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Veena MNDepartment of Zoology,
Karnatak University Dharwad,
Karnataka, India**Shwetha S**Department of Zoology,
Karnatak University Dharwad,
Karnataka, India**Raju L**Department of Zoology,
Karnatak University Dharwad,
Karnataka, India**Vaibhav PU**Department of Zoology,
Karnatak University Dharwad,
Karnataka, India**Dheeraj K Veeranagoudar**Department of Zoology,
Karnatak University Dharwad,
Karnataka, India**Pulikeshi M Biradar**Department of Zoology,
Karnatak University Dharwad,
Karnataka, India**Correspondence****Pulikeshi M Biradar**Department of Zoology,
Karnatak University Dharwad,
Karnataka, India

Survey of hymenopteran diversity in Karnatak University Campus, Dharwad (Karnataka) India

Veena MN, Shwetha S, Raju L and Vaibhav PU, Dheeraj K Veeranagoudar and Pulikeshi M Biradar

Abstract

Hymenopterans are one of the diverse groups of insects in size, structure, numbers, habitats and food preferences. These are most evolved and diversified of all the terrestrial insects and they also act as pollinators, predators and parasitoids there by helping in the improvement of agricultural productions and the economy. The present study was undertaken to survey the diversity of hymenopterans within the Karnatak University Campus, Dharwad. The survey was undertaken by using different collection methods such as, hand picking, aerial net and pitfall trap. The study revealed the occurrence of 35 species belonging to 09 hymenopteran families. Further, when the data was looked for the occurrence of dominance in terms of number of species, Formicidae was the most dominant family followed by Vespidae and Apidae, where as Scoliidae, Sphecidae, Syrphide and Mutillidae were the least dominated families in the present study area.

Keywords: Diversity, hymenoptera, KU Campus, Dharwad

1. Introduction

Hymenopterans consist of a variety of insects such as ants, bees and wasps, including few parasitoid wasps which are small, flashy and few are phytophagous, predators and pollinators. They are one of the largest components of terrestrial ecosystem with approximately 1,15,000 described species. They occupy various terrestrial habitats and represent more than 20% of all insect population, they also have much economic importance as they contribute in enhancing the production of commercial products [1-3]. It is an important insect group containing agriculturally, ecologically and economically valuable species, for example, ants, honey bees and bumble bees are good pollinators, honey bees have been described as ecological indicators of biodiversity or landscape structure in environmental studies and they need rich flowering plant diversity. These play a very important role in the smooth functioning of ecosystems [4]. Hymenopteran parasitoids are well known bio-control agents in agricultural fields and are essential for natural pest control. The Karnatak University campus is covered by lush greenery with flowering plants. The distribution of Hymenopterans in this campus remains unstudied and poorly understood, hence, the present study was undertaken so as to survey, document and create a base line data of Hymenopteran diversity in KU campus, Dharwad.

2. Materials and Methods

2.1 Study area

Karnatak University Campus, Dharwad, commonly known as "Chotta Mahabaleshwar Hill" is located at an elevation of 698.97m above MSL (15° 26' 24" N and 74° 59' 3" E) (Figure-1). The campus is spread over an area of 750 acres with undulating topography with lush greenery and various species of flora. It is rich in dry deciduous vegetation, endowed with more than 150 plant families. Throughout the year it has a pleasant environment with temperature ranging from 16 to 38°C and average annual rainfall of about 800mm.

2.2 Sampling and identification of hymenopterans

Most of the hymenopteran species were collected by hand- picking method. Pitfall trap method was used for the collection of ground dwelling species and even sometimes ants. Aerial net was only used to collect flying hymenopterans such as Bees and Wasps. Soon after collecting, multiple photographs of the specimens were taken in the field itself and then they were released back. Later, the photographs were used for the identification based on the standard

taxonomic keys available from the literature [2, 5, 6] and unidentified insect photographs were taken to the Department

of Entomology, University of Agricultural Sciences, Dharwad for identification.

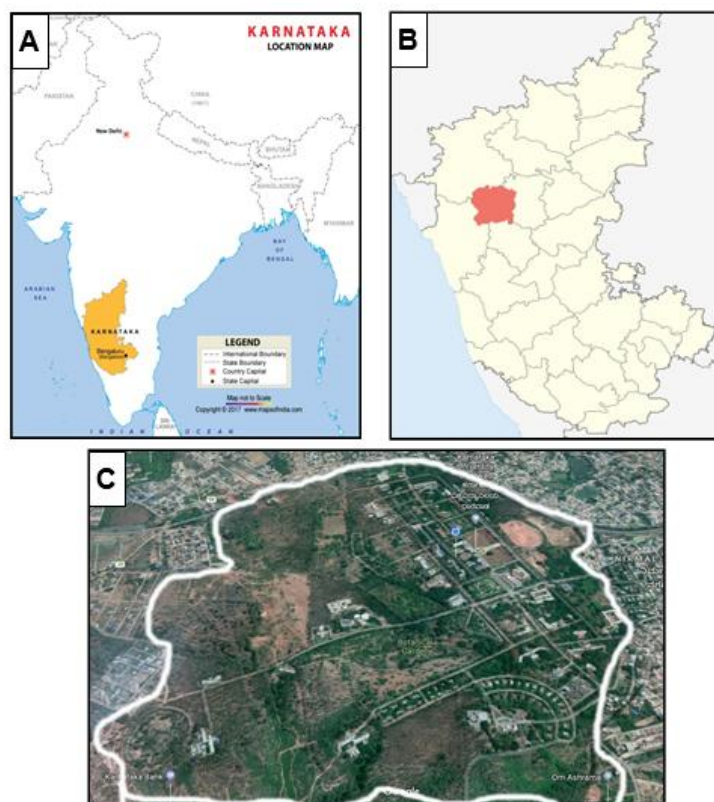


Fig 1: A) Indian map showing the location of Karnataka state. B) Karnataka map showing the location of Dharwad district. C) Google image depicting the study area (Karnatak University campus, Dharwad).

3. Results

In the present survey, a total of 35 hymenopteran species belonging to 27 genera under 09 families were recorded. The data revealed that there is a variation in the number of species among different families, as Formicidae family recorded the highest number with 18 species (51.43%) and dominated over

the other families such as Vespidae with 05 species (14.28%), Apidae with 04 species (11.43%), Chrysididae and Pompilidae with 02 species each (5.71%), Scoliidae, Sphecidae, Syrphidae and Mutillidae with only one species each (2.86%) (Table-1; Figure. 2).

Table 1: List of hymenopteran species recorded under different families within Karnatak University campus, Dharwad.

Sl. No.	Common name	Scientific name	Family
1	Giant honeybee	<i>Apis dorsata</i>	Apidae
2	Large honeybee	<i>Apis florea</i>	
3	Dammer bee	<i>Tetragonula iridipennis</i>	
4	Carpenter bee	<i>Xylocopa sp.</i>	
5	Emerald wasp	<i>Ampulex compressa</i>	Chrysididae
6	Cuckoo wasp	<i>Stilbum cyanurum</i>	
7	Carpenter ant	<i>Camponotus americanus</i>	Formicidae
8	Carpenter ant	<i>Camponotus compresses</i>	
9	Western carpenter ant	<i>Camponotus modoc</i>	
10	Black carpenter ant	<i>Camponotus pennsylvanicus</i>	
11	Golden black ant	<i>Camponotus sericeus</i>	
12	Labiates male	<i>Dorylus labiatus</i>	
13	Horse/Red wood ant	<i>Formica rufa</i>	
14	Jumping ant	<i>Harpegnathos saltator</i>	
15	Meat ant	<i>Iridomyrmex purpureus</i>	
16	Little black ant	<i>Monomorium minimum</i>	
17	Weaver ant	<i>Oecophylla smaragdina</i>	
18	Black crazy ant	<i>Paratrechina longicornis</i>	
19	Obscure thorax	<i>Pheidole obscurithorax</i>	
20	Fire ant	<i>Solenopsis germinate</i>	
21	Red imported ant	<i>Solenopsis invicta</i>	
22	Odorous house ant	<i>Tapinoma sessile</i>	
23	Pavement ant	<i>Tetramorium caespium</i>	
24	Arboreal bicolor ant	<i>Tetraponera rufonigra</i>	

25	Red velvet ant	<i>Dasymutilla occidentalis</i>	Mutillidae
26	Blue black Spider wasp	<i>Anoplius sp.</i>	Pompilidae
27	Black orange wasp	<i>Cryptocheilus bicolor</i>	
28	Black flower wasp	<i>Scolia sp.</i>	Scoliidae
29	Blue mud dauber wasp	<i>Chalybion sp.</i>	Sphecidae
30	Hovers fly	<i>Volucella sp.</i>	Syrphidae
31	Potter wasp	<i>Delta conoideum</i>	Vespidae
32	Potter wasp	<i>Delta pyriforme</i>	
33	Potter wasp	<i>Phimenes flavopictum</i>	
34	Paper wasp	<i>Ropalidia marginata</i>	
35	Paper wasp	<i>Ropalidia sp.</i>	

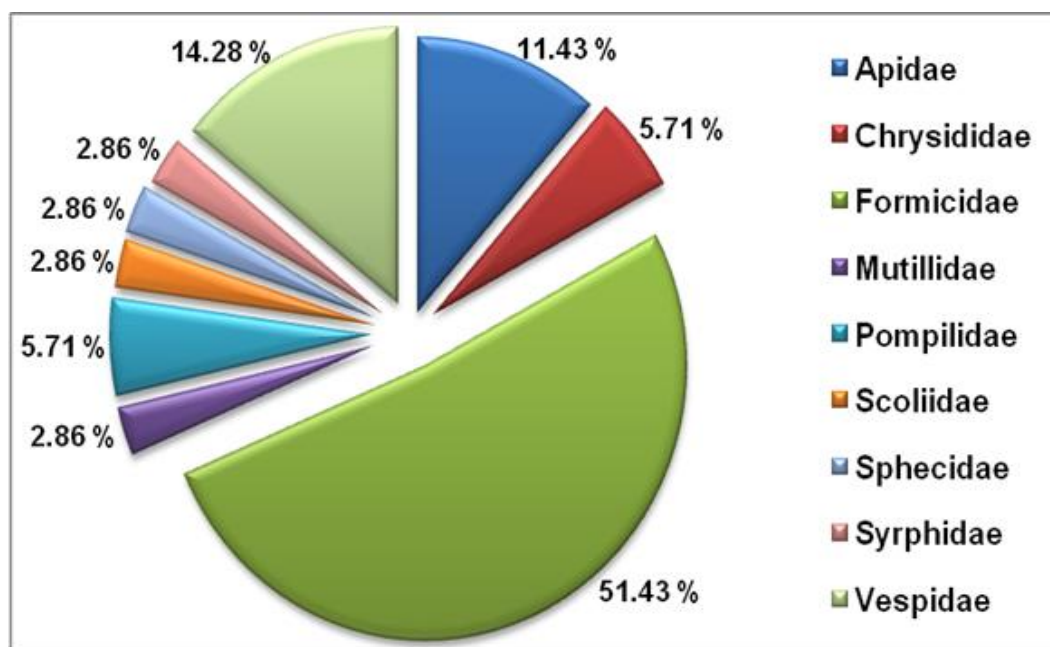


Fig 2: Percentagewise (%) distribution of hymenpteran species under different families within Karnatak University campus, Dharwad

4. Discussion

Hymenopterans play an important role in the terrestrial ecosystems by interacting with different plant species as seed dispersers, leaf/seed- predators and also as pollinators [5]. Approximately there may be over 4, 00, 000 hymenopteran species in the World of which nearly 1, 15,000 species have been described so far [6-8]. A three year survey carried out by Naidu and Kumar [9] documented 47 species of bees and wasps belonging to 29 genera from 15 families in Vadodara, Gujarat. The Karnatak University campus has rich hymenopteran diversity along with other insect species. The present results that revealed the occurrence of 35 species of hymenopterans speculate that, the diversity is influenced by topography, flora, fauna and climatic conditions of a particular area. The earlier survey of hymenopteran diversity in the University of Agricultural Sciences Dharwad, campus by Rashmi and Ganesh [10] have recorded 28 species belonging to nine families. The data of the present survey showed the presence of maximum number of ant species belonging to the family Formicidae, our results corroborated with that of the earlier work carried out on the ants by Yashavantakumar *et al.*, [11] they documented more than 24 ant species belonging to two families from the same area. Many hymenopterans are known to be good pollinators and their occurrence also coordinates with the floral diversity. Itioka *et al.*, [12] have also reported that there is a rapid increase in the number of honey bee colonies during flowering season. The availability of most of the insects, including hymenopterans largely depends upon the occurrence of various environmental conditions and habitats

such as, floral diversity [13], diet [14] and shade [15]. Herren and Ochieng [16] reported the increase in pollination by wild bees due to occurrence of wild habitats near the cultivated land. They also reported *Xylocopa sp.* and *macronomia sp.* as effective pollinators of eggplant (*Solanum melongena*). In the present study we also witnessed the presence of 04 species of Apidae and 05 species of Vespidae families which act as both pollinators and predators, suggesting the probability of good pollination in the adjacent cultivated lands. The abundance of Apidae members recorded in the present study correlates with the presence of a large number of flowering plants in the campus that shows more foraging and nesting activities. The presence of huge trees and buildings, calm environment provides an ideal habitat for the bees to construct large hives throughout the campus. In the present study few parasitoids belonging to Pompilidae and Scoliidae family were recorded, which are very good bio-control agents of lepidopteran's eggs and larvae, scarab beetles and hemipteran insects there by controlling the increase in the number of harmful pests of agricultural crops. Likewise, larvae of Syrphidae family mainly feed on aphids, thrips and other plant-sucking insects. Thus, they are important natural enemies and are essential components in Integrated Pest Management (IPM) practices. Therefore, there is a need for regular surveys of these insects so as to conserve their population which includes both useful as well as harmful insects along with the habitats composed of their host plants. Based on those reports we can plan and modify our cultural practices in agriculture and also plan for IPM accordingly to have a better crop yield.

5. Conclusion

Such regular surveys are needed to document and also to conserve the flora and faunal diversity of different habitats, these works will also shed light on the significance of each group of organisms. The study area is rich with flowering plants, trees and buildings that provide suitable habitat and peaceful environment favoring rich insect diversity. The overall study depicts the dominance of Formicidae followed by Apidae and Vespidae. Although the number of Mutillidae, Scoliididae, Sphecidae and Syrphidae species were minimum in the present survey, further studies and observations throughout the year would be necessary in order to document their various developmental stages. This particular study provides a good baseline data to take up necessary precautions and measures to conserve the insect diversity within the campus.

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