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Seasonal variations in Vespidae (Insecta: Hymenoptera) from Malakand, Pakistan

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Abstract

Vespidae is diverse and large family of the order (Hymenoptera) Insecta: Arthropoda. Vespid Wasps were collected from 23 March 2018 to 30 October 2018. Wasps were collected from diverse localities of District Malakand through active search with the use of the hand net. Polistinae wasps made their appearance in March, Increases up to June and then decreases from July to October. Maximum numbers of wasps belonging to Subfamily Polistinae were collected in June. The populations of Vespinae Wasps were increases from March to July with increase in temperature and then their numbers decreases from August to October, gradually with decrease in temperature. The wasps belonging to Subfamily Eumeninae made their appearance in April, Increases up to May and then their population gradually decrease from June to September. The numbers of Eumeninae wasps were found high in May.

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Introduction

The Family (Vespidae) is divesre (varied) and large family of the order (Hymenoptera) Insecta: Arthropoda (Pickett and John, 2004). It has about 5000 species and 250 genera under 6 subfamilies. Wasps are originated in *Jurassic period* and present throughout the world except on the polar region (Arsalan *et al.,* 2018). The members of Vespidae are broadly spread in Africa, Tropical Asia, South Africa, Australia, Eurasia and America (Vecht, 1966). But the species of vespidae are more abundant in tropical regions (Ebrahimi and Carpenter, 2008). Adult are typically brown or black, having white or yellow markings (Kumar and Sharma, 2015). Most Species of the Vespidae are carnivorous. They feed on other insects, spiders or grubs. The wasps contain biting mouthparts while the females also contain stinging behavior. Through Stinging female paralyze their prey and the prey brings to their nest (Das and Gupta, 1989). Some species of vespidae are scavengers (Richter, 1990). The vespid wasps play very important role in terrestrial ecosystem, act as a biological control agents, Pollinators, invasive pests and scavengers (Bodlah *et al.,* 2016).

Most species of the vespidae construct nests. Wasps construct their nests in different shapes: mud pots, large or small nests in soil, small nests or large nests in the trees and series of mud cellules. Some wasps are social parasite lives in the nest of other wasps (Espelie, 1990). The members of vespidae constructed their nests in that area which is protected, substances required for nest formation and food are easily available (Andena *et al.*, 2009). The nests of social wasps have three casts: worker, queen and male. Construction of the nests starts by the queen in early summer. In late summer the nest reached to its maximum size. During fall the drones and workers die and queen undergoes to hibernation due decrease in temperature (Khan *et al.*, 2018). Many evidences are available which shows that seasonal variations or fluctuations occur in the population of wasps. Different studies were conducted in the tropical regions showed that population of wasps fluctuate during the year (Rasool *et al.,* 2017).

The present study describes seasonal variations reported among three subfamilies of Vespidae at District Malakand, Khyber Pakhtunkhwa, Pakistan. The aims of the currentstudy to find seasonal variations and distributional pattern of the family Vespidae in District Malakand.

Materials and methods

Study Area

District Malakand is located among 34-22' to 34-41' north latitudes and 71-37' to 72-14' East longitudes. Total range (area) of this District is about 952 Square Kilometers (District Census Report, 1998) Fig. 1. The weather of District Malakand is abstemiously cool during wintertime and agreeable during summer. June, August and July are the warmest months. The supreme temp (Temperature) in summer time is 39°C while lowest temperature during winter season is 4°C is shown in Table 1 (Climate-Data-org).

Table 1. Month wise mean temperature and rainfall of District Malakand (2018).

Months	Mean Temperature °C/ °F		Rainfall/ Precipitation mm
	Maximum	Minimum	
January	17 / 63	4 / 40	1.3
February	19 / 66	6 / 43	3.2
March	24 / 75	10 / 51	2.6
April	30 / 86	15 / 59	2.4
May	36 / 96	20 / 67	1.1
June	39 / 102	23 / 74	1.1
July	37 / 99	26 / 78	2.5
August	36 / 97	25 / 77	2.7
September	34 / 94	21 / 70	1.1
October	30 / 86	15 / 58	0.8
November	24 / 76	8 / 47	0.8
December	20 / 67	4 / 40	0.8

Source: Climate-Data-org

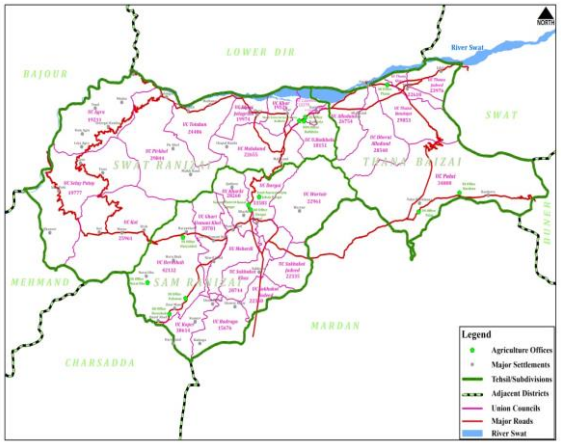

Fig. 1. Map of the study area.

Specimens Collection

The Vespid wasps were collected from diverse localities of Malakand through active search with the use of the hand net. The specimens were caught from both Plan area (public parks, old and new buildings, flowering plants, agronomic crops, Gardens, fruit markets, vegetable markets, fields and other vegetation) and mountains (grasses, springs water, damp area, water stream, small and large trees) of the Malakand. The Captured specimens were then killed by spraying insecticides (Black Cobra) in the hand nets.

Preservation of the Specimens

The killed specimens were transferred to bottles having 95% ethanol, cyanide and ethyl acetate. The specimens were then placed in freezer for 1 or 2 days to prevent any fungal contamination. The entomological pins were used for the pining of dead specimens. The dried wasps (specimens) were labeled and transferred to insect boxes. Naphthalene balls were present in each insect box as a preservative.

Specimens Data

Each specimen Data i.e collection date, tehsil name, time, local name and locality was entered in the register.

Specimens identifications

The collected wasps were observed and identified (recognized) up to species and genus level using of pervious published latest literature like Gawas *et al.* (2019); Nidup *et al.* (2018); Khan *et al.* (2018); Sheikh *et al.* (2017); Pannure *et al.* (2016); Kumar *et al.* (2016); Kumar and Sharma (2015); Kumar and Sharma (2014); Dvorak and Carpenter (2010); Das and Gupta (1989).

Results

In the present study total of 6673 specimens were collected from different localities of Malakand through active search. The collection of specimens was made from 23 March to 30 Octobar 2018. The collected specimens were belonging to three subfamilies Polistinae, Vespinae and Eumeninae. Among the collected specimens 3891 specimens were Polistinae wasps, 2576 were Vespinae wasps and 206 were Eumeninae wasps. *Polistes wattii* numbers increase from March to June and then decrease from July to October. The populations of *Polistes olivaceous, and Polistes stigma* were increases upto July and decreases from August. The numbers of *Polistes rothneyi* were also increases with increase in temperature from March to July.

Polistes indicus numbers were increases upto September. The queen of *Polistes wattii* and *Polistes rothneyi* come out from Hibernation in March, *Polistes stigma* in May, *Polistes olivaceous,* and *Polistes indicus* were made their appearance in April. Only one specimen of the genus *Ropalidia, Ropalidia brevata* was collected in July. *Vespa orientalis* come out in March, while *Vespa velutina* and *Vespa tropica* in April from hibernation. The Populations of *Vespa orientalis* and *Vespa tropica* increases upto September and then decreases in Octobar. The numbers *Vespa velutina* wasp's increses with incrases in temperature from April to July while decreases after July with decrease in temperature. Only four Specimens of *Vespula flaviceps* were collected in September and only one specimen of *Vespa mandarinia* in Octobar.206 wasps of the Eumeninae Subfamily were captured from March to October. The numbers of *Delta* species were increases from April to July and then decreases with decrease in temperature after August.

The numbers of *Katamenes* Species were high in April while *Eumenes* Species in May. The population of *Rhynchium Species* increases from April to July while *Oreumenoides* Species increases from May to June. Only one specimen of *Anterhynchium* was captured in September. *Antodynerus* Species numbers were increases from May to July and then decreases from August. Only one specimen of *Knemodynerus* was collected in May. The species of *Antepipona* and *Euodynerus* were high in May and then decreases After June. The species of *Delta, Katamenes, Eumenes* and *Rhynchium* come out in April while the members of *Oreumenoides, Antodynerus, Knemodynerus, Antepipona* and *Euodynerus* come out in May. *Allorhynchium* and *Xenorhynchium species* were come out in July (Table 2).

Table 2. Number of Specimens of different species of the family Vespidae collected from March to October.

Subfamily	Species Name	Mar	Apr	May	June	July	Aug	Sep	Oct	Total
Polistinae	*Polistes wattii*	97	332	472	1201	809	393	104	6	3414
	Polistes olivaceous	0	28	44	30	66	22	6	5	201
	Polistes stigma	0	0	7	5	13	4	0	0	29
	Polistes indicus	0	2	0	0	0	2	53	0	57
	Polistes rothneyi	1	26	52	43	52	13	2	0	189
	Ropalidia brevata	0	0	0	0	1	0	0	0	1
	Total	98	388	575	1279	941	434	165	11	3891
Vespinae	*Vespa orientalis*	3	59	13	54	622	393	795	194	2133
	Vespa velutina	0	13	6	48	301	14	4	1	387
	Vespa tropica	0	3	8	1	2	15	22	0	51
	Vespula flaviceps	0	0	0	0	0	0	4	0	4
	Vespa mandarinia	0	0	0	0	0	0	0	1	1
	Total	3	75	27	103	925	422	825	196	2576
Eumeninae	*Delta* sp	0	9	4	8	12	8	1	0	42
	Katamenes sp	0	3	2	0	0	0	0	0	5
	Eumenes sp	0	2	7	0	0	2	0	0	11
	Rhynchium sp	0	2	2	0	15	6	3	0	28
	Oreumenoides sp	0	0	5	12	6	2	0	0	25
	Anterhynchium sp	0	0	0	0	0	0	1	0	1
	Antodynerus sp	0	0	4	0	5	3	0	0	12
	Knemodynerus sp	0	0	1	0	0	0	0	0	1
	Allorhynchium sp	0	0	0	0	1	0	0	0	1
	Antepipona sp	0	0	20	6	8	1	0	0	35
	Euodynerus sp	0	0	40	2	1	0	0	0	43
	Xenorhynchium sp	0	0	0	0	1	1	0	0	2
	Total	0	16	85	28	49	23	5	0	206

Discussion

In the current study wasps were collected from diverse localities of District Malakand through active search with the use of the hand net. The collected wasps were belonging to 16 genera of the three Subfamilies Polistinae, Vespinae and Eumeninae. All the collected wasps were first time reported from Malakand, earlier the vespid fauna of District Malakand were not studied. It was found that the populations of vespid wasps belonging to Subfamily Polistinae, Subfamily Vespinae and Subfamily Eumeninae show seasonal variations in their numbers. The populations of Polistinae wasps were increases up to June and then their numbers decreases from July to October. Vespinae wasps made their appearance in March, increases up to July and then their populations were decreases gradually from August to October. The wasps belonging to Subfamily Eumeninae made their appearance in April, Increases up to May and then their population gradually decrease from June to September. The numbers of Polistinae wasps were found high in June, Vespinae wasps in July and Eumeninae wasps in May. The queens of most wasps come out from hibernation in March and April with increases in temperature and availability of food. The results of the present study reveal that temperature and humidity are the most important abiotic factors which effect the wasp's populations. The populations of wasps increase with increase in temperature and then decreases with decrease in temperature.

The results of the study were similar to the pervious study in Swat Khyber Pakhtunkhwa Pakistan recorded that the members of the vespidae show seasonal variations in abundance. Various abiotic factors and abiotic factors of the environment (Ecosystem) effect the distributions and abundance of the wasps. Temperature and humidity are the most important environmental factors which effect the wasp's populations (Rasool *et al.,* 2017). The temperature in the months of November, December, January and February is very low in the study area and the queen undergoes to hibernation. So wasps were not collected in these months. Construction of the nests starts by the queen in early summer. In late summer the nest reached to its maximum size. During fall the drones and workers die and queen undergoes

to hibernation due decrease in temperature (Khan *et al.*, 2018). Only 98 specimens of Polistinae and 3 Specimens of Vespinae were collected in the March. The sizes of these wasps were large and easily identified as queens. Many evidences are available which shows that seasonal variations or fluctuations occur in the population of wasps. Different studies were conducted in the tropical regions showed that population of wasps fluctuate during the year (Rasool *et al.,* 2017).

References

Andena RB, Carpenter JM, Pickett KM. 2009. Phylogenetic analysis of species of the neotropical social wasp *Epipona* Latreille, 1802 (Hymenoptera, Vespidae, Polistinae, Epiponini). ZooKeys **20,** 385-398.

Arsalan M, Abbas A, Gul SU, Rehman HU, Jwad SM, Shah W, Mehmood, A. 2018. Biodiversity of wasps species collected from District Karak, KP, Pakistan. Journal of Entomology and Zoology Studies **6(2),** 21-23.

Bodlah I, ALI H, Akram M, Naeem M, Mohsin A, Aziz MA. 2016. First record of three species of genus *Polistes* (Vespidae: Hymemoptera) from District Layyah (Punjab), Pakistan. Asian Journal of Agriculture and Biology **4(2),** 33-37.

Das BP, Gupta VK. 1989. The social wasps of India and the adjacent countries (Hymenoptera: Vespidae). Oriental Insects Monograph **11,** 1-292.

Dvorak L, Carpenter JM. 2010. New records of vespid wasps from Yemen with synonymy in Belonogaster (Hymenoptera: Vespidae: Polistinae and Eumeninae). Linzer Biologische Beitrage **42(1),** 561-563.

Ebrahimi E, Carpenter JM. 2008. Catalog of the vespid wasps of Iran (Hymenoptera, Vespidae). Zootaxa **1785,** 1-42.

Espelie K. 1990. Surface lipids of the social wasp *Polistes Annularis* (L.) and its nest and nest pedicel. Journal of Chemical Ecology **16,** 1841-1852.

Gawas SM, Kumar PG, Gupta A, Sureshan PM. 2019. Checklist of vespid wasps (Hymenoptera: Vespidae) of Goa, India, with new records and a key to species. Zootaxa **4585(2),** 269-294.

Khan MT, Rafi MA, Sultana R, Munir A, Ahmad S. 2018. Wasps of subfamilies Eumeninae, Vespinae and Polistinae from Sindh-Pakistan. Journal of Entomology and Zoology Studies **6(2),** 892-897.

Kumar GP, Carpenter JM, Sureshan PM. 2016. A taxonomic review of the genus *Antepipona* de Saussure, 1855 (Hymenoptera: Vespidae: Eumeninae) from India. Zootaxa **4150(5),** 501-536.

Kumar PG, Sharma G. 2014. Taxonomic studies on vespid wasps (Vespidae: Vespoidea: Hymenoptera: Insecta) of Rajasthan, India with six new records from the State. Journal on New Biological Reports **3(3),** 240-258.

Kumar PG, Sharma G. 2015. Taxonomic studies on vespid wasps (Hymenoptera: Vespoidea: Vespidae) of Chhattisgarh, India. Journal of threatened Taxa **7(14),** 8096-8127.

Nidup T, Klein W, Kumar PG, Dorji P. 2018. Additional reports of solitary potter wasps (Hymenoptera: Vespidae: Eumeninae) in Bhutan. Journal of Threatened Taxa **10(5),** 11686-11696.

Pannure A, Belavadi VV, Carpenter JM. 2016. Taxonomic studies on potter wasps (Hymenoptera: Vespidae: Eumeninae) of south India. Zootaxa **4171(1),** 001-050.

Pickett KM, John WW. 2004. Phylogenetic analysis of the new world *Polistes* (Hymenoptera: Vespidae: Polistinae) using morphology and molecules. Journal of the Kansas Entomological Society **77(4),** 742-60.

Rasool M, Zahid M, Shah M. 2017. Seasonal variations in the population of Vespidae (Insecta: Hymenoptera) of Swat Pakistan. Journal of Entomology and Zoology Studies **5(2),** 358-360.

Richter MR. 1990. Hunting social wasp interactions: Influence of prey size, arrival order and wasp species. Ecology ecological society of America **71(3),** 1018-1030.

Sheikh AH, Kumar PG, Thomas M, Bhandari R. 2017. Taxonomic studies on Vespid Wasps (Hymenoptera: Vespoidea: Vespidae) of Dumna Nature Park, Jabalpur, Madhya Pradesh. Records of the zoological Survey of India **117(3),** 198-213.

Vecht J. 1966. The East Asiatic and Indo Australian species of Polybiodes Buysson and Parapolybia Saussure (Hymenoptera: Vespidae). Zoologische Verhandelingen **82,** 1-42.