



E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2015; 3 (1): 69-74
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Received: 24-12-2014
Accepted: 06-01-2015

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Biodiversity of spider fauna in Pir Baba, district Buner, Khyber Pakhtunkhwa, Pakistan

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Abstract

In the present study spider fauna was explored in Pir baba and its peripheries in District Buner. The collection was done during July-December 2013 by hand picking, pit fall trap and nets. The collected specimens (n=1705) belonged to 10 families, 10 genera and 12 species; the family *Pholcidae* was dominant (23%) while *Sparassidae* (3%) was rare. The rest of the families found with their relative abundance are *Salticidae* (7%), *Theridiidae* (6%), *Caponiidae* (5%), *Gnaphosidae* (16%), *Ctenidae* (5%), *Lycosidae* (11%), *Selenopidae* (16%), *Scytodidae* (6%). The genus *Micrommata* (3%) was scarce while *Pholcus* (23%) was enormous. The species *Pholcus phalangioides* (23%) was abundant in number while *Micrommata virescens* (3%) was found rare. The observed spider species were found non-poisonous according to taxonomic catalog. Abundance of spider fauna was observed in the month of July from Jawkhela (29%) and lowest from Batai (2%). A detailed study is required for further exploration of spider fauna in the region.

Keywords: Biodiversity; Spider fauna; Relative abundance; Pir baba; Buner.

1. Introduction

Spiders are carnivorous and voracious predators belonging to the order Araneae of the Class Arachnida of the Phylum Arthropoda. All over world 38,000 species have been identified. Some believed that about 200,000 species exist. Almost all species are venomous, but only 40 species are known to be potentially poisonous to humans [1]. Worldwide spider fauna consists of more than 42,055 described species in which 757 species of Araneae belonging to 265 genera and 48 families have been recorded from Turkey [2]. A report from India has mentioned 95 species of spiders belonging to 56 genera and 18 families [3].

An updated report has documented the 110 families of spider fauna belonging to 3859 genera and 42751 species worldwide [4]. Platnick in 2013 discovered and modified the genus *Oxyopes latreille* by 297 species and subspecies worldwide. Up to date 17 species of the *Oxyopes* have been recorded from Pakistan. There is less number of *Oxyopes* from Pakistan literature. One of the student of Cambridge described *Oxyopes jubilans* from Karakorum and Islamabad, Pakistan [5].

Many researchers have reported multiple species from different parts of the country, Butt and Beg described new species (*Oxyopes azhari*) from Faisalabad, Punjab, Ursani and Soomro recorded five species (*Oxyopes campii*, *Oxyopes hindostanicus*, *Oxyopes ryvesii*, *Oxyopes oryzae* and *Oxyopes wroughtoni*) from Sindh and discovered two new species (*Oxyopes machuensis* and *Oxyopes shakilae*) from Punjab, Pakistan as well [6].

It is reported that the genus *Philodromus* comprised 244 species but in 2013 revised and updated to 282 by different zoologist worldwide [7]. Shabir discovered two species from Chakwall, Fatima recorded five species, one new species (*Philodromus sindhicus*) was also reported from Jamshoro, Sindh [7].

A survey was conducted on the spider fauna of Cholistan desert in Punjab, Pakistan during 2001-2003. They reported 10 families belonging to 32 genera and 62 species. Family Lycosidae (68%) of spider fauna was considered to be the dominant [8].

Spiders are generally considered as the hateful and injurious creatures. They inhabit the ground, underground tunnel systems, under stones and near water; but habitually, they like moist place also water spiders exist. Dyal firstly researched the taxonomy of spider fauna in Peshawar and adjoining areas of KPK, reporting 18 species under 13 genera and 8 families [9]. Tahir and Butt studied spiders fauna of Punjab and reported 44 species from 30 genera of 12 families [9].

District Buner is an ever green area in Khyber Pukhtunkhwa (KPK), Pakistan, which has rich biodiversity of fauna and flora but no specific extensive studies have ever been carried out on biodiversity of spider fauna in the region. Therefore present study was designed to explore the biodiversity and distribution of spider fauna in the region. Data thus collected may facilitate future initiatives of biodiversity database of these species in the region.

2. Materials and Methods

2.1 Collection

The specimens were collected (July-December 2013) by hand picking, jarring, net picking, plastic bags collection, and pitfall trap. The most convenience, simple, easy and time saving method is hand picking. The plastic bags were used to capture and seize the spiders because they are very active and may be hazardous to humans. The safest mode is pitfall trap in which small container having water is put in soil up to level. The wandering spiders and other insects fall into the container. The container was covered by lid to protect them from rain, wind and soil entrance to it.

2.2 Collection areas

Buner lies between 34-9 and 34-43 N latitude and 72-10 and 72-47 E longitude on geographical point. It shares boundary on the North by Swat District, on the West by Malakand Agency, on the South by Mardan District, and on the East by river Indus and Hazara Division. The region is encircled with

hill on all sides and is separated from Swat by a range of mountains. Elevation varies from 1200 ft in Totalai (Khudukhel) in the South to 9,550 ft of Dosara Peak in the North. The hilly mountainous ranges are enriched with mineral which has now become the vivid, attractive and beneficial symbol of business and sign of prosperity in the area. The collection of spider was done from Pir Baba, Batai, Jawkhela, PachaKalay, Sultanwas, BaloKhan, Gounday, BhaiKalay, Kala Khela, Ghazi Khanay located in District Buner, KPK.

2.3 Indoor collection

Collection was done during July-December 2013 in the homes by the permission of dwellers. Homes were found rich of spider fauna. Most of spiders were residing in the warm apartments of households like warm rooms, wash rooms, kitchens, ceilings, walls and cattle rooms (Table 1).

2.4 Outdoors collection

Spiders were also collected from various open arachnid habitats. Some of the enriched opened survey areas were Cultivated and Barren fields, Grasslands, Vegetables fields, Bushes, Maize crops. The collected specimens (n=1705) belonged to 10 families, 10 genera and 12 species with their relative abundance has been shown in (Table 1 & 2). In the present work a total of 1705 spiders were collected by various collection techniques, the identification and taxonomy of spider was done by morphological characteristics using the key ^[10].

Table 1: Taxonomy of the collected spider fauna

S. No	Family	Genera	Species
1	Salticidae	Plexippus	<i>Plexippus paykulli</i>
2	Sparassidae	Micrommata	<i>Micrommata virescens</i>
3	Theridiidae	Enoplognatha	<i>Enoplognatha ovate</i>
4	Pholcidae	Pholcus	<i>Pholcus phalangoides</i>
5	Caponiidae	Diplogena	<i>Diplogena capensis</i>
6	Gnaphosidae	Drassdes	<i>Drassdes cupreus</i>
7	Ctenidae	Phoneutria	<i>Phoneutria fera</i>
8	Lycosidae	Hippasa	<i>Phoneutria agelenoides</i>
9	Selenopidae	Salenops	<i>Selenops latreille</i>
10	Scytodidae	Scytodes	<i>Scytodes globula</i>

Table 2: Relative abundance of Spiders with respect to spots during (July-December)

	July	August	September	October	November	December	Total
Indoor Collection							
Warm rooms	48	47	41	35	51	49	271
Wash rooms	39	35	34	29	45	41	223
Kitchen	40	32	32	23	34	29	190
Ceiling & walls	33	34	35	31	21	06	160
Cattle rooms	45	26	23	17	38	19	168
Net indoor							1012
Outdoor Collection							
Baren fields	44	38	34	27	1	0	144
Grasslands	29	34	31	25	1	0	120
Vegetable fields	24	15	17	16	0	0	72
Bushes	37	27	19	13	0	0	96
Maize crops	43	31	28	24	0	0	126
Net outdoor							558
Grand net							Indoor + Outdoor= 1012 + 558 = 1570

Table 3: Relative abundance of species in surveyed areas

Family	Species Zoological Names	Quantity	Percentage
Salticidae	<i>Plexippus paykulli</i>	110	7.006%
Sparassidae	<i>Micrommata virescens</i>	50	3.184%
Theridiidae	<i>Enoplognatha ovate</i>	89	5.668%
Pholcidae	<i>Pholcus phalangioides</i>	363	23.121%
Caponiidae	<i>Diplogena capensis</i>	73	4.649%
Gnaphosidae	<i>Drassdes cupreus</i>	257	16.369%
Ctenidae	<i>Phoneutria fera</i>	82	5.222%
Lycosidae	<i>Phoneutria agelenoides</i>	95	6.050%
	<i>Lycosa alacris</i>	74	4.713%
Selenopidae	<i>Selenop slatreille</i>	275	17.515%
Scytodidae	<i>Scytodes thoracica</i>	35	2.229%
	<i>Scytodes globula</i>	67	4.267%

Table 4: Month wise collection of Spiders

S no.	Family	July	Aug	Sep	Oct	Nov	Dec	Total
1	Salticidae	30	20	21	18	14	7	110 (7.006%)
2	Sparassidae	14	12	10	8	4	2	50 (3.184%)
3	Theridiidae	28	20	16	14	7	4	89 (5.668%)
4	Pholcidae	80	75	69	55	48	36	363 (23.121%)
5	Caponiidae	21	16	13	10	9	4	73 (4.649%)
6	Gnaphosidae	58	52	48	36	33	30	257 (16.369%)
7	Ctenidae	22	18	16	12	10	4	82 (5.222%)
8	Lycosidae	39	31	30	27	23	19	169 (10.764%)
9	Selenopidae	65	53	50	45	32	30	275 (17.515%)
10	Scytodidae	25	22	21	15	11	8	102 (6.496%)
Total		382 24.331%	319 20.318%	294 18.726%	240 15.286%	191 12.165%	144 9.171%	

Relative abundance = $n/L \times 100$

The 'n' represents number of specimens of each Spider species while L stands for the total number of specimens collected. The Spider species were classified in following relative abundance categories: Satellite species, relative abundance <1%; sub-dominant species, relative abundance <5% and dominant Species, relative abundance >5% [11].

Distribution (C) = $n/N * 100$

Where n stands for number of collecting sites, N represents total number of collecting spots and * represents sign of multiplication. The following classes were used to illustrate distribution status of different species: C1 (sporadic) 0-20%; C2 (infrequent) 20.1-40%; C3 (moderate) 40.1-60%; C4 (frequent), 60.1-80%; and C5 (constant) 80.1-100% [10].

Table 5: Relative abundance and distribution of spider species

Species	Collection Frequency	Collection Sites	Relative abundance%	Distribution	Relative abundance Status	Distribution Status
<i>Plexippus paykulli</i>	110	5	7.006	50	Dominant Moderate	
<i>Micrommata virescens</i>	50	3	3.184	30	Subdominant	Infrequent
<i>Enoplognatha ovate</i>	89	2	5.668	20	Dominant	Sporadic
<i>Pholcus phalangioides</i>	363	8	23.121	80	Dominant	Frequent
<i>Diplogena capensis</i>	73	2	4.649	20	Subdominant	Sporadic
<i>Drassdes cupreus</i>	257	6	16.369	60	Dominant	Moderate
<i>Phoneutria fera</i>	82	3	5.222	30	Dominant	Infrequent
<i>Phoneutria agelenoides</i>	95	4	6.050	40	Dominant	Infrequent
<i>Lycosa alacris</i>	74	4	4.713	40	Subdominant	Infrequent
<i>Selenops slatreille</i>	275	7	15.515	70	Dominant	Frequent
<i>Scytodes thoracica</i>	35	9	2.229	90	Subdominant	Constant
<i>Scytodes globula</i>	67	9	4.267	90	Subdominant	Constant

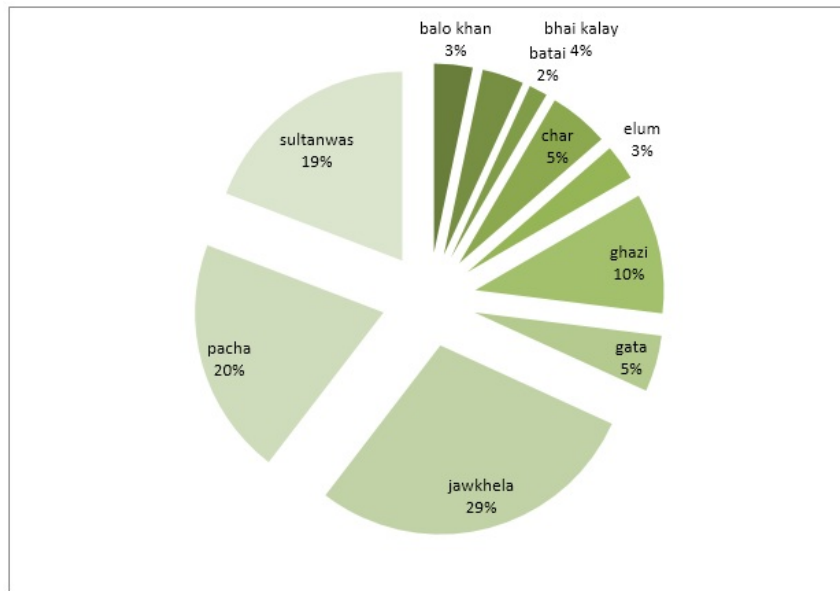


Fig 1: Village wise spider collection in Pir baba

3. Results and Discussion

The present research was done in diverse habitats of spiders in Pir Baba District Buner, Khyber Pakhtunkhwa, Pakistan. The family Pholcidae was the dominant while the family Sparassidae was the scarce one (Table 1). The distribution of spider species showed up and downs during the collection period in different months, even some species reduced much at cold temperature in the month of December (Table 4). The families explored from Pir baba and its territories also showed fluctuation regarding their relative abundance during July-December (Table 2 & 5).

The family Salticidae was represented by *Plexippus paykulli* having frequency of 110 with relative abundance of 7%, similarly family Sparassidae was represented by *Micrommata virescens* (n=50) with relative abundance of 3%, Theridiidae by *Enoplognatha ovate* (n=89) with relative abundance of 6%, Pholcidae by *Pholcu sshalangioides* (n=363) with relative abundance of 23%, Caponiidae by *Diplogena capensis* (n=73) with relative abundance of 5%, Gnaphosidae by *Drassdes cupreus* (n=257) with relative abundance of 16%, Ctenidae by *Phoneutria fera* (n=82) with relative abundance of 5% while the family Lycosidae was represented by two species like *Phoneutria agelenoides* (n=95) with relative abundance of 6% and *Lycosaalacris* (n=74) with relative abundance of 5%, Selenopidae by *Selenops latreille* (n=275) with relative abundance of 18% and the last family Scytodidae was also represented by two species *Scytodes thoracica* (n=35) with relative abundance of 2% and *Scytodes globula* (n=67) with relative abundance of 4% (Table 3). During our study we followed the method^[10] as explained above.

The species explored like *Plexippus paykulli* having dominant relative abundance status and moderate distribution status, *Micrommata virescens* possess subdominant relative abundance status and infrequent distribution status, *Enoplognatha ovate* having dominant relative abundance status and sporadic distribution status, *Pholcus phalangioides* has dominant relative abundance status and frequent distribution status, *Diplogena capensis* has subdominant relative abundance status and sporadic distribution status, *Drassdes cupreus* having dominant relative abundance status and moderate distribution status, *Phoneutria fera* having dominant relative abundance status and infrequent distribution

status, *Phoneutria agelenoides* having dominant relative abundance status and infrequent distribution status, *Lycosaalacris* having subdominant relative abundance status and infrequent distribution status, *Selenops latreille* having dominant relative abundance status and frequent distribution status, *Scytodes thoracica* having subdominant relative abundance status and constant distribution status while the last one specie of the present work was *Scytodes globula* having subdominant relative abundance status and constant distribution status (Table 5). Each species had its unique and specific relative abundance depending upon temperature, geography and availability of food. The frequency of each species has been shown in Table 6.

This study is first of its nature in District Buner, KPK. Among 10 families, the *Pholcidae* was the dominant and leading spider family in the research areas having relative abundance of 23.12% while the *Sparassidae* was the least abundant family with 3% (Table 3). The similar families have been reported by parveen *et al.*^[9] in F.R Peshawar, KPK, they observed 9 families, 17 genera, and 23 species, but we explored some new species like *Theridiidae*, *Caponiidae*, *Ctenidae* and *Selenopidae* which were not observed in their study. Accordingly another study was conducted on spider biodiversity by Tahir *et al.*^[4] in various sites of Punjab and reported 44 species. The differences among the studies may be due to the environmental factor, geographical differences, temperature and food availability (Table 6).

In the present research it was observed that spider population decreased from summer-winter even much reduced in December as shown in (Table 4). The spiders were most active during day time and hides after dusk. Mukhtar *et al.*^[12] discovered 104 species belong to 51 genera and 17 families from Punjab. According to their work the relative abundance of *Araneidae* family was highest while that of *Corinnidae* was lowest. However in present survey family *Pholcidae* has 23% and *Sparassidae* has 3% occurrence. Therefore, it is suggested that spider fauna greatly depends upon temperature, geography and weather (Ursani and Soomro, 2010)^[1] studied a total of 132 species belonging to 24 families and 73 genera from 16 surveyed districts of Sindh province. Among which the family *Zodariidae* for the first time recorded from Pakistan.

The families of our study like salticidae, sparassidae, therididae, pholcidae, gnaphosidae, lycosidae and scytodidae are common to their reported families but the caponidae, ctenidae and selessopidae are only explored in the present study. The families explored in our study have already been reported from Pakistan but this study conducted for the first time in district Buner, Pir baba KPK to explore the biota of spider.

Sial *et al.* [8] collected 3007 spider specimen from fourteen selected localities of Cholistan desert, Punjab Pakistan, all the specimens belonged to 10 families 31 genera and 66 species. Families described by them are *Lycosidae*, *Gnaphosidae*, *Philobromidae*, *Araneidae*, *Clubionidae*, *Thomisidae*, *Eresidae*, *Tetragnathidae*, *Theridiidae* and *Zodaridae*. In the present study we reported only 10 genera, 10 families and 12 species (Table 1). The family *Lycosidae* and *Gnaphosidae* are common in both the studies.

Parveen *et al.* [9] explored the spider fauna of Faisalabad, Pakistan, during 1996 to 1998. They captured about 14743 specimens belonging to 21 families, 58 genera and 157 species. Some of our spider families are also reported by them. They discovered the family *Salticidae* as predominant family (31.09%) with 9 genera and 27 species while in the current study it was observed as a moderate family. They reported the family *Gnaphosidae* (2.68%) as consisting of 10 genera and 25 species; they observed 2 new species for but have been reported in our study as subdominant (16%) (Table 4 & 5). Similarly the family *Eusparassidae* represented by 2 genera and 2 newly described species in their study but found rare in our study (3%) (Table 3). The family *Pholcidae* was found as dominant in our work but rare in their study. The presence of families like *Salticidae*, *Lycosidae*, *sparassidae*, *pholcidae*, *gnaphosidae* and *scytodidae* (Table 1) are common in both the studies which strengthen our results. Families like *Salticidae* and *Lycosidae* were cosmopolitan in distribution though their number and species were reduced in arid regions in both the studies.

The key adopted by Perveen *et al.* [9] for the identification and classification of spiders was based on morphological characters. Similarly we also identified the species on morphological basis along with adopting the keys of dyal and latter arachnologists as well. They reported 9 families and 23 species from FR Peshawar while the current research discovered 10 families and 12 species in Buner. They reported 9 families in which *Lycosidae* was the largest family with ten species, while *Clubionidae*, *Scytodidae* and *Sparassidae* are the smallest families having only one species. Our study explored the families *Theridiidae*, *Caponidae*, *Ctenidae* and *Selessopidae* that are not observed by them. Their work reported the family *Salticidae* represented by 2 species, *Sparassidae* by 1, *Pholcidae* by 2, *Gnaphosidae* by 2, *Lycosidae* by 10, *Scytodidae* by 1, while we found family *Salticidae* represented by 1 species, *Sparassidae* by 2, *Pholcidae* by 1, *Gnaphosidae* by 1, *Lycosidae* by 2 and *Scytodidae* by 2 species. The families discovered by them like *Thomsidae*, *Clubionidae* and *Aranidae* were not found anywhere in Buner. In our work we have collected 10 families with their relative abundance (Table 1, 5 & 6). The diversity difference of spider fauna in our study as compared to the previous work in the same province may be due to the limited area of our study, the geographical and ecological differences.

Sing *et al.* [13] reported that the spider fauna exhibits great diversity with location. Most of the families and species of spiders in our research have been reported from other parts of the country with different relative abundance (Table 6). As the earlier scientists and explorer mentioned that spider fauna is

enriched in warm areas. The similar situation was observed in the current research. The spider populations have been reported as decreasing when the weather changed from summer to winter. Similarly (Chetia and Kalita, 2012) [3] reported that most of the important factors are the availability of food (small insects) and environmental changes which play major role in the distribution of spiders in different geographic sites. They reported plenty of spider species from warmer regions as compared to cold regions. Different geographic sites have their specific climatic conditions responsible for diversity of spiders. Our study shows consistency with the above reports because we observed the diversification of spiders in warmer points as compared to cold region in the same district. Therefore, our study suggests that warmer areas are enriched with spider fauna as compared to moderate and cold areas of the region (Table 3 & 4). The spider fauna recorded in the present study is somewhat different from Sindh (Ursani and Soomro, 2010) [1], Peshawar and FATA, KPK (Perveen and Jamal, 2012) [9], because the climate and habitat of the areas mentioned in their studies are different from the present research area. This is a preliminary survey and more extensive study of spider biodiversity is needed. It is expected that further studies will explore many more and some interesting species from this ecological and agriculturally important area of the Khyber Pakhtunkhwa.

4. Authors Contribution

Conceived and designed the research: JK. Performed the experiments: AZ. Analyzed the data: JK AZ. Contributed reagents/materials/analysis tools: JK. Wrote the paper: AZ. Provided suggestions and comments on the manuscript: JK

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