

**Preliminary Study on Alpha Diversity of vespid wasps (Hymenoptera: Vespidae) of farook College Campus**

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**Abstract**

Wasps are highly important to ecosystems. Most of them are either parasitic or predaceous. All wasps are eaten by other species, thereby providing many links in the food web. Many parasitic wasps have been cultured and used in the biological control of agricultural pests. Although a few of the stinging wasps are considered nuisances, they also provide benefits. Many species are pollen vectors contributing to the pollination of several plants, being potential or even effective pollinators and therefore play a vital role in limiting the populations of thousands of other insect species. Considering the above roles of wasps, a preliminary study was carried out to explore the diversity of Vespid wasps of Farook college campus from December 2012 to June 2013. Super family Vespidae include six subfamilies viz., Eumeninae, Polistenae, Vespinae, Stenogastrinae, Euparagiinae and Masarinae. The Vespidae are a large (nearly 5000 species), diverse, cosmopolitan family of wasps, including mostly eusocial wasps and some solitary wasps. The subfamilies Polistinae and Vespinae are composed solely of eusocial species, while Eumeninae, Euparagiinae, and Masarinae are all solitary; the Stenogastrinae subfamily contains a variety of forms from solitary to social. In the present study the subfamily Eumeninae could be recognized as the most diverse family accommodating the maximum number of species (6). This was followed by Polistenae (5) and Vespinae (2). Members from Stenogastrinae, Euparagiinae, and Masarinae are totally absent in this study area. Nests patterns of wasps is also different from each other.

*Keywords: Vespid Wasps, Hymenoptera, Eumeninae, Polistinae, Vespinae, Euparagiinae, Masarinae*

**Introduction**

Members of the insect order Hymenoptera and suborder Apocrita other than the saw flies, ants and bees are often referred to as wasps. The word 'wasps' was apparently derived from the root web meaning to weave, referring to the paper nests of social wasps. (Richards, 1978). The true wasps are, therefore, members of the super family Vespoidea and this term is used for the vespid in a restricted sense. The term "wasps" has therefore included the true wasps (vespoidea), digger wasps (sphecoidea), spider wasp (pompiloidea) and even the parasitic wasps (Ichneumoidea, chalcidoidea, Evanioidea, Proctotrupeoidea, etc). (Gupta, 2007). Members of the family vespidae, commonly known as potter wasps, paper wasp, hornet or yellow jackets, are chiefly predator of many insect larvae. (Ross H. Arnett, 2000). By their predatory habit they destroy a large number of insect pest of agricultural crops and few species have been utilized in different parts of the world as effective predator for the control of some of these pests. Parasitic wasps are increasingly used in agricultural pest control as they prey mostly on pest insects and have little impact on crop. (Stamp, 2001). The classification of vespoidea will be briefly reviewed presently. The study of vespidae may be said to have in 1756 when Linnaeus described *vespa cobra*, *spex tropica* and *vespa ulgaris*. Later in 1767 Linnæus described *vespa gollicia*. Linnaeus was followed by De Geer who contributed to the study of vespidae in 1773. Fabricius studied the taxonomy of vespidae in 1793 and in 1798. Gupta and Das (1975) studied distributional pattern of Indian vespidae with reference to altitude. Carpenter (1988) published three taxonomic papers. In the 1<sup>st</sup> paper he dealt with phylogenetic relationship and classification of vespinae. In second paper he commented on the evolutionary genetics of social wasps and phylogeny of the vespinae. In 3<sup>rd</sup> paper he made

review of the subspecies in eumeninae genus *zeta sassure*. ] Soika (1990) revised neotropical eumenidae of the genera *bachymenes sassure* as *bachymenes soika*. *psedodacaromenes soika*, *stenostigma soika*. LamberT. and Narendran (2002) published a paper in the journal of zoological society of kerala, in which they reported a new species of *Antepipona Saussure* (Hymenoptera: Vespidae) from India..Gupta(2007) published new species *Aculata* from western doon shiwalik . The indispensable role of Hymenoptera in gardens were described by Grissell (2010). The distribution and taxonomy of vespine wasps of Iran (Hymenoptera: Vespidae: Vespinae) was carried out by Dvořák *et al* (2012). Khoobdel *et al* (2013) studied the diversity and abundance of medically importance flies including wasps in Iranian islandsThe related studies on wasp diversity in kerala, especially in western Ghat region was very little and promising.. Hence the present study is under taken to make an attempt to study the diversity of wasps, their role in pollination , nesting pattern and economic importance.

### Study Area

The two study areas selected for the present study were Farook college campus and IDB hostel, situated at Kozhikode district(11.25N, 75.77E), also known as Calicut , is a city in the state of Kerala in southern India , on the Malabar coast; belonging to Ramanatukara, panchayath (Plate-1) The study was carried out during 2012 August to 2013 June. IDB hostel, near Farook college campus (plate-2), have sparse vegetation. The area is surrounded by human settlements and near to the ecologically important Azhinjilam wetland which allows the favourable conditions for the survival of the vast diversity of organisms. The Farook college campus (plate-2) has an area of 100 ha and it is situated at the border of Kozhikode and Malappuram districts and has a mean altitude of 55 m. composed of patches of secondary scrub jungle with stretches of laterite soil sparsely covered with grasses and intermixed with endemic and exotic flora. Four alternate seasons covers during the study. They are the hot season (march-may) south-west monsoon (June- September) post monsoon (October-November) and north-west monsoon (December-February). The annual temperature ranges below a maximum of 35.9c and minimum of 23.8 only. The main relative humidity value ranges from 60-90%. The annual rainfall is excessive with over 3200cm..

### PLATE 1- -Study Area

fig. 1-Map showing study area



**fig. 2-An over view of study area**

Site1

Site-2



## **Materials and Methods**

### **Method of collection**

The adult specimens were collected alive from indoors and out doors. Standard entomological collections technique includes using insect net, the killing jar, or tube with ethyl acetate is used. Adult insect also collected from the nests.

Wasps are usually collected by Net sweeping method. The type of net suitable for sweeping is of a particular design. The net used in the present investigation is a modified model of one designed by Noyes (1982).

The sweep net essentially consists of bag attached on a triangular frame which in turn connected to cylindrical handle.(Plate-3). For sweeping, it is important to choose an area where the vegetation is as diverse as possible. Grassland with a good variety of plants surrounded by several kinds of bushes and trees from an excellent location for collection. The sweeping is done as described by NOYES (1982).. The wasps caught in to the net are transferred to killing jar or tube with ethyl acetate or sucked in to the aspirator. Wasps visiting on the plants were collected by using small hand nets. After blowing, the collected specimens were transferred to killing jar or tube with ethyl acetate. Temporary labels were written in the field at the time of collecting the specimen.

### **Storing and preservation**

Waps were put directly from the net into vial of alcohol. They can then be pinned whenever convenient. Long term preservation in alcohol can be improved by freezing. The alcohol was changed periodically so as they prevent the damage.

Relaxing.

For relaxing, specimen was kept in an atmosphere of acetic acid for at least 6-8 hours. This method was found very suitable for specimen which had been killed using ethyl acetate or other killing agent. Relaxing helped to prevent breakage of specimen when they were being card mounted.

### **Mounting**

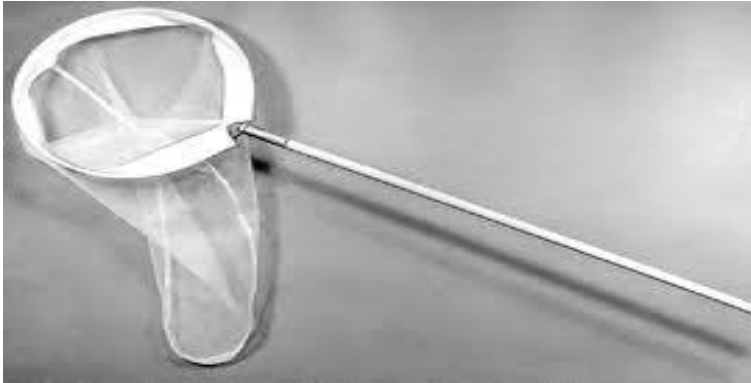
Mounting of specimens needed special care in taxonomy. The specimen were mounted in such away that all characters were visible easily.

Mounting on cards

The method followed in the present work is that adopted by BOUCEK and NOYES (1982) .the well dried specimen was mounted on a rectangular card. The size of the card altered depending up on the size of the specimen. In other methods specimen were pinned by

using standard entomological passing through the mesosoma from dorsal side. The mounted specimens were held on Asta insect pin, and then the specimens were labeled. . After mounting specimen, permanent labels. Indicating the name of the country, state, date of collection etc., were added . Registering of specimen were done after the specimen have been identified at least up to generic level. with corresponding literature and expert persons in the field.

**Plate-2: Insect net**



## Results and Discussion

.. A total of 80 specimens of vespids were collected from the study areas. Out of 80, 40 belong to sub family eumeninae, 30 belongs to sub family polistenae, and 10 from sub family vespinae. During the period of study any one of specimens from the sub family stenogastrinae, Euparagiinae, and Masarinae was recorded as they are reported to be abundant in high range regions ( carpender, 1988) . The total absence of wasp species from these sub families may be due to change in habitat condition and latitudinal gradient in diversity.

The study revealed a total of 13 species of wasps belonging to 8 genera under three sub families from the two study areas..(Table 1, Fig 1) In the present study the subfamily eumeninae could be recognized as the most diverse family accommodating the maximum number of species (6) viz., *Paraleptomena sp*, *Subancistroceru sichelii*, *Anterhynchium abdominale*, *Delta pyriforme*, *D. conoideum* and *Philmenes flavopectum* (Table-1 Fig-2, plate-4). This was followed by polistenae (5) revealed the following species *Ropalidia spatulata*, *R.jacobsoni*, *Polistes stigma* and *P.nigritarsis* (plate-4 ) Vespinae exhibited only two species viz., *Vespa tropica* and *V.affinis* (Table-1, fig-4, plate-5) . In terms of generic diversity eumeninae occupied first position as it supported (5) genera. This was closely followed by polistenae and vespinae (2 and 1).

The diversity of wasps found in each ecosystem was supported to diversity of vegetation (Gilbert *et al*, 2011) This observation is supported the observation of present investigation. In present study eumeninae were found dominated in less vegetated building areas and they made nest with mud on the wall of old buildings. This kind of site selection and nesting behavior was also reported by (Girish kumar *et al*.2011) .Polistenae was reported to be large number on highly vegetated area such as garden (Lambret *et al* 2012) .The present study also revealed that diversity of polistenae was abundant in gardens. The abundance in the diversity of this group may be attributed to their highly pollinating behaviour. Most of the specimens from vespinae were collected from herby and shrubby vegetations. Vespinae make their nest on trees or riverbanks or old buildings at sunny places. (Soika *et al* 1989) .Thus the vegetation structure influences directly both fundamental and realized niches of communities of social wasp. (Ross &. Matheus. 1991)

FIG- 1 Percentage of Wasp Species Collected

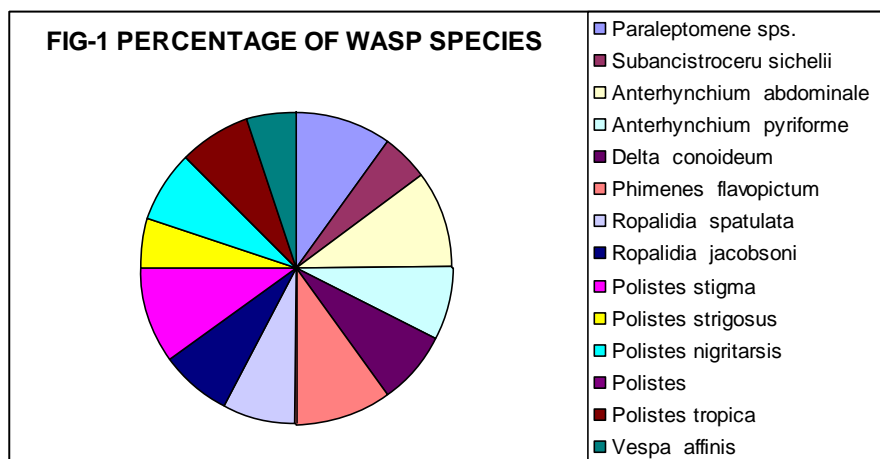


TABLE-1 Diversity of Wasps with Their Classification

SUB FAMILY	GENUS	SPECIES	NO. SPECIMEN COLLECTED
<b>EUMENINAE</b>	<i>Paraleptomene</i>	<i>sps.</i>	8
	<i>Subancistroceru</i>	<i>sichelii</i>	4
	<i>Anterhynchium</i>	<i>abdominale</i>	8
	<i>Delta</i>	<i>pyriforme</i>	6
		<i>conoideum</i>	6
	<i>Phimenes</i>	<i>flavopictum</i>	8
<b>POLISTENAE</b>	<i>Ropalidia</i>	<i>spatulata</i>	6
		<i>jacobsoni</i>	6
	<i>Polistes</i>	<i>stigma</i>	8
		<i>strigosus</i>	4
		<i>nigritarsis</i>	6
<b>VESPINAE</b>	<i>Vespa</i>	<i>tropica</i>	6
		<i>affinis</i>	4
<b>TOTAL</b>			80

TABLE-1 CHECK LIST OF NUMBER AND DIVERSITY OF SPECIMEN COLLECTED FROM THE ST AREA

FIG -2 Number of Species Collected From Sub Family Eumeninae

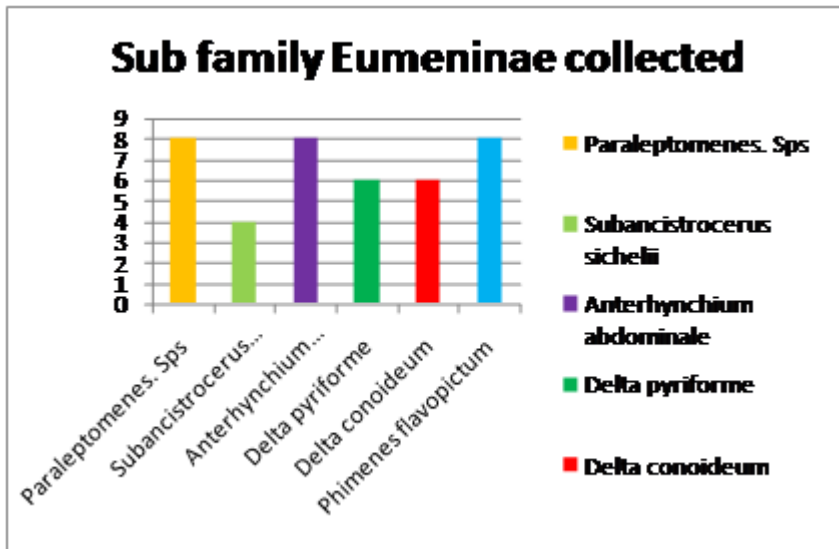


FIG -3 Number of Species Collected From Sub Family Polistenae

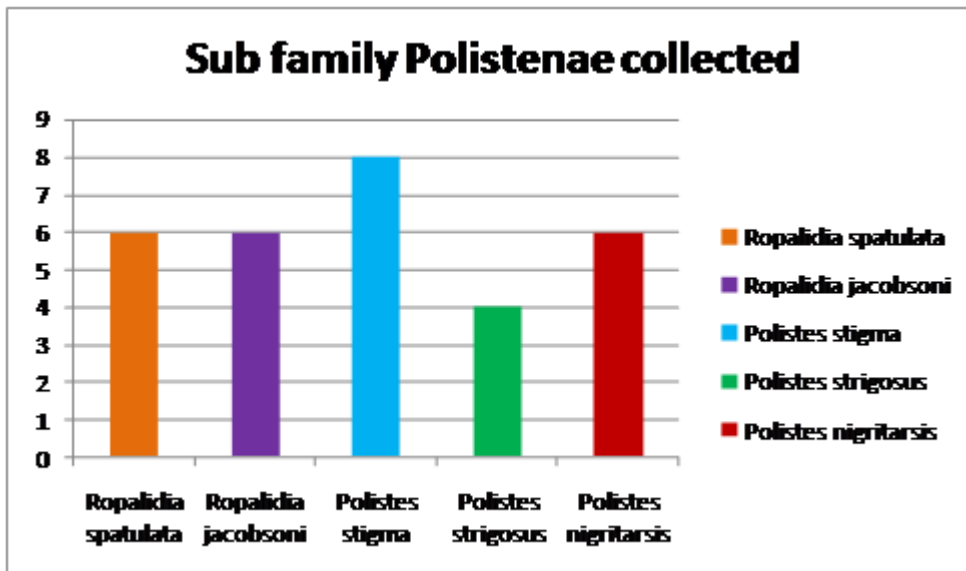
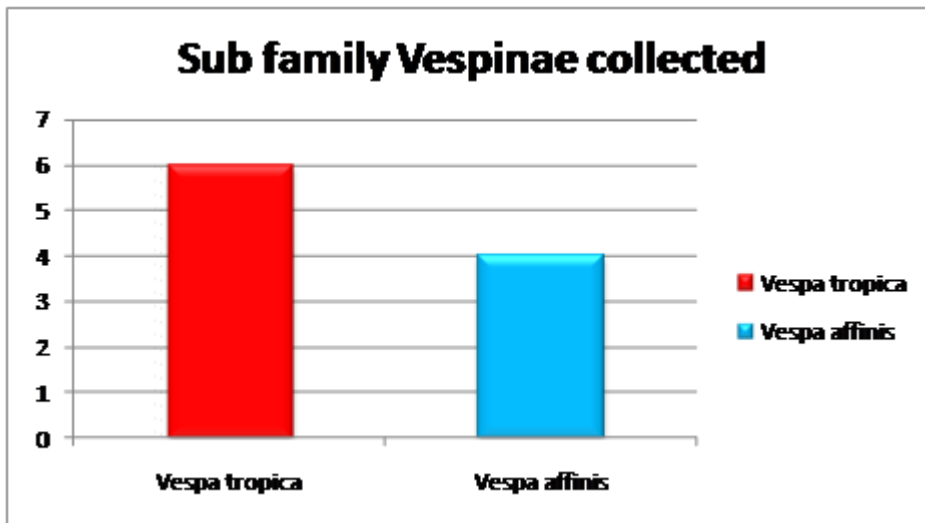


FIG 4-Number of Species Collected From Sub Family Vespinae



Wasps especially polistenae are reported to be important pollinators. During the present study all polistenae species should be seen in the study areas especially the garden in large number at time between 9-11 am. It is the time for flowers waiting for pollinators. While the vast majority of wasps play no role in pollination, a few species can effectively transport pollen and therefore contribute for the pollination of several plant species, being potential or even efficient in pollination. In a few cases such as figs pollinated by fig wasps, they are the only pollinators, and thus they are crucial to the survival of their host plants (Compton *et.al* 1991).

During the present study it was noted that, the nests of vespidae wasps is occupied with many insect larvae such as beetles, moths, butterflies etc., The wasps were found utilize these insect larvae for feeding their young ones. So wasps exhibited role in biological control. And are the best agents in biological control. They eliminate the pests of agriculture and garden plants also. This observation is supported that Vespidae are predators of almost all insect larvae, which attack forest, agriculture and plantation crops. They feed on the larvae of butterflies, beetles, moths and other wasps, which are serious pests of useful crops. They often bring these larvae to their comb to feed their own larvae. (Edward & Archer 2001).

### Nest patterns

#### SUB FAMILY EUMENINAE (PLATE 3)

The small pitcher nest made up of mud. It was found in muddy places where building materials were easily available. It has a smooth outer surface attached from the lower side. It contains up to 10 cells for larvae. It has an opening on upper side for entry or exit. They close their nest opening up to maturation of their larvae. They are present on the wall of the building or on leaves etc. In the present study my observation is also supported the observation that eumeninae nest consist of a linear row of cell separated by transverse partition made up of soil mastics (Fatteryya 2013)

#### SUB FAMILY POLISTENAE (PLATE 3)

The nest of polistes found among branches or open torus. Structurally it was oval shape and attached with a minute but strong stalk. It was formed with a single layer of hexagonal cells, which open directly to the outside with increasing number of wasps, the worker start to build new layer beneath the old ones, they reached a maximum of five layer. The oldest layer was the largest and other gradually decreases. Studies of Farzana Perveen and Muzafar Shah

also (2012) also revealed that polistes nest was hexagonal in shape and made up of cellulose like substance .

**SUB FAMILY VESPINAE( PLATE 3)**

The spherical nest was mostly found attached downward towards the roof of the veranda. The attached portion of the nest was flat and continuously by a protective layer . Inside 1-10 layer layers were found, depending on increasing number of wasps. The first starts from the upper side by a strong attachment which leads to a layer of hexagonal cells. One main opening was found for the entry and exit. Many small tubes like routs were also found in each layer which lead to the main opening .Nest were used for many years until they were destroyed. Studies of Farzana P erveen and Muzafar shah also (2012) also revealed that vespa nest was completely closed except for one opening for or exit with 1-10 layer of hexagonal cells inside the nest entry

**PLATE 3**

**NEST OF SUB FAMILY EUMENINAE**



**NEST OF SUB FAMILY POLISTENAE**





NEST OF VESPINAE



PLATE4- SUB FAMILY EUMENINAE

*Paraleptomenes* sps



*Subancistrocerus sichelii*



*Anterhynchium abdominale*



*Delta pyriform*



*Phimenes flavopictum*



*Delta conoideum*

**SUB FAMILY POLISTENAE**

***Ropalidia spatulata***



***Ropalidia jacobsoni***



***Polistes stigma***



***polisterstrigosus***



***Polister nigritarsis***



**PLATE 5-SUB FAMILY VESPINAE**

***Vespa tropica***



***Vespa affinis***



**Conclusion**

The present work comprises the alpha diversity of vespids in farook college campus..From the study it has been recorded 13 species of vespidae belong to three sub family, 8 genera .out of which 6 species belongs to sub family eumeninae, 5 and 2 in plistenae and vespinae respectively. The sub family stenogastrinae which is abundant in high range region is totally absent in the study area The study also concluded economic importance of wasp such as pollination, biological control and medicinal field. The study also reveals the characteristics of nest up to sub family level. Polistenae made nest with mud, and other two with available materials like cellulose after processing.

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