

## **The diversity of spiders from the vicinity of Dharoi Reservoir, North Gujarat, India**

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### **Abstract**

The present study of spiders was conducted in 2016 to 2018 around five sites of Dharoi Reservoir, North Gujarat. The study was planned to determine the spider diversity at various habitats like Natural forest, Grassland, Hilly area, and agriculture area. A total of 981 samples were collected using various methods like line transects, visual searching, vegetation beating, sweep netting, beating sheets, aerial hand collection, ground hand collection, and hand-picking, etc. Out of a total of 142 species of spiders belonging to 86 genera and 25 families were recorded. Most numerical dominant families were Araneidae and Salticidae followed by Thomisidae, Tetragnathidae, Sparassidae, and other families that contribute less than 5% in total recorded spiders. This region has detected more than 43% of Indian spiders families. The result of this study pointed out the high conservation importance of natural forest for the existence of spiders' fauna.

**Keywords:** Spiders, diversity, Dharoi, Gujarat. India.

### **Introduction**

Spiders are occurring in all terrestrial ecosystems as predator organisms; they exert an important regulatory function. Order Araneae is one in all the larger orders in phylum Arthropoda of the kingdom Animalia. There are concerning 48643 species of 4173 genera belonging to 128 families of spiders within the world (World Spider Catalog, 2020) and concerning 1686 species belonging to 438 genera of 60 families from the Indian subcontinent (Keswani *et al.*, 2012). The spider diversity of Gujarat consists of 415 species under 169 genera and 40 families (Yadav *et al.*, 2017). In Gujarat, ninety species belonging to 46 genera and 18 families were recorded from Mahesana (Patel &

Patel, 2015) and 157 species were identified belonging to 27 families and 88 genera to indicate an extremely diverse and wealthy spider fauna in Satlasana Taluka (Parmar, 2018).

## Material and Methods

### Study Area

The Dharoi reservoir is the most significant reservoir in North Gujarat at the point of irrigation. The study area is located in three Districts of North Gujarat named Mahesana, Banaskantha, and Sabarkantha. A total of 349.39 hectare areas fall under this reservoir; 28 villages are fully and 19 villages are partially submerged in this reservoir. The climate of the Dharoi reservoir is considered by a hot summer and general aridness for the most part of the year. The ranges of day temperatures are around 38°C in summer and 20°C in winter. The average yearly rainfall is 618.7 mm.

### Methodology

The study was applied from 2016 to 2018 using line transects, visual searching, vegetation beating, sweep netting, beating sheets, aerial hand collection, ground hand collection, and hand-picking in 5 study sites (Table 1). The line transects were of 1.5 kms length and 20 m width, with sampling, restricted to a maximum height of 1.6 m. The sampling methods of the spiders included: Ground hand collections were done searching for leaf litter or fallen dry wood; Sweep netting was done through standard sweeps for the foliage home spiders covering the herbs, and shrubs; Aerial hand collection and beating sheets were wooden standard stick and an umbrella placed beneath the branches of tiny trees to catch the spiders. Web pattern, habitat type, section, and different notes of importance were recorded with every encounter. The spiders were placed separately in vials with 70% ethyl alcohol. All such specimens were kept within the specimen tubes properly labelled with the date, detailed and elaborate notes of importance. For a detailed examination of all specimens a stereo zoom microscope (Olympus SZ51) was used. Standard references, monographs and taxonomic keys (Pocock, 1900; Tikader, 1977, 1980, 1982a, 1982b, 1987; Tikader & Malhotra, 1980; Sebastian & Peter, 2009) are used for identification of spiders with World Spider Catalog (2020).

Table 1. Sites description of study area.

No.	Site name	Geographical location	Description
1	Dharoi Village	24°00'26"N, 72°50'32"E	Mixed thorny type Natural jungle and around agriculture farming
2	Umedpura Village	24°02'59"N, 72°51'54"E	Submerge land, agriculture farming, and Tropical thorn scrub type vegetation
3	Bhavangadh Village	24°03'19"N, 72°50'23"E	Tropical thorn scrub type vegetation
4	Nakod Village	23°59'56"N, 72°55'55"E	Submerge land and agriculture farming
5	Mahor Village	23°58'15"N, 72°51'59"E	Tropical thorn scrub type vegetation

## Results

A total of 142 species (Table 2) were recorded and identified from Dharoi Reservoir from 2016 to 2018. The family Araneidae was numerical dominant which had the highest number of species (32); followed by Salticidae (25), Thomisidae (10),

Tetragnathidae (9), Theridiidae (8), Sparassidae (8), and Oxyopidae (7). Most of the other families had less than 5 species. Total of nine guilds (Table 3) were recorded during the study: the orb-weaving spiders with the highest number of total species with 45 species (31.69% of all species), followed by stalker spiders with 32 species (22.53%), ground spiders with 27 species (19.09%), irregular web builder with 12 species (8.45%), ambusher spiders with 12 species (8.45%), foliage hunter/ runner spiders with 6 species (4.22%), and other guilds consist of less than 5% of spiders.

Table 2. Systematic list of recorded spiders in the study area.

No.	Family	Name of species
1	ARANEIDAE	<i>Araneus bilunifer</i>
2		<i>Araneus ellipticus</i>
3		<i>Araneus mitificus</i>
4		<i>Argiope anasuja</i>
5		<i>Chorizopes</i> sp.
6		<i>Cyclosa bifida</i>
7		<i>Cyclosa confragra</i>
8		<i>Cyclosa</i> sp.
9		<i>Cyrtophora cicatrosa</i>
10		<i>Cyrtophora citricola</i>
11		<i>Eriophora</i> sp.
12		<i>Eriovixia excelsa</i>
13		<i>Eriovixia laglaizei</i>
14		<i>Gasteracantha geminata</i>
15		<i>Gea spinipes</i>
16		<i>Larinia chloris</i>
17		<i>Larinia phthisica</i>
18		<i>Larinia</i> sp.
19		<i>Neoscona muckerjei</i>
20		<i>Neoscona nautica</i>
21		<i>Neoscona odites</i>
22		<i>Neoscona subfusca</i>
23		<i>Neoscona theisi</i>
24		<i>Neoscona vigilans</i>
25		<i>Neoscona</i> sp.1
26		<i>Neoscona</i> sp.2
27		<i>Nephila pilipes</i>
28		<i>Parawixia dehaani</i>
29		<i>Poltys bhabanii</i>
30		<i>Poltys</i> sp.
31		<i>Singa</i> sp.
32		<i>Thelacantha brevispina</i>
33	CHEIRACANTHIIDAE	<i>Cheiracanthium</i> sp.1
34		<i>Cheiracanthium</i> sp.2
35	CLUBIONIDAE	<i>Clubiona drassodes</i>
36		<i>Clubiona</i> sp.
37	CORINNIDAE	<i>Castianeira tinae</i>

38		<i>Castianeira</i> sp.
39	CTENIDAE	<i>Ctenus</i> sp.
40	ERESIDAE	<i>Stegodyphus pacificus</i>
41		<i>Stegodyphus sarasinorum</i>
42	FILISTATIDAE	<i>Pritha napadensis</i>
43		<i>Sahastata ashapuriae</i>
44	GNAPHOSIDAE	<i>Drassodes</i> sp.
45		<i>Gnaphosa stoliczkai</i>
46		<i>Poecilochroa</i> sp.
47		<i>Zelotes</i> sp.
48	HERSILIIDAE	<i>Hersilia savignyi</i>
49		<i>Hersilia</i> sp.
50	LYCOSIDAE	<i>Arctosa indica</i>
51		<i>Hippasa agelenoides</i>
52		<i>Lycosa tista</i>
53		<i>Lycosa</i> sp.
54		<i>Pardosa birmanica</i>
55		<i>Pardosa</i> sp.
56	OECOBIIDAE	<i>Oecobius putus</i>
57		<i>Uroctea thaleri</i>
58		<i>Uroctea</i> sp.
59	OXYOPIDAE	<i>Hamataliwa</i> sp.
60		<i>Oxyopes javanus</i>
61		<i>Oxyopes minutus</i>
62		<i>Oxyopes ryvesi</i>
63		<i>Oxyopes</i> sp.
64		<i>Peucetia elegans</i>
65		<i>Peucetia</i> sp.
66	PHILODROMIDAE	<i>Philodromus</i> sp.
67		<i>Tibellus</i> sp.
68	PHOLCIDAE	<i>Crossopriza lyoni</i>
69		<i>Pholcus phalangioides</i>
70		<i>Pholcus</i> sp.
71		<i>Physocyclus globosus</i>
72	PISAUROIDAE	<i>Perenethis</i> sp.
73		<i>Pisaura</i> sp.
74	SALTICIDAE	<i>Carrhotus sannio</i>
75		<i>Carrhotus viduus</i>
76		<i>Epeus indicus</i>
77		<i>Epocilla aurantiaca</i>
78		<i>Hasarius adansoni</i>
79		<i>Hyllus semicupreus</i>
80		<i>Menemerus bivittatus</i>
81		<i>Menemerus brachygnathus</i>
82		<i>Menemerus fulvus</i>
83		<i>Myrmaplata platyleoides</i>
84		<i>Myrmarachne</i> sp.
85		<i>Phidippus</i> sp.

86		<i>Phintella vittata</i>
87		<i>Phintella</i> sp.
88		<i>Phlegra dhakuriensis</i>
89		<i>Plexippus paykulli</i>
90		<i>Plexippus petersi</i>
91		<i>Rhene</i> sp.
92		<i>Siler semiglaucus</i>
93		<i>Stenaelurillus lesserti</i>
94		<i>Stenaelurillus</i> sp.1
95		<i>Stenaelurillus</i> sp.2
96		<i>Telamonina dimidiata</i>
97		<i>Thiania</i> sp.
98		<i>Thyene imperialis</i>
99	SCYTODIDAE	<i>Scytodes thoracica</i>
100		<i>Scytodes</i> sp.
101	SELENOPIIDAE	<i>Selenops</i> sp.
102	SICARIIDAE	<i>Loxosceles rufescens</i>
103	SPARASSIDAE	<i>Heteropoda bhaikakai</i>
104		<i>Heteropoda venatoria</i>
105		<i>Heteropoda</i> sp.
106		<i>Olios bhavnagarensis</i>
107		<i>Olios iranii</i>
108		<i>Olios milleti</i>
109		<i>Olios wroughtoni</i>
110		<i>Olios</i> sp.
111	TETRAGNATHIDAE	<i>Guizygiella indica</i>
112		<i>Guizygiella melanocrania</i>
113		<i>Guizygiella shivui</i>
114		<i>Leucauge decorata</i>
115		<i>Tetragnatha keyserlingi</i>
116		<i>Tetragnatha mandibulata</i>
117		<i>Tetragnatha viridorufa</i>
118		<i>Tetragnatha</i> sp.
119		<i>Tylorida ventralis</i>
120	THERIDIIDAE	<i>Achaearanea triangularis</i>
121		<i>Achaearanea</i> sp.
122		<i>Argyrodes argentatus</i>
123		<i>Argyrodes flavescens</i>
124		<i>Chrysso angula</i>
125		<i>Chrysso</i> sp.
126		<i>Steatoda</i> sp.
127		<i>Theridion</i> sp.
128	THOMISIDAE	<i>Diaea</i> sp.
129		<i>Indoxysticus minutus</i>
130		<i>Misumena</i> sp.
131		<i>Oxytate</i> sp.
132		<i>Runcinia</i> sp.
133		<i>Synema decoratum</i>

134		<i>Thomisus lobosus</i>
135		<i>Thomisus projectus</i>
136		<i>Thomisus</i> sp.
137		<i>Xysticus kali</i>
138	ULOBORIDAE	<i>Uloborus danolius</i>
139		<i>Uloborus krishnae</i>
140		<i>Uloborus</i> sp.
141		<i>Zosis</i> sp.
142	ZODARIIDAE	<i>Mallinella</i> sp.

Table 3. Generic distribution and guilds of spiders.

No.	Family	Genera	Species	Family distribution (%)	Guild
1	Araneidae	16	32	22.69	Orb web weaver
2	Cheiracanthiidae	1	2	1.40	Foliage runner
3	Clubionidae	1	2	1.40	Foliage hunter
4	Corinnidae	1	2	1.40	Ground runner
5	Ctenidae	1	1	0.70	Ground runner
6	Eresidae	1	2	1.40	Snare/sheet web builder
7	Filistatidae	2	2	1.40	Funnel web
8	Gnaphosidae	4	4	2.81	Ground runner
9	Hersiliidae	1	2	1.40	Foliage hunter
10	Lycosidae	4	6	4.22	Funnel web/ground runner
11	Oecobiidae	2	3	2.11	Disc web builder
12	Oxyopidae	3	7	4.92	Stalker
13	Philodromidae	2	2	1.40	Ambusher
14	Pholcidae	3	4	2.81	Scattered line weaver
15	Pisauridae	2	2	1.40	Ground runner/nursery web builder
16	Salticidae	17	25	17.60	Stalker
17	Scytodidae	1	2	1.40	Ground runner
18	Selenopidae	1	1	0.70	Ground runner
19	Sicariidae	1	1	0.70	space web-weaver
20	Sparassidae	2	8	5.63	Ground runner
21	Tetragnathidae	4	9	6.33	Orb web weaver
22	Theridiidae	5	8	5.63	Scattered line weaver
23	Thomisidae	8	10	7.04	Ambusher
24	Uloboridae	2	4	2.81	Orb web weaver
25	Zodariidae	1	1	0.70	Ground runner
	Total	<b>86</b>	<b>142</b>	<b>100</b>	

## Discussion and Conclusion

The study leads to the conclusion that the spider diversity of the Dharoi Reservoir is very rich in quality and quantity. The natural and undisturbed forest is consisting of high plant diversity that forms a complex structure that supports a number of animals including spiders (Uetz, 1991). However, if the natural forest becomes fragmented or land use pattern changes, certain factors act as a barrier within the dispersion and

abundance of species (Bonte *et al.*, 2004). Since the study area is a human-dominated landscape, they are facing threats like habitat loss, mining, pollution, and changes in land-use patterns. But necessary steps need to be taken up to conserve the spider fauna. This can be done by educating the students, school nature club, scientists, local forest department and farmers to preserve the natural equilibrium in the various habitats.

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