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A preliminary study on hymenopteran diversity in university of agricultural sciences campus, Dharwad

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Abstract

In the present study, total of 30 hymenopterans with 30 genera and 28 species spread over nine families were recorded in the University of Agricultural Sciences (UAS) campus, Dharwad. Wasps were recorded to be dominant with 18 species belonging to six families. The family Vespidae was dominant with six species of wasps followed by Ichneumonidae and Sphecidae with four species each, Pompiliidae with two species and Scoliidae and Evaniidae with one species each. Among eight species of bees, Apidae and Megachilidae consisted of four species each, whereas four species of ants belonged to Formicidae family. Presence of rich vegetation, occurrence of flowering plants, large trees and calm environment in the campus appears to favour the insect diversity in the UAS campus, Dharwad.

Keywords: Hymenoptera, wasps, bees, ants, insect, biodiversity

1. Introduction

Insects play a critical role in ecosystem function. Insects cycle nutrients, pollinate plants, disperse seeds, maintain soil structure and fertility, control populations of other organisms and are themselves a major food source for other taxa^[1]. There is a vast diversity of insects in India. Roonwal^[2] has estimated that insects constitute 2/3 of the total fauna in India and comprise nearly 1, 00,000 species, of which about half remain yet to be studied. Later on, Varshney^[3] has reported 589 families and 51,450 species of insects from India, whereas Alfred *et al.*^[4] have estimated 59,353 species. In terrestrial ecosystems, insects play a vital function as herbivores, pollinators, predators and parasites^[5]. The Hymenoptera order contains some of the familiar members such as ants, bees, wasps, sawflies and bumble bees. Most hymenopterans exhibit a great diversity of habits and complexity of behaviour such as social organization. Thus, differences in climatic conditions and interruption in interactions between species might affect the diversity of this group. In this view there is a need to document the diversity status of hymenopterans to understand possible threats to their survival. Dharwad is a hilly town and considered as the gateway for malnad. The University of Agricultural Sciences (UAS) in Dharwad has a huge campus, and is covered by lush greenery with agricultural crops and flowering plants, but distribution of hymenopterans in this campus remains poorly understood. Therefore, the objective of the present investigation is to document the diversity of hymenopterans in UAS campus, Dharwad.

2. Materials and Methods

2.1. Study area

University of agricultural sciences Dharwad, is located in the northern part of Karnataka and comes under transitional belt at 15° 26' North latitude, 75°07' east longitude and at an altitude of 678m above the mean sea level (Fig. 1). The total area of the campus is 1800 acres of which, cultivated land is about 1170 acres.

2.2. Sampling and identification of hymenopterans

The study was carried out regularly thrice in a month from August 2015-February 2016 as part of M. Sc dissertation work. Collection of hymenopterans was done mainly from the agricultural land and some garden area of UAS campus (Fig. 1). The insects were collected by direct hand picking method. The representative hymenopterans were transferred to killing bottles, pinned by piercing through the thorax region and preserved in wooden insect box in

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dry condition. Wherever necessary, the hymenopterans were trapped using insect collecting net. The insect species were identified using standard taxonomic literature [6, 7]. For calculating the percent occurrence of families, the following formula was used.

$$\frac{\text{Number of species in each family}}{\text{Total number of species}} \times 100$$

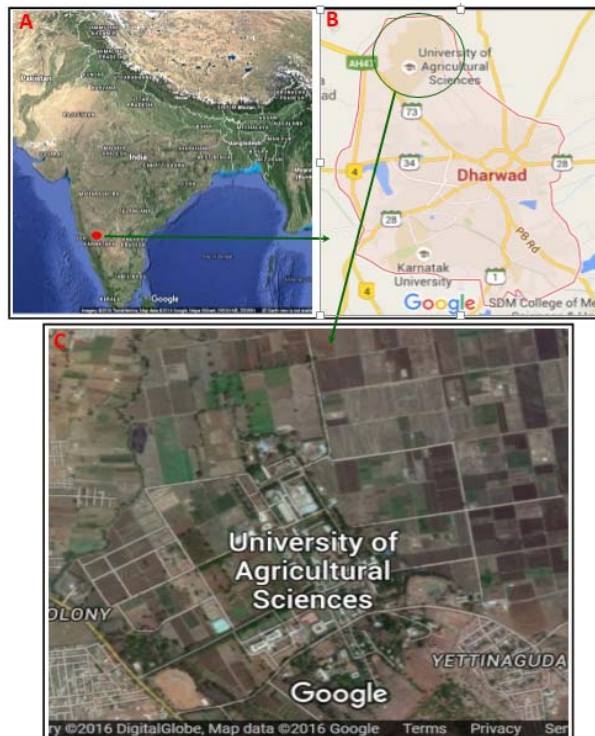


Fig 1(A-C): Map of India showing the location of Karnataka state (A), Dharwad (B) and the study area, University of Agricultural Sciences campus (C).

Table 1: Checklist of hymenopteran species at UAS campus, Dharwad.

Sl. No.	Scientific name	Common name	Family
1	<i>Vespa cincta</i>	Yellow banded wasp	Vespidae
2	<i>Rhynchium sp.</i>	Mason wasp	Vespidae
3	<i>Delta conoideum</i>	Mason wasp	Vespidae
4	<i>Rhopalidiabrevita</i>	Paper wasp	Vespidae
5	<i>Ropalidia marginata</i>	Paper wasp	Vespidae
6	<i>Polistes stigma</i>	Paper wasp	Vespidae
7	<i>Sceliphron madraspatum</i>	Mud dauber	Sphecidae
8	<i>Ammophila insignis</i>	Digger wasp	Sphecidae
9	<i>Oresbiusfulvibasis</i>	Digger wasp	Sphecidae
10	<i>Sceliphron sp.</i>	Mud dauber	Sphecidae
11	<i>Xanthopimpla punctata</i>	Ichneumon wasp	Ichneumonidae
12	<i>Echthromorphaagrestoria</i>	Yellow banded ichneumon	Ichneumonidae
13	<i>Ophion obscuratus</i>	Ichneumon wasp	Ichneumonidae
14	<i>Enicospilus purgatus</i>	Ichneumon wasp	Ichneumonidae
15	<i>Spilostethus nitidus</i>	Spider wasp	Pompilidae
16	<i>Pepsis thisbe</i>	Tarantula hawk wasp	Pompilidae
17	<i>Evaniaappendicularis</i>	Ensign wasp	Evaniidae
18	<i>Scolia soror</i>	Hairy flower wasp	Scoliidae
19	<i>Apis dorsata</i>	Rock bee	Apidae
20	<i>Apis cerana indica</i>	Asian honey bee	Apidae
21	<i>Melipona iridipennis</i>	Stingless bee	Apidae
22	<i>Xylocopa sp.</i>	Carpenter bee	Apidae
23	<i>Megachile sp.</i>	Leaf-cutting bee	Megachilidae
24	<i>Megachile sculpturalis</i>	Giant resin bee	Megachilidae
25	<i>Coelioxys sp.</i>	Leaf-cutting cuckoo bee	Megachilidae
26	<i>Megachile bicolor</i>	Leaf-cutting bee	Megachilidae
27	<i>Oecophylla smaragdina</i>	Weaver ant	Formicidae
28	<i>Camponotus compressus</i>	Carpenter ant	Formicidae
29	<i>Dorylus orientalis</i>	Army ant	Formicidae
30	<i>Solenopsis invicta</i>	Fire ant	Formicidae

3. Results and Discussion

In the present study, total of 30 hymenopterans with 30 genera and 28 species spread over nine families were recorded. The distribution of species in different families showed the dominance of Vespidae with six species (20%) followed by Apidae, Ichneumonidae, Formicidae, Megachilidae and Sphecidae with four species each (13.33% each), Pompilidae with two species (6.66%), and Scoliidae and Evaniidae with one species each (3.33% each; Fig. 2; Table-1).

Data on month-wise occurrence of species belonging to different families revealed the occurrence of total of 28 species in August, followed by 25 species in September, 20 species in October, 13 species in November, nine species in December, seven species in January and eight species in February month (Fig. 3). Particularly, the families such as Vespidae, Apidae, Sphecidae, Ichneumonidae and Formicidae were more common in August, September and October months (Fig. 3). Some of the hymenopterans belonging to Pompilidae and Scoliidae were completely absent between November and February months, whereas members belonging to Sphecidae, Evaniidae, Megachilidae and Ichneumonidae were either absent or showed low abundance between December and February months (Fig. 3). Tewari and Kaushal^[8] have also observed maximum number of insects during the rainy season and minimum during the winter season. The decrease in insect abundance has been attributed to the absence of flowering stage of the plants^[9]. Similar association appears to exist in the present study, as shown by the absence of flowering stage of the plants concomitant with a decline in the hymenopteran species during winter.

Subhakar *et al.*^[10] have studied on pollinator diversity in bitter gourd, *Momordica charantia* Linn., and reported 14 insect species including six hymenopterans, five lepidopterans and three dipterans, whereas Bharti^[11] has studied altitudinal diversity of ants in Himalayan regions and recorded 199 species. Sabu *et al.*^[12] have documented 29 species of forest litter-inhabiting ants belonging to 18 genera under six subfamilies along elevations in the Wayanad region of the Western Ghats, whereas D'Cunha and Grover Nair^[13] have studied distribution of ant fauna in Hejamadi Kodi sandspit located in Udupi district and reported 31 species belonging to 17 genera under five subfamilies (Formicinae, Myrmicinae, Ponerinae, Dolichoderinae and Pseudomyrmecinae). Naidu and Kumar^[14] have conducted three year survey at Vadodara of Gujarat and documented 47 species of bees and wasps belonging to 29 genera from 15 families. In the present study, out of 30 hymenopterans, 18 species were wasps, followed by eight species of bees and four species of ants. In general, vegetation is the main substrate for founding social wasp colonies. Therefore, rich vegetation in the UAS campus appears to favour wasp diversity, In addition, diversified feeding habitats and their ability to adopt in changing environmental conditions and availability of wide range of hosts might be other factors responsible for their abundance in the UAS campus. However, occurrence of only one wasp species belonging to Evaniidae might be related to its life-history trait as it is a completely parasitic insect, which depends on egg capsules of the cockroach. On the other hand, Ichneumonidae members like *Xanthopimpla Punctata* and *Ophionobscuratus* noticed in the present study are parasitoids which act as biological pesticides. The abundance of Apidae members noticed in the present study might be due to the availability

of flowers during post-monsoon period that triggers foraging behaviour of bees and nesting activity. Also, presence of trees and buildings in calm environment might be favouring bees' diversity in the campus.

4. Conclusion

Overall, the study shows dominance of wasp species followed by bees and ants in UAS campus, Dharwad. While thick vegetation appears to favour the wasps, presence of flowering trees, and buildings suitable for construction of the hives in peaceful environment might be favouring bees' diversity in the campus. Although the number of ant species were minimum in the present study, further studies involving observations throughout the year would be necessary in order to get comprehensive information. However, the present study forms a good basis to take up necessary precautions and measures to conserve the insect diversity in the campus.

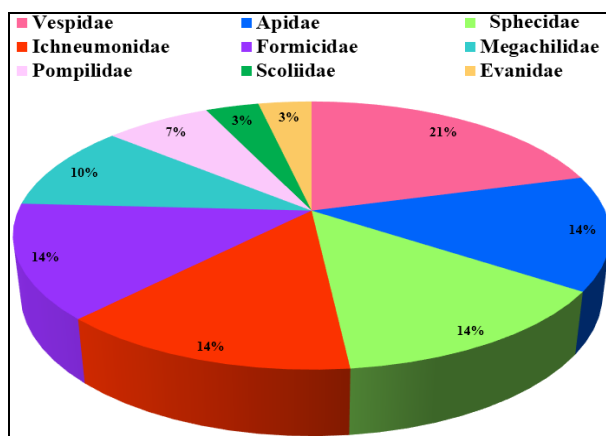


Fig 2: Percent occurrence of hymenopteran species belonging to different families at UAS Campus, Dharwad.

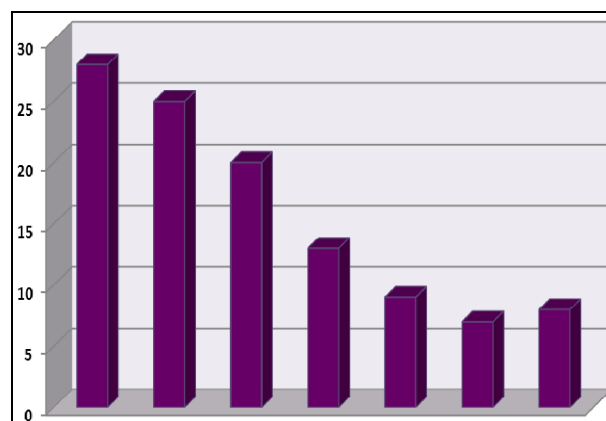


Fig 3: Month-wise occurrence of different species of Hymenopterans.

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