



## DIVERSITY OF SPIDER FAUNA AT DIFFERENT SITES IN PALANI HILLS, DINDIGUL DISTRICT, TAMIL NADU, SOUTH INDIA

<sup>a</sup>Umarani, S. & <sup>b</sup>Umamaheswari, S.

<sup>a</sup>Department of Zoology, APA College of Arts & Culture, Palani 624 601, Tamil Nadu, India.

<sup>b</sup>Department of Biotechnology, Manonmaniam Sundaranar University, Abishekapatti – 627012, Tamil Nadu, India.

### ABSTRACT

The objective of the present study is to explore the abundance and diversity of spider fauna at different sites of Palani hills, Dindigul District, Tamil nadu, South India. In total 43 species of spiders belonging to 12 families and 25 genera were observed. The families Araneidae and Lycosidae were the most dominant families exploring 9 species. A comparison was made between different sites of Palani hills in different seasons (Pre monsoon, Monsoon and Post Monsoon). Palani hills exist in “Western Ghats”, one of the biodiversity hotspots of the world. The abundance was highest in the Site 6 (Tinnavarai) and lowest was in the Site 2 (Ponnimalai). Site 5 of Palani hills did not show much difference in Species Richness, Shannon diversity Index and Evenness. However Site 2 (Ponnimalai) had significantly lower abundance of spider species. The high species diversity of spiders in Palani hills can be attributed to the high diversity of plants and insects.

**KEYWORDS:** Spider, Species Richness, Abundance, Evenness.

### INTRODUCTION

Spiders are an important group of generalised predators in the world. They are the largest order of Arachnids and rank seventh in the total species diversity among all the other groups of organisms (Sebastin, 2009). Though spiders form one of the most ubiquitous and diverse group of organisms existing in Palani Hills, their study has always remained largely neglected. They have, however, largely been ignored because of the human tendency to favor some organisms over others of equal importance, because they lack a universal appeal (Humphries *et al.*, 1995). The present knowledge on the spiders of Western Ghats remains confined to the works of Pocock (1900), Hirst (1909), Gravelly (1935), Sherriff (1927) and Sinha (1951). Recently Smith (2004), Sugumaran *et al.*, (2005), Jose *et al.*, 2006) and Wankhade *et al.*, (2012) tried to document the diversity of spider fauna in and around Western Ghats. Due to the high species endemism, Western Ghats are listed in the 34 ‘Biodiversity Hotspots’ of the world (Mittermeier *et al.*, 2005). Major contributions to Indian Arachnology were made by R.I Pocock and B.K.Tikader who were responsible for bringing spider studies to the notice of other researchers (Siliwal *et al.*, 2005). Considering the importance of spiders in the natural suppression of many insect pests and as bio indicators, urgent efforts are needed to understand their diversity. The current world list of spiders includes nearly 39,000 species in over 3600 genera in 110 families (Platinick, 2005). The aims of the study were to investigate the diversity of spiders in the Palani hills ecosystem and to reveal the species richness, evenness and diversity index between the 6 different sites of Palani hills. Though the study of spiders from Palani hills is still far from complete, the present study forms a basis for further investigations on this group.

### MATERIALS & METHODS

The present study was conducted in February 2012 to January 2013 at six different sites of Palani hills, Dindigul District, Tamil Nadu, South India. Palani hills are an eastward extension of the Western Ghats ranges which run parallel to the west coast of India. Palani hills is situated at 10 17’N latitude and 77 31’E longitude and forms a part of Western Ghats. Annual rainfall is 1611mm and mostly during the north east monsoon from June to November. Temperature ranges from 10.1 to 20 C in summer and 8 C in winter. Elevation ranges 2500m (8202ft). Localities of collections were Vellakkal malai (Site 1), Ponni malai (Site 2), Rangasamy malai (Site 3), Pachalur (Site 4), Perumal malai (Site 5) and Tinnavarai (Site 6). Spiders were collected by adopting standard sampling techniques such as Visual searching (Sebastian *et al.*, 2005), hand picking suggested by Tikader (1987) and Pitfall traps (Curtis, 1980). All surveys were conducted in the morning hours from 6.45 a.m to 11 a.m of weekly alternate days of every month. Collected spiders were counted and marked and some of them are preserved in glass bottles containing 70% ethyl alcohol for taxonomic identification and others were released to their natural habitat. On identification spiders were identified by Dr. B.H.Patel, Specialist in Spider Identification, Patel Society, Vyayamshala Road, Lotia Bhagole, Anand, Gujarat. The data thus collected were subjected to the statistical analysis namely Species Richness, Evenness and Shannon Index.

### RESULTS & DISCUSSION

Spiders representing 12 families, 25 genera and 43 species were recorded from six sites of Palani hills during the study (Table 1). This represents 20% of the total families reported from India (Siliwal *et al.*, 2005). Sebastian *et al.*, (2005) reported 16 families, 40 genera and 51 species in

Mangalavanam, Kerala, India. Araneidae and Lycosidae were the dominant families constituting 9 species from 4 genera. Tetragnathidae (6sp), Sparassidae (3sp), Hersillidae (2sp) and Eresidae, Oxyopidae, Pholcidae, Psechridae, Theridae and Uloboridae (1 sp each). Araneidae was the dominant family in Mannavan Shola Forest which is composed of 17 species and 10 genera (Sudhikumar *et al.*, 2005). The high species diversity of spiders in Palani hills can be attributed to the high diversity of plants and insects. It can be assumed that a high floral diversity sustains a high faunal diversity by providing diverse microhabitat especially for invertebrates. A total of 32 species were discovered from limited area of Pune University, Pune (Wankhade *et al.*,

2012). Out of the 252 genera from the Indian region (Siliwal *et al.*, 2005), 25 genera are discovered in Palani hills. Maximum generic diversity was found in Araneidae (6), Salticidae (4), Lycosidae and Tetragnathidae (3). The number of genera recorded in the other major Indian spider studies viz., Andaman and Nicobar Islands -33 genera, Sikkim – 41 genera and Calcutta -47 genera (Tikader, 1970, 1977, Tikader *et al.*, 1981). The spider species that occurred in all 6 sites is furnished in Table 1. Site 6 (Tinnavarai) possessed high abundance of spider species (40), whereas Site 5 (Perumal malai - 37), Site 3 (Rangasamy malai – 36), Site 4 (Pachalur – 35), Site 1 (Vellakkal malai – 27) and Site 2 (Ponni malai – 20) had fewer species in Palani hills.

**TABLE 1:** check list of spider species in six different sites of Palani hills in 2012-13.

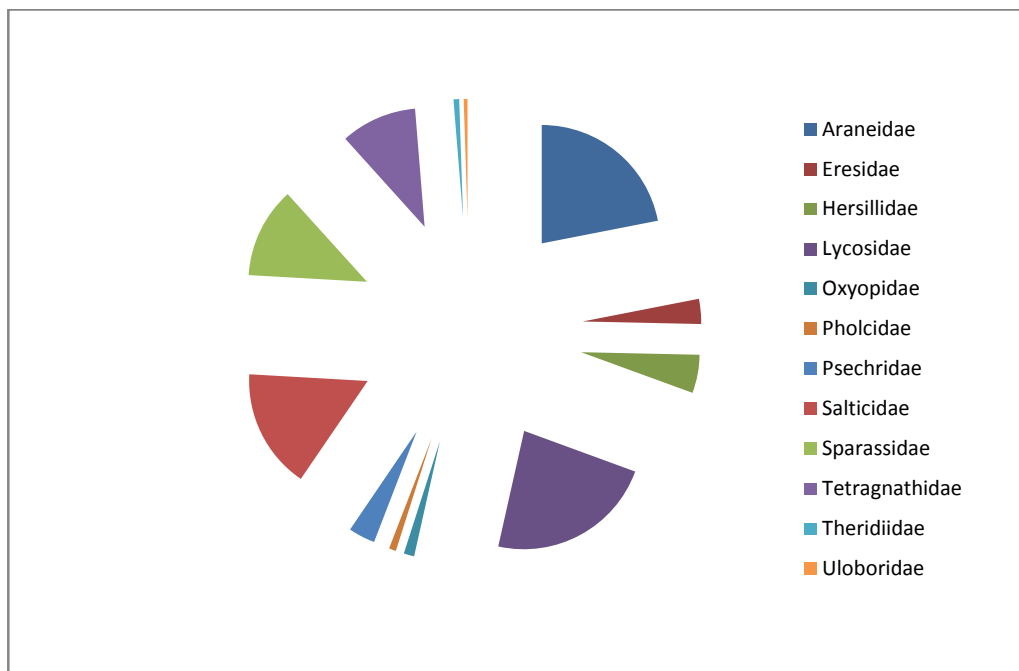
S.No	FAMILY	SPECIES	SIT E 1	SITE 2	SIT E 3	SIT E 4	SIT E 5	SIT E 6	TOTAT (P)	TOTAL (A)
1		<i>Araneus sp</i>	P	P	P	P	P	P	6	0
2		<i>Argiope anasuja</i>	A	P	P	P	A	P	4	2
3		<i>Cyclosa sp</i>	P	A	P	A	P	P	4	2
4	<b>Araneidae</b>	<i>Cyrtophora cicutrosa</i>	A	A	P	P	P	P	4	2
5	<b>(Orb</b>	<i>Gasteracantha geminata</i>	A	A	P	P	P	P	4	2
6	<b>weavers)</b>	<i>Gasteracantha hasseltii</i>	P	A	A	P	A	P	3	3
7		<i>Neoscona mukerjei</i>	A	A	P	P	A	P	3	3
8		<i>Neoscona nautica</i>	P	P	P	P	P	P	6	0
9		<i>Neoscona theisi</i>	P	P	P	A	P	A	4	2
	<b>Eresidae</b>		P	A	A	P	P	P	4	2
10	<b>(Social/Velvet spiders)</b>	<i>Stegodyphus sarasinorum</i>								
	<b>Hersillidae(</b>									
	<b>Two</b>									
	<b>tailed/Tree</b>	<i>Hersillia savignyi</i>	P	P	P	P	P	P	6	0
	<b>trunk</b>									
	<b>spiders)</b>									
11										
12		<i>Hersillia sp.</i>	A	A	P	P	P	P	4	2
13		<i>Hippasa pisaurina</i>	P	P	P	P	P	P	6	0
14		<i>Hippasa sp.</i>	P	P	P	P	P	P	6	0
15		<i>Lycosa madraspatana</i>	A	A	P	A	P	P	3	3
		<i>Lycosa</i>	A	A	P	A	P	A	2	4
16	<b>Lycosidae</b>	<i>mahabaleshwariensis</i>								
17	<b>(Wolf</b>	<i>Pardosa atropalpis</i>	A	A	P	A	A	P	2	4
18	<b>spiders)</b>	<i>Pardosa birmanica</i>	P	A	A	P	P	P	4	2
19		<i>Pardosa mukundi</i>	P	A	A	P	P	P	4	2
20		<i>Pardosa sp.</i>	A	A	P	P	P	P	4	2
21		<i>Pardosa sumatrana</i>	P	P	P	P	A	P	5	1
	<b>Oxyopidae</b>									
22	<b>(Lynx</b>	<i>Oxyopes swetae</i>	P	P	P	P	P	P	6	0
	<b>spiders)</b>									
	<b>Pholcidae</b>									
	<b>(Daddy</b>									
	<b>Long</b>	<i>Crossopriza lyoni</i>	A	A	P	P	P	P	4	2
23	<b>spiders)</b>									
	<b>Psechridae</b>									
	<b>(Jungle</b>									
	<b>Cribellate</b>	<i>Psechrus alticeps</i>	P	A	P	P	P	P	5	1
	<b>spiders)</b>									
24										
25		<i>Marpissa bengalensis</i>	P	P	P	P	P	P	6	0
26		<i>Marpissa sp.</i>	P	P	P	A	P	P	5	1
27	<b>Salticidae</b>	<i>Phidippus bengalensis</i>	A	P	P	P	P	P	5	1
28	<b>(Jumping/</b>	<i>Phidippus indicus</i>	A	P	A	P	P	P	4	2
29	<b>Trunk living</b>	<i>Phidippus pateli</i>	A	A	A	P	P	P	3	3
30	<b>spider)</b>	<i>Phidippus sp.</i>	A	A	P	P	P	P	4	2
31		<i>Plaxippus payakulii</i>	P	A	P	P	P	P	5	1

32		<i>Salticus sp.</i>	P	A	P	P	P	P	5	1
33	<b>Sparassidae</b>	<i>Heteropoda bhaikakai</i>	P	P	P	P	P	P	6	0
34	<b>(Giant crab/Hunts man spiders)</b>	<i>Olios punctipes</i>	P	P	P	P	P	P	6	0
35		<i>Olios sp.</i>	P	P	P	P	P	P	6	0
36		<i>Herennia ornatissima</i>	P	P	P	P	P	P	6	0
37	<b>Tetragnathi dae (Long jawed spiders)</b>	<i>Herennia sp.</i>	P	P	P	P	P	P	6	0
38		<i>Leucauge celebesiana</i>	A	A	P	A	A	P	2	4
39		<i>Leucauge fastigata</i>	A	P	A	P	P	P	4	2
40		<i>Nephila kuhlii</i>	P	P	P	A	P	A	4	2
41		<i>Nephila pilipes</i>	P	A	P	P	P	P	5	1
	<b>Theridiidae (Comb footed/ Sheet line spiders)</b>	<i>Theridion sp.</i>	P	A	P	P	P	P	5	1
42	<b>Uloboridae (Safe spiders)</b>	<i>Uloborus danolius</i>	P	A	P	P	P	P	5	1
43		<b>TOTAL</b>	<b>27</b>	<b>20</b>	<b>36</b>	<b>35</b>	<b>37</b>	<b>40</b>		
		<b>PERCENTAGE (%)</b>	<b>62.8</b>	<b>46.5</b>	<b>83.7</b>	<b>81.4</b>	<b>86</b>	<b>93</b>		

(SITE 1 - Vellakkal malai, SITE 2 - Ponni malai, SITE 3 - Rangasami malai, SITE 4 - Pachalur, SITE 5 - Perumal malai and SITE 6 - Tinna varai. P – Present, A – Absent)

**TABLE 2:** Total number of individuals present in three different seasons in six different sites in Palani hills during 2012-13.

S.No	Name of the Sites	Pre monsoon	Monsoon	Post monsoon	TOTAL
1	Vellakkal malai	1690	2799	2106	6595
2	Ponni malai	903	1440	1083	3426
3	Rangasamy malai	1534	2911	1919	6364
4	Pachalur	2186	3812	2679	8677
5	Perumal malai	2400	3835	2830	9065
6	Tinnavarai	2648	4460	3151	10259
	<b>TOTAL</b>	<b>11361</b>	<b>19257</b>	<b>13768</b>	<b>44386</b>



**FIGURE 1:** Number of species present in each spider family in 6 different in Palani hills during 2012-13

Table 2 indicated that Tinnavarai (Site 6) had the greatest number of individuals (10259), followed by Perumal malai (Site 5 (9065)), Pachalur (Site 4 – (8677)), Vellakkal malai (Site 1 (6595)), Rangasamy malai (Site 3(6364)) and

Ponni malai had the least number of individuals (3426). Three seasons each were used to analyze seasonal preferences of spiders in Palani hills declared that spider density was rich in Monsoon season (19,257 ) only. The

greatest number of spiders during the monsoon season might be due to the availability of large number of insects

in masses from the pond which may serve as an abundant food source for the spiders.

**TABLE 3:** Results for SR, E and H' during 2012-13.

S.NO	Name of the sites	SR	E	H'
1	Vellakkal malai	2.96	0.94	3.11
2	Ponni malai	2.33	0.92	2.76
3	Rangasamy malai	4.00	0.96	3.44
4	Pachalur	3.75	0.98	3.47
5	Perumal malai	3.95	0.96	3.46
6	Tinnavarai	4.22	0.97	3.57

(SR – Species Richness; E – Evenness and H' – Shannon Index)

Different diversity indices were calculated to study the diversity and abundance of spiders in the Palani hills. The traditionally used Margalef Species Richness (SR), Pielou Evenness (E) and Shannon Index (H') were used to describe the community structures of spiders among six different sites of Palani hills (Table 3). Sites having slightly different species compositions, but similar abundance patterns might have identical diversity index values. Among the six different sites of Palani hills the highest value (4.22) of Species richness index was recorded in Tinnavarai (Site 6) in 2012-13 and the lowest value (2.33) was recorded in Ponnimalai (Site 2). Culin *et al.*, (1983) noted that the Species richness of spiders is significantly higher in systems that have not been heavily manipulated. Species Richness is the only one way to assess habitat quality. Average Evenness index was 0.96. Thus, the distribution of spider is even in all these sites. Value of Shannon diversity index was 3.11, 2.76, 3.44, 3.47, 3.46 and 3.57 in Site 1, 2, 3, 4, 5 and 6 respectively. It holds good diversity of spiders. Faunal similarity of spiders found in Palani hills with other regions of India is also striking. *Nephila pilipes* is a species commonly found in the spider fauna of Sikkim (Tikader, 1970), Andaman and Nicobar Island (Tikader, 1977), Calcutta (Tikader, 1981) and Kerala (Sudhikumar *et al.*, 2005). *Oxyopes shweta* is commonly found in spider fauna of Sikkim (Tikkader, 1970) and Kerala (Sudhikumar *et al.*, 2005). Unlike other ecologically important zones, there is no previous work to compare the spider diversity in Palani hills. This indicates the need for further sampling in this area. Though the study of spiders from Palani hills is still far from complete, the present study forms a basis for further investigations on the spider diversity.

## REFERENCES

Ambalaparambil, V., Sudhikumar, A., Mundackatharappel Mathew, J., Enathayil Sunish, Shourimuthu Murugesan, Pothalil Sebastian, A. (2005) Preliminary studies on the Spider fauna in Mannavan Shola forest, Kerala, India (Araneae). *Euro.Arachnol. Acta Zoologica bulgarica*. 1, 319-327.

Culin, J. D. and Yeargan, K.V. (1983) Spider found of alfalfa and soyabean in Central Kenlucky (86 identified genera and 143 identified species). *Transactions of the Kentucky academy of Sciences (USA)*. 44, 40-45.

Curtis, D.J. (1980) Pitfalls in spider community studies (Arachnida, Araneae), *J. Arachnol.* 8, 271-280.

Gravely, F.H. (1935) Notes on Indian mygalomorph spiders II – *Records of Indian Museum*, 37, 69-84.

Hirst, A.S. (1909) On some new or little known mygalomorph spiders from the Oriental Region and Australasia – *Records of Indian Museum*, 3, 383-390.

Humphries, C.J, Wilson, P.H., Vane-Wright, R.I. (1995) Measuring biodiversity value for conservation. *Annual Reviews of Ecology and Systematics*, 26, 93-111.

Jose, S.K, Sudhikumar, A.V., Davis, S., Sebastin, P.A. (2006) Preliminary studies on the spider fauna (Arachnida:Araneae) in Parambikulam Wildlife Sanctuary in Western Ghats, Kerala, India – *J.Bombay Nat. His.Soc.* 102-3.

Manju Siliwal, Sanjay Molur and Biswas, B. K. (2005) Indian Spiders (Arachnida:Araneae):Updated Checklist 2005. *Zoo's Print Journal* 20(10):1999-2049.

Manju Siliwal, Sanjay Molur and Robert Raven (2009) two new species of the genus of the Dipthele (Araneae, Barychelidae) from Orissa, India with notes on D.walshi. *J. Arachnol.* 37(2): 178-187.

Mittermeier, R.A., Patricio, R.G. Hoffman, M., Pilgrim, J., Brooks, T., Mittermeier, C. G., Lamoreux, J., Fonseca, G.A.B. (2005) Hotspots Revisited: Earth's Biologically Richest and Most Endangered Terrestrial Ecoregions, Conservation International, USA, 432p.

Pocock, R.I. (1900) The fauna of Britiesh India, Arachnida. Taylor and Francis, London, 279.

Pothalis, A. Sebastian, Shourimuthu Murugesan, Mundackatharappel Mathew, J., Enathayil Sunish, Ambalaparambil V Sudhikumar (2005) Spiders in Mangalavanam, an ecosensitive mangrove forest in Cochin, Kerala, India (Araneae), *Euro.Arachnol. Acta Zoologica bulgarica*. 1,315-318.

Sebastian, P.A. & Peter, K .V. (2009) Spiders of India. University Press, Hyderabad.

Sherriff, W.R. (1927) A Contribution to the study of South Indian Arachnology II . *Annuals and Magazine of Natural History*, 9, 533-542.

- Smith, A.M. (2004) A new species of the arboreal therapsid, genus *Poecilotheria*, from southern India (Aranea, Mygalomorphae, Theraphosidae) with notes on its conservation status – *J. British Tarantula Socie.* 19, 48-61.
- Sinha, T.B. (1951) On the collection of lycosid spider in Zoological Survey of India. *Records of Indian Museum*, 48, 9-52.
- Sugumaran, M.P., M. Ganeshkumar, K. Ramasamy, (2005) Biodiversity of spiders in Western Ghats of Tamil Nadu – *J. Entomol*, 30(2), 157-163.
- Tikader, B. K. (1970) Spider fauna of Sikkim – *Records of the Zoological Survey of India*, 6, 1-83.
- Tikader, B.K. (1977) Studies on spider fauna of Andaman and Nicobar islands, Indian Ocean – *Records of Zoological Survey of India*, 72,153-212.
- Tikader, B. K., B. Biswas (1981) Spider fauna of Calcuta and vicinity: Part 1 – *Records of Zoological Survey of India*. Occasional papers. 30, 1-49.
- Tikader, B. K. (1987) *Handbook of Indian spiders*. Zoological Survey of India, Calcutta, 251.
- Wankhade, V.W., Manwas, N.A., Rupwate, A.A. and Raut, N. M. (2012) Diversity and abundance of Spider fauna at different habitats of University of Pune, Pune, M. S. India, *Global Advanced Research Journal of Environmental Science and Toxicology*, vol.1(8), 203-210.