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A Preliminary Report on the Diversity of Spiders (Arachnida: Araneae) in the Cholistan Desert, Pakistan

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Abstract.– Spiders (Arachnida.: Araneae) were collected by hand picking and shaking plants methods from different habitats of the Cholistan Desert. These samples contained 10 families, 32 genera and 62 species. The Philodromidae was found to have greatest diversity of species (30%) followed by Lycosidae (26%) and Gnaphosidae (18%) respectively. Studies on species sex ratios studies indicated that generally female spiders were more abundant than males and immature spiders during the entire study. The present study provides preliminary data on the diversity of spiders which can be useful for the researchers working on diversity, taxonomy and conservation of spiders. It was concluded that the Arachnida is a diverse class of Arthopoda in the Cholistan Desert. However, it is suggested that more intensive studies are needed to fully document the arachnid diversity in this region.

Key words: Araneae, Cholistan Desert, sex ratio.

The Cholistan Desert comprises of a large area of 26000 km^2 in the South Eastern portion of Punjab Province. It is located between latitude 27°42́ and 29° 45́ north and longitude 69° 52́ and 72° 24́ east (FAO, 1993; Akbar *et al.*, 1996). This desert is characterized by extremely hot summers (±51°C) and cold winters (±0°C). The relative humidity is low in summer but high during winter (Fig.1). The flora of the desert mostly consists of drought resistant plants. The most common grasses such as *Cenchrus, Lasiurus, Cymbopogon* and *Penicum* and shrub and tree species (*Calligonum, Haloxylon, Prosapis, Zizyphus and Acacia*) have profound effects on habitat structure and fauna (Arshad and Rao, 1994). A number of researchers have been exploring the ecology and taxonomy of desert spiders all over the world (Ward and Lubin, 1993; Hanschel, 1994; Lubin and Hanschel, 1996; Brandit, 1998), and India (Tikader, 1974, 1980, 1982; Tikader and Biswas, 1981). Information on the desert spiders of Pakistan is very scarce. Ghafoor and Beg (2002) and Mukhtar (2004) have provided important taxonomic information on species from various non desert locations in Punjab Province, Pakistan. Considering the small amount of data available on the taxonomy of Pakistan desert spiders, this study was initiated to provide bench mark data on the diversity of desert spiders of the Cholistan Desert which can be utilized by future researchers working on the taxonomy, distribution and conservation of desert spiders.

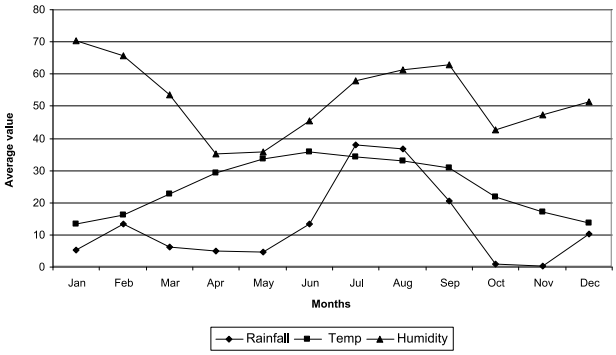

Fig. 1. Monthly average meteorological data for five years (2001 – 2005) including the study years (2001 – 2003) from Cholistan Desert. Source: Regional Meteorological Station Bahawalpur.

Materials and methods

Specimens were collected from January 2001 to December 2003. The samples were collected from various localities around Bahawalpur, its out skirts and the desert area of Bughdad – ul – jadeed Campus, The Islamia University of Bahawalpur.

Arachnids were collected using hand picking and shaking plants methods. Collected samples were stored in separate vials containing preservative solution (50 ml 70% ethanol, 1 ml glycerin, and 5ml glacial aectic acid). Samples were stored at a cool place in the laboratory until studied. Specimens were identified to the species level with the aid of various standard taxonomic keys provided by Pocock, (1900), Tikadar (1980) and Tikadar and

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Biswas (1981). The specimens collected were enumerated and sexed. Some specimens could not be identified to the species level because of unresoleved taxonomic problems. Immature spiders are generally considered difficult to the species level. Some specimen may represent new species.

Results

A total of 10 families, 32 genera and 62 spider species were recoded from the specimens collected during this study. The Philodromidae had the highest diversity (19 species) while Theridiidae, Zodaridae and Tetragnathidae each had but one species. The Lycosidae, Graphosidae, Araneidae, Thomisidae and Erasidae were represented 16, 11, 4, 4 and 2 species, respectively (Table I).

The relative diversity (%) among families is given in Figure 2. The Philodromidae has the highest diversity (30% of spider species collected), followed by the Lycosidae (26%) and Gnaphosidae (18%), respectively. The Araneidae and Thomisidae had 6% of the total diversity, while the rest of the families had 5% or less.

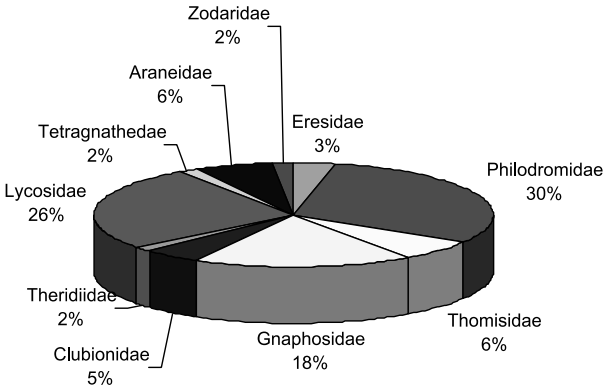

Fig. 2. Relative diversity of spider families recorded during in three study years

The sex ratios for the examined spiders (Fig. 3) showed that the maximum percentage of females to males occurred during 2001 and 2003 while the minimum occurred in 2002. The number of male spiders generally remained very low compared to that of female spiders; however, relatively more male spiders were collected during 2002. The lowest number of immature spiders was observed in 2003 and the highest in 2002.

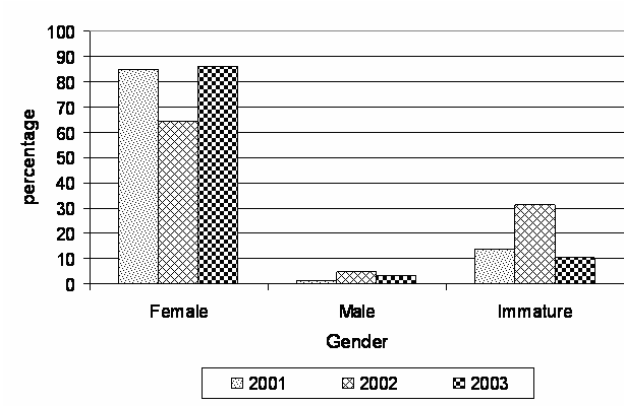

Fig. 3. Sex ratio of spiders collected by hand picking method during study period (2001 – 2003)

Discussion

Little is known about the ecology and diversity of arachnids from Pakistan's desert areas, particularly the Cholistan Desert. Our results show that 10 families with 62 species were encountered. A relatively high diversity of spiders can be expected in the desert areas considering our findings and those of Sivaperuman and Rathore (2004) who observed 13 families and 28 species in the Desert National Park of Rajusthan India. The diversity of spiders in deserts appears to be strongly influenced by habitat conditions and vegetation structure as we collected a higher number of spiders from the bushy habitats than in tree habitats (Bonte and Maelfait, 2001; Sorensen, 2003). These data would thus suggest that only selected taxa are able to adapt successfully to the extreme climatic conditions and limited habitat diversity (Pearce *et al.*, 2003). During our study it was also noted that in spite of very harsh environmental conditions in the desert some spider were visible throughout year.

The strong dominance of Philodromideae in this study may be attributed to the vegetation composition (bushy and grassy). Abundance of individual species in different habitats may be affected by the vegetation types (Pearce *et al.*, 2003). The hand picking and plant shaking methods are more useful than the pit fall method in the desert areas due to arid conditions causing the preserving solution to evaporate too soon to capture the specimens.

Table I. – Number and abundance of arachnid species recorded from different habitats during the study period (January 2001 – December 2003).

Families	Species	Year 2001	Year 2002	Year 2003	Total specimens	
		F – M – Imt	F – M – Imt	F – M – Imt	No.	%
Lycosidae	*Evippa shivajii* (Tikader & Malhotra, 1980)		56 – 14 – 0	0 – 0 – 0	70	2.33
	Flanona puellula (Simon 1898)	0 – 0 – 0	42 – 14 – 0	0 – 0 – 0	56	1.86
	Evippa sohani (Dyal 1935)	28 – 0 – 0	28 – 0 – 0	0 – 0 – 0	56	1.86
	Aractosa mulani (Dyal 1935)	0 – 0 – 0	28 – 0 – 0	0 – 0 – 0	28	0.93
	Hippasa madrasptana (Gravely 1924)	0 – 0 – 0	14 – 0 – 0	0 – 0 – 0	14	0.47
	Hippasa partita (G. P. Cambridge 1876)	0 – 0 – 28	42 – 0 – 0	0 – 0 – 0	70	2.33
	Ocyale atlanta (Sudouin 1826)	0 – 0 – 0	28 – 0 – 0	0 – 0 – 0	28	0.93
	Lycosa poonaensis (G. P. Cambridge 1876)	0 – 0 – 0	14 – 0 – 0	0 – 0 – 0	14	0.47
	Evippa Rajasthanicus (Tikader & Malhotra, 1980)	14 – 0 – 0	0 – 0 – 0	0 – 0 – 0	14	0.47
	Evippa praelongipes (O. P. – Cambridge, 1870)	154 – 0 – 14	210 – 0 – 14	420 – 0 – 28	840	27.93
	Evippa rubiginosa (Simon, 1885)	546 – 0 – 0	0 – 0 – 252	0 – 14 – 0	812	27.00
	Evippa Sp.1	0 – 01	9 – 0 – 8	1 – 0 – 1	20	0.67
	Evippa Sp.2	0 – 0 – 0	1 – 1 – 0	0 – 0 – 0	2	0.06
	Evippa Sp.3	0 – 0 – 3	0 – 0 – 1	1 – 0 – 0	5	0.17
	Hippasa Sp.	0 – 0 – 0	0 – 0 – 0	1 – 0 – 0	1	0.03
	Evippa Sp.4	0 – 0 – 0	0 – 0 – 0	1 – 0 – 0	1	0.03
Araneidae	*Cyrtophora feae* (Threll 1887)	42 – 0 – 0	0 – 0 – 0	0 – 0 – 0	42	1.40
	Araneus bitubercula (Walckenaer 1802)	28 – 0 – 0	28 – 0 – 0	0 – 0 – 0	56	1.86
	Neoscona theis (Walckenaer 1841)		28 – 14 – 0	0 – 0 – 0	42	1.40
	Neoscona Sp.	1 – 0 – 0	0 – 0 – 0	0 – 0 – 0	1	0.03
Tetragnathidae	*Leucauge* Sp.	1 – 0 – 1	0 – 0 – 0	0 – 0 – 0	2	0.06
Eresidae	*Stegodyphus* Sp.	0 – 0 – 0	1 – 0 – 0	1 – 0 – 0	2	0.06
Theridiidae	*Latrodectus* Sp.	0 – 0 – 0	0 – 0 – 0	2 – 0 – 0	2	0.06
Zodaridae	*Asceua* Sp.	0 – 0 – 0	1 – 1 – 0	0 – 1 – 0	3	0.10
Clubionidae	*Clubiona pashabhai* (Litsinger 1992)	0 – 0 – 0	42 – 0 – 14	0 – 0 – 0	56	1.86
	Clubiona filicata (O. P. – Cambridge, 1874)	42 – 0 – 0	0 – 0 – 0	0 – 0 – 0	42	1.40
	Castianeir tinae (Patel & Patel 1974)	0 – 0 – 0	28 – 0 – 0	0 – 0 – 0	28	0.93
Gnaphosidae	*Gnaphosa poonaensis* (Tikader 1973)	56 – 0 – 112	0 – 0 – 0		168	5.59
	Cllilepis rajasthanicus (Tikader & Gaybe 1977)	42 – 0 – 14	0 – 0 – 14	70 – 0 – 14	154	5.12
	Scotophinus maind (Simon 1905)	0 – 14 – 0	0 – 0 – 0	28 – 0 – 0	42	1.40
	Sosticus sundar (Chamvberlin 1922)	14 – 0 – 0	0 – 0 – 0	0 – 0 – 0	14	0.47
	Eilica platnigki (Tikader & Gaybe 1976)	14 – 0 – 0	0 – 0 – 0	0 – 0 – 0	14	0.47
	Scotophinus Sp.1	1 – 0 – 1	0 – 0 – 0	0 – 0 – 0	2	0.06
	Poecilochroa Sp.	3 – 0 – 1	0 – 0 – 0	0 – 0 – 0	4	0.13
	Callilepis Sp.1	1 – 0 – 1	0 – 0 – 0	0 – 0 – 0	2	0.06
	Callilepis Sp.2	1 – 0 – 1	0 – 0 – 0	0 – 0 – 0	1	0.03
	Callilepis Sp.3	2 – 0 – 2	2 – 0 – 2	2 – 0 – 2	12	0.40
	Callilepis Sp.4	0 – 0 – 0	0 – 0 – 0	1 – 0 – 0	1	0.03
	Drassylus Sp.1	0 – 0 – 1	0 – 0 – 0	1 – 0 – 0	2	0.06
	Drassodes Sp.2	0 – 0 – 0	0 – 0 – 0	1 – 0 – 0	1	0.03
	Gnaphosa Sp.	1 – 1 – 0	0 – 0 – 0	0 – 1 – 0	3	0.10
	Scotophaeus Sp.2	0 – 0 – 0	0 – 0 – 0	0 – 1 – 0	1	0.03
Thomisidae	*Oxyptila reenae* (Basu 1964)	14 – 0 – 0	0 – 0 – 0	0 – 0 – 0	14	0.47
	Dieae kapuri (Thorell 1869	0 – 0 – 0	14 – 0 – 0	0 – 0 – 0	14	0.47
	Xysticus Sp.	3 – 0 – 0	0 – 0 – 0	0 – 0 – 0	3	0.10
	Ebo emo (Tikader 1970)	0 – 1 – 3	1 – 0 – 1	5 – 0 – 1	12	0.40
	Ebo somathaii (Tikader 1965)	1 – 0 – 0	0 – 0 – 0	0 – 0 – 0	1	0.03
Philobromidae	*Tibellus pashanensis* (Tikader 1960)	14 – 0 – 0	14 – 0 – 0	0 – 0 – 0	28	0.93
	Thantus dhakuricus (Tikader 1962)	42 – 0 – 0	0 – 0 – 0	0 – 0 – 0	42	1.40
	Philodromus decoratus (Tikader 1962)	28 – 0 – 0	0 – 0 – 0	0 – 0 – 0	28	0.93

Continued

Families	Species	Year 2001	Year 2002	Year 2003	Total specimens	
		F – M – Imt	F – M – Imt	F – M – Imt	No.	%
	Philodromus Sp.1	9 – 0 – 0	0 – 0 – 0	5 – 0 – 5	19	0.63
	Philodromus Sp.2	0 – 0 – 0	0 – 0 – 0	4 – 0 – 6	10	0.33
	Philodromus Sp.3	5 – 0 – 2	0 – 0 – 0	16 – 0 – 0	23	0.76
	Philodromus Sp.4	1 – 0 – 0	2 – 0 – 0	1 – 0 – 0	4	0.13
	Philodromus Sp.5	0 – 0 – 0	0 – 0 – 1	3 – 0 – 0	4	0.13
	Philodromus Sp.6	17 – 0 – 1	7 – 2 – 4	0 – 0 – 0	31	1.03
	Philodromus Sp.7	2 – 0 – 2	0 – 0 – 4	1 – 2 – 4	15	0.50
	Philodromus Sp.8	0 – 0 – 0	1 – 0 – 1	1 – 0 – 1	4	0.13
	Philodromus Sp.9	0 – 0 – 0	2 – 0 – 1	0 – 0 – 1	4	0.13
	Philodromus Sp.10	0 – 0 – 0	0 – 0 – 0	1 – 0 – 0	1	0.03
	Philodromus Sp.11	0 – 0 – 0	1 – 0 – 0	1 – 0 – 0	2	0.06
	Philodromus Sp.12	1 – 0 – 0	1 – 0 – 0	1 – 1 – 1	5	0.17
	Philodromus Sp.13	0 – 0 – 0	0 – 0 – 0	1 – 0 – 2	3	0.10
	Philodromus Sp.14	1 – 0 – 0	0 – 0 – 0	0 – 0 – 0	1	0.03
	Tibellus Sp.1	1 – 0 – 0	4 – 0 – 1	0 – 0 – 0	6	0.20
	Tibellus Sp.2	0 – 0 – 0	0 – 0 – 0	1 – 0 – 4	5	0.17

Imt, immature; F, female; M, male.

Females were found more frequently than males which may be attributed to the time of collection during our survey. Most of our collections were limited to early mornings or during the mild and cool seasons of the year. It has been reported that desert insects are more active during the above mentioned times. (Pearce *et al*., 2003). During summer most of the spider webs were observed either on the undersurface of the plant leaves or beneath a bush on the ground where shade and moisture was available. Another reason for this sex ratio may be the breeding behavior of the spiders as it has been reported that breeding of spiders under the desert conditions is more common in cooler, milder conditions. The seasonal timing of the surveys may also explain the high number of immature specimens encountered (Foelix, 1982; Walker and Rypstra, 2002).

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