

Full Length Research Paper

Biodiversity of spiders' fauna in the Frontier Region, Peshawar, Pakistan

Farzana Perveen*, Ahmad Jamal, Samina Yasmin and Khalid Usman Khatak

Department of Zoology, Hazara University, Garden Campus, Mansehra-21300, Pakistan.

Accepted 5 March, 2012

Spiders can survive in most environments and are polypagous; therefore, they have great biodiversity. To explore spider fauna of Frontier Region (FR) Peshawar, in the Federally Administered Tribal Areas (FATA) of Pakistan, 23 species of spiders belonging to 15 genera and 9 families were collected and identified from April to September 09, 2010. The identified families were 4% each for Clubionidae, Scytodidae and Sprassidae; 9% each for Araneidae, Gnaphosidae, Pholicidae and Salticidae; 13% for Thomisidae and 43% for Lycosidae which was the dominant family of spiders of FATA. A detail study is required for further exploration of spider fauna of FR Peshawar, FATA, Pakistan; with special reference to the taxonomy, physiology and ecology.

Key words: Aranae, biodiversity, carapace, Frontier Region (FR) Peshawar, ground spiders, garden spiders.

INTRODUCTION

The Federally Administered Tribal Areas (FATA) are a semi-autonomous tribal region in the northwest of Pakistan, lying between the province of Khyber Pakhtunkhwa, Balochistan, and the neighboring country of Afghanistan. The FATA comprise seven agencies (tribal districts) and six frontier regions (FRs). It is located at 33°0'0"N and 70°10'0"E with an area of 27,220 km² and a population of 3,176,331 (Talbot, 1998) (Figure 1). It can be divided into the northern, central and southern regions which happen to coincide with administrative boundaries. The mountainous terrain is broken by small basins or valleys, dotted with settlements and agricultural fields. Most parts of FATA are arid and semi-arid, with warm summers and cool winters, although some areas in the Kurram and Orakzai agencies fall within the humid and sub-humid zone. Annual rainfall in the area varies dramatically, from 88 to 630 mm. Most of the area is under cultivation of different types of crops providing habitat for different kind of invertebrates. Among them the spiders are a dominating member of the community. Moreover, in the past, they have been rarely studied because most researchers see them as less important

organisms (Butt and Beg, 2000, 2001).

Spiders belong to the order Aranae, which is one of the grasping animals group (Riechert and Lockely, 1984). The most important characteristic of spiders is the presence of carapace found on dorsal side of cephalothorax. Their jaws are called chelicerae, having fangs which are used as piercing device for injecting venom. Spiders produce silk through spinnerets, located on the ventral side of the abdomen. Females' spiders are larger than males. The female reproductive organ is called Epigynum, and it is situated on the ventral side of the abdomen. Breathing organs are trachea and book lungs (Nieuwenhuys, 2008). They vary in size and colors. The size of the giant bird eating spider, *Theraphosid* (Thorell), is 75 mm, with leg length up to 255 mm. Their metamorphosis takes place through molting, where their size is increased with replacement of hard and old skin with new one (Kingsley, 1999). They represent the hateful and injurious animals (Davey, 1994). In fact, they help to protect crops from the pests (Fabre, 1999) as a biological pest control agent (Platnick, 1995). Their venom pollute less than pesticides used in agro-ecosystem (Novak, 2001), and testing for the treatment of heart disease (Davey, 1994). They inhabit the ground, underground tunnel systems, under stones and near water; but habitually, they like moist place. Some spiders live on the seaside where they sink into the sea twice a

*Corresponding author. E-mail: farzana_san@hotmail.com.
Tel: +0922-414266.

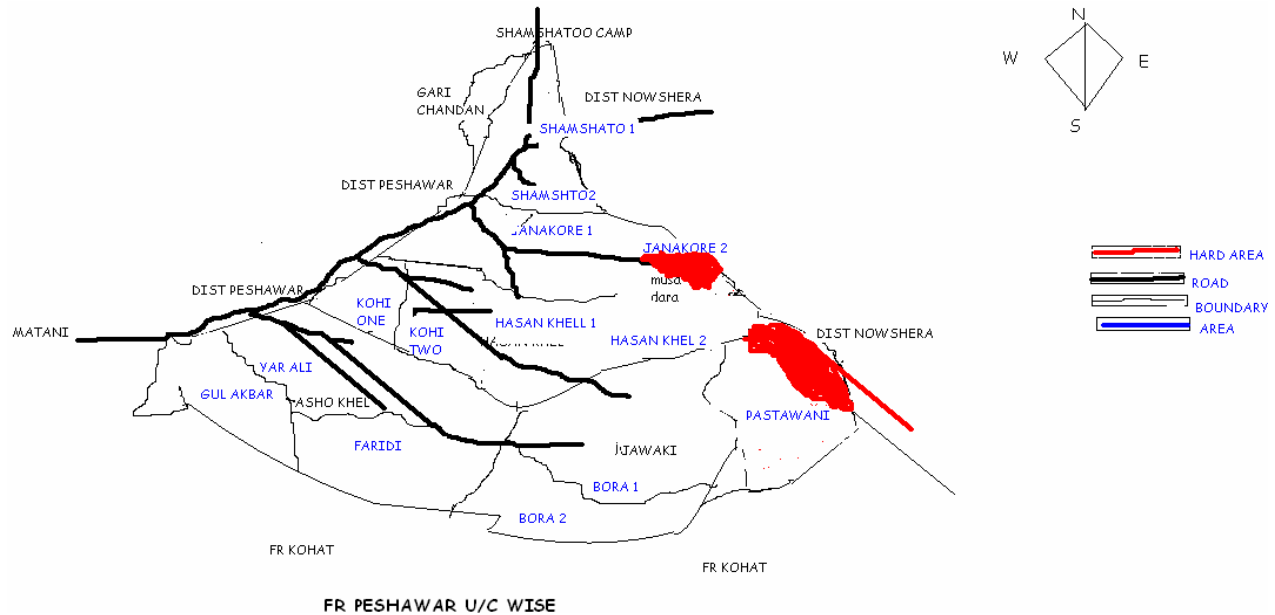


Figure 1. Map of the FR Peshawar, FATA, Pakistan where the present surveyed was conducted for determining the biodiversity of the spiders' fauna during April to September 2009-2010 (Daud, 2010).

many species including the water spiders, *Argyroneta aquatica* (Clerck) (Karren, 2002).

Little literature is available about spiders of Pakistan. Some studies on taxonomy, ecology and economic importance of spiders from Punjab and other areas of Pakistan, provide the importance of these little creatures (Dyal, 1935; Arshad et al., 1984; Khatoon, 1985-1986; Mushtaq and Qadir, 1999; Butt and Beg, 2001; Ghafoor and Beg, 2002; Mukhtar, 2004; Tahir and Butt, 2009). Dyal (1935) was the first to research the taxonomy of spider fauna in the areas of Pakistan. Arshad et al. (1984) worked on spiders' fauna, and reported 18 species under 13 genera and 8 families from Peshawar and adjoining areas. Ghafoor and Beg (2002) reported 2 new species from Faisalabad. Recently, Tahir and Butt, (2009) studied the spiders' fauna of Punjab and reported 44 species from 30 genera of 12 families, in which 3 species were explored for the first time. No work has been done on spider fauna of KP and FATA; therefore, the objective of the present research is to determine the spiders' fauna of FR Peshawar, FATA, Pakistan.

MATERIALS AND METHODS

The tribal area FR (Frontier Region) Peshawar is on the south east of Peshawar district, Pakistan. Nowshera is on the north east and FR Kohat on the south (Figure 1). The spiders were collected from the surveyed areas, mainly composed of level grounds which contain hills, many tourist resorts, gardens and several small mountains of Asho Khel area of FR Peshawar, during April to September 2009-10. The spiders were collected by pitfall trap and manual hand picking, labeled and preserve in 70% alcohol with few drops of glycerin. Active collection by hand picking may be difficult

or time consuming, especially in habitats where it is hard to see the spiders such as thick grass or leaf litter, therefore the pitfall traps were used. The spiders were arranged uniformly in transects or grids or in some places, randomly placed across the landscape. They were placed in urban areas, villages, people's homes, private property, agricultural areas, and unmanaged lands. The pitfall traps were collected twice a day. Collected spiders were identified with the help of keys (Levi and Randolph, 1975; Namkung et al., 2002) and already preserved specimen. Photographs (Camera: 7.0 mega pixel; Nikon, Tokyo, Japan) were taken.

RESULTS

In the present study, most of the collected specimens belong to ground spiders and a few belong to garden spiders. A total of 107 specimens were collected; 21 specimens were identified to species level, 2 specimens to generic level, and 74 duplicates and young stages of identified ones; however, they belong to 9 families. The most dominant family among the present research was Lycosidae. However, the least numbers of species were recorded from families Clubionidae, Scytodidae and Sparassidae. These 23 species are distributed into families Lycosidae (10 spp.), Thomisidae (3 spp.), Araneidae (2 spp.), Gnaphosidae (2 spp.), Pholcidae (2 spp.), Salticidae (2 spp.), Clubionidae (1 spp.), Scytodidae (1 spp.) and Sparassidae (1 spp.) (Figure 2).

Spitting spider, *Scytodes thoracica* (Latreille, 1804)

They are small brown spider with a unique pattern of black spots. The cephalothorax is sloped downward on



Figure 2i. Spitting spider, *Scytodes thoracica* (Latreille, 1804).
Phylum: Arthropoda, Sub-Phylum: Chelicerate, Class: Arachnida, Order: Araneae, Family: Scytodidae.



Figure 2ii. Huntsman, *Isopeda tuhogniga* (Barrion and Litsinger, 1995).
Phylum: Arthropoda, Sub-Phylum: Chelicerate, Class: Arachnida, Order: Araneae, Family: Sprassidae.

the anterior, while abdomen downward on the posterior. The chelicerae are vertical curved and internally bearing fangs. Padipalps are short and function as genital organ in male. It has six eyes, which are arranged in three pairs. The abdomen is round or oval and smaller or equal to the length of the cephalothorax. The epigynum is small, longer and wide. The eggs are carried by the female on the ventral side of the body, attached with spinnerets. They are not dangerous to humans because the fangs are small and cannot open. They are insectivores and found in buildings, under sheds, bridges, caves and houses. They are found in Europe, Asia and Australia (Figure 2i).



Figure 2iii. Sac spider, *Clubiona drassodes* (Cambridge, 1874).
Phylum: Arthropoda, Sub-Phylum: Chelicerate, Class: Arachnida, Order: Araneae, Family: Clubionidae.

Huntsman, *Isopeda tuhogniga* (Barrion and Litsinger, 1995)

The cephalothorax is brown with black eye margin. Chelicerae are large, vertical, brown and with small fangs. Fovea is long and shallow. They have eight eyes in two rows. Clypeus is moderately small. Labium and maxillae are reddish brown. Labium is wide and long, and maxillae are wide and long. Padipalps are medium size. The legs are long, cylindrical and have black spot at joints, with last segment of legs black. Abdomen is yellow and pointed at posterior. Epigynum of the female is round and reddish brown. They are non-toxic but may cause some allergy. They are insectivores and found in the dry woods, under stone, ground and houses. They are found in Pakistan, India, Australia and Africa (Figure 2ii).

Sac spider, *Clubiona drassodes* (Cambridge, 1874)

They have large chelicerae (forwards pointing in males). The chelicerae and carapace are dark brown and abdomen is oval, longer than wide and has a dark central stripe on top. Cephalothorax is brown. Padipalps are narrow and sperm sac at tip in male, while in female with un-swollen tips and serve as sense organ. Anal area is conical in shape and clothed with dark brown hairs. Anterior part of abdomen is broad. Spinnerets are yellowish brown and visible dorsally. Spermathecal sac is small and oval. The toxicity of this species is uncertain and may cause mild illness, skin irritation and redness. They are insectivores found on foliage, ground, under stones, gardens and houses. They are found in Pakistan, India, Sri Lanka and Bangladesh (Figure 2iii).

Garden spider, *Araneus diadematus* (Clerck, 1757)

They have eight eyes arrange in three rows. Body is



Figure 2iv. Garden spider, *Araneus diadematus* (Clerck, 1757).

Phylum: Arthropoda, Sub-Phylum: Chelicerate, Class: Arachnida, Order: Araneae, Family: Araneidae.



Figure 2v. Garden spider, *Neoscona theis* (Walckenaer, 1841).

Phylum: Arthropoda, Sub-Phylum: Chelicerate, Class: Arachnida, Order: Araneae, Family: Araneidae.

yellow to dark grey and has mottled marks on abdomen. The white dots are created due to a byproduct produces during protein metabolism. Cephalothorax region is smaller than abdomen. Padipalps have hair; serve as genital organ in male and sense organ in female. Legs are weak with brown colour strips at joints. Abdomen is broad at anterior end and narrow downward with pointed at posterior. Whole body is covered with small hairs. Epigynum is brown small and wider. Spinnerets are small. They are non-toxic, insectivores and found in gardens on the foliage, grass and houses. They are found in India, Pakistan, Australia, Bangladesh, Sri Lanka, North America and Canada (Figure 2iv).



Figure 2vi. Ground spider, *Gnaphosa eucalyptus* (Ghafoor and Beg, 2002).

Phylum: Arthropoda, Sub-Phylum: Chelicerate, Class: Arachnida, Order: Araneae, Family: Gnaphosidae.

Garden spider, *Neoscona theis* (Walckenaer, 1841)

They are yellowish brown and clothed with hairs having dark bands. Cephalothorax is longer than wide. Anterior median eyes are larger than posterior median; and lateral are close. Sternum is dark brown with hair. Padipalps are medium size and brownish yellow. Maxillae is brown and longer than wide. Chelicerae are strong and have hair and spines. Abdomen length is sub-oval and is clothed with hair. The dorsal side of abdomen has a white-chalk bar and ventral side is brownish. Epigynum is in middle and has prominent rim. They are non-toxic and found on grass land, wheat crops and garden but may enter into houses. They are found in India, Pakistan, India and Bangladesh (Figure 2v).

Ground spider, *Gnaphosa eucalyptus* (Ghafoor and Beg, 2002)

They are brown to blackish with brown cephalothorax. Prosoma is heart shaped, broad and clothed with hair. Eyes are arranged in three rows with first row of eyes slightly recurved. Chelicerae are narrow and brown. Legs are long, strong, have spiny hairs with the 4th one longer than other legs. Abdomen has white lines in center with narrow and pointed posterior while broad anterior end. Epigynum is brownish. Epigynal plate is brown and longer than wide. The toxicity of this species is unknown but biting may cause headache, nausea, rapid pulse, ulceration, redness of the skin and sometime even coma. They live in houses, under side of leaves, loose barks of tree trunks and are insectivores. They are found in Pakistan (Figure 2vi).

Ground spider, *Scotophaeus faisalabadiensis* (Ghafoor and Beg, 2002)

Body is dark brown with reddish brown cephalothorax.



Figure 2vii. Family: Gnphosidae. Ground spider, *Scotophaeus faisalabadiensis* (Ghafoor and Beg, 2002).

Phylum: Arthropoda, Sub-Phylum: Chelicerate, Class: Arachnida, Order: Aranae, Family: Gnphosidae.

They have eight eyes arranged in three rows; last row is longer and recurved. Chelicerae are broad and directed forward. Clypeus is narrow. Pedipalps are brown. Maxilla is longer than wide with pale-yellowish colour. The dark brown legs are comparatively long and physically powerful, covered with hairs and some spines. Posterior part of abdomen is narrow and covered with hairs. Spinnerets are long with last pair longer than the others. The toxicity is uncertain and bite may cause unpleasant effect, allergy and skin irritation. They are found in dry woods, under stone, near root of the trees, dark places and gardens. They are found in Pakistan and India (Figure 2vii).

Pholicid spider, *Artema atlanta* (Simon, 1897)

Identification of this species can only be done with help of stereo microscopes. Carapace has black spots with middle fovea. Front part has eight eyes arranged in two groups of three eyes and two eyes are smaller. Pedipalps are prominent in male and work as sperm transferring device during mating, while they serve as sense organ in female. Chelicerae are strong and have small fangs. Legs are yellow with black bands near the joints. Pedicel is medium size and elastic. Epigynum is brownish. Toxicity is unusual, cause normal inflammation and other allergic problems. They are insectivores and found in houses, and other manmade structures. They are found all over the world (Figure 2viii).

Daddy long legs, *Crossopriza lyoni* (Blackwall, 1867)

They are sexually dimorphic, with males smaller than



Figure 2viii. Pholicid spider, *Artema atlanta* (Simon, 1897).

Phylum: Arthropoda, Sub-Phylum: Chelicerate, Class: Arachnida, Order: Aranae, Family: Pholicidae.

females. Cephalothorax is round, pointed forward. Eyes are arranged in three pairs, where two pairs have three eyes and the remaining two eyes are below them. Legs are gray, very thin and delicate with brown spot. Knee joints are brown, while the end of tibia and femur has white spots. Third pair of the legs is smaller, while the front legs are longest. Abdomen is brownish yellow having black patches, rounded, oval and projected downward humped. They vibrate when disturbed. They are non-toxic and found inside houses, buildings, manmade structures, and are insectivores. They are found all over the world (Figure 2ix).

Jumping spider, *Marpissa tigrina* (Tikedar, 1970)

They have four large eyes pointed forward, two smaller ones behind and then the two medium size, posteriorly. Chelicerae are yellowish brown with broad conical tooth. Labium is longer than wider. Pedipalps serve as genital organ in male, while in female, food tasting and sense organ. Legs are yellowish and normally short with two tarsal claws. Body is brightly coloured, stout, and has beautiful marks on dorsal side. Abdomen is oval, pointed behind and longer than wide with yellow bands in middle. Epigynal plate of female is longer than wider. It is non-toxic but they may cause allergy. They are insectivores found on walls, rocks, tree trunks and other dark places. They are found in Pakistan, India, Bangladesh, Australia and Africa (Figure 2x).

Jumping spider, *Plexippus paykullii* (Audouin, 1826)

Carapace is high and black. Chelicerae are strong and broad with small hairs. Pedipalps are brown with medium size. In between the eyes, the stripe continues and front



Figure 2x. Jumping spider, *Marpissa tigrina* (Tikedar, 1970).

Phylum: Arthropoda, Sub-Phylum: Chelicerate, Class: Arachnida, Order: Araneae, Family: Salticidae.



Figure 2xi. Jumping spider, *Plexippus paykullii* (Audouin, 1826).

Phylum: Arthropoda, Sub-Phylum: Chelicerate, Class: Arachnida, Order: Araneae, Family: Salticidae.



Figure 2xii. Crab spider, *Diaea evanida* (Thorell, 1870).

Phylum: Arthropoda, Sub-Phylum: Chelicerate, Class: Arachnida, Order: Araneae, Family: Thomisidae.

face appears with three white stripes. Female is brownish grey with dark eyes area. Abdomen has central white stripe and on both side of stripe has a pair of white spot near the posterior end of the abdomen. Epigynum is oval and brownish. Epigynal plate is wider than longer. Egg sac is 2.5 to 3.5 mm in diameter. Body is covered with short and grayish hairs. They are non-toxic but may cause allergy and skin problems in human. They are found on walls, under stone and dry wood. They are insectivore and burrow in soil. It is cosmopolitan in distribution and has been reported from Pakistan, India, Africa, Florida and Australia (Figure 2xi).

Crab spider, *Diaea evanida* (Thorell, 1870)

They are dimorphic with bright colours, females are larger than males. Cephalothorax is red and oval. Eyes are arranged in four in front side and in two rows of two eyes on left and right. Front eyes are bright. Padipalps are medium size. Front legs have red with dark brown strip on joints, while last two pairs are green. Tarsi have two teeth, and chelicerae are free and of medium size. Abdomen is longer than wider. Epigynum is small and brown. They are non-toxic, found on brightly coloured flowers. They wait for their prey and suddenly attack the prey. They are widely found in areas where flowers are more (Figure 2xii).

Crab spider, *Thomisus pugilis* (Stoliczka, 1869)

Females are larger than males. Cephalothorax is broad at posterior and narrow at anterior with two conical processes at anterior. Cephalothorax is light yellow. Anterior eyes are large and located on lateral edge of conical process. Padipalps are short. Chelicerae are strong with inwardly band fangs. Sternum is oval and clypeus is high. They have eight cylindrical legs. Front legs are large with pale yellow strips, and also bear five pairs of ventral spines. Posterior legs are smaller than front ones. Abdomen is triangular, broad at anterior which becomes narrow pointed at posterior with pale yellow having three black or brown spots at left, right and posterior end. Epigynum is oval and brownish. They are non-venomous, insectivores and found on flowers. They are found in India, Pakistan, USA and Australia (Figure 2xiii).

Crab spider, *Thomisus spectabilis* (Doleschall, 1859)

Body is brightly coloured, bears two conical processes on anterior. Their males are smaller than females. Cephalothorax is white with dark white spot on middle of thorax and posterior part is wider than anterior one. Padipalps are short and modified as genital organ in males, while it serves as a sense organ in females.



Figure 2xiii. Crab spider, *Thomisus pugilis* (Stoliczka, 1869).
Phylum: Arthropoda, Sub-Phylum: Chelicerate, Class: Arachnida,
Order: Araneae, Family: Thomisidae.



Figure 2xiv. Crab spider, *Thomisus spectabilis* (Doleschall, 1859).
Phylum: Arthropoda, Sub-Phylum: Chelicerate, Class:
Arachnida, Order: Araneae, Family: Thomisidae.

Chelicerae are medium size, with fangs. Front eyes are large and located on ventral edge of cone, and clypeus is high. Front legs are longer than remaining legs, all with white strips and five pairs of ventral spines; however, posterior legs have no spine. Pedicel is short. Abdomen is white with brown or black spots at left, right edges and



Figure 2xv. Wolf spider, *Arctosa littoralis* (Simon 1897).
Phylum: Arthropoda, Sub-Phylum: Chelicerate, Class:
Arachnida, Order: Araneae, Family: Lycosidae.

posterior end of abdomen. Epigynum is oval and brownish. They are non-venomous and insectivores. They usually sit on flowers and wait for their prey. They are found in India, Pakistan, USA and Australia (Figure 2xiv).

Wolf spider, *Arctosa littoralis* (Simon, 1897)

Body is pale yellow with black ocular area. Thorax is wider than cephalothorax and slightly high. Eyes are arranged in two rows. Dark fovea is present in middle of cephalothorax. Base of eyes has dark brown to black band, extended to thoracic region. Clypeus is vertical and chelicerae are brown with toothed margin. Tarsi of padipalp have claws with three teeth. Legs are thin with three claws tarsi. Abdomen is longer, oval, brown, pointed on posterior, and covered dorsally with hairs and patches. Epigynum is reddish brown and long. Their toxicity was not reported, while they cause some illness in human being, however, bite may cause some allergic and skin problems. They are insectivores and found on the ground, under stones, dark places and burrows. They are found all over the world (Figure 2xv).

Wolf spider, *Hippasa partita* (Tikader, 1970)

Their females are larger than males. Cephalothorax is longer than wide, high at anterior and slightly lower at posterior. Cephalothorax is brown or grayish, and covered with small hairs. There is dark fovea in middle of the thorax. A black strip starts from the base of posterior eyes to end of the thorax. Eyes are arranged in three rows, with slightly recurved anterior row. Padipalps are brown and bended downward. Chelicerae are strong,



Figure 2xvi. Wolf spider, *Hippasa partita* (Takidar, 1970).
Phylum: Arthropoda, Sub-Phylum: Chelicerate, Class: Arachnida,
Order: Aranae, Family: Lycosidae.



Figure 2xvii. Wolf spider, *Lycosa maculate* (Tahir and butt, 2009).
Phylum: Arthropoda, Sub-Phylum: Chelicerate, Class:
Arachnida, Order: Aranae, Family: Lycosidae.

longer than wide, and pointed downward with fangs. Legs are cylindrical and brown, with hairs. Abdomen is long with dark strips at anterior. Posterior end of abdomen is pointed and is covered with small grey brown hair.

Toxicity is unknown but may cause some allergic disease in human. They are found on ground, gardens, under stones, dry places, and feed on fluid of insects and their larvae. They are found in Pakistan, India and Australia (Figure 2xvi).

Wolf spider, *Lycosa maculata* (Tahir and Butt, 2009)

Carapace has dark fovea in thorax region. Anterior of cephalothorax is narrow than posterior. It has eight eyes arranged in three rows. Chelicerae are vertical and longer than wide with fangs. Padipalps are medium size, brown and modified as genital organ in males, while sense organ in females. Legs are long, bearing spines. Tarsi are blackish, and bear claws with toothed margin ventrally. Abdomen is brown, oval, pointed toward posterior margin and clothed with hairs and black spots on ventral side. Epigynum is longer than wide and dark brown. Female has spherical egg sac. Spinnerets are small. They are poisonous and may cause some illness, inflammation with fever and allergic. They are insectivores and found in underground burrows, under stones, loose barks of trees, may enter the houses and gardens. They are found in Australia, Pakistan, India and USA (Figure 2 xvii).

Wolf spider, *Lycosa species* (Simon, 1897)

They are brown to off black. Eyes arrange in three rows. In the middle of the thorax is sharp brown fovea surrounded by a broad light brown to black longitudinal bands from base of posterior eyes to base of thorax. Posterior region is wider than anterior with pointed and truncate anteriorly. Chelicerae are downward and reddish brown, padipalps in male are modified to male sperm transferring organ while in female work as sense organ. Legs are long and moderately thin. Tarsal segment is blackish with claw and teeth. Abdomen has black to brown with white spots throughout its length. Epigynum is round and brown. They are non-toxic, insectivores and found on ground, under stones and dry woods. They are distributed in India, Pakistan, Burma, China, Sri Lanka, Australia and Africa (Figure 2 xviii).

Wolf spider, *Lycosa species* (Simon, 1897)

Cephalothorax is high at anterior and lower at posterior. In middle of cephalothorax, there is dark fovea. A dark strips start from the base of posterior eyes and goes on edge to posterior base of cephalothorax. Eyes are arranged in three rows with dark colour. Posterior eyes are large, while the anterior four eyes are small in size. Padipalps are brown and bear claw with tooth. Chelicerae are strong and wide. Legs are yellow, long and moderately thin with dark strip at joint and tarsal segment. Abdomen is oval, brown with dark spots and narrow at posterior. Epigynum is wide and brown. Toxicity is unknown but may cause some unpleasant effect on biting and sometime allergic problems. They are insectivores and found on ground, under stones, hilly areas, burrows, dry woods and dark places. They are found in Pakistan, Burma, Bangladesh, India and



Figure 2xviii. Wolf spider, *Lycosa* species (Simon 1897).
Phylum: Arthropoda, Sub-Phylum: Chelicerate, Class: Arachnida, Order: Araneae, Family: Lycosidae.



Figure 2xx. Wolf spider, *Lycosa terristis* (Tahir and butt, 2009).

Phylum: Arthropoda, Sub-Phylum: Chelicerate, Class: Arachnida, Order: Araneae, Family: Lycosidae.



Figure 2xix. Wolf spider, *Lycosa* species (Simon 1897).
Phylum: Arthropoda, Sub-Phylum: Chelicerate, Class: Arachnida, Order: Araneae, Family: Lycosidae.

Australia (Figure 2xix).

Wolf Spider, *Lycosa terristis* (Tahir and Butt, 2009)

They are pale yellow and black near eyes region. Anterior of cephalothorax is narrow than posterior. Eyes are eight and arrange in three rows, the anterior eyes rows are slightly recurved. Cephalothorax has black or brown fovea in middle, and has brown marks at its edge. Clypeus is vertical and sternum brown. Labium is long, light brown, and width is greater than length. Length of

maxilla is more than width and has scapulae on inner margin. Chelicerae are vertical, brown and bear teeth. Legs are long, thin and brown with white spots. Abdomen is pale brown, oval with pointed posteriorly. Body is clothed with hairs and patches dorsally. Epigynum is grayish brown. Epigynal plate is wider than long. They are non-toxic, seldom bites which is little unpleasant. They are insectivores and found on the ground, under stone, dry woods and other hiding places. They are found in Pakistan, India, Bangladesh, Sri Lanka, Australia and UK (Figure 2xx).

Wolf spider, *Lycosa madanensis* (Parveen, 2003)

Wolf spiders are notable vagrants and can sometimes be found outside the burrow foraging for insects. Cephalothorax is longer and its middle has a dark brown fovea. Anterior of cephalothorax is narrower than posterior region. Cephalic region is grayish in appearance with some black spots and hairs. Head is more erect than the thorax region. Eyes are arranged in three rows, and anterior row are slightly recurved. Padipalps are modified to genital organ in males, while sense organ in females. Legs are long and thin. Abdomen is oval, pointed on posterior, grayish in appearance with dark spot and covered with hair. Epigynum of female is longer than wide, and is reddish brown. They are non-toxic but may cause allergy. They are found on ground, burrows, dark places and insectivores. They are found in Pakistan, India, China, Burma and Bangladesh (Figure 2xxi).

Wolf spider, *Pardosa birmanica* (Simon, 1897)

Cephalothorax is brown to black with greater length than



Figure 2xxi. Wolf spider, *Lycosa madanensis* (Parveen, 2003).

Phylum: Arthropoda, Sub-Phylum: Chelicerate, Class: Arachnida, Order: Aranae, Family: Lycosidae.



Figure 2xxiii. Wolf spider, *Pardosa distincta* (Backwall, 1867).

Phylum: Arthropoda, Sub-Phylum: Chelicerate, Class: Arachnida, Order: Aranae, Family: Lycosidae.



Figure 2xxii. Wolf spider, *Pardosa bimanica* (Simon 1897).

Phylum: Arthropoda, Sub-Phylum: Chelicerate, Class: Arachnida, Order: Aranae, Family: Lycosidae.

width and convex, clothed with pubescence. Cephalic part is narrow and slightly high at front. Center of thorax is brown with fovea. Clypeus is vertical. Padipalps are brown with medium size and swollen tip in male with function as sperm transferring device, while in female serve as sense organ. Chelicerae are strong and long. Legs have white spots, tarsi has two claws with toothed margin. Abdomen is brown to black with white spots all over on dorsal side. Anterior of abdomen is broad, pointed and clothed with pubescence. Epigynum is longer than wide and brown. Their bite may cause allergy. They are insectivores, and are found on the ground, grasses, dry woods, and forests. They are found in Pakistan, Burma, India, Sri Lanka and Bangladesh (Figure 2xxii).

Wolf spider, *Pardosa distincta* (Backwall, 1867)

Cephalothorax is grayish and dark brown in middle with dark fovea. It is longer than wider and narrow at anterior, while broad at posterior. Clypeus is vertical. Padipalps are small and brown serve as genital organ in male, while in female serve as sense organ. Eyes are arranged in three rows. Anterior row is slightly recurved. Chelicerae are strong and longer than wider with white spots. Tarsi have two claws with toothed margin. Abdomen is oval and brown to grey with dark spots all over the dorsal side. Anterior part of abdomen is wide, while posterior part is narrow and pointed. Epigynum is wide and brown. The entire body is covered with hair. They are non-toxic, insectivores, and are found on ground, under stones, bark of trees, grasslands and wood land. They are found in Pakistan, Burma, India, Sri Lanka and Bangladesh (Figure 2xxiii).

DISCUSSION

In the present study, collection and identification of the spiders of FR Peshawar, FATA, Pakistan was conducted during April to September 2009-2010. Arshed et al. (1984) studied and highlighted eighteen species under 13 genera and 8 families of the spider in Peshawar district. In the present research, 23 species under 17 genera and 9 families were recorded from FR Peshawar. Five species documented from the present area were more than Arshad et al.'s (1984) documentation, however, both studies showed difference in the diversity of the spiders' fauna due to differences in the climatic factors of two areas.

The biodiversity and predatory efficacy of the spiders in rice field were studied from central Punjab Pakistan, and 44 spider species were recorded from a huge collection of 28000 specimens (Tahir and Butt, 2009). While, the present research was a general survey reported total 107 specimens and only 9 families. Therefore, one can argue that both studies have different biodiversity.

Moreover, the environmental factor, geographical occurrence, temperature and food availability were the factors responsible for diversity differences in both studied areas.

Namkung et al. (2002) reported a critical check list of the spiders from Jeju Island, Korea with review of published reports during 1936 to 2001 and identified specimens collected from 1964 to 2001. Total of 166 genera and 347 species belonging to 36 families of spiders was classified from Jeju Island. In the present research, 15 genera and 23 species belonging to 9 families were reported during April to September 2009-10 from FR Peshawar, FATA, Pakistan. The time period for both researches was different as Namkung et al., 2002 had collected 166 genera and 347 species within 37 years, but recently it was done within six months.

Levi and Randolph (1975) developed a simple key for identifying spiders of the genera of Theridiidae. A mimeographed version of the key has had a limited circulation for several years as a tryout. The limits of the family Theridiidae were arbitrary. Better knowledge of southern hemisphere spiders, especially Symphytognathidae, may make it possible to define the family better. Presently, characteristics, reasons for identification, habits and habitats observed on the basis of spiders' fauna of FR Peshawar, FATA, Pakistan, has been identified.

Mukhtar (2004) surveyed the spider fauna of the foliage from Punjab and reported 124 species belonging to 51 genera and 17 families and the most dominated family was Araneidae and the less number of species was reported from Corinnidae family. However, during the present research, 9 families were reported, where the largest family was Lycosidae with 10 species, while the smallest families were Clubionidae, Scytodidae and Sprassidae each with only one species. Therefore, in both studies, the diversity differences were due to habitat, environmental and geographical differences of both areas. The present study area was more toward the northern pole and away from equator and the climatic conditions were little colder than Punjab, Pakistan.

Ursani and Soomro (2010) updated the checklist of spider fauna from 16 districts of Sindh, province, Pakistan. A total of 132 species were recorded belonging to 24 families and 73 genera. Majority of these species were earlier defined, however, only the family Zodariidae for the first time was recorded from Pakistan. In the present research, 23 species were recorded from FR Peshawar FATA Pakistan area. As insects are the main

source of food for spider, and are abundant in the warm areas, therefore, the diversity in spider fauna in both studies was due to geographical and ecological differences. Majority of presently explored species were earlier defined from Pakistan, etc. Previously, *Scytodes thoracica* (Figure 2i) was reported by Ghafoor and Beg (2002), and Parveen (2003) from Pakistan; Tikader (1981), and Sudhikumar et al. (2005) from India. *Isopeda tuhogniga* (Figure 2ii) by Patel and Vyas (2001), and Sudhikumar et al., (2005) from India; Parveen (2003) from Pakistan. *C. drassodes* (Figure 2iii) by Mukhtar (2004), and Faisalabad and Tikader (1982) from India; *Araneus diadematus* (Figure 2iv) by Dyal (1935) from Lahore, Khatoon (1985-86), Butt and Beg (2001) and Qadir (1997) from Faisalabad, Punjab and Patel (2001), Tikedar (1970), and Sudikumar et al. (2005) from India; *N. theis* (Figure 2v) by Qadir (1997), Punjab and Razzaq (2002) from Kaghan; *G. eucalyptus* (Figure 2vi) by Ghafoor and Beg (2002) from Faisalabad; *Cotophaeus faisalabadiensis* (Figure 2vii) by Ghafoor and Beg (2002) from Faisalabad, Pakistan; *A. atlanta* (Figure 2viii) by Tikader and Malhotra (1980) from India, Mukhtar (2004) and Perveen (2003) from Pakistan; *C. lyoni* (Figure 2ix) by Tikader (1981), Patel and Vyas (2001) from India and Arshad et al. (1984), Parveen (2003) and Mukhtar (2004) from Pakistan; *M. tigrina* (Figure 2x) by Arshad et al. (1984) from Pakistan and Tikader (1970) from India; *Porzana paykullii* (Figure 2xi) by Arshad et al. (1984), Parveen (2003), Tahir and Butt (2009) from Pakistan and Tikader (1982), Patel and Vyas (2001) from India; *Diaea evanida* (Figure 2xii) by Okuma et al. (1993) from Bangladesh; *T. pugilis* (Figure 2 xiii) by Tikader (1970), Patel (2003), Sudhikumar et al., (2005) from India and Khatoon (1985-86), But and Beg (2000), Mukhtar (2004) and Parveen (2003) from Pakistan; *Tiarrituris spectabilis* (Figure 2xiv) by Tikader (1970) and Patel (2003) from India and Parveen (2003) from Pakistan; *Aristolochia littoralis* (Figure 2xv) by Tikader (1970), Sudhikumar et al., (2005) from India and Khatoon (1985-1986) from Pakistan; *Hippasa partita* (Figure 2xvi) by Tikedar (1970) from India and Butt and Beg (2001) from Pakistan; *Lysiosquillina maculata* (Figure 2xvii) by Tahir and Butt (2009) from Punjab, Pakistan; *L. species* (Figure 2xviii) by Gahfoor (2002), Mukhtar (2004) and Tahir and Butt (2009) from Pakistan; *L. species* (Figure 2xix) was previously reported by Gahfoor (2002), Mukhtar (2004) and Tahir and Butt (2009) from Pakistan; *Lumbricus terristis* (Figure 2xx) by Tahir and Butt (2009) from Pakistan; *L. madanensis* (Figure 2xxi) by Parveen (2003) from Pakistan; *Pardosa birmanica* (Figure 2xxii) by Tikader and Malhotra (1980) from India, Mukhtar (2004) and Tahir and Butt (2009) from Pakistan; *Puccinia distincta* (Figure 2xxiii) by Ghafoor and Beg (2002), from Pakistan.

The taxonomy, physiology and ecology of spider fauna have been required for further exploration of spider fauna of FR Peshawar, FATA, Pakistan.

REFERENCES

- Arshad M, Jan GA, Iqbal M (1984). Some spiders of Peshawar and adjoining areas. *Zool. Sur. Pak.*, 10: 83-89.
- Audouin V (1826). Explication sommaire des planches d'araignées de l'Égypte et de la Syrie publiées. In: Description de l'Égypte. *Hist. Nat.*, 1(4): 7-22.
- Barrion AT, Litsinger JA (1995). Riceland spiders of South and Southeast Asia. *CAB Intl. Wall. UK.*, pp. 1-700.
- Blackwall J (1867). Descriptions of several species of East Indian spiders, apparently to be new or little known to archaeologists. *Ann. Mag. Nat. Hist.*, (3)19: 387-394.
- Butt A, Beg MA (2000). Some new species of *Marpissa* (Salticidae) from Pakistan. *Pak. J. Zool.*, 32: 75-79.
- Butt A, Beg MA (2001). Description of two new species of spiders of the families Clubionidae and Oxyopidae from Pakistan. *Pak. J. Zool.*, 33: 35-37.
- Cambridge (1874). *Nemesia congener*. *Nat. Hist. Mus. USA.*, pp. 3-5.
- Clerck C (1757). Nursery web spider. *Nat. Hist. Mus. USA.*, pp. 1-8.
- Davey GCL (1994). The disgusting spider, the role of disease and illness in the perpetuation of fear of spiders, *Society and Animals. Acad. Sci.*, 2: 17-25.
- Doleschall CL (1859). Tweede Bijdrage tot de kennis der Arachniden van den Indischen Archipel. *Act. Soci. Scient. Indo. Neêrl.*, 5 (5): 1-18.
- Dyal S (1935). Fauna of Lahore, 4 spiders of Lahore. *Bull. Dept. Zool. Punj. Uni. Lah. Pak.*, 1: 117-252.
- Fabre JH (1999). The life of the spider. *Mell. Uni. Mell. UK.* 1-13.
- Ghafoor A, Beg MA (2002). Description of two new species of Araneid spiders from Pakistan. *Intl. J. Agric. Biol.*, 4: 525-527.
- Karren JB (2002). Spiders. *Uta. Uni. Uta. USA.*, 22-34.
- Khatoun S (1985-86). A checklist of Arachnids of Pakistan. *Bull. Hydrobiol. Res. Kar. Pak.*, 1: 645-6650.
- Kingsley R (1999). The spiders. *New Star Std. Indus. (Pvt.) Ltd. Sing.*, pp. 2-34.
- Latreille PA (1804). General study of spider families. *Nouv. Ann. Ed. Nat. Mus. Pari. Fran.*, 1: 61-76
- Levi HW, Randolph DE (1975). A key and checklist of American spiders of the family Theridiidae north of Mexico (Araneae). *J. Arach.*, 3: 31-51.
- Okuma C, Kamal NQ, Hirashima Y, Alam MZ, Ogata K (1993) Illustrated monograph of the rice field spiders of Bangladesh. *IPSA. JICA. Proj. Publ.*, 1: 1-93
- Mukhtar MK (2004) Taxonomic studies on the foliage Spider fauna of Punjab. Department of Zoology and Fisheries, University of Agriculture, Faisalabad, Pakistan, pp. 61-76.
- Mushtaq S, Qadar A (1999). Three new species of genus *Oxyopes* (Araneae: Oxyopidae) from Pakistan. *Pak. J. Zool.*, 31: 255-261.
- Namkung J, Im MS, Kim ST, Lee JH (2002). Spider Fauna of Jeju Island in Korea. *J. Asi. Paci. Entomol.*, 5(1): 55-74.
- Nieuwenhuys B (2008). Spider Information. Online: <http://ednieuw.home.xs4all.nl/spiders> (Accessed: 20-07-2011)
- Novak K (2001). Spider venom helps hearts keep their rhythm. *Nat. Medic.* 3: 25-26. <http://insects.about.com/od/noninsectarthropods/p/arachnida.htm> (Accessed: 8-2-2010)
- Parveen R (2003). Taxonomic study on some spider of Punjab, Pakistan. Thesis, Department of Zoology and Fisheries, Agriculture University Faisalabad, Pakistan, pp. 1-261.
- Patel BH, Vyas R (2001). Spiders of Hingolghadh national education sanctuary, Gujarat, India. *Zoo. Prin.*, 16: 589-590.
- Patel BH (2003). Fauna of protected areas in India-I: Spiders of Vansda National Park, Gujarat. *Zoo. Prin. J.*, 18: 1079-1083.
- Platnick N (1995). An abundance of spiders. *Nat. Hist. Mus. USA.*, 104: 50-53.
- Qadir A (1997). Taxonomic studies of spider's families Arancidae, Oxyopidae, Clubionidae and Eresidae of Sialkot. MSc Thesis, Department of Zoology and Fisheries, Agriculture University Faisalabad, Pakistan, pp. 1-109.
- Razzaq A (2002). Taxonomical studies on spider fauna of Kaghan Valley, Pakistan. MPhil Thesis, Department of Zoology and Fisheries, Agriculture University Faisalabad, Pakistan, pp. 1-112.
- Riechert SE, Lockely T (1984). Spiders as biological control agents. *Ann. Rev. Entomol.*, 29:299-320.
- Simon E (1897). *Arachides recueillis* par M. M. Maindron a Kurrachee et a Matheran (press Bombay). *En. Bull. Mus. Hist. Nat. Pari. Fran.*, pp. 289-297.
- Stoliczka F (1869). Contribution to the knowledge of Indian Arachnoidea. *J. Asi. Soci. Beng.*, 2 (4): 201-251.
- Sudhikumar AV, Mundackatharappel J, Mathew A, Murugesan S, Pothalil A, Sebastian A (2005). Preliminary studies on the spider fauna in Mannavan Shola forest, Kerala, India (Araneae). *Act. Zool. Bul.*, 1: 319-327.
- Talbot I (1998). Pakistan, a modern history (revised ed.). *Palg. Mac.*, pp. 2-3.
- Tahir M, Butt A (2009). Some new species of family Lycosidae from agricultural fields of Punjab, Pakistan. *Pak. J. Zool.*, 38: 185-189.
- Tikader BK (1970). Spider fauna of Sikkim. *Zool. Sur. Ind.*, 64: 1-83.
- Tikader BK, Malhotra MS (1980). The fauna of India, Calcutta, India. *Zool. Survey India*, 1(2): 272-439.
- Tikader BK, Biswas B (1981). Spider fauna of Calcutta and vicinity. *Zool. Sur. Ind.*, 30: 1-48.
- Tikader BK (1982). The Fauna of India: Araneae: Araneidae. *Zool. Sur. Ind.*, 2: 1-293.
- Thorell A (1870). Araneae, Australia. *Biol. Inv.* 13(4): 1000-1103.
- Ursani TJ, Soomro NM (2010). Checklist of spider fauna of Sindh Province, Pakistan. *Pak. J. Entomol.*, 32(1): 20-25, 61-73.