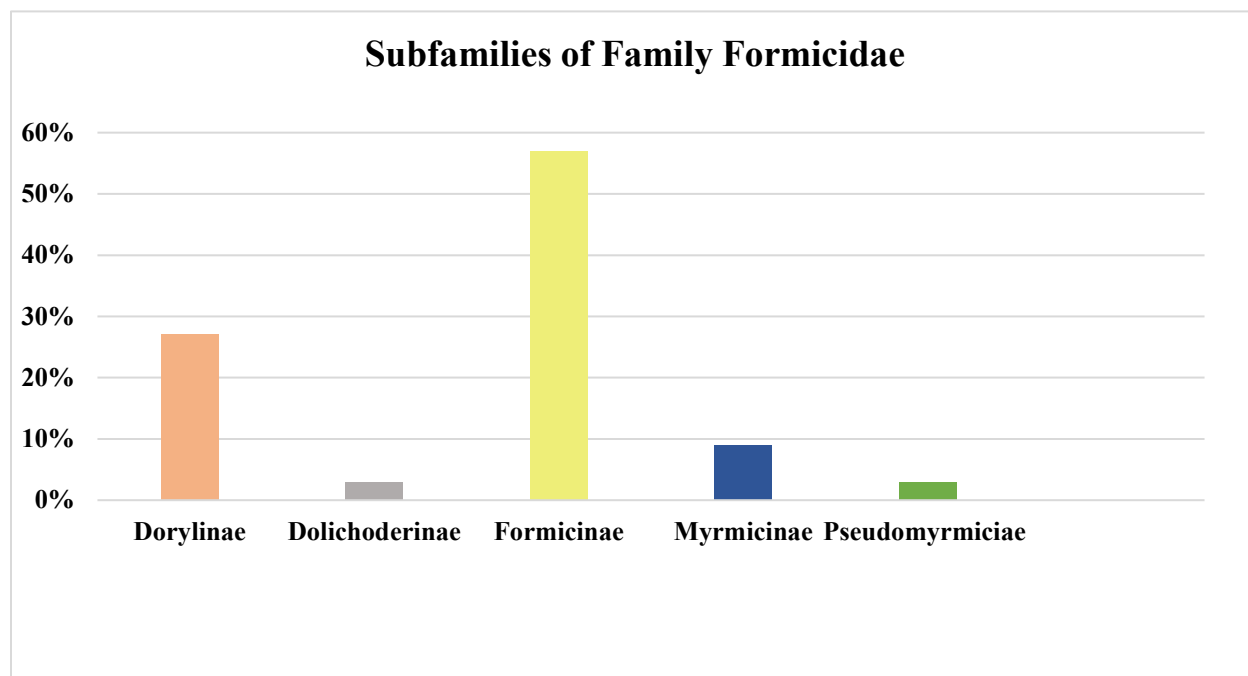
Table 2 presents the sampling sites selected for the specimens, along with their geographic coordinates and dominant vegetation. Three sites were surveyed, representing different habitat types: (S1) grassland, (S2) tree patches, and (S3) an ornamental plant area. The dominant vegetation differs among these sites: roses are present at S1 and S3, whereas fruit-bearing plants predominate at S2. These sites were located within a similar geographic range, with coordinates around 34.196° N and 73.227° E.

Table 2. Sampling sites for collection of Ants specimens.

Site code	Sampling area	Coordinates	Dominant vegetation
S1	Grassland	34.195999, 73.227	Rose
S2	Tree patches	34.196351, 73.227	Fruits
S3	Ornamental plant	34.196112, 73.227	Rose

Subfamily-wise Abundance of Ants

A total of 33 ant specimens belonging to five subfamilies, Dorylinae, Dolichoderinae, Formicinae, Myrmicinae and Pseudomyrmecinae were collected from the Postgraduate College for Women, Mandian, Abbottabad. Most of the ants (57%) belonged to the subfamily Formicinae, while Pseudomyrmecinae contributed only 3% of the total collection. This indicates that Formicinae were the dominant subfamily in the survey.

Figure 1. Sub-family wise abundance of Ants.**Shannon and Simpson Index**

Shannon Diversity Index:

Formula: $H' = \sum P_i (\ln P_i) = 2.4803$

This value of H' indicates that the diversity is moderate.

Simpsons Diversity Index:

Formula: $D = \sum (P_i)^2 = 0.104$

Simpsons index of diversity = $1 - D = 0.896$

This value of D is close to 1 so it indicates that there is high diversity of ants.

Shannon evenness:

Formula: $E = H' / \ln(S) = 0.916$

The Shannon Diversity Index (H') for ant genera in the study area was calculated as 2.48, indicating a relatively high level of diversity. The Simpson's Diversity Index (D) was 0.104, and the Simpson's Index of Diversity ($1-D$) was 0.896, which suggests an 89.6% probability that two individuals randomly selected from the sample will belong to different genera, confirming high diversity and low dominance. Furthermore, the Shannon Evenness (E) value of 0.916 shows that individuals are distributed very evenly among the 15 genera, with no single genus being overly dominant in the community.

Table 1. Shannon and Simpson Index Diversity of Ants

Genus	# of Individual	Pi	ln(pi)	Pi (ln (Pi))
<i>Sphinctomyrmex</i>	2	0.6060	-2.8034	-0.1699
<i>Cerapachys</i>	5	0.1515	-1.8871	-0.2859
<i>Dorylus</i>	2	0.6060	-2.8034	-0.1699
<i>Tapinoma</i>	1	0.3030	-3.4965	-0.1060
<i>Acropyga</i>	4	0.1212	-2.1102	-0.2558
<i>Componotus</i>	1	0.3030	-3.4965	-0.1060
<i>Gesomyrmex</i>	6	0.1818	-1.7047	-0.3100
<i>Lepisiota</i>	1	0.3030	-3.4965	-0.1060
<i>Myrmoteras</i>	1	0.3030	-3.4965	-0.1060
<i>Paratrechina</i>	4	0.1212	-2.1102	-0.2558
<i>Plagiolepis</i>	2	0.6060	-2.8034	-0.1699
<i>Crematogaster</i>	1	0.3030	-3.4965	-0.1060
<i>Myrmecia</i>	1	0.3030	-3.4965	-0.1060
<i>Strumigenys</i>	1	0.3030	-3.4965	-0.1060
<i>Tetraponera</i>	1	0.3030	-3.4965	-0.1060
Total	33	1.0000		$\Sigma = 2.4803$

Relative Abundance of Ants:

The distribution of ant genera recorded during the study is presented in table 4. Among the observed specimens, *Gesomyrmex* of the subfamily Formicinae was the most abundant genus with 6 individuals, representing 18.1% of the total collected ants. In contrast, *Tapinoma* belonging to the subfamily Dolichoderinae and *componotus*, *lepsiota*, *Myrmoteras*, belonging to subfamily formicinae was the least abundant genus with only 1 individual (3%).

Table 4. Relative abundance of Ants

Sub-family	Genus	Total No. Individuals	Percentage
Dorylinae	<i>Sphinctomyrmex</i>	2	6%
	<i>Cerapachys</i>	5	15%
	<i>Dorylus</i>	2	6%
Dolichoderinae	<i>Tapinoma</i>	1	3%
Formicinae	<i>Acropyga</i>	4	12.2%
	<i>Componotus</i>	1	3%
	<i>Gesomyrmex</i>	6	18.1%
	<i>Lepisiota</i>	1	3%
	<i>Myrmoteras</i>	1	3%
	<i>Paratrechima</i>	4	12.2%
	<i>Plagiolepis</i>	2	6%
Myrmicinae	<i>Crematogaster</i>	1	3%
	<i>Myrmecia</i>	1	3%
	<i>Strumigenys</i>	1	3%
Pseudomyrmecinae	<i>Tetraponera</i>	1	3%

Discussion

The present study provides an assessment of the diversity and relative abundance of ants (Hymenoptera: Formicidae) occurring in different habitats of Government Postgraduate College for Women, Mandian, Abbottabad. The survey recorded 33 specimens representing 15 genera belonging to five subfamilies, namely Dorylinae, Dolichoderinae, Formicinae, Myrmicinae, and Pseudomyrmecinae. The occurrence of representatives from five subfamilies within a relatively restricted sampling area indicates that the college premises provide a variety of microhabitats capable of supporting a diverse ant community. The sampling sites included grassland, tree patches, and ornamental plant areas, with differences in vegetation among the sites, particularly the presence of roses and fruit-bearing plants.

The diversity recorded in the present study is noteworthy because previous information on the ant fauna of Pakistan remains comparatively limited. The paper notes that 103 ant species belonging to 35 genera and seven subfamilies had previously been reported from Pakistan. Therefore, the identification of 15 genera from a small study area contributes useful information to the understanding of local Formicidae diversity. The findings also demonstrate the importance of conducting localized surveys, as habitats such as educational institutions, gardens, grasslands, and tree-covered areas can harbor considerable insect diversity.

Among the five recorded subfamilies, Formicinae was the most abundant, accounting for 57% of the collected specimens, whereas Pseudomyrmecinae represented only 3% of the total collection. This uneven representation suggests that members of Formicinae were particularly successful under the environmental conditions prevailing at the study sites. The relatively high abundance of Formicinae may also be associated with the availability of suitable vegetation and microhabitats within the surveyed area. However, because the present study was conducted at a limited number of sites and involved a relatively small sample, further seasonal and habitat-specific sampling would be necessary to establish whether this pattern remains consistent throughout the year.

At the genus level, *Gesomyrmex* was the most abundant genus, with six individuals constituting 18.1% of the total collection. *Cerapachys* was the second most represented genus with five individuals, while *Acropyga* and *Paratrechina* each contributed four individuals. In contrast, *Tapinoma*, *Componotus*, *Lepisiota*, *Myrmoteras*, *Crematogaster*, *Myrmecia*, *Strumigenys*, and *Tetraponera* were represented by only one individual each. This pattern indicates that although *Gesomyrmex* was the most frequently collected genus, the community was not characterized by extreme dominance of a single genus.

The diversity indices further support this interpretation. The study calculated a Shannon Diversity Index (H') of 2.48, a Simpson Index (D) of 0.104, a Simpson Index of Diversity ($1-D$) of 0.896, and Shannon evenness of 0.916. The high evenness value indicates that the collected individuals were relatively evenly distributed among the recorded genera, while the Simpson Index of Diversity indicates a high level of diversity within the sampled community. Thus, despite *Gesomyrmex* being the most abundant genus, the overall ant assemblage appears to contain a relatively balanced representation of different genera.

The presence of three distinct sampling habitats—grassland, tree patches, and ornamental plant areas—also suggests that habitat heterogeneity may contribute to the observed ant diversity. Vegetation can provide different food resources, nesting opportunities, shelter, and microclimatic

conditions for ants. The occurrence of multiple genera across the surveyed area may therefore reflect the availability of diverse ecological niches. Nevertheless, the present study does not provide sufficient quantitative data to establish a statistical relationship between vegetation type and ant abundance or diversity. Such relationships should therefore be investigated in future studies through systematic and replicated sampling.

Overall, the findings demonstrate that the Mandian, Abbottabad area surveyed in this study supports a diverse assemblage of ants. The results provide a useful baseline for future taxonomic, ecological, and biodiversity studies of Formicidae in Abbottabad and other parts of Pakistan.

Conclusion

The present study investigated the diversity and relative abundance of ants in selected habitats of Government Postgraduate College for Women, Mandian, Abbottabad. A total of 33 specimens belonging to 15 genera and five subfamilies of Formicidae were recorded. The five subfamilies included Dorylinae, Dolichoderinae, Formicinae, Myrmicinae, and Pseudomyrmecinae.

Formicinae was the dominant subfamily, accounting for 57% of the collected specimens, whereas Pseudomyrmecinae had the lowest representation at 3%. At the genus level, *Gesomyrmex* was the most abundant genus, contributing six individuals or 18.1% of the total collection. Several genera were represented by only one individual, demonstrating variation in the relative abundance of genera within the sampled community. The calculated diversity measures indicate a diverse and relatively even ant community. The Shannon Diversity Index was 2.48, Simpson's Index of Diversity was 0.896, and Shannon evenness was 0.916. These values indicate high diversity and relatively even distribution of individuals among the recorded genera within the sampled area.

The study therefore concludes that the surveyed areas of Mandian, Abbottabad support considerable ant diversity and that even relatively small and human-managed habitats can provide suitable environments for a variety of Formicidae. The study also establishes a useful baseline for further investigations of ant diversity and distribution in Abbottabad and other regions of Pakistan.

Recommendations

Based on the findings of the present study, the following recommendations are proposed:

1. Expand the geographical coverage: Future studies should investigate ant diversity in additional localities of Abbottabad and surrounding areas to develop a more comprehensive inventory of Formicidae.
2. Conduct seasonal sampling: Ant populations can vary with environmental conditions. Sampling should therefore be conducted during different seasons to determine seasonal changes in abundance and diversity.
3. Increase sampling effort: Future investigations should use larger sample sizes and repeated sampling to obtain more representative estimates of ant diversity and relative abundance.
4. Compare different habitats: Systematic comparisons should be conducted among grasslands, forests, agricultural fields, gardens, residential areas, and other habitat types to determine the influence of habitat characteristics on ant communities.

5. Study species-level diversity: The present study identified specimens up to the genus level. Future research should attempt species-level identification using detailed morphological keys and, where possible, molecular techniques.
6. Document environmental variables: Future studies should record factors such as temperature, humidity, soil characteristics, vegetation composition, and availability of food resources to better understand factors influencing ant distribution.
7. Establish long-term monitoring: Regular monitoring of ant communities could provide valuable information about changes in biodiversity associated with habitat modification and environmental changes.
8. Promote biodiversity awareness: Educational institutions should be encouraged to recognize and conserve small natural habitats within their premises, as these areas can support considerable insect diversity.
9. Develop a broader Pakistani ant database: Since information on the ant fauna of Pakistan remains limited, additional surveys from different ecological regions are recommended to improve the national checklist and understanding of Formicidae distribution.
10. Use ants as ecological indicators: Because ants are abundant and occur in a wide range of habitats, future research may explore their potential use in monitoring habitat quality and ecological changes.

References

- Bolton, B. 2021. An online catalog of the ants of the world. (<https://antcat.org>).
- Bolton, B. 2011. Bolton's Catalogue and Synopsis. (<https://gap.entclub.org/> Version: 1).
- Rasheed M.T., I. Bodlah, A.G. Fareen, A.A. Wachkoo, X. Huang and S.A. Akbar. 2019. A Checklist of Ants (Hymenoptera: Formicidae) in Pakistan. *Sociobiology*. 66(3): 426-439.
- Ward, P.S. 2007. Phylogeny, classification, and species-level taxonomy of ants (Hymenoptera: Formicidae). *Zootaxa*. 1668: 549-563.
- Wilson, E.O. 1971. The insect societies, Harvard University Press.