

A Study on Diversity of Spiders at Malavagoppa Village, in Shimoga District, Karnataka

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Abstract— Spiders belong to the order Araneae which is the largest order among the class Arachnida. Spiders are considered as indicators of overall species richness and the health of terrestrial communities. The village with different plantations harbors a good number of spiders. The survey was carried out from February 2018 to January 2019 by using active searching, beating, leaf sampling and net sweeping techniques. During the study, a total number of 51 species belonging to 42 genera of 16 families were documented. In the present study it was found that the family Araneidae was dominated by having 14 species followed by the family Salticidae having 12 species and the least were from Clubionidae, Corinnidae, Eresidae, Gnaphosidae, Hersiliidae, Linyphiidae, Sparassidae, Theridiidae and Uloboridae with a single species from each family.

Keywords— Araneidae, Malavagoppa Village, Spiders Diversity.

I. INTRODUCTION

Spiders form one of the most ubiquitous groups of predaceous organisms in the animal kingdom (Riechert and Lockley 1984). Among all organisms, spiders (Order: Araneae) form the seventh largest order in terms of number of known species (Sebastian and Peter, 2009). They belong to the class Arachnida of the Phylum Arthropoda that possesses jointed appendages with a chitinous exoskeleton system. They are characterized by two body parts, the cephalothorax having 4 pairs of segmented legs and the abdomen. They have simple eyes, no antenna and no wings, which differentiate them from insects.

Spiders are the key components of all ecosystems in which they live. They are the ancient animals with a history going back over 350 million years (Sebastian and Peter, 2010). This is the most diverse, female dominated and entirely predatory order in the Arthropod world. Globally, spiders include about 48,147 described species in 4131 genera and 117 families. (World Spider Catalog, 2019). They are distributed on every continent except

Antarctica and have adapted to all known ecological environments except air and the open sea (Foelix, 1996). Spiders of the Western Ghats are poorly studied compared to other parts of the country. With respect to its geographical, climatic and ecological features, the Western Ghats harbors a rich amount of arachnids out of which spiders have a huge share. Studies on Indian spiders were initiated by Blackwall (1850). Different studies have shown that spiders regulate prey populations depending on their density. Recent studies have shown that the spiders act as ecological indicators and early warning signs of environmental changes (Kremen et. al., 1993).

II. MATERIALS AND METHOD

Study site:

Malavagoppa village, located at 13.8998°N 75.6194°E Shimoga district, Karnataka. This village is an urban area with good number of vegetation.

Methods:

Study sites included indoor habitats such as inside houses and other buildings, surroundings of human dwellings; outdoor habitats included were gardens, areca plantations, and open field.

The study was carried out from February 2018 to January 2019 covering all three seasons.

Survey was done 2 times in a week. The techniques involved were all out active searching, beating, visual observation and photographic methods. Collections were done by hand picking, gentle beating on surroundings so as to make the individual pass into the collection box. Detailed morphological study was done using Stereo-zoom and compound microscope. Identifications were done by referring 'Spiders of India' book, literatures and other scientific papers.

Statistical analysis:

Calculations were done by using Microsoft excel.

Formulae used:

$$\text{Frequency} = \frac{\text{Number of seasons studied}}{\text{Total number of seasons studied}}$$

III. RESULTS

A. Species diversity of spiders

The study site has a great spider diversity of 51 species belonging to 42 genera of 16 families.

In the present study site, the family Araneidae is dominated by having 14 species (9 genera) followed by the family Salticidae having 12 species (12 genera), the Tetragnathidae with 6 species (3 genera), Lycosidae with 3 species (3 genera), Oxyopidae with 3 species (2 genera), Thomisidae and Pholcidae with 2 species (2 genera) in each and the Clubionidae, Corinnidae, Eresidae, Gnaphosidae, Hersiliidae, Linyphiidae, Sparassidae, Theridiidae and Uloboridae were identified with single species in each (Table.1).

Table.1: Spiders recorded in Malavagoppa village during Feb 2018- Jan 2019

Sl. No	Family	Scientific name	Common name	Species count
1	Araneidae	<i>Araneus spp</i> (Clerck, 1757)	Angulated Orb Weaver	14
		<i>Argiope anasuja</i> (Throell, 1887)	Signature Spider	
		<i>Argiope pulchella</i> (Throell, 1881)	Garden Cross Spider	
		<i>Argiope spp.1</i> (Audouin, 1826)	Signature Spider	
		<i>Cyclosa bifida</i> (Doleschall, 1859)	Long-bellied Cyclosa	
		<i>Cyrtophora cicatrosa</i> (Stoliczka, 1869)	Tent-web Spider	
		<i>Cyrtophora citricola</i> (Forsskal, 1775)	Tropical Tent-web Spider	
		<i>Eriovixia spp.</i> (Archer, 1951)		
		<i>Gasteracantha geminata</i> (Fabricius, 1798)	Oriental Spiny Orb-weaver	
		<i>Gasteracantha spp.1</i> (Sundevall, 1833)	Spiny Orb-weaver	
		<i>Neoscona crucifera</i> (Lucas, 1838)	Common Garden Spider	
		<i>Neoscona nautica</i> (L. Koch, 1875)	Grey Sphere Spider	
		<i>Parawixia dehaani</i> (Doleschall, 1859)	Abandoned Orb-weaver	
		<i>Thelacantha brevispina</i> (Doleschall, 1857)	False Gasteracantha (Double Spotted Spiny Spider)	
2	Clubionidae	<i>Clubiona spp.</i> (Latreille, 1804)	Leaf Curling Sac Spiders	1
3	Corinnidae	<i>Castianeira zetes</i> (Simon, 1897)	Black Ant-mimicking Spider	1
4	Eresidae	<i>Stegodyphus sarasinorum</i> (Karsch, 1892)	Indian Social Spider	1
5	Gnaphosidae	<i>Gnaphosa spp.</i> (Latreille, 1804)	Ground Dwelling Spider	1
6	Hersiliidae	<i>Hersilia savignyi</i> (Lucas, 1836)	Two Tailed Spider	1
7	Linyphiidae	<i>Neriere sunaica</i> (Simon, 1905)	Black Dwarf Spider	1
8	Lycosidae	<i>Geolycosa spp.</i> (Montgomery, 1904)	Wolf spider	3
		<i>Hippasa agelenoides</i> (Simon, 1884)	Funnel Web Spider	
		<i>Pardosa spp.</i> (C. L. Koch, 1847)	Wolf Spider	
9	Oxyopidae	<i>Oxyopes javanus</i> (Throell, 1887)	Striped Lynx Spider	3
		<i>Oxyopes sunandae</i> (Tikader, 1970)	Orange Lynx Spider	
		<i>Peucetia viridians</i> (Hentz, 1832)	Green Lynx Spider	
10	Pholcidae	<i>Crossopriza lyoni</i> (Blackwall, 1867)	Tailed Cellar Spider	2
		<i>Pholcus spp.</i> (Walckenaer, 1805)	Daddy long leg spider	
11	Salticidae	<i>Asemonea spp.</i> (O. Pickard-Cambridge, 1869)	Green jumping spider	12
		<i>Bavia kairali</i> (Samson & Sebastian, 2002)	Scorpion Spider	
		<i>Carrhotus viduus</i> (C. L. Koch, 1847)	Double Striped Carrhotus	

		<i>Chrysilla volupe</i> (Karsch,1879)	Colored Jumping Spider	
		<i>Epeus indicus</i> (Proszynski,1992)	White Spotted Green Jumper	
		<i>Hyllus semicupreus</i> (Simon, 1885)	Heavy-bodied Jumping Spider	
		<i>Menemerus bivittatus</i> (Dufour, 1831)	Gray Wall Jumper	
		<i>Myrmarachne plataleoides</i> (O. Pickard-Cambridge,1869)	Kerengga Ant-like Jumper	
		<i>Phintella vittata</i> (C. L. Koch,1846)	Banded Phintella	
		<i>Plexippus paykulli</i> (Audouin, 1826)	Pantropical Jumping Spider	
		<i>Portia albimana</i> (Simon, 1900)	Fringed Jumping Spider	
		<i>Telamonia dimidiata</i> (Simon, 1899)	Two-striped Jumping Spider	
12	Sparassidae	<i>Heteropoda venatoria</i> (Linnaeus, 1767)	Huntsman Spider	1
13	Tetragnathidae	<i>Leucauge decorata</i> (Blackwall, 1864)	Decorative silver orb weaver	6
		<i>Leucauge tessellata</i> (Throell,1887)	Long jawed orb weaver	
		<i>Leucauge spp.1</i> (White, 1841)	Decorative spider	
		<i>Opadometa fastigata</i> (Simon, 1877)	Pear Shaped Leucauge	
		<i>Tetragnatha mandibulata</i> (Walckenaer, 1841)	Long-jawed Orb-weaver	
		<i>Tetragnatha spp.1</i> (Latreille, 1804)	Long jawed Spider	
14	Theridiidae	<i>Theridion spp.</i> (Walckenaer, 1805)	Comb-footed Spider	1
15	Thomisidae	<i>Misumenops rubrodecoratus</i> (Milot,1942)	Green Crab Spider	2
		<i>Thomisus spectabilis</i> (Doleschall, 1859)	White Crab spider	
16	Uloboridae	<i>Uloborus spp.</i> (Latreille, 1806)	Feather-footed Spider	1

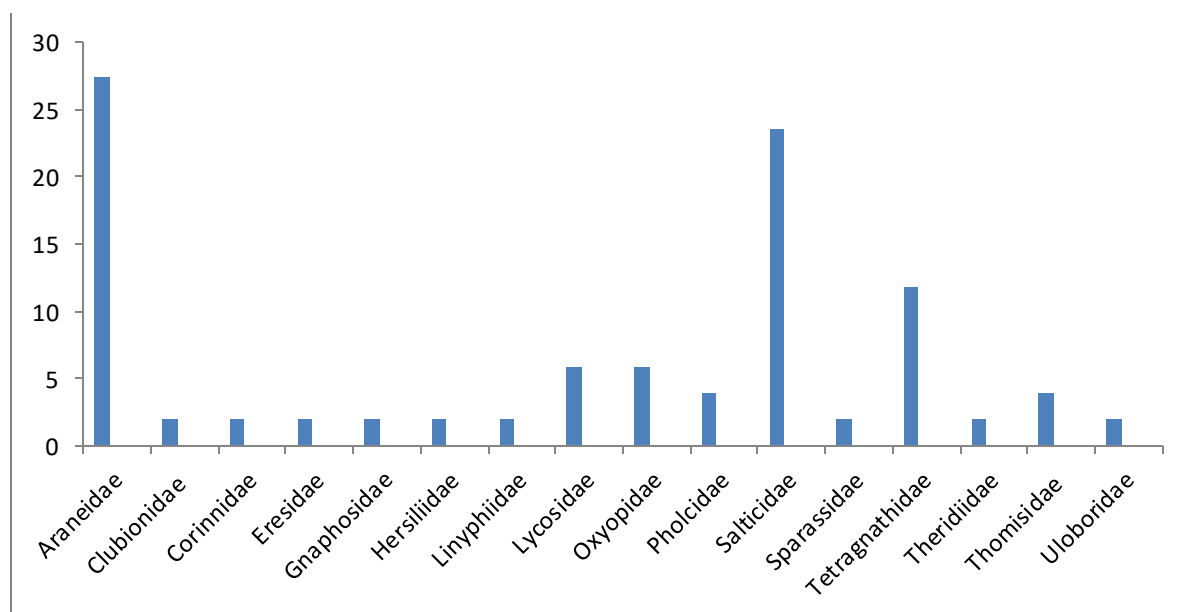


Fig.1: Graph of species percentage under each family

B. Diversity richness and seasonal abundance

Three main seasons were studied viz., rainy, winter and summer. Most spider species were found

throughout the study period and few were found only in two seasons. But, only one species (*Oxyopes sunandae*) has occurred in one season (rainy). (Table 2).

Table.2. Shows individual counts of each species during different seasons.

Sl No.	Spider Species	Individual counts of spider in different seasons			Total count
		Rainy	Winter	Summer	
1	<i>Araneus spp</i>	11	9	3	23
2	<i>Argiope anasuja</i>	12	13	9	34
3	<i>Argiope pulchella</i>	13	14	8	36
4	<i>Argiope spp.1</i>	6	5	3	14
5	<i>Asemonea spp</i>	8	9	6	23
6	<i>Bavia kairali</i>	2	1	0	3
7	<i>Carrhotus viduus</i>	4	4	3	11
8	<i>Castianeira zetes</i>	15	16	11	42
9	<i>Chrysilla volupe</i>	12	13	16	41
10	<i>Clubiona spp</i>	14	8	6	28
11	<i>Crossopriza lyoni</i>	50	55	50	155
12	<i>Cyclosa bifida</i>	25	23	15	63
13	<i>Cyrtophora cicatrosa</i>	40	44	25	109
14	<i>Cyrtophora citricola</i>	20	20	12	52
15	<i>Epeus indicus</i>	4	4	3	11
16	<i>Eriovixia spp.</i>	4	3	3	10
17	<i>Gasteracantha geminata</i>	12	12	0	24
18	<i>Gasteracantha spp.1</i>	2	1	0	3
19	<i>Geolycosa spp.</i>	40	45	50	135
20	<i>Gnaphosa spp</i>	8	7	2	17
21	<i>Heteropoda venatoria</i>	6	4	4	14
22	<i>Hersilia savignyi</i>	10	11	11	32
23	<i>Hippasa agelenoides</i>	30	31	29	90
24	<i>Hyllus semicupreus</i>	4	3	2	9
25	<i>Leucauge decorata</i>	12	15	7	34
26	<i>Leucauge tessellata</i>	4	2	0	6
27	<i>Leucauge spp.1</i>	2	1	0	3
28	<i>Menemerus bivittatus</i>	10	8	9	27
29	<i>Misumenops rubrodecoratus</i>	1	2	0	3
30	<i>Myrmarachne plataleoides</i>	16	17	15	48
31	<i>Neoscona crucifera</i>	32	34	33	81
32	<i>Neoscona nautica</i>	4	3	2	9
33	<i>Neriene sundaica</i>	30	34	15	79
34	<i>Oxyopes javanus</i>	45	50	50	145
35	<i>Oxyopes sunandae</i>	2	0	0	2
36	<i>Opadometa fastigata</i>	2	2	0	4
37	<i>Parawixia dehaani</i>	1	1	0	2
38	<i>Pardosa spp</i>	45	56	60	161
39	<i>Peucetia viridans</i>	20	25	16	61
40	<i>Phintella vittata</i>	2	4	8	14
41	<i>Pholcus spp</i>	55	50	55	160
42	<i>Plexippus paykulli</i>	62	65	64	191

43	<i>Portia albimana</i>	0	2	2	4
44	<i>Stegodyphus sarasinorum</i>	7	8	14	29
45	<i>Telamonia dimidiata</i>	13	12	10	35
46	<i>Tetragnatha mandibulata</i>	9	11	8	28
47	<i>Tetragnatha spp.1</i>	1	2	0	3
48	<i>Thelacantha brevispina</i>	9	9	0	18
49.	<i>Theridion spp.</i>	9	10	9	28
49	<i>Thomisus spectabilis</i>	4	5	0	9
51	<i>Uloborus spp</i>	4	5	2	11
Total count during each season		753	788	650	2174

Table.3: Frequency, density, abundance and species importance value of each species

Sl No.	Species	F	D	A	SIV
1	<i>Araneus spp</i>	1.00	7.67	7.67	3.21
2	<i>Argiope anasuja</i>	1.00	11.33	11.33	3.76
3	<i>Argiope pulchella</i>	1.00	11.67	11.67	3.71
4	<i>Argiope spp.1</i>	1.00	4.67	4.67	2.80
5	<i>Asemonea spp</i>	1.00	7.67	7.67	3.21
6	<i>Bavia kairali</i>	0.67	1.00	1.50	1.58
7	<i>Carrhotus viduus</i>	1.00	3.67	3.67	2.66
8	<i>Castianeira zetes</i>	1.00	14.00	14.00	4.08
9	<i>Chrysilla volupe</i>	1.00	13.67	13.67	4.03
10	<i>Clubiona spp</i>	1.00	9.33	9.33	3.44
11	<i>Crossopriza lyoni</i>	1.00	51.67	51.67	9.23
12	<i>Cyclosa bifida</i>	1.00	21.00	21.00	5.03
13	<i>Cyrtophora cicatrosa</i>	1.00	36.33	36.33	7.13
14	<i>Cyrtophora citricola</i>	1.00	17.33	17.33	4.53
15	<i>Epeus indicus</i>	1.00	3.67	3.67	2.66
16	<i>Eriovixia spp.</i>	1.00	3.33	3.33	2.61
17	<i>Gasteracantha geminata</i>	0.67	8.00	12.00	2.53
18	<i>Gasteracantha spp.1</i>	0.67	1.00	1.50	1.58
19	<i>Geolycosa spp.</i>	1.00	45.00	45.00	8.32
20	<i>Gnaphosa spp</i>	1.00	5.67	5.67	2.93
21	<i>Heteropoda venatoria</i>	1.00	4.67	4.67	2.80
22	<i>Hersilia savignyi</i>	1.00	10.67	10.67	3.62
23	<i>Hippasa agelenoides</i>	1.00	30.00	30.00	6.27
24	<i>Hyllus semicupreus</i>	1.00	3.00	3.00	2.57
25	<i>Leucauge decorata</i>	1.00	11.33	11.33	3.71
26	<i>Leucauge tessellata</i>	0.67	2.00	3.00	1.71
27	<i>Leucauge spp.1</i>	0.67	1.00	1.50	1.58
28	<i>Menemerus bivittatus</i>	1.00	9.00	9.00	3.39
29	<i>Misumenops rubrodecoratus</i>	0.67	1.00	1.50	1.58
30	<i>Myrmarachne plataleoides</i>	1.00	16.00	16.00	4.35
31	<i>Neoscona crucifera</i>	1.00	33.00	33.00	6.68
32	<i>Neoscona nautica</i>	1.00	3.00	3.00	2.57
33	<i>Neriere sunaica</i>	1.00	26.33	26.33	5.76

34	<i>Oxyopes javanus</i>	1.00	48.33	48.33	8.78
35	<i>Oxyopes sunandae</i>	0.33	0.67	2.00	0.81
36	<i>Opadometa fastigata</i>	0.67	1.33	2.00	1.62
37	<i>Parawixia dehaani</i>	0.67	0.67	1.00	1.53
38	<i>Pardosa spp</i>	1.00	53.67	53.67	9.51
39	<i>Peucetia viridans</i>	1.00	20.33	20.33	4.94
40	<i>Phintella vittata</i>	1.00	4.67	4.67	2.80
41	<i>Pholcus spp</i>	1.00	53.33	53.33	9.46
42	<i>Plexippus paykulli</i>	1.00	63.67	63.67	10.88
43	<i>Portia albimana</i>	0.67	1.33	2.00	1.62
44	<i>Stegodyphus sarasinorum</i>	1.00	9.67	9.67	3.48
45	<i>Telamonia dimidiata</i>	1.00	11.67	11.67	3.76
46	<i>Tetragnatha mandibulata</i>	0.67	1.00	1.50	1.58
47	<i>Tetragnatha spp.1</i>	1.00	9.33	9.33	3.44
48	<i>Thelacantha brevispina</i>	0.67	6.00	9.00	2.26
49.	<i>Theridion spp.</i>	1.00	9.33	9.33	3.44
49	<i>Thomisus spectabilis</i>	0.67	3.00	4.50	1.85
51	<i>Uloborus spp</i>	1.00	3.67	3.67	2.66

F- Frequency; D- Density; A- Abundance; SIV- Species Importance Value

Frequency value is 1 for those species which found throughout all seasons, 0.67 for which found in only two seasons and 0.33 tells it was found only in one season. Highest density is 63.67 for *Plexippus paykulli*, followed by 53.67 of *Pardosa spp*. The least density is of *Parawixia dehaani* which is 0.67. Abundant species was *Plexippus paykulli* showing the abundant value 63.67 and the least abundant was *Parawixia dehaani*, having the abundant value 1.00. SIV is highest for *Plexippus paykulli* i.e. 10.88 shows the greater dominancy of the species followed by *Pardosa spp*. with 9.51 and least was for *Parawixia dehaani*.

Shannon index is 3.39 and Simpson value is 0.447 which indicates greater biodiversity of spiders in the study area (Table.3).

IV. CONCLUSION

From the present study it is evident that spiders can survive in different habitats as Ground runners (Lycosidae, Salticidae, Corinnidae, Gnaphosidae, and Sparassidae) Foliage runners (Clubionidae, Hersiliidae) Stackers (Oxyopidae and Salticidae), Ambushers (Thomisidae), and Web-builders. The types of vegetation greatly affect the population and diversity of spiders. The study area being an urban region, provide a good environment for the survival of spiders. Rainy season and winter season provide favourable condition for these creatures by supplying a large population of prey insects. Shannon index being 3.39 indicates good species diversity in all three main seasons. The individual count

was highest during winter season and lowest during summer season. This indicates overall diversity richness in the study area as they are both good predator and prey. Species occurrence and abundance is also related to habitat preference.

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Study sites





Species Plates



Araneus spp



Argiope spp.1



Argiope pulchella



Argiope anasuja



Cyclosa bifida



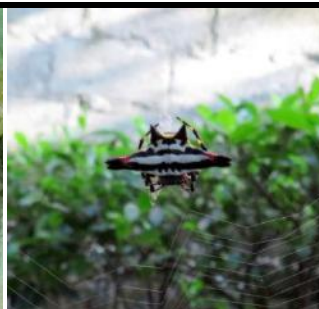
Cyrtophora citricola



Cyrtophora citricola



Eriovixia spp



Gasteracantha geminata



Gasteracantha spp.1



Neoscona crucifera



Neoscona nautica



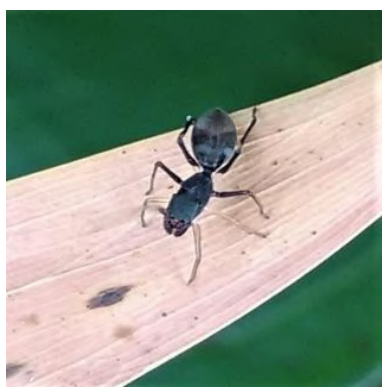
Parawixia dehaani



Thelacantha brevispina



Clubiona spp



Castianeira zetes



Stegodyphus sarasinorum



Gnaphosa spp.



Hersilia savignyi



Nerine sundaica



Geolycosa spp



Hippasa agelenoides



P. ardosa spp.



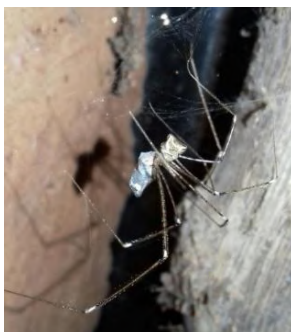
Oxyopes javanus



Oxyopes sunandae



Peucetia viridians



Crossopriza lyoni



Pholcus spp.



Asemonea spp



Bavia kairali



Carrhotus viduus



Chrysilla volupe



Epeus indicus



Hyllus semicupreus



Menemerus bivittatus



Myrmarachne plataleoides



Phintella vittata



Plexippus paykulli



Portia albimana



Telamonia dimidiata



Heteropoda venatoria



Leucauge decorata



Leucauge tessellata



Leucauge spp.1



Opadometa fastigata



Tetragnatha spp.1



Tetragnatha mandibulata



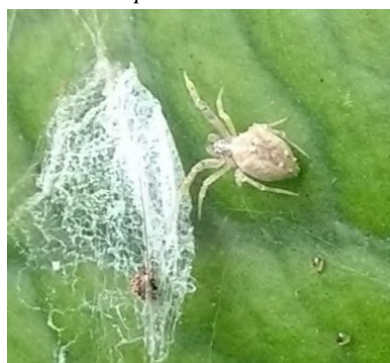
Theridion spp



Misumenops rubrodecoratus



Thomisus spectabilis



Uloborus spp