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Research paper

Study of diversity and population status of araneid fauna of Talash Valley, Dir (L) Pakistan

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Abstract

Spiders are invertebrates belonging to the phylum Arthropoda, class Arachnida, and order Araneae. Arachnids are one among the largest and most diverse groups, with 129 families, 4234 genera and 49,773 species. Spiders are carnivorous and polyphagous in nature. They are most effective against pests. This study was carried out to examine the arachnoid fauna status and diversity in Talash Valley, Lower Dir district of KPK. Spiders were collected from different parts of the study area. The surveyed period wss from April to July 2022 and was done by hand picking and beet crushing method. Most spiders are collected by hand. The collected samples were then stored in 70% ethanol solution. Spiders are identified with the help of available information. A total of 10 families were identified. These are Salticidae, Lycosidae, Sparassidae, Pholcidae, Hersilidae, Gnaphosidae, Oxyopidae, Araneidae, Scytodidae and Theridiidae. The dominant families in this study are salicidae with three species, lycosidae and sparassidae with two species each, and seven other families with one species each.

Keywords: *Spider; Fauna; Population Status; Talash Valley; Pakistan.*

1. Introduction

Spiders belong to the phylum Arthropoda, class Arachnida, and order Araneae. Araneae is among the largest and most diverse groups, with 129 families, 4,234 genera, and 49,773 species (World Spider Catalog, 2021). Spiders are an ancient and successful group of invertebrates known as poisonous arthropods. Most species are poisonous, but 40 species are more toxic to humans Qasim et al. (2015), Noreen et al (2017).

Some scientists believe that spiders evolved in Sea water some 400 Million years ago. Two groups of spiders then developed; having a set of leg muscles, and the other group lacked these muscles. Its stomach was first fragmented and then became intact. The oldest spiders are in the suborder Mesothelium which was present in the Devonian period (410-360 my) in the United States (New York). Segmented-bellied spider fossils were found during the Carboniferous period (360-290 my) Ghazanfar et al. (2016).

Pakistan has many habitats and rich arthropod fauna, but no reliable information about spiders exists, Muhtar et al (2012). The different habitats of the order Araneae are land, houses, forests, meadows, forests, fields, and flowers, and they can even lead an amphibious life. Ghafoor and Mahmoud (2011). They live in many habitats, both underground and above ground. They also live on land and near water sources. They usually occur in wet areas. Some will cross the sea and fall into the water (Perveen et al. 2016). Their distribution is often affected by environmental changes, different plant communities, various abiotic factors, and influences. Spiders are often ecologically specialized because they adhere to a specific prey group.

studied fauna differ in different locations, which is important regarding species richness and diversity (Jarrio et al. 2016). Habitat heterogeneity has been shown to have a significant impact on the abundance and diversity of spider species in natural and agricultural ecosystems (Shabnam et al. 2021). Thanks to the web that allows spiders to create many places on the ground, they can survive in extreme weather conditions from one place to another. Some spiders can travel up to 30 km per day. Spiders are missing almost anywhere in the world (Nyffeler and Birkhofer, 2017). Spiders come in all colors and sizes. They are mostly found as predators in terrestrial ecosystems. They are found in soil, under rocks, in underground channels, and in many habitats near water, but are most likely to live in wet areas. Their metamorphosis occurs through ecdysis (molting). Replacing old skin with new helps it grow (Sajid et al. 2021).

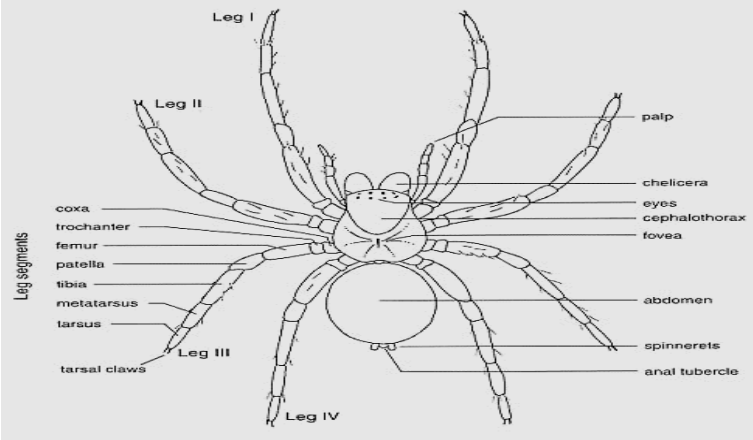

Fig. 1: Morphology of Spider.

2. Materials and methods

2.1. Study area

This study was carried out in Talaṣh valley. Talash is located in Dir (L) KPK district of Pakistan. The area of activity is 34º 44″ 27′ north latitude and 71º 52″ 38′ east longitude. Summers in Talaṣh are longer than winters. The hottest months of the year in Talaṣh hare June and July, and the coldest months are December and January. There are many agricultural areas, hilly areas, and buildings in Talaṣh that provide habitat for various arthropods, including spiders.

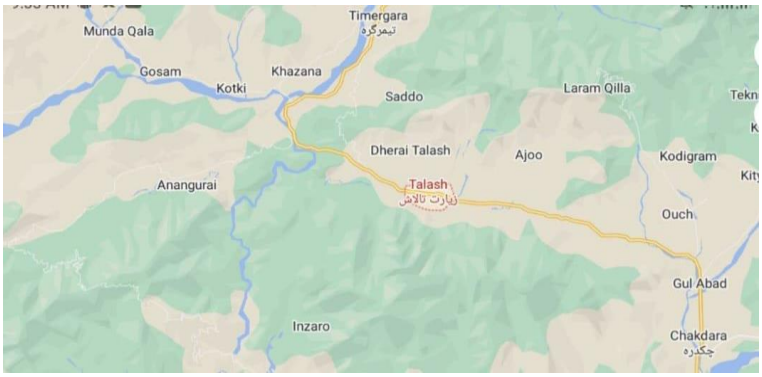

Fig. 2: Map of Talash.

2.2. Material required

Gloves, plastic bags, ethanol (70%), bottles and jar.

2.3. Spider collection

The spiders were collected by hand picking and beat sheet method (jerking the plants over a white cloth). The sampling was done from April 2022 to July 2022. The picture was taken from the live specimen at the time of collection for identification. The spiders were collected both indoors and outdoors, from walls, ground, under stones, plants, and marshy places. Spiders were collected from Bajawro, Khatkaly, Ziarat, Shamshikhan, and Gumbad.

2.4. Photography

For photography, high megapixel digital camera was used.

2.5. Preservation

Collected Spiders were stored in 70% ethyl alcohol with proper labeling of locality, date of collection, and other notes of importance.

2.6. Identification

Identification of spiders was done by using a microscope, identification app (picture insect), available keys (Pocock, 1900; Tekedar, 1980; Roberts, 1995; Sebastian and Peter, 2009). The eye pattern is very helpful in identification because different families have different eye arrangements.

3. Results

In the current study a total of 10 families, 13 genera and 14 species were identified.

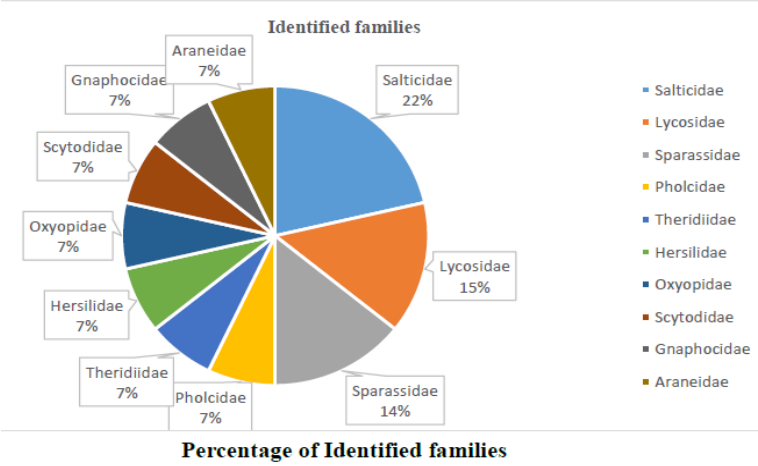

Fig. 3: Percentage of Identified Families.

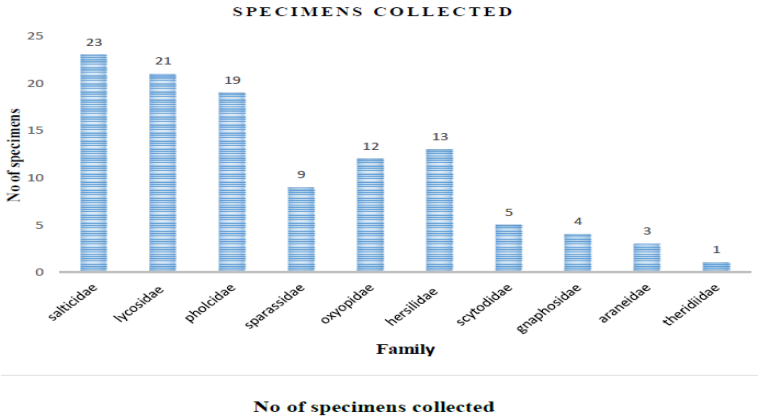

Fig. 4: Graph of Number of Specimens of Identified Families.

3.1. Family salticidae (jumping spider)

3.1.1. Plexippus paykulli (audouin, 1826)

Fig. 5: Plexippus Paykulli.

- Description

The male has a black carapace and belly with a wide longitudinal white stripe in the middle and white stripes on each side. They have two white bumps near the end of their abdomen. They have eight eyes in three rows. The middle eyes are larger and more prominent. The abdomen is oval, first longer, then wider, narrower at the tip. Its body is short-haired. The legs are thick and strong and covered with hair. It is mostly seen in residential areas (Wikipedia).

- Systematic position
- Class Arachnida
- Order Araneae
- Family Salticidae

- Genus Plexippus
- Specie P. paykulli

3.1.2. Menemerus bivittatus (dufour, 1831)

Fig. 6: Menemerus Bivittatus.

- Description

These animals are flattened dorsally and ventrally. They have eight eyes in three rows. There are four eyes in the front row, with the front middle eye being larger. In the second row, there are two small eyes. There are two eyes in the third row. The female's body color is gray or brown with vertical black stripes on each side that meet at the rear end of the abdomen. Its shell is longer than it is wide and has thin white stripes on both sides. The anterior part of the abdomen is broadly oval and usually larger than the cephalothorax. The whole body is covered with short and dense gray-white hair.

- Systematic position
- Class Arachnida
- Order Araneae
- Family Salticidae
- Genus Menemerus
- Species M.bivittatus

3.1.3. Menemerus nigli (wesolowska & freudenschuss, 2012)

Fig. 3.1.3: Menemerus Nigli.

- Description

The Body color is brown or grey. They have eight eyes in three rows. The front eye is large and important. The middle eye at the back is quite small in size. These spiders are dorsally and ventrally flattened and covered with short, dense gray-white hair. The abdomen is oval and has a pointed rear end. There is a white band around the edge of their shell. It has small black claws. The legs are light brown with dark rings and patches. Most of them are on the walls of buildings.

- Systematic position
- Class Arachnida
- Order Araneae
- Family Salticidae
- Genus Menemerus
- Species M. nigli

3.2. Family hersiliidae (two tailed spider)

3.2.1. Hersilia savignyi (lucas, 1836)

Fig. 3.2.1: Herssilia Savignyi.

- Description

Their bodies are dark brown and gray and they are often camouflaged according to their surroundings. The abdomen is flat, and the posterior end is rounded. The cephalothorax is smaller than the abdomen. Chelicerae are small and weak. Fovea now. They have eight eyes arranged in two rows. The front central eye is sharp, large, and bright. Very long legs. The femur, tibia, and metatarsals are longer than the sole, trochanter and patella. Tarsi has three claws for attachment. The third leg is shorter than the third pair. The cardinal points are arranged symmetrically on both sides. The rear spindle is very long. There are dark circles on the legs and spinnerets. They have long spinnerets that help with identification.

- Systematic position
- Class Arachnida
- Order Aranae
- Family Hersiliidae
- Genus Hersilia
- Specie H. savignyi

3.3. Family oxyopidae

Also called lynx spider.

3.3.1. Oxyopes javanus (thorell, 1887)

Fig. 3.3.1: Oxyopes Javanus.

- Description

Their bodies are long and delicate; It is approximately four times their width. They have eight eyes; They have two small eyes in the front row, and the remaining six eyes form hexagons. The carapace is longer than it is wide, and the head is long and narrow. Body color varies from pale white to yellow and green with black and white vertical stripes. The lower part of the abdomen is long and narrow. The legs are covered with black spines. Tarsus has three claws. Labialis is very high and vertical. Men are short. The upper jaw and lips are long. The longest body of females is 10 mm, and that of males is up to 9 mm. They are diurnal active predators that prey on invertebrates on plants.

- Systematic position
- Class Arachnida
- Order Aranaea
- Family Oxyopidae
- Genus Oxyopes
- Specie O. javanus

3.4. Family scytodidae (spitting spider)

3.4.1. Scytodes thoracica (latreille, 1802)

Fig. 3.4.1: Scytodes Thoracica.

- Description

Body colors are light brown and buff with characteristic dark markings. The anterior part of the shell is sloping downwards and the ventral part is sloping downwards. These spiders have six eyes divided into three pairs. There is no fovea. Chelicerates have short, thick teeth. The color of the lips and the upper jaw is similar to the sternum. The upper jaw is elongated, and longer than wide. Legs and whiskers are yellowish brown. These spiders do not create webs. It spits a poisonous, sticky substance at its creatures. The female carries a clutch of eggs attached to a spinneret on the ventral side of her body.

- Systematic position
- Class Arachnida
- Order Araneae
- Family Scytodidae
- Genus *Scytodes*
- Species *S. thoracica*

3.5. Family araneidae (orb weavers)

3.5.1. *Neoscona theisi* (Walckenear, 1841)

Fig. 3.5.1: *Neoscona theisi.*

- Description

They have eight eyes arranged in two rows. The outer eye is far from the middle eye. The front line is slightly curved backward. Although its body color is brown, it can also be in different colors. Their abdomen is triangular and covered with spines. The legs have alternating light brown and black stripes and are covered with numerous spines. The first pair of legs is the longest, and the third pair is the shortest.

- Systematic position
- Class Arachnida
- Order Aranae
- Family Araneidae
- Genus *Neoscona*
- Species *theisi*

3.6. Family sparassidae

Also called huntsman spider. These are fast moving spiders.

3.6.1. *Heteropoda afghana* (roewer, 1962)

Fig. 3.6.1: *Heteropoda afghana*

- Description

This spider has eight eyes in two rows, four in the front row and four in the back row. This spider is brown and has dark spots on its body and abdomen. They have strong, curved teeth. There are rows of teeth on the chelical margin. It has long brown legs covered with feathers and spines. Two tarsal claws. Hunting spiders do not create webs.

- Systematic position
- Class Arachnida
- Order Araneae
- Family Sparassidae
- Genus *Heteropoda*
- Specie *H. afghana*

3.6.2. Olio stimulator (simon, 1897)

Fig. 3.6.2: *Olios stimulator*.

- Description

They have eight eyes arranged in two rows. There are four eyes in the front row and four smaller eyes in the back row. The medial eye is slightly larger than the anterolateral eye. Body colors are light brown and light yellow. The abdomen is oval and covered with a thick layer of fine hairs.

Dark-colored swelling sticking to the selected area in the abdomen. The labrum is much narrower. It has long, broad black claws with toothed edges. Its legs are very long and are 15 centimeters long.

- Systematic position
- Class Arachnida
- Order Araneae
- Family Sparassidae
- Genus *Olios*
- Species *O. stimulator*

3.7. Family Gnaposidae (Ground spider)

3.7.1. *Scotophaeus faisalabadiensis* (Ghafoor & Beg, 2002)

Fig. 3.7.1: *Scotophaeus faisalabadiensis.*

- Description

Its carapace is reddish brown. The belly is gray-brown with short and thick hair. The abdomen is long and has a pair of long spinnerets. The eyes are arranged in two rows. The middle of the eye is closer to the neighboring eye than to each other. The legs are also dark brown and covered with small bark-like hairs. Adult males can reach 9 mm in length. The female body length is 12 months. Instead, they don't let online harassment get to them. It is found in the bark of trees in the surroundings and houses.

- Systematic position
- Class Arachnida
- Order Araneae
- Family Gnaphosidae
- Genus *Scotophaeus*
- Species *faisalabadiensis*

3.8. Family Pholcidae (Daddy long legs spider)

3.8.1. *Pholcus phalangioides* (Fuesslin, 1775)

Fig. 3.8.1: *Pholcus phalangioides.*

- Description

Its carapace is almost round and has the same width as its length. The abdomen is long and round-oval in shape. The middle eye is smaller than the other eye, while the anterolateral and posterior eyes (triad eye group) are slightly larger on each side of the shell. Their body color is brown and grey. Very long legs. The female carries the eggs wrapped in her chelicerae. Females are 8-10 mm long; males are slightly smaller. Spider larvae are transparent and have short legs. It is usually found in the corners of houses and buildings.

- Systematic position
- Class Arachnida
- Order Araneae
- Family Pholcidae
- Genus *Pholcus*
- Specie *P. phalangioides*

3.9. Family Theridiidae (Cobweb spider)

3.9.1. *Latrodectus hasselti* (Thorell, 1870)

Fig. 3.9.1: *Latrodectus hasselti.*

- Description

Body color is black. Females have an orange or red stripe on the back of their abdomen. The stomach is spherical. The cephalothorax is smaller than the abdomen and is black. It has eight small eyes made in two rows. The first pair of legs is usually the longest, while the third pair is the shortest. They have toothless chelicerae. Very small ones. The body length of females is approximately 10 months, while males have a body length of 3-4 months.

- Systematic position
- Class Arachnida
- Order Araneae
- Family Theridiidae
- Genus *Latrodectus*
- Species *L. hasselti*

3.10. Family Lycosidae (Wolf spider)

3.10.1. *Hogna radiate* (Latreille, 1817)

Fig. 3.10.1: *Hogna radiata.*

- Description

Body colors are light brown. They have eight eyes in three rows, four small eyes in the first row, two large eyes in the second row, and two middle eyes in the third row. The shell is narrow in the head area and wide in the chest area. The abdomen is oval, brown and covered with soft fur. Chelicerids are black and covered with brown hairs. The legs are covered with thick, brown, small hairs and some spines. These are found in grasses.

- Systematic position
- Class Arachnida
- Order Araneae
- Family Lycosidae
- Genus *Hogna*
- Species *H. radiata*

3.10.2. ***Arctosa littoralis*** **(Hentz, 1844)**

Fig. 3.10.2: *Arctosa littoralis.*

- Description

They have clay colored bodies. They have eight eyes in three rows. There are four little eyes in the front row. There are two large eyes in the middle row and two middle eyes in the back row (4:2:2). Dark spots and spots appear on their body. The chest is wider than the cephalothorax. The stomach is oval. Chelicerae are brown and have serrated edges. It has brown legs covered with spines and hair. There are black spots or rings on both legs. It is found in the sand, on rocks near water, and on the shore (Wikipedia).

- Systematic position
- Class Arachnida
- Order Araneae
- Family Lycosidae
- Genus *Arctosa*
- Species *littoralis*

4. Discussion

This study was conducted on different indoor and outdoor spider species in Talash Valley, Dir lower, Pakistan. Between April and July 2022, spiders were collected from a variety of habitats and niches in the study area, including leaves, trees, under rocks, and swamps. The collected samples were analyzed using a microscope. In this study, a total of 110 samples from 10 families, 13 genera, and 14 species were collected. These families are Salticidae, Lycosidae,Sparassidae, Pholcidae, Theridiidae, Hersilidae, Oxyopidae, Scydidae, Araneidaeand Araneidae. These genera are Plexipus and Menemerus from the Salticidae family, Hogna and Arctosa from the Lycosidae family, Heteropoda and Olios fromthe Sparassidae family, Pholcus from the Pholcidae family, Latrodectus from the Theridiidae family, Hersilia, Ootoopes, Scytodesidae, Scocytoesidaeus, Hersilia, Operxyopes, Scytodesidae, Scoolee. us and Neconosidae, Scytodidae and other families, Gnaphosidae and Araneidae, respectively. The most important family in this study is Halidae because it is widespread and has many habitats. This family is the richest in the world. Tahir et al. (2011) collected a total of 1098 spiders belonging to 9 families, 22 genera, and 38 species in citrus fields in Lahore. The largest family is Gnaphosidae, with 2 species in Tetragnathidae,Thomisidae, and Oxyopidae, and 1 species in Clubionidae. This study shows that the most abundant family is Salticidae, which also includes the families Pholcidae, Theridiidae, Hersilidae, and Scytodidae, which are not represented in their study. Both studies found differences in spider diversity due to collection methods, food availability, and climate change. Riaz and his colleagues collected a total of 1,210 spider samples from three selected crops: oil bean, sunflower, and Indian mustard at the Ayub Agricultural Research Institute in Faisalabad, Pakistan. There are 68species of these spiders belonging to 5 families and 14 genera. They define the families Wolfidae, Thomicidae, Clubionidae, Salticidae, and Philodromidae. This is a comprehensive study covering 10 families. The only families in both studies were Caddisidae and Halidae. In this study, families such as Oxyopidae,Pholcidae, Hersilidae, Theridiidae, Scytodidae, Gnaphosidae, Araneidae, and Sparassidae, which were not included in the study of Riaz et al., we re-identified. Both studies found differences in arthropod fauna because they examined arthropod fauna in regions such as soybean, sunflower, and Indian mustard, and their collections (incorrectly) were also different. Previously, Parveen and Jamal (2012) reported 9 spider families from FR Peshawar. These families are Clubionidae, Scytodidae,Sparassidae, Araneidae, Gnaphosidae, Pholicidae, Salticidae, Thomisidae and Lycosidae. Most of their findings are consistent with the results of the current study, but this study is at a higher level than that of a family in the study conducted by Parveen and Jamal (2012) in FR Peshawar. This increase is due to different spider collection methods and different animals in different places investigate the arthropod fauna of Pir Baba in the KPK district of Buner, Pakistan. In their study, a total of 10families were identified: Sparssidae, Theridiidae, Gnaphosidae, Lycosidae,Scytodidae, Caponiidae, Selenopidae, Ctenidae, Phlcidae and Salticidae. Thisstudy defines 10 families such as Salticidae Sparassidae, Hersilidae,Lycosidae, Theridiidae, Phocidae Araneidae, Scytodidae, Oxyopidae andGnaphosidae. Our family's situation is different from that of education. This difference may be due to the collection method. Noreen et al (2017) conducted a study to explore the diversity of spider fauna in the Charsadda district of KPK, Pakistan. The research period was from March 2015 to January 2017. They identified 15families in their research project. These families are Araneidae, Clubionidae,Corinnidae, Gnaphosidae, Hersilidae, Lycosidae, Oxyopidae, Pisauridae,Salticidae, Scytodidae, Sparassidae, Tetragnathidae, Theridiidae, Thomisidaeand Trochanteriidae. The five-family study differed from the current study by Noreen et al. (2017) conducted a comprehensive study at the district level, while the current study is limited to the union council level. The timing of animal collection also differed between the two studies. Sajid et al (2021) identified 6 spider families in the Dir Lower region. These families are Salticidae, Araneidae, Sparassidae, Thomisidae, Scytodidae and Eresidae. Themain family is Salticidae, and the main family in this study is Salticidae,similar to our study. A similar study was conducted by Sajid et al. (2021) in Lower Dir, where the most common species was P. pekuli. The reason for abundance of P paykulii is characterized by its cosmopolitan distribution compared to other species. Ahmad et al., (2015) reported 13 spider species belonging to 6 families: Lycosidae, Sparassidae, Phlcidae, Araneidae, Salticidae and Tetragnathidae. In their study, it was determined that the most importantfamily was Lycosidae and the

most dangerous was Sparssidae.Although 14 species from 10 families are shown in thisstudy, the most important family is the Salticidae family. In the current study, one species each from Theridiidae, Hersilidae,Oxyopidae, Scytodidae, and Gnaphocidae was also reported which was not present in Ahmad et al studies. In their study, Tetragnathidae was represented by two species which is absent in our study. This difference in the diversity of spiders in both areas may be due to climate change, temperature, and food availability.

5. Conclusion

A total of 110 samples were collected in this study and analyzed with the help of available data. In this study, 14 species belonging to 10 different families were identified: Salticidae, Lycosidae, Sparassidae, Phlcidae, Araneidae, Gnaposidae, Oxyopidae, Scytodiidae, Hersilidae and Theridiidae. This study concluded that the arachnid fauna of Talash valley is very rich, but to date, the diversity of this area has not been investigated. For this reason, it is thought that many spider families can be found in this area, more research is needed to investigate the spider fauna of this region, and it is important to add information.

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Conflict of interest

The authors declare that they have no conflict of interest.

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