Spider (Araneae: Arachnida) fauna of district Charsadda Khyber Pakhtunkhwa Pakistan

Nadia Nooreen, Muhammad Zahid and Muhammad Rasool

Abstract
The present study was carried out to explore the diversity of spiders’ fauna from District Charsadda KPK, Pakistan, from March, 2015 to January, 2017. A total of 20,055 specimens were collected representing 44 species under 29 genera and 15 families. The family Araneidae was represented by 4 species, Clubionidae by 3 species, Corinnidae by 1 species, Gnaphosidae by 3 species, Hersiliidae by 1 species, Lycosidae by 3 species, Oxyopidae by 4 species, Pisauridae by 1 species, Salticidae by 10 species, Scytodidae by 1 species, Sparassidae by 2 species, Tetragnathidae by 3 species, Theridiidae by 2 species, Thomisidae by 5 species and family Trochanteriidae by 1 species in the study area. The most dominant family in the area was Salticidae followed by Sparassidae. All of the species were reported for the first time from the study area.

Keywords: Spider, salticidae, sparassidae, thomisidae, Arenadai, clubionidae

1. Introduction
Spiders belong to the order Araneae of the Class Arachnida of the Phylum Arthropoda, the most abundant and species rich order of the Phylum with 38,000 identified species from all over the world [1]. The number may be greater and there is a possibility of 170,000 species [2]. Others believe that about 200,000 species may exist. Although all species of the spiders are venomous, but only 40 species are potentially poisonous to humans [3]. Spiders being the largest order of arachnids, rank seventh among all other orders of organisms in total species diversity [4]. It is proposed that spiders existed round about 400 million years ago and the earliest reported spiders were larger in size having segmented body while all recent spider species have unsegmented abdomen except members of the suborder Mesothelae [5].

Spiders are air-breathing having eight legs and chelicerae with fangs for injecting venom. During prey manipulation, a spider uses pedipalps which are located on the tarsi of the appendages and in this way provides chemosensory information [6].

The Spiders are carnivorous and voracious predators feeding on various types of insects and their larvae protecting our crops from the dangerous insect pests [7]. Due to there this function they can be used as good biocontrol agents [8]. Spiders can also be used as bioindicators to evaluate anthropogenic disturbance in natural ecosystems [9]. They are useful in many terrestrial habitats in regulating the population of insects [10].

There is a lot of variation in the size and colour of spiders. The largest of the spiders is the giant bird eating spider, Theraphosid (Thorell) about 75 mm long with a leg length of 25 mm. The size of female spider is larger than male. During metamorphosis in spiders the hard old exoskeleton is replaced causing increase in size [11].

Every habitat is virtually occupied by Spiders having wide range of life styles, morphological adaptation and behaviours [12]. Spiders are literally found everywhere; on trees, under stone or logs, in rubbish and leaf litter on forest floor [10]. They inhabit ground, underground tunnels systems, near water but they like moist places. Many species including the water spiders (Argyroneta aquatic) also use seaside and fresh water as their territory [5].

According to an updated report, 110 families of spider fauna belonging to 3859 genera and 42,751 species worldwide have been documented [13].

Another recorded study from Turkey reports more than 42,055 described species in which 757 species of Araneae belonging to 265 genera and 48 families [14]. 95 species of spiders belonging to 56 genera and 18 families are reported from India [15]. Although the world spider fauna is well documented, the exact data for certain countries like Pakistan are lacking. Pakistan has rich and diverse habitats for spiders but there exists no consolidated account on
its fauna. Therefore, there is a need to properly explore the area and document its diverse fauna. The present study was carried out to explore the diversity of spiders fauna from District Charsadda Pakistan.

2. Materials and Methods

2.1 Study Area

The district Charsadda lies between 71-28' and 71-53' east longitudes and 34-03' and 34-38' north latitudes and with an altitude of 276 metres (908 feet). The district Charsadda is bounded by Mardan district to the east, Malakand District to the north, Mohmand Agency of FATA to the west and Nowshera and Peshawar districts to the south [16] (Fig. 1).

![Fig 1: Map of the Study Area.](image)

In the central plain of the Peshawar valley lies district Charsadda. At a point near the south west of the district, enters the River Kabul which flows along the southern boundary of the district. Water of this river cross the district in the extreme south eastern corner. It covers an area of 2,296 km² and its population is round about 334,453 [16]. The Charsadda district has extreme climate. The summer season is extremely hot. A steep rise of temperature is observed from May to June. Even July, August and September record quite high temperatures. During May and June, dust storms are quite frequent at night. The temperature reaches to its maximum in the month of June. Due to the intensive cultivation and irrigation the tract is humid and the heat is oppressive. A rapid fall in temperature is recorded from October onwards. The coldest month is January. Towards the end of the cold weather there are occasional thunderstorms and hail storms. The maximum rainfall is received in July and August during which the weather becomes hot and humid. The relative humidity is quite high throughout the year. Maximum humidity is recorded in December. In the Charsadda, the average winter rainfall is higher than that of the summer rainfall [16].

Lands of Charsadda are very fertile producing various important crops. Most of the area is under cultivation of different types of crops providing habitat for different kinds of invertebrates. Among them spiders are dominating member of the community. Moreover, in the past, they have been rarely studied because most of the researchers call them as less important organisms [17].

2.2 Sample Collection

The spiders were collected from seven different localities of Charsadda (tangi, sherpao, umarzai, turangzai, utmanzai, rajjar, prang and forest of tharnao doaba) of District Charsadda during March 2015- January 2017 through active search by visiting various habitats like urban area, villages, homes, poultry farms, agricultural fields, unmanaged land and river/stream banks (Fig. 2).

![Fig 2: Various Habitats searched for spider collection](image)

Aerial sampling (for upper layer spiders up to 1.5 m) involved searching leaves, branches, tree trunks, and spaces in between, from knee height up to maximum overhead arm’s reach.

2.3 Sampling methods

Sampling was carried out over three periods, summer (March 2015 – June 2015), monsoon (July 2015–October 2015) and winter (November 2015–February 2016) and same three periods were selected up to February 2017.
2.3.1 Ground collection
(for ground layer spiders) involved searching on hands and knees, exploring the leaf litter, logs, rocks, and plants below low knee level. Beating (for middle layer spiders up to 1 m) consisted of striking vegetation with a 1m long stick and catching the falling spiders on a tray held horizontally below the vegetation. Litter sampling was done by hand sorting spiders from leaf litter collected in a litter collection tray.

2.3.2 Foliage dwelling spiders
Sweep netting (for middle layer spiders up to 1 m) will be carried out in order to access foliage dwelling spiders.

2.4 Preservation of spiders
The spiders were searched visually and collected from the surveyed areas generally at the time of morning and night. The sampling methods used were jarring when foliage spider’s collections, and manual hand picking by plastic bags and jars, were labelled. Finally spiders were preserved in vials in 70% ethylene alcohol with 20% of glycerine prepared for ecological studies.

2.5 Identification of the specimens and photography
The specimens were brought to the laboratory and studied under stereo microscope (XTD-2A China) for various spiders from leaf litter collected in a litter collection tray.

3. Results
The present study was conducted from March, 2015 to February, 2017 to determine the spiders’ fauna of DistrictCharsadda Pakistan. A total of 2005 specimens were collected representing 44 species under 29 genera and 15 families. The most dominant and species rich family observed during the study was Salticidae. Family wise distribution of the species was: Araneidae 4 species, Clubionidae 3 species, Corinnidae 1 species, Gnaphosidae 3 species, Hersiliidae 1 specie, Lycosidae 3 species, Oxyopidae 4 species, Pisauridae 1 specie, Salticidae 10 species, Scytodidae 1 specie, Sparassidae 2 species, Tetragnathidae 3 species, Theridiidae 2 species, Thomisidae 5 species, Trochanteriidae 1 species (Table 1). The detailed of the families along with the reported species is given as under.

3.1 Family Araneidae (Simon, 1895)
Four species under four different genera of the family were identified as i) Eriophora transmarina (Keyserling, 1865) commonly known as Garden orb weaver spider; ii) Argiope keyserlingi (Karsch, 1878) generally known as St Andrew's cross spider; iii) Neoscona crucifera (Lucas, 1839) with a common name Hentz orb weaver; and iv) Backobourkia heroine (L. Koch, 1871) generally called Wheel weaver spider.

3.2 Family Clubionidae (Wagner, 1887)
Three species of this family representing one genus were collected during the present study from the area. i) Clubiona corticalis (Walckenaer, 1802) commonly called Sac spider, ii) Clubiona comta (C. L. Koch, 1839), iii) Clubiona pallidula (Clerck, 1757).

3.3 Family Corinnidae (Karsch 1880)
Only one species Falcolina gracilis (Keyserling, 1891) commonly called ground dweller was collected.

3.4 Family Gnaphosidae (Pocock, 1898)
The family was represented in the area by three species of the same genus. i) Zeolotes duplux Chamberlin 1922, ii) Hentzia carolinensis (Walckenaer, 1805), and iii) Zeolotes funestus (Keyserling, 1887), iii) Zeolotes longipes (L.Koch, 1866).

3.5 Family Hersiliidae (Thorell, 1870)
One species of Bark spider Hersilia savignyi (Lucas, 1836) representing the family was collected.

3.6 Family Lycosidae (Sundevall, 1833)
Three species of three different genera of the family collected were i) Schizocosa mecooki (Montgomery, 1904), ii) Hogna carolinensis (Walckenaer, 1805), and iii) Tigrosa helluo (Walckenaer, 1837).

3.7 Family Oxyopidae (Thorell, 1870)
Four species of the same genus were collected. Sometimes the members of this family is called Lynx spider. i) Oxyopes variabilis L. Koch 1878, ii) Oxyopes salticus (Hentz, 1845), iii) Oxyopes macilentus L. Koch, 1878, and iv) Oxyopes javanus Thorell, 1887.

3.8 Family Pisauridae (Simon, 1890)
Only one species of this family, Dolomedes instabilis (L. Koch, 1876) also commonly called as Nursery web of fishing spider was collected.

3.9 Family Salticidae (Blackwell, 1841)
The members of this family are also known as jumping spiders. This was the most abundant family of area and ten species were reported during the present study. i) Trite auricoma Urquhart, 1886, ii) Menemerus bivittatus (Dufour, 1831), iii) Hentzia mitrata (Hentz, 1846), iv) Epocilla aurantiaca (Simon, 1885), v) Epocilla calcarata (Karsch, 1880), vi) Epocilla biairei Zakba, 1985, vii) Menemerus similimatus (Carl Wilhelm Hahn 1827), viii) Macaroeris midcolens (Walckenaer, 1802), ix) Plexippus paykulli (Audouin, 1826) and x) Phintella vittate (C L Koch 1846).

3.10 Family Scytodidae (Blackwall, 1864)
Only one species of this family, Spitting spider, Scytodes thoracica (Latreille, 1804) was collected.

<table>
<thead>
<tr>
<th>S No.</th>
<th>Families</th>
<th>Natural history</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Araneidae</td>
<td>Orb web spider</td>
<td>7.58%</td>
</tr>
<tr>
<td>2</td>
<td>Clubionidae</td>
<td>Bark sac spider</td>
<td>0.69%</td>
</tr>
<tr>
<td>3</td>
<td>Corinnidae</td>
<td>Antmimic/gound sac spider</td>
<td>0.29%</td>
</tr>
<tr>
<td>4</td>
<td>Gnaphosidae</td>
<td>Ground spider</td>
<td>0.34%</td>
</tr>
<tr>
<td>5</td>
<td>Hersiliidae</td>
<td>Two tailed/bark spider</td>
<td>1.04%</td>
</tr>
<tr>
<td>6</td>
<td>Lycosidae</td>
<td>Wolf spider</td>
<td>1.24%</td>
</tr>
<tr>
<td>7</td>
<td>Oxiopidae</td>
<td>Lynx spider</td>
<td>1.89%</td>
</tr>
<tr>
<td>8</td>
<td>Pisauridae</td>
<td>Fishing spider</td>
<td>1.99%</td>
</tr>
<tr>
<td>9</td>
<td>Salticidae</td>
<td>Jumping spider</td>
<td>23.74%</td>
</tr>
<tr>
<td>10</td>
<td>Scytodidae</td>
<td>Spitting spider</td>
<td>0.19%</td>
</tr>
<tr>
<td>11</td>
<td>Sparassidae</td>
<td>Huntsman spider</td>
<td>9.92%</td>
</tr>
<tr>
<td>12</td>
<td>Tetragnathidae</td>
<td>Stretched/long jawed spider</td>
<td>5.48%</td>
</tr>
<tr>
<td>13</td>
<td>Theridiidae</td>
<td>House spider</td>
<td>2.39%</td>
</tr>
<tr>
<td>14</td>
<td>Thomisidae</td>
<td>Crab spider</td>
<td>1.29%</td>
</tr>
<tr>
<td>15</td>
<td>Trochanteriidae</td>
<td>Flat rock spider</td>
<td>0.09%</td>
</tr>
</tbody>
</table>
3.11 Family Sparassidae (Bertkau, 1872)
Two species representing two different genera were collected.
i) Holconia immanis (L. Koch, 1867), ii) Heteropoda venatoria Linnaeus 1767).

3.12 Family Tetragnathidae (Menge, 1866)
The members of this family are commonly known as Long jawed or four jawed spiders. Two species representing one genus were collected. i) Tetragnatha extensa (Linnaeus, 1758), ii) Tetragnatha montana (Simon, 1874).

3.13 Family Theridiidae (Sundevall, 1833)
Two species of this commonly known House Spider family were collected from the study area. i) Steatoda Triangulosam (C. A. Walckenaer, 1802), ii) Steatoda paykulliana (Walckenaer, 1805).

3.14 Family Thomisidae (Sundevall, 1833)
Five species of the family commonly known as Crab spiders, belonging to three genera were collected. i) Thomisus spectabilis (Walckenaer, 1805), ii) Thomisus stoliczka (Thorell) 1887, iii) Synalus angustus (Koch, 1876), iv) Tmarus angulatus (Walckenaer, 1837), v) Tmarus marmoreus (L. Koch, 1876):

3.15 Family Trochanteriidae (Karsch, 1879)
Only one species of the Flat Rock Spider, Morebilus plagiusus (Walckenaer, 1837) was collected.

Table 2: Taxonomy of the collected Spider species recorded during the study

<table>
<thead>
<tr>
<th>S.no</th>
<th>Family</th>
<th>Genus/body length</th>
<th>Species (Scientific name)</th>
<th>Common name</th>
<th>Natural history</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Araneidae (Simon,1895)</td>
<td>Eriophora ♀20 – 25 mm ♂ 15 – 17 mm</td>
<td>Eriophora transmarina (Keyserling, 1865)</td>
<td>Garden orb weaver spider</td>
<td>Orb web spider</td>
</tr>
<tr>
<td>2</td>
<td>Argiope</td>
<td>Clubiona ♀ are 7–10 mm, ♂ 6–10 mm</td>
<td>Clubiona corticalis (Walckenaer, 1802)</td>
<td>Bark sac spider</td>
<td>Bark of dead trees, sometimes in houses</td>
</tr>
<tr>
<td>3</td>
<td>Neoscona</td>
<td>Zelotes ♀ 9-19mm, ♂ 8-15mm</td>
<td>Zelotes duplex (Chamberlin, 1922)</td>
<td>Ground Spiders</td>
<td>Ground dweller</td>
</tr>
<tr>
<td>4</td>
<td>Backbourkia</td>
<td>Schizocosa ♀ 9.6-22.7mm ♂ 9.1-15mm</td>
<td>Schizocosa mccooki (Montgomery, 1904)</td>
<td>Wolf Spider</td>
<td>Ground Dweller</td>
</tr>
<tr>
<td>5</td>
<td>Hersilia</td>
<td>Hogna ♀ 4-25mm ♂ 19mm</td>
<td>Hogna carolinensis (Walckenaer, 1805)</td>
<td>Carolina wolf spider</td>
<td>Ground Dweller</td>
</tr>
<tr>
<td>6</td>
<td>Tigrosa</td>
<td>Tigrosa helluo (Walckenaer, 1837)</td>
<td>Wolf spider</td>
<td>Ground Dweller and under rocks</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Oxyopidae (Thorell, 1870)</td>
<td>Oxyopes ♀ 7mm ♂ 5mm</td>
<td>Oxyopes variabilis (L. Koch, 1878)</td>
<td>Lynx spider</td>
<td>Vegetation, favouring grasses</td>
</tr>
<tr>
<td>8</td>
<td>Oxyopidae</td>
<td>Oxyopes ♀ 5-6mm, ♂ 4-5mm</td>
<td>Oxyopes salticus (Hentz, 1845)</td>
<td>Striped Lynx Spider</td>
<td>Grasses and leafy vegetation; grassy, weedy fields, and row crops</td>
</tr>
<tr>
<td>9</td>
<td>Oxyopidae</td>
<td>Oxyopes ♀ 10 mm ♂ 9 mm</td>
<td>Oxyopes macilenta (L. Koch, 1878)</td>
<td>lean lynx spider</td>
<td>Grassy areas and rice fields</td>
</tr>
<tr>
<td>10</td>
<td>Oxyopidae</td>
<td>Oxyopes ♀ 6-8 mm ♂ 5-7 mm</td>
<td>Oxyopes javanus (Thorell, 1887)</td>
<td>Striped lynx spider</td>
<td>Forage on the upper surfaces of green leaves and bushes.</td>
</tr>
</tbody>
</table>
4. Discussion
The present study shows the dominance of ground dwelling spiders like Salticidae, Sparassidae and Araneidae in different habitats of District Charsadda KPK, Pakistan. The district has extreme climate with an extreme hot summer season. In district Charsadda, most of the area is under cultivation of different types of crops that provides different habitats for different kinds of invertebrates. A more diverse community of spiders is supported by complex herbs and shrubs [23]. Among them spiders are most dominating member of the community. Moreover, in the past, they have been rarely studied because most of the researchers call them as less important organisms [19]. A total of 44 species (Table 2 and 3) belonging to 29 genera and 15 families were recorded from the study area during March 2015- February 2017.

Most dominant species of domestic habitate were Plexippus paykoli and Argiope keyserlingi. In forest habitat Leucoge drumadaria and Macaroeris nidicolens were dominant species. In the stream bank habitat, Tetragnatha straminia and Oxyopes javanus were dominant species. On the other hand in the crops fields’ species Phintella vitata and Oxyopis variabilis and that of hilly habitat species Plexippus paykoli and Holcomia immanis were most dominant. Similarly species Uloborus diversus and Palystus castanus were dominant in garden habitat, while the remaining species listed here were less frequent.

A total of 1098 araneid species including 38 species, 22 genera and 9 families were recorded from citrus field in Lahore, Pakistan [21]. The most dominant family was Araneidae, Eriophora, Argoipe, Neoscona, and Backobourkia. There was found only one genus each in Family Clubionidae as genus Clubiona, genus Zelotes in family Gnaphosidae and genus Hersila in family Hersiliidae. In the current research it was studied that Family Lycosidae was represented by Schizocosa, Hogna and Tigrosa. One genus was studied as Oxyopes in family Oxyopidae and Dolomedes in family Pisauridae. Seven genera as Trite, Phintella, Plexippus, Menemerus, Epocilla, Hentzia, Macaroeris were recorded in Family Salticidae. One genus Scytodes was recorded in family Scytodidae. Two genera as Holconia and Heteropoda in the family Sparassidae were found. In the present study family Tetragnathidae consisted upon one genus as Tetragnatha and one genus Steatoda in family Theridiidae. Three genera as Thomisus, Synalus and Tmarus belong to family Thomisidae and one genus Morebilus was recorded in family Trochanteridae (Table 2).

The aim of the present research was to identify the spider families, genera and species present at district Charsadda in different habitats. An overview of the result showed that the most abundant among all fourteen families during the whole trapping session was family Salticidae. The order of abundance of the families was Salticidae > Thomisidae > Araneidae > Oxyopidae > Lycosidae > Clubionidae > Gnaphosidae > Tetragnathidae > Sparassidae > Theridiidae > Corinidae > Hersiliidae > Scytodidae > Trochanteridae (Table 1). There is a need of more research for determining relationship between patterns for spiders’ distribution and management practices.

Further study is required for differences in the community compositions among different management practices which are helpful to determine spider inhabitants. This knowledge may prove to be helpful for manipulating agricultural habitats for maintaining and enhancing spider population in the field of integrated pest management.

5. Conclusion
This study provides baseline information for the occurrence, abundance and ecology of the different species of spiders. The present study will help us to work for specifying the hidden benefits in spiders and the conservation of the species. Araneidae, Clubionidae, Corinidae, Gnaphosidae, Hersiliidae, Lycosidae, Oxyopidae, Pisauridae, Salticidae, Scytodidae, Sparassidae, Tetragnathidae, Theridiidae, Thomisidae and Trochanteridae are the predators in different habitats like meadows, Forest, garden, crops fields, stream banks, hills, tree trunks and domestic level. Spiders in these...
areas are feeding on small insects like aphids, moths, beetles, grasshoppers and butterflies etc thus helps suppressing insect pest and provide maintenance of ecological equilibrium [23]. Therefore by rearing spiders can be used as biocontrol media where needed. The present study provides information about the distribution of different spider species in a particular habitat with response to disturbance, availability of food, and environment. Reporting 44 species of 15 families show that the area has a great potential and diverse fauna therefore, a proper exploration of the area fauna is required.

6. Acknowledgment
This study is a part of the Ph.D work of the first author, and she is thankful to all those who helped her in the collection and preservation of the samples.

7. References