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Spiders of rocky desert in Kailana, Rajasthan, India

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Abstract

The Thar Desert constitutes a unique ecosystem in Indian subcontinent characterized by low rainfall, dryness, and extreme temperature. Ecologically, natural habitats in the Thar Desert can be classified as sandy, gravelly, and rocky. These arid rocky regions of the Thar Desert are totally unexplored in arachnological point of view. This study is a pioneering attempt to document the diversity of spider fauna of Kailana, Rajasthan which is a part of rocky desert. Spiders were collected for two years (December 2016-December 2018) using several methods: hand picking, aspiration, beating net, and litter sampling techniques. A total of 59 species of spiders belonging to 12 families under 30 genera were recorded during the study. Twelve species are new records from Rajasthan. The most diverse family collected was Araneidae followed by Salticidae. Guild structure analysis of collected spiders revealed six feeding guilds viz., stalkers, sheet-web builders, orb weavers, ground runners, foliage runners, and ambushers.

Keywords: Araneae, Thar Desert, Jodhpur, Guild structure, Rajasthan, India.

Introduction

Spiders are major terrestrial entomophagous predators in nature (Moulder & Reichle, 1972). They indirectly increase plant biomass and primary productivity by reducing herbivorous arthropod populations through predation (Lawrence & Wise, 2000). Studies have also shown that spiders play vital role in indirectly enhancing ecological processes like decomposition (Lawrence & Wise, 2004). Spiders can be considered as

ecological indicators, as they have been studied for monitoring pollution and ecosystem health (Clausen, 1986). Size of spiders and their fecundity are found to increase in areas with more anthropogenic disturbance (Lowe *et al.*, 2014).

The perusal of literature reveals that despite the ecological importance of spiders, they have been only sparsely studied in the Thar Desert landscape of India. Tikader (1966) reported 13 species of spiders from desert areas of Rajasthan. A preliminary study on spider fauna of Desert National Park reported 28 species of spiders belonging to 13 families and 21 genera (Sivaperuman & Rathore, 2004). Present work is the pioneering attempt to study the spiders of rocky arid region of the Thar Desert. Ecologically, natural habitats in the Thar Desert can be classified as sandy, gravelly, and rocky. These arid rocky regions of the Thar Desert are totally unexplored in arachnological point of view. The study area is Kailana which consists of hilly rocky to gravelly scrub area of the Thar Desert. Most of the studies on other faunas in this region have been done from Machia Safari Park an *insitu* conservation area and lake Kailana near by the present study site. A total of 146 species of birds belonging to 43 different families were reported from this area (Ram *et al.*, 2011) and 18 species of Lepidoptera belonging to 15 genera and 9 families were also observed in this region (Rajpurohit *et al.*, 2017). Thakur (1985) listed 18 species of Odonata around lake Kailana. Soota *et al.* (1983) studied sponges of Lake Kailana and their ecology. Rathore & Bohra (1987) studied the molluscan fauna of Lake Kailana. The present study was undertaken with an objective to prepare the checklist of spiders of arid rocky region of the Thar Desert at Kailana for the first time.

Material and Methods

Study area

Kailana is located 8 km north-west to Jodhpur city, Rajasthan, India. The area lies at 26.289°N and 72.974°E. It is located near an artificial lake called Kailana and Machia forest block. Igneous rock formations can be seen in areas in and around Kailana. Volcanic rock found here is chiefly rhyolite. This region is characterized by rocky to gravelly terrain with ridges. Climatically this region falls under semi-arid zone. Annual rainfall is 363 mm restricted mainly to months of July to August. Average annual maximum and minimum temperature ranges from 49°C to 20°C. Arid desert vegetation predominates here. Common plants noted in this habitat are *Barleria* sp., *Capparis decidua*, *Cleome viscosa*, *Euphorbia caducifolia*, *Grewia tenax*, *Indigofera cordifolia*, *Prosopis juliflora*, *Tephrosia purpurea* etc.

Methods

The study was conducted from December 2016 to December 2018. The spiders were collected by hand picking, aspiration, beating net, and litter sampling techniques. Rocks were upturned and searched for spiders. The collected specimens were preserved in vials containing 70% ethyl alcohol. All the vials were labelled with the place, date of collection, and other relevant information. All the preserved specimens were taken to the laboratory and were identified using Leica-M205C Stereozoom microscope. Adult specimens were identified by dissecting out the genital structures, *i.e.* epigynes and palps. Attempts were made to identify juveniles by examining morphological characters. Adults were identified up to species level and juveniles up to genus level using standard literature (Barrion & Litsinger, 1995; Jocqué & Dippenaar-Schoeman, 2006; Prószyński, 2017; Tikader, 1982a, 1982b; Tikader & Malhotra, 1980).

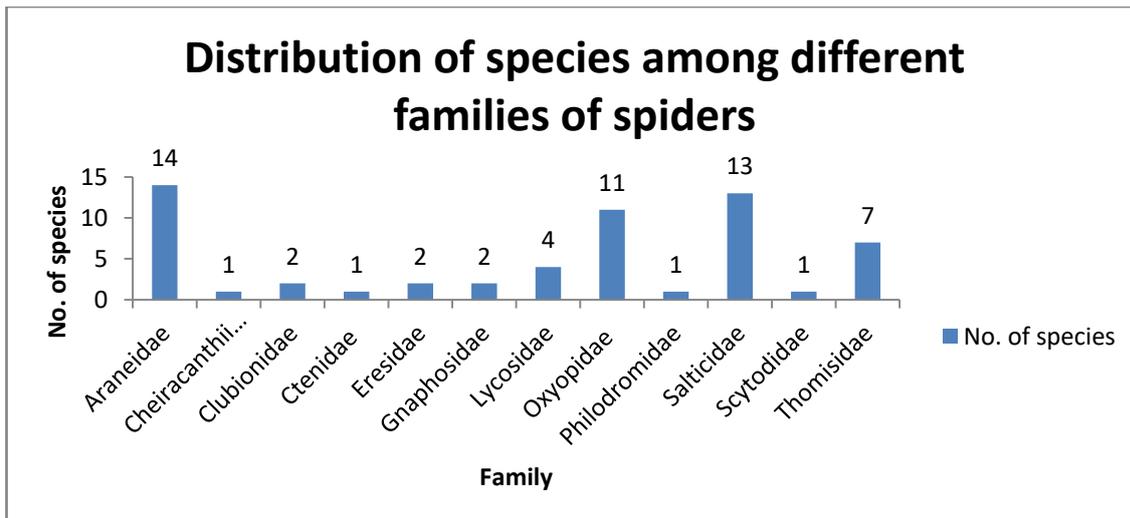


Fig. 1. Graph showing the distribution of species among different families of spiders.

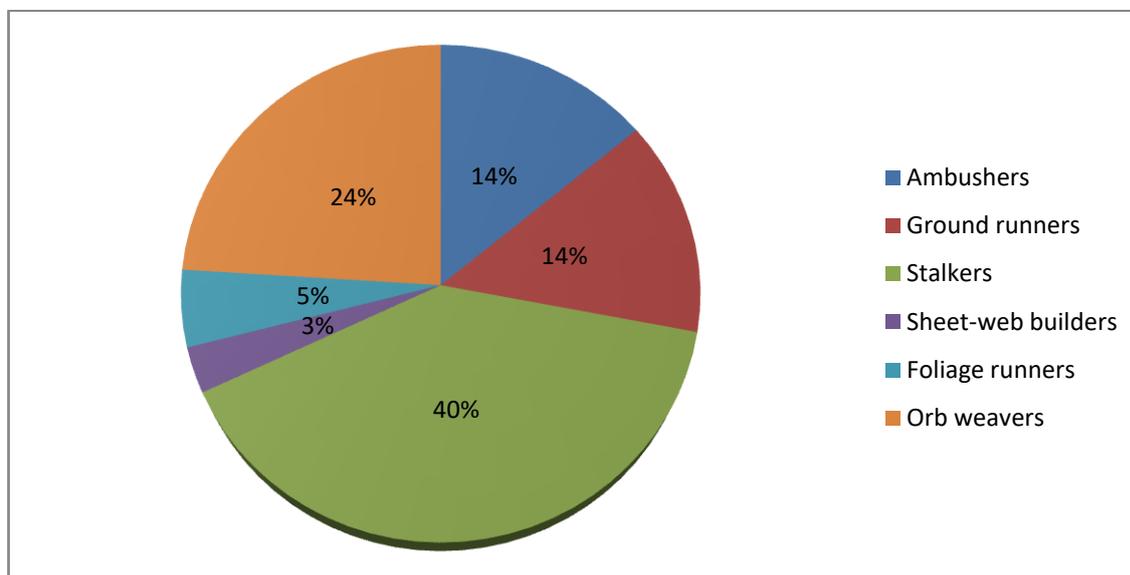


Fig. 2. Pie chart showing the guild structure of spiders.

Results and Discussion

A total of 59 species of spiders belonging to 12 families under 30 genera were recorded during the study (Table 1). Twelve species viz., *Araneus panchganiensis*, *Cyrtophora moluccensis*, *Draposa atropalpis*, *Hamataliwa subhadrae*, *Neoscona biswasi*, *Neoscona odites*, *Oxyopes chittrae*, *Oxyopes gujaratensis*, *Ozyptila brevipes*, *Peucetia latikae*, *Peucetia yogeshi*, and *Rudakius ludhianaensis* are new records from Rajasthan. Araneidae is the most species rich family with 14 species of 5 genera followed by Salticidae with 13 species belonging to 8 genera (Fig. 1). Guild structure analysis (Uetz *et al.*, 1999) yielded six types of feeding guilds viz., Ambushers, Ground runners, Stalkers, Sheet-web builders, Foliage runners, and Orb weavers. Stalkers were found to be the dominant guild constituting 40% of the total samples collected. Stalkers were followed by Orb weavers (24%), Ambushers (14%), Ground runners (14%), Foliage runners (5%), and Sheet-web builders (3%) (Fig. 2).

Table 1. Checklist of spiders of Kailana.

No.	Family / Species	Guild Structure
I	Araneidae Clerck, 1757	
1	<i>Araneus panchganiensis</i> Tikader & Bal, 1981	Orb weavers
2	<i>Araneus</i> sp.	Orb weavers
3	<i>Cyrtophora cicatrosa</i> (Stoliczka, 1869)	Orb weavers
4	<i>Cyrtophora citricola</i> (Forsskål, 1775)	Orb weavers
5	<i>Cyrtophora moluccensis</i> (Doleschall, 1857)	Orb weavers
6	<i>Herennia multipuncta</i> (Doleschall, 1859)	Orb weavers
7	<i>Larinia chloris</i> (Savigny, 1825)	Orb weavers
8	<i>Neoscona biswasi</i> Bhandari & Gajbe, 2001	Orb weavers
9	<i>Neoscona muckerjei</i> Tikader, 1980	Orb weavers
10	<i>Neoscona nautica</i> (L. Koch, 1875)	Orb weavers
11	<i>Neoscona odites</i> (Simon, 1906)	Orb weavers
12	<i>Neoscona pavidata</i> (Simon, 1906)	Orb weavers
13	<i>Neoscona theisi</i> (Walckenaer, 1841)	Orb weavers
14	<i>Neoscona</i> sp.	Orb weavers
II	Cheiracanthiidae Wagner, 1887	
15	<i>Cheiracanthium melanostomum</i> (Thorell, 1895)	Foliage runners
III	Clubionidae Wagner, 1887	
16	<i>Clubiona filicata</i> O. Pickard-Cambridge, 1874	Foliage runners
17	<i>Clubiona</i> sp.	Foliage runners
IV	Ctenidae Keyserling, 1877	
18	<i>Ctenus</i> sp.	Ground runners
V	Eresidae C.L. Koch, 1845	
19	<i>Stegodyphus pacificus</i> Pocock, 1900	Sheet-web builders
20	<i>Stegodyphus sarasinorum</i> Karsch, 1892	Sheet-web builders
VI	Gnaphosidae Pocock, 1898	
21	<i>Gnaphosa kailana</i> Tikader, 1966	Ground runners
22	<i>Gnaphosa</i> sp.	Ground runners
VII	Lycosidae Sundevall, 1833	
23	<i>Draposa atropalpis</i> (Gravely, 1924)	Ground runners
24	<i>Lycosa tista</i> Tikader, 1970	Ground runners
25	<i>Pardosa birmanica</i> Simon, 1884	Ground runners
26	<i>Pardosa pusiola</i> (Thorell, 1891)	Ground runners
VIII	Oxyopidae Thorell, 1870	
27	<i>Hamataliwa subhadrae</i> (Tikader, 1970)	Stalkers
28	<i>Oxyopes birmanicus</i> Thorell, 1887	Stalkers
29	<i>Oxyopes chittrae</i> Tikader, 1965	Stalkers
30	<i>Oxyopes gujaratensis</i> Gajbe, 1999	Stalkers
31	<i>Oxyopes javanus</i> Thorell, 1887	Stalkers
32	<i>Oxyopes pankaji</i> Gajbe & Gajbe, 2000	Stalkers
33	<i>Oxyopes shweta</i> Tikader, 1970	Stalkers
34	<i>Peucetia latikae</i> Tikader, 1970	Stalkers
35	<i>Peucetia viridana</i> (Stoliczka, 1869)	Stalkers
36	<i>Peucetia yogeshi</i> Gajbe, 1999	Stalkers
37	<i>Peucetia</i> sp.	Stalkers

IX	Philodromidae Thorell, 1870	
38	<i>Philodromus</i> sp.	Ambushers
X	Salticidae Blackwall, 1841	
39	<i>Aelurillus improvisus</i> Azarkina, 2002	Stalkers
40	<i>Afraflacilla</i> sp.	Stalkers
41	<i>Langona</i> sp.1	Stalkers
42	<i>Langona</i> sp.2	Stalkers
43	<i>Menemerus bivittatus</i> (Dufour, 1831)	Stalkers
44	<i>Menemerus brachygnathus</i> (Thorell, 1887)	Stalkers
45	<i>Mogrus rajasthanensis</i> Caleb, Chatterjee, Tyagi, Kundu & Kumar, 2017	Stalkers
46	<i>Mogrus</i> sp.1	Stalkers
47	<i>Mogrus</i> sp.2	Stalkers
48	<i>Pellenes</i> sp.	Stalkers
49	<i>Rudakius ludhianaensis</i> (Tikader, 1974)	Stalkers
50	<i>Thyene imperialis</i> (Rossi, 1846)	Stalkers
51	<i>Thyene</i> sp.	Stalkers
XI	Scytodidae Blackwall, 1864	
52	<i>Scytodes</i> sp.	Ground runners
XII	Thomisidae Sundevall, 1833	
53	<i>Bomis</i> sp.	Ambushers
54	<i>Ozyptila brevipes</i> (Hahn, 1826)	Ambushers
55	<i>Ozyptila reena</i> Basu, 1964	Ambushers
56	<i>Thomisus lobosus</i> Tikader, 1965	Ambushers
57	<i>Thomisus</i> sp.	Ambushers
58	<i>Tmarus kotigeharus</i> Tikader, 1963	Ambushers
59	<i>Tmarus</i> sp.	Ambushers

This study is the pioneering approach to explore spiders of arid rocky habitat of the desert. A better understanding of biodiversity of a region can contribute to the planning of conservation efforts in that area. This study reports 59 species of spiders which is indeed a good number in desert scenario. Further research on biodiversity of Thar Desert is urgently required as it is facing several threats like climate change, impact of Indira Gandhi Canal project, mining activities population pressure etc. (Sharma *et al.*, 2013).

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