International Journal of Entomology Research
www.entomologyjournals.com
ISSN: 2455-4758, Impact Factor: RJIF 5.24
Received: 24-01-2021, Accepted: 25-02-2021, Published: 01-04-2021
Volume 6, Issue 2, 2021, Page No. 170-174

Diversity of spiders (*Araneae*: *Arachnida*) in selected mangrove ecosystems of Northmalabar, Kerala, India

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Abstract
A preliminary study was conducted to document the spider diversity in mangrove ecosystem, Kannur District, Kerala State in southern India. The study was conducted from January to July 2016. A total of 63 species of spider belonging to 30 genera of 13 families were recorded during the study**.** Araneidae was the dominant family corresponding to 21 species from 9 genera constituting 33% of the total spider population followed by Salticidae, Theridiidae and Thomisidae (11% each). Shannon's index was used to calculate the spider diversity in each site. Highest diversity was observed at Mathikavu. The spiders collected during the study were classified into six ecological guilds based on their foraging mode. These are orb web weavers, stalkers, ground runners, foliage hunters, scattered line weavers and ambushers. Orb web weavers constituted the dominant feeding guild representing 48% of the total collection. They are followed by stalkers and foliage hunters constituting 19% and 3% respectively of the total catch.

Keywords: *Araneidae*, mathikavu, chekkikunipalam, koduvally, guild

Introduction

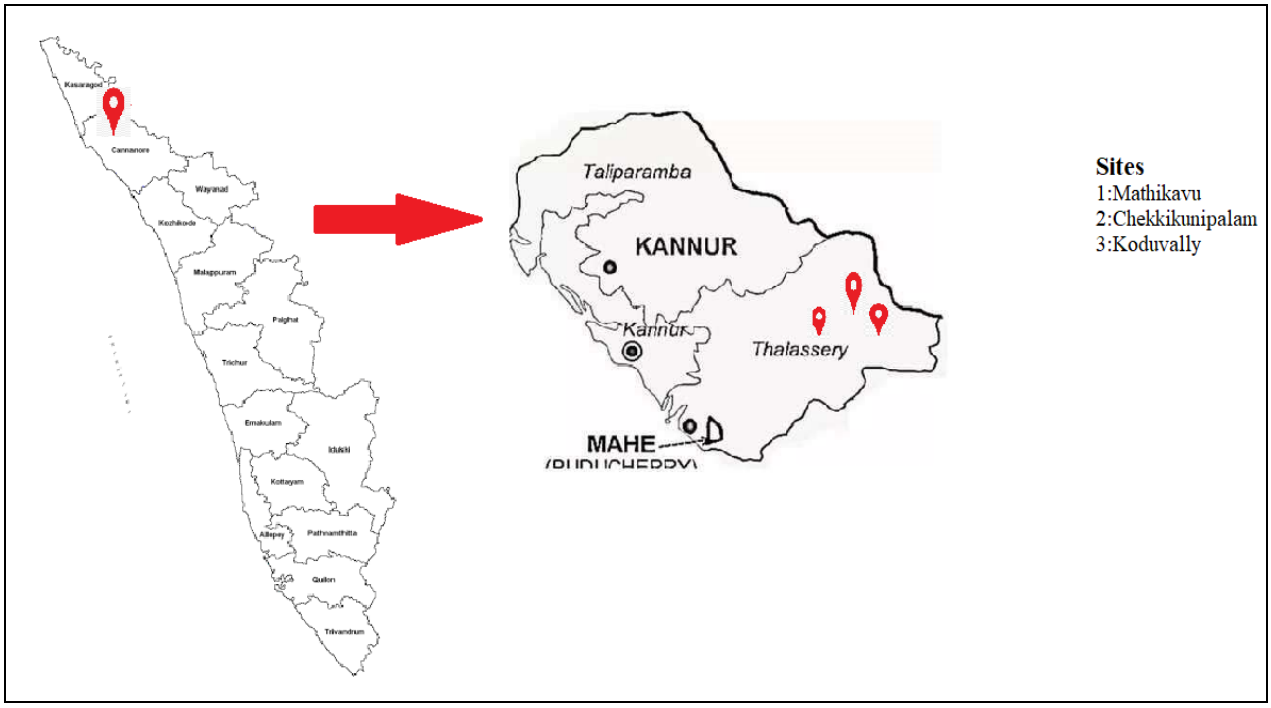
Mangroves are a taxonomically diverse group of salt-tolerant, mainly arboreal, flowering plants that grow primarily in tropical and subtropical regions [6]. Although mangroves have a significant ecological role as physical habitat and nursery grounds for a wide variety of marine and estuarine vertebrates and invertebrates they are being destroyed at alarming rates. Over the last 50 years, about one-third of the world's mangrove forests have been lost [1].

India is rich in both flora and fauna and is a mega diverse country. Spiders are one of the most diverse groups of organisms and are an important group of generalised predators in the world. They are abundant and widespread in almost all ecosystems and constitute one of the most important components of global biodiversity [16]. Spiders are generalist feeders with great species richness in every type of terrestrial habitat and play an important role in the structure of communities and food webs, both as an individual numbers and as energy consumers [4].

The spider fauna of India has never been studied in its entirety despite of contributions by many arachnologists since Stoliczka [18]. They have, however, largely been ignored because of the human tendency to favour some organisms over others of equal importance because they lack a universal appeal [6]. About 40,000 spider species are currently known throughout the world. A total of 1686 species of spiders coming under 438 genera of 60 families has so far been reported in India [9]. Biological control through spiders is one of the best strategies to reduce the use of chemical pesticides as well as the population of the insect pests [5]. Spiders play important role in maintaining biological balance of nature. Spiders have a very significant role to play in ecology by being exclusively predatory and thereby maintaining ecological equilibrium. They can be used as successful biological indicators to assess the 'health 'of an ecosystem because they can be easily identified and are differentially responsive to natural and anthropogenic disturbances [12]. Documenting spider diversity patterns in any ecosystem can provide information on the general biodiversity status of that ecosystem [11]. Unfortunately, studies on spiders of mangroves in India are comparatively few and limited. A total of 48,256 species of spiders belonging to 4,141 genera under119families have been described worldwide [24].

Study area

The mangrove ecosystem undertaken for the current study is located in the Malabar region of Kerala, India. Three sites were randomly selected and are follows, Mathikavu– (11°45' N, 75°29' E)**,** Chekkikunipalam – (11° 48'N, 75°29'E) and Koduvally – (11°46' N, 75°28'E).



Fig

Methods

The study was conducted from January to July 2016. Sampling was carried out at each habitat at an interval of 7 days. Spiders were collected by handpicking method as suggested by Tikader [20]. Collected specimens were preserved in 70% alcohol. Preserved specimens were examined under a stereo zoom microscope (Leica-MS5) in the laboratory for taxonomic identification and were identified up to species level with the help of experts and available literature [16]. The taxonomy and nomenclature followed is as per the World Spider Catalogue [24]. The diversity of spiders was analysed by widely used indices *viz*., The Shannon–Wiener index (H1), which is sensitive to changes in the abundance of rare species in community. Shannon-Wiener index is defined as: H1 = -∑ i log pi Where: pi = the observed relative abundance of a particular species [17].

Results

A total of 63 species of spider belonging to 30 genera of 13 families were recorded during the study (Table 2). Araneidae was the dominant family corresponding 21 species from 9 genera constituting 33% of total spider population followed by Salticidae, Theridiidae and Thomisidae 11% each (Fig 1). The number of species obtained in each family is in the order of Araneidae>Salticidae=Theridiidae=Thomisidae>Tetrgnathidae>Lycosidae=Oxyopidae>Uloboridae>Eutrichuridae=Gnaphosidae=Hersiliidae=Theraphosidae=Theridiosomatidae. Guild structure analysis revealed six feeding guilds (Uetz *et al*. 1999). These are orb web weavers, stalkers, ground runners, foliage hunters, scattered line weavers and ambushers (Table 1). Orb web weavers constituted the dominant feeding guild representing 48% of the total collection. They are followed by stalkers and foliage hunters constituting 19% and 3% respectively of the total catch. During the study, 32 species were observed in Koduvally (site:3) and 21 species were observed in Mathikavu (site:1). Chekkikunipalam (site: 2) represented only 10 species. Considering the families, Mathikavu was more diverse to other sites (Fig 2). Spider diversity was calculated for each site using Shannon –Wiener index (H1). Maximum index was obtained for site 1 (H11.94996) where the diversity was high and least value for site 3 (H11.71833) representing low diversity (Fig.2).

Table 1: Total number of species recorded in each Family with guild structure

Family	Number of Species	Guild
Araneidae	21	Orb weavers
Cheiracanthiidae	1	Foliage runners
Gnaphosidae	1	Ground runners
Hersilidae	1	Foliage runners
Lycosidae	4	Ground runners
Oxyopidae	4	Stalkers
Salticidae	7	Stalkers
Tetragnathidae	6	Orb weavers
Theraphosidae	1	Stalkers
Theridiidae	7	Space web builders
Theridiosomatidae	1	Orb web weavers
Thomisidae	7	Ambushers
Uloboridae	2	Orb weavers

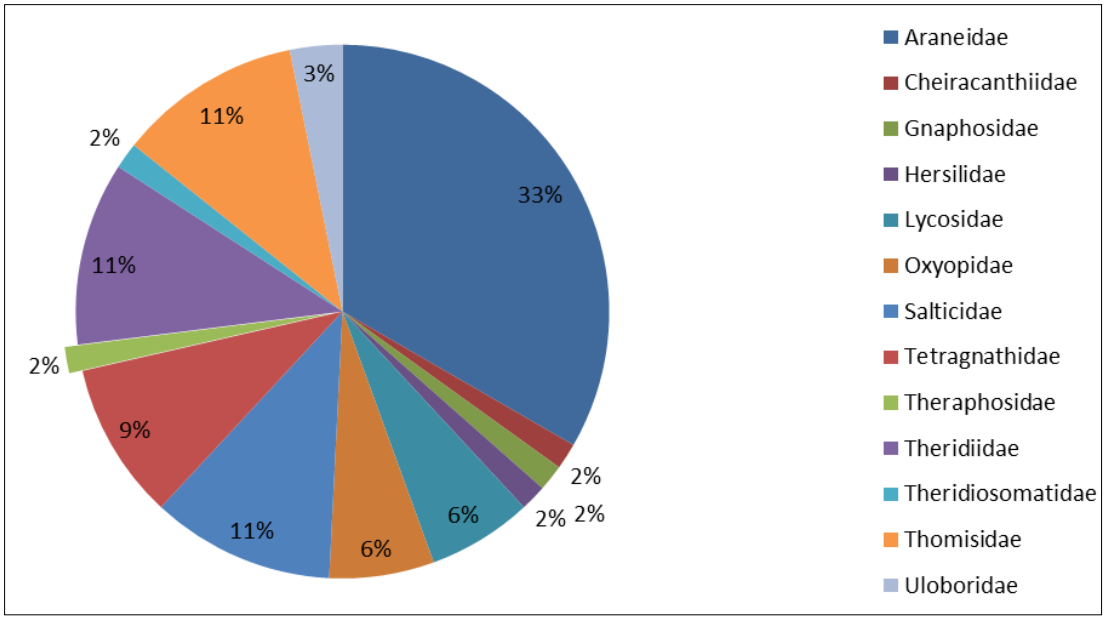


Fig 1: Percentage of species recorded in each family

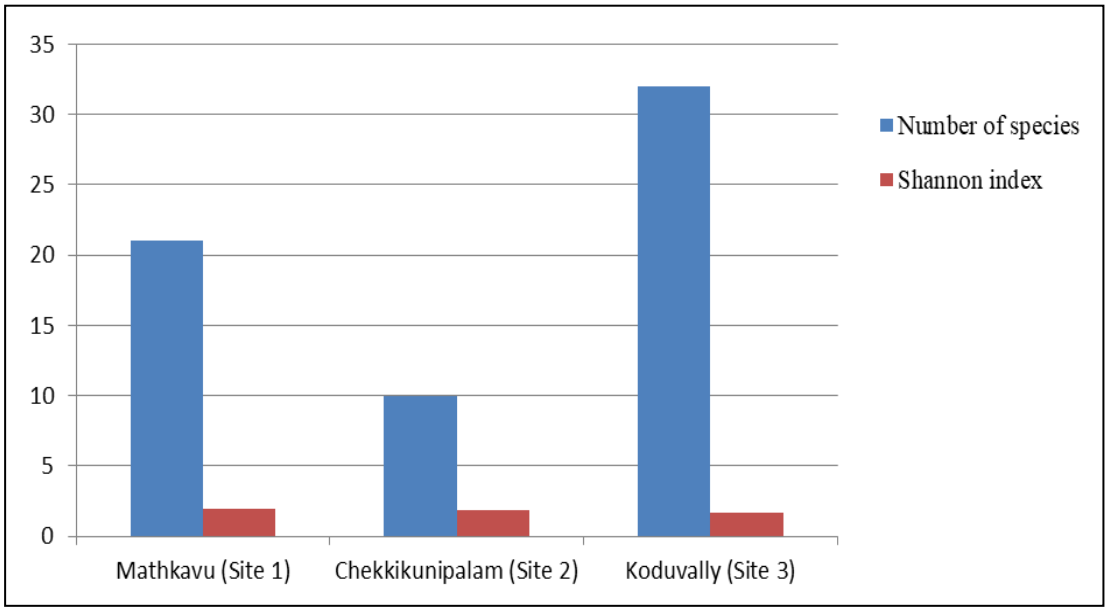


Fig 2: Shows Shannon index and number of species in each site

Table 2: Checklist of spiders in mangrove ecosystem

S. No.	Family	Species	Site 1	Site 2	Site 3
1	Araneidae Simon, 1895	*Araneus mitificus* (Simon, 1886)	1	-	-
2		*Araneus nympha* (Simon, 1889)	-	-	1
3		*Anepsion maritatum* (O. Pickard-Cambridge, 1877)	-	-	1
4		*Argiope aemula* (Walckenaer, 1841)	-	-	1
5		*Argiope catenulate* (Doleschall, 1859)	1	-	-
6		*Argiope pulchella* (Thorell, 1881)	-	-	-
7		*Cyclosa bifida* (Doleschall, 1859)	-	-	1
8		*Cyclosa confraga* (Thorell, 1892)	-	1	-
9		*Cyclosa* sp.	-	-	1
10		*Cyrtophora cicatrosa* (Stoliczka, 1869)	-	-	1
11		*Cyrtophora citricola* (Forsskål, 1775)	-	-	1
12		*Cyrtophora moluccensis* (Doleschall, 1857)	1	-	-
13		*Eriovixia laglaizei* (Simon, 1877)	-	-	1
14		*Gasteracantha geminata* (Fabricius, 1798)	-	-	1
15		*Gasteracantha kuhli* (C. L. Koch, 1837)	1	-	-
16		*Gasteracantha hasselti* (C.L. Koch, 1837)	-	-	1
17		*Neoscona bengalensis* (Tikader & Bal, 1981)	1	-	-
18		*Neoscona mukerjei* (Tikader, 1980)	1	-	-

19		*Neoscona nautica* (L. Koch, 1875)	-	1	-
20		*Thelacantha brevispina* (Doleschall, 1857)	1	-	-
21		*Thelacantha* sp.	-	-	1
22	Cheiracanthiidae wagner,1887	*Cheiracanthium danieli* (Tikader, 1975)	1	-	-
23	Gnaphosidae Pocock, 1898	*Drassodes* sp	1	-	-
24	Hersiliidae	*Hersilia savignyi* (Lucas, 1836)	-	1	-
25	Lycosidae Sundevall, 1833	*Hippasa agelenoides* (simon1884)	-	-	1
26		*Pardosa psedoannulata (Bosenberg& strand,1906)*	-	1	-
27		*Pardosa* sp.1	1	-	-
28		*Pardosa* sp.2	-	1	-
29	Oxyopidae Thorell, 1870	*Oxyopes bharatae* (Gajbe, 1999)	1	-	-
30		*Oxyopes javanus* (Thorell, 1887)	-	1	-
31		*Oxyopes* sp	-	1	-
32		*Oxyopes shweta* (Tikader, 1970)	1	-	-
33	Salticidae Blackwall, 1841	*Carrhotus viduus* (C L Koch,1846)	-	-	1
34		*Curubis* sp	1	-	-
35		*Hasarius* sp.	-	-	1
36		*Plexippus paykulli* (audouin,1826)	-	1	-
37		*Rhene flavigera* (C L Koch,1846)	-	-	1
38		*Rhene danieli*	1	-	-
39		*Telamonia dimidiate* (simon,1899)	-	-	1
40	Tetragnathidae Menge, 1866	*Tetragnatha cochinensis* (Gravely,1921)	1	-	-
41		*Tetragnatha*sp.1	-	-	1
42		*Tetragnatha*sp.2	-	-	1
43		*Tetragnatha*sp.3	1	-	-
44		*Tetragnatha*sp.4	-	1	-
45		*Tetragnatha viridorufa* (Gravely,1921)	1	-	-
46	Theraphosidae Thorell, 1869	*Poecilotheria* sp.	-	-	1
47	Theridiidae Sundevall, 1833	*Argyrodes flavescens* (O. Pickard-Cambridge, 1880)	-	-	1
48		*Argyrodes fissifrons (*O.P.Cambridge, 1869)	-	-	1
49		*Argyrodes gazedes* (Tikader, 1970)	-	-	1
50		*Argyrodes ambalikae* (Tikader, 1970)	-	-	1
51		*Parasteatoda mundula* **(**L. Koch, 1872)	-	-	1
52		*Phycosoma* sp.	-	-	1
53		*Theridion manjithar* (Tikader, 1970)	-	-	1
54	Theridiosomatidae Simon, 1881	*Wendilgarda* sp. Juvenile	1	-	-
55	Thomisidae Sundevall, 1833	*Camaricus formosus* (Thorell, 1887)	-	-	1
56		*Thomisus projectus* (Tikader, 1960)	-	-	1
57		*Thomisus pugilis* (Stoliczka, 1869)	-	-	1
58		*Thomisus spectabilis* (Doleschall 1859)	1	-	-
59		*Thomisus lobosus* (Tikader, 1965)	1	-	-
60		*Thomisus* s	1	-	-
61		Indoxysticus minutus (Tikader, 1960)	-	-	1
62	Uloboridae Thorell, 1869	*Uloborous krishnae* (Tikader, 1970)	-	1	-
63		*Uloborus danolius* (Tikader, 1969)	-	-	1

Conclusion

Among arthropods, spiders are the most abundant predators in many terrestrial ecosystems, playing an important role in ecosystem functioning throughout habitats [23]. In present study a total of 63 species of spider belonging to 30 genera of 13 families were recorded. Radhakrishnan [13] recorded 13 species from Kannur district (includes the study area) in his study of mangroves and their faunal associates in Kerala with special reference to northern Kerala. Sebastian [15] observed, Araneidae was the most dominant family recording 12 species belonging to 8 genera found in Mangalavanam mangroves which agree with the present study of 21 species from 9 genera. Joseph [8] discovered one new species of araneid found in the mangroves of Singapore. Muthukumaravel [10] found total of 9 species of spiders belonging to 6 genera under 5 families *viz*., Lycosidae, Oxyopidae, Araneidae, Tetragnathidae and Eresida.

The species diversity of spiders an ecosystem can be attributed to the high diversity of plants and insects [19]. In the current study maximum spider diversity was observed on site 1(H_s1.94996) and it may be related to the dense mangrove vegetation as one of the factors prevailed in the area. The least index obtained (H_s1.71833) in the site 3 reveals its low diversity and it may be due to high degree of habitat destruction and human interferences in the area. Earlier study of Hore and Uniyal [22] also agree with the above interpretation.

Additionally, there are many factors that determine the species composition. This may be related to the changes in the vegetation structure of the habitat and many environmental factors that affect species diversity [14]. However, when spiders were divided according to their functional group there was a significant effect of habitat on the diversity of these groups. In the study of Joseph and Davis [8] in Kumarakam bird sanctuary on spider fauna classified 7 ecological guilds based on their foraging mode. In the present study 6 ecological guilds were observed. The web building and foliage running spiders relay on vegetation for some part of their lives, either for finding

food, building retreats or for web building. Several authors have tried to define spider guilds by using foraging strategies to predict arthropod prey group as the shared resource [21 2]. The results of this study also indicate the influence of vegetation structure on the diversity of resident spider community. It is the first approach in this region, to study the spider fauna, thus providing base line information for future studies. So, further study is required to formulate the conservation strategies if necessary.

Acknowledgments
Authors are grateful to St. Joseph's college Devagiri, Calicut, Kerala for infrastructural facilities. Financial assistance is provided by Council of scientific and industrial research (CSIR) is gratefully acknowledged.

References

1. Alongi DM. Present state and future of the world's mangrove forests. Environmental Conservation, 2002:29(3):331-349.
2. Dias SC, Carvalho LS, Bonaldo AB, Brescovit AD. Refining the establishment of guilds in Neotropical spiders (Arachnida: Araneae). Journal of Natural History,2010:44:219-239.
3. Ellison JC, Stod dart DR. Mangrove ecosystem collapse during predicted sea- level rise: Holocene analogues and implications. Journal of Coastal Research 1991:7:151-165.
4. Gajbe UA. spiders fauna of conservation areas; fauna of kanha tiger reserve, Madhya Pradesh. Zoological survey of India,1995; a:27-30.
5. Ghafoor A, Mohmood A. Population dynamics of the araneid fauna from district Gujranwala, Pakistan. Jounal of animal and Plant Science,2011:21(4):812-816.
6. Humphries CJ, Wilson PH. Vane-Wright RI. Measuring biodiversity value for conservation. Annual Review of Ecology and Systamatics,1995:26:93-111.
7. Joseph KH. koh. Spiders of the family araneidae in Singapore Mangroves, Raffles bulletin of zoology, 1991:39(1):169-182.
8. Joseph M, Jobi, Davis Samson P. Apioneering study on the spider (arachnida: araneae) fauna of Kumarakom bird sanctuary. International Journal of Science, Environment and Technology,2014:3:872-880.
9. Keswani S, Hadole P, Rajoria A. Checklist of spiders (Arachnida: Araneae) From India 2012. Indian journal of Arachnology,2012:(1):1-129.
10. Muthukumaravel KA. Amsath and Bose Raja R. a preliminary investigation of spider fauna in associated mangroves of muthupet at adirampattinam coast, tamil nadu, India, International Journal of Pure and Applied Zoology,2013:1:304-309.
11. Noss RF. Indicators for monitoring biodiversity: a hierarchical approach. Conservation Biology, 1990:4:355-364.
12. Pearce JL, Venier LA. The use of ground beetles Coleoptera: Carabidae and spiders Araneae as bio indicators of sustainable forest management: A review. Ecological Indicator,2006:6:780-793.
13. Radhakrishnan C. Gopi KC. Muhammed Jaffor Palot. Mangroves and their faunal association in kerala with special reference to northern kerala, occasional paper 2006, 246.
14. Rosenzweig ML. Species diversity in space and time. The journal of wildlife management, 1995, 971.
15. Sebastian PA. Shourimuthu Murugesan, Mathew M J. Sudhi kumar AV. Enathayil Sunish. Spiders in Mangalavanam, an ecosensitive mangrove forest in Cochin, Kerala, India (Araneae), acta zoological bulgarica,2005, 315-318.
16. Sebastian PA, Peter KV. Spiders of India. Universities Press (India) Pvt. Ltd 2009, 614.
17. Solow AR. A simple test for change in community structure. Journal of Animal Ecology, 1993:62:191-193.
18. Stoliczka F. Contribution towards the knowledge of Indian Arachnoides. Journal of the Asiatic Society of Bengal,1869:56:101-117.
19. Swarupanandan KN, Sasidharan KC, Chacko SC. Basha Studies on the Shola Forests of Kerala. Kerala Forests Research Institute research report 2000, 158.
20. Tikader BK. Handbook of Indian Spiders. Calcutta, Zoological Survey of India 1987, 251.
21. Uetz GW. Habitat structure and spider foraging. In: Bell S.S., E. D. Mc Coy, H. R. Mushinsky(eds): Habitat structure: the physical arrangement of objects in space. London, Chapman & Hall 1991,325-348.
22. Upamanyu Hore. Uniyal VP. Diversity and compositon of spider assemblaesin five vegetation types of the terai conservation area, India. Journal of arachnology, 2008:36(2):251-258.
23. Van Hook RI. Energy and Nutrient dynamics of spider and ortho pteran population in a grassland Ecosystem. Ecol. Monogr,1971:41:1-26.
24. World Spider Catalog World Spider Catalog. Version 22.0. Natural History Museum Bern, online at http://wsc.nmbe.ch, accessed on Accessed on 12 March 2021. Doi: 10.24436/2.