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Field Observations on the Defense and Hunting Behaviour of Pompilidae (Hymenoptera: Insecta) Species

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Abstract This study was conducted at 8 sites determined in the south-west of Kars rural area between 2009 and 2015. "During the study, female members of *Anoplius viaticus* (Linnaeus 1758) of Pompilidae family taken from GPS sites were marked and its hunting success and refinding the losting prey and the number of nests dug on a daily basis were examined between 9 am and 6 pm in a day." The study has found out that, female members of pompilids Asilidae (Diptera: Insecta) family attacked directly, whereas the members of *Formica rufa* Linnaeus,1761 attacked indirectly to pompilids. Obtained information from this study is new about pompilids.

1. INTRODUCTION

Most Pompilidae species live solitarily whereas few species live communally. Those who live communally make their nests under the sand. Those who live solitarily make their nests in the soil, cracks and cleavages in the soil, stone cleavages, tree crusts, dried plant bodies, deserted scorpion, spider or rodent nests; they also use abandoned insect nests as their own nests (Day, 1988). Adults of the family feed on nectars. However, female members generally hunt and paralyze spiders from Lycosidae family as a food for their larvae. It carries the paralyzed prey to the nest site and covers it temporarily to prevent it from being seen by other organisms. After it completes own nest, it carries the prey there (Darryl, 1979). After Pompilid carries the prey to the nest, it lays one egg on its prey. After hatching, the larva sucks the body fluid of the spider and completes its development. Female Pompilidae carries the paralyzed prey to its nest by two methods, flying or dragging (Day, 1988). It holds the prey with the mouthparts; it moves backwards while the prey is turned to

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the other side. Sometimes it cuts off the parts of the prey that will be dragged to avoid tripping during carrying (Coello 2000; Olberg 1959).

It has been determined that the pompilid species, *Episyron quinquenotatus* (Say) make two or three nests in a day (Evans and Yashimoto, 1962).

Although, especially the female members of pompilid species are predators of spiders, their behaviour for predation and hunting is not well known. No certain animal group is known to be the predator of pompilids; however, it has been reported that some Asilidae (Diptera: Insecta) species disturb pompilids during flight (Day, 1988).

The aim of this study was to report the daily activity and hunting hours, prey searching behavior, success at catching the prey, the number of nests dug during the day and organisms that threatened Pompilid wasps.

2. MATERIAL AND METHOD

This study was conducted at 8 sites in the south-west of Kars rural in between 2005 and 2008 (table 1).

Table 1. GPS coordinations of the sites.

Habitas	North	East
1	40°35'35.41"N	43° 3'14.49"E
2	40°35'21.84"N	43° 2'41.73"E
3	40°34'32.33"N	43° 2'5.38"E
4	40°35'47.16"N	43° 3'56.37"E
5	40°35'57.99"N	43° 4'16.88"E
6	40°35'51.38"N	43° 4'34.59"E
7	40°34'34.38"N	43° 3'42.12"E
8	40°34'46.52"N	43° 4'24.21"E

For each site, were recorded the air and soil temperatures for every research day at the beginning hour, midday and the end of the day. On a yearly basis, fore wings of the samples that was given its number at the table 2 was marked with nail polish (phthalates, toluene, and formaldehyde) from each site. The research was divided into two sections as hunting and nest digging behaviour of Pompilids and other organisms that pose a threat to Pompilids. The research was divided into two sections as hunting and nest digging behaviour of Pompilids and other organisms that pose a threat to Pompilids.

Table 2. Members whose fore wing were marked.

Years	Sites I and II		Sites III and IV		Sites V and VI		Sites VII and VIII	
	First Marked	Recaught	First Marked	Recaught	First Marked	Recaugh t	First Marked	Recaught
2005	3	2	3	2	3	1	4	4
2006	2	1	4	3	3	2	3	2
2007	2	2	3	2	4	2	2	1
2008	3	3	3	2	2	1	3	2

3. RESULTS

3.1. Hunting and Nest-Making Behaviour of Pompilids

It was determined that *A.viaticus* and other Pompilid species start their daily feeding and hunting activities when the air temperature reaches to 9 ^{o}C. It was observed that as the air temperature increases, activities of *A.viaticus* and other pompilids intensify, which reaches its peak at 10-12 hrs before the noon and 14-16 hours afternoon. It was found that the most suitable habitats for observing the hunt of *A.viaticus* and other pompilids were small stony areas, soil cavities, soil cleavages, soil cracks and stone bottoms. *A. viaticus* and other pompilid species move very fast when they search for their prey. Pompilid wasp catches and paralyzes the prey at the first moments of the chase in a stony area; if it does not catch, the prey can cover its traces as the pompilid cannot pursue well. It means that as *A. viaticus* loses the trace of the spider it cannot find its hiding place. It was determined that exhausted pompilid gives up on searching its prey and starts searching for another prey.

When female pompilid flied to skyward with the paralyzed prey, it was tried to get caught by atrap but escaped giving up its prey. When we tried to find where the paralyzed prey, A.Viaticus returned 15-20 minutes later and found its prey easily located.

Fore wing of the caught members were marked with nail polish: (hthalates, toluene, and formaldehyde) in order to determine the number of nests dug by *A. viaticus* in a day. A specimen of the species marked with nail polish was caught 4 times in a day. It was determined that it as it cathches a prey; it digs a nest for each of them.

3.2. Other Organisms That Pose Threat To Pompilids

It was determined that *Dasypagon* spp. (Asilidae: Diptera) directly attacked to *A.viaticus* during flight. In addition, it was observed that members of *F. rufa* indirectly attacked the female *A.viaticus* which carried its prey. It was also observed that when A.viaticus dragged its prey, an ant (F.rufa) pulled the prey by holding from the opposite direction A.viaticus which dragged by the ant along with the prey for some period, got tired and took rest frequently *A.viaticus* left its prey and chased the ant. As soon as *A.viaticus* restarted dragging its prey, the ant came again and continued to make it difficult for *A.viaticus* to carry its prey by pulling the body in the opposite direction. After a while, the second ant (*F. rufa)* came and accompanied it. Shortly afterwards, Pompilid could not drag the prey and left from there by giving its prey to the ants. Shortly afterwards, Pompilid could not drag the prey and left from there by giving its prey to the ants

4. DISCUSSION AND CONCLUSION

Although female individuals of pompilids move very fast, it is observed that they are not very capable at following their prey evertheless, after unsuccessful hunting attempt of female A. viaticus (when tried to fly skyward with paralyzed prey) it have left the prey and have returned about 15-20 minutes. And finally it have found the prey easily

It was determined that as the female Pompilid carried its prey, an ant (F. Rufa) tried to get the prey. The wasp attacked and chased to the ant. As soon as. However, the ant returned and reattacked to the prey. Then another ant came to cooperate with the first one and put into a difficult situation the wasp. Pompilid attacked the ants for a couple of times but it could not rescue the prey from the ants. Eventually ants took away the wasp's prey. It was the first observation on attacking of *Formica rufa* members to a pompilid wasp indirectly.

Day (1988) stated that although the spider is also poisonous the Pompilid wasp can paralyze it. However, when the paralyzed spiders are taken and stored under suitable conditions, they completely return to the previous state after 60-70 minutes.

While researcher tried to find the location of paralyzed hunt, he saw that the female Pompilidae came back to the former location.

It is well known that members of Asilidae attack to Pompilids indirectly under natural conditions. It was observed that Asilidae members attacked to Pompilid wasps

directly when the Pompilid flied to skyward, in this study

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