



Preliminary Studies on the Spider Fauna in the Residential Area of Palakkad, North Kerala, India

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Article History	Abstract:
Received: 18-04-2022 Revised: 12-06-2022 Accepted: 25-07-2022	Spiders are the largest order of arachnids and rank seventh in the total species diversity among all other organisms. The spider diversity of Kottayi Panchayath, Palakkad district of Northern Kerala, was studied for a period of four months (November 2021–February 2022). The exploration yielded 43 species of spiders under 38 genera belonging to 14 families. Salticidae was the most abundant family with 12 species, followed by Araneidae with 8 species. The least abundant families observed during the study period were Clubionidae, Corinnidae, Philodromidae, Sparassidae, Scytodidae, and Hersiliidae, with 1 species. Based on their foraging behaviour in the field, six feeding guilds (Functional groups) of spiders were identified: scattered line weavers, orb weavers, foliage hunters, ground runners, stalkers, and ambushers. The most dominant guild was the orb web weavers, constituting 35% of the total species. Out of 43 species, 24 were wandering spiders, and 19 were web-builder spiders. Spiders foraging strategies involve alert attacks and behavioural responses through the perception of habitat vibration, while others prefer dead prey.
CC License CC-BY-NC-SA 4.0	Keywords: Spider diversity, Guild structure, Residential area, North Kerala, India

INTRODUCTION

Spiders belong to the class Arachnida of the phylum Arthropoda, animals which jointed appendages and a chitinous exoskeleton. The members of the class possess Arachnida, generally characterized by two body regions, the cephalothorax and abdomen. Scientists described over 75000 species at arachnids. In general, spiders are able to inject venom (Cushing, 2008) and possess spinnerets that extrude silk (Selden et al., 2008). In terms of both number and variety of species, spiders are widespread throughout the world. Their diminutive stature enables them to preserve their community in a constrained space. They are vital component of the ecosystem, contributing significantly to the composition of food webs and communities. Considering the significance of spiders as bioindicators and in the natural reduction of numerous insect pests, it is imperative to make rapid progress in understanding their diversity (Churchill, 1997, 1998; Hore and Uniyal, 2008).

A number of researchers have thoroughly recorded the diversity of spiders in India ((Tikader, 1980; Keswani et al., 2012). An updated checklist of Siders in Northeast India was done by Singh and Singh in 2021. Gravelly (1935) made a remarkable study on the spiders of Central Kerala in the erstwhile Cochin state, which includes present-day Ernakulum, Trichur, and Palakkad districts. Studies by Subrahmanyam (1955) also provide scattered information about the spiders of Kerala. Urbanization has led to a daily decrease in the number of spiders (Ramakrishnaiah et al., 2014). Sumesh and Sudhikumar published a new check list of spiders found in the sacred woods of Northern Kerala (2020).

In this study, the collected spiders from the residential area of Kottayi Panchayath of Palakkad, North Kerala, India were analysed with a focus on their guild structure, diversity, and foraging behaviour. There have been no published, in-depth studies specifically examining the variety of spider species in this area. As a representative group of invertebrates from this ecosystem, the spiders (Arachnida: Araneae) are the subject of this study. The information so gathered might help with upcoming projects to create a biodiversity database for these species in the area.

MATERIALS AND METHODS

Study area

Kottayi (10.764614°N 76.545203°E) is a village in Palakkad District, in the state of Kerala, India. It is one of the 29 villages in Alathur and sits at the confluence of the Gayathry River (Figure.1)



Figure 1: Location of Kottayi village in Palakkad District in the state of Kerala, India

Collection

The spider diversity of Kottayi Panchayath, Palakkad district of Northern Kerala, was studied for a period of four months (November 2021–February 2022). Methods of collection followed Coddington et al. (1991); Toti et al. (2000). Adopted methods are described below:

- 1. Sedentary Spiders:** Resting on walls, leaf blades, tree trunks or in the webs can be caught in a jar by holding it open beneath them and by tapping the spider into it with the lid.
- 2. Sweep Net:** This is an old method usually used for collecting insects and butterflies. An insect net is swept through tall grass and weeds and the spiders caught in it are collected in a small glass vial containing 70% alcohol (Kujur R & Ekka A, 2016).
- 3. Inverted Umbrella:** Here, an inverted umbrella is placed below flowering shoots or bushes and when the tree or branch is thoroughly shaken, spiders along with insects fall to the inverted umbrella. After removing leaves, spiders can be transferred into collecting ethyl alcohol with the help of a fine water brush.
- 4. Small Spiders:** Which are live under the bark of trees, in debris or in the corners of walls are collected with a fine water brush dipped in alcohol.
- 5. Spiders of the family Theraphosidae:** They are quite large and usually live in burrows in the ground. These are collected by keeping a large glass bottle against the burrows and allowing the spiders to crawl into it. The spider is then killed in a cyanide bottle before transferring it to 70% ethyl alcohol.
- 6. Kerchief Method:** This method is used for collecting running and wandering spiders, especially those belonging to the families Lycosidae and Salticidae. An open kerchief will be thrown over the running spider, which is then carefully caught in the folds of kerchief.

After the spider was observed photographs were taken at the field for identification of species, and it was then

promptly released back into its natural environment. Live spiders were photographed with a Huawei Y6 II mobile phone camera, while dead spiders were preserved in 70% alcohol.

Identification

Morphological features and the taxonomy key for Indian spiders (Kaston, 1978; Tidaker, 1987; Barrion and Litsinger, 1995; Pocock, 1900; Sebastian and Peter, 2009) were used to identify the spiders collected from the study area.

RESULTS AND DISCUSSION

A total of 43 species of spiders belonging to 38 genera and 14 families (Table-1 and Figure 4) were recorded from the study area during the study. These spider species were represented by 14 subfamilies, namely Araneidae, Clubionidae, Corinnidae, Hersiliidae, Lycosidae, Oxyopidae, Philodromidae, Pholcidae, Salticidae, Sparassidae, Scytodidae, Tetragnathidae, Theridiidae and Thomisidae (Figure-2). The subfamily Salticidae showed the highest species diversity. Twelve species recorded from the study area in salticidae family (*Hasarius adansoni*, *Hippasa agelenoides*, *Indopadilla insularis*, *Menemerus bivittatus*, *Phintelloides jesudasi*, *Plexippus petersi*, *Asemonea tenuipes*, *Chalcotropis pennata*, *Chrysilla volupe*, *Epeus indicus*, *Myrmarachne plataleoides*, *Telamonia dimidiata*) and nine species were recorded in Araneidae family (*Anepsion maritatum*, *Araneus bilunifer*, *Argiope anasuja*, *Argiope keyserlingi*, *Cyrtophora citricola*, *Eriophora pustulosa*, *Gasteracantha geminata*, *Neoscona Mukerji*, *Nephila pilipes*). Four species were present in Thomisidae family (*Camaricus Formosus*, *Indoxysticus minutus*, *Thomisus kitamurai*, *Thomisus pugilis*). The Theridiidae and Tetragnathidae families were represented with three species each. It is followed by the Lycosidae, Pholcidae, and Oxyopidae families, each with two members. The families Clubionidae, Corinnidae, Philodromidae, Sparassidae, Scytodidae and Hersiliidae were the least abundant during the study period. Only one species was recorded from these families (Figure-3).

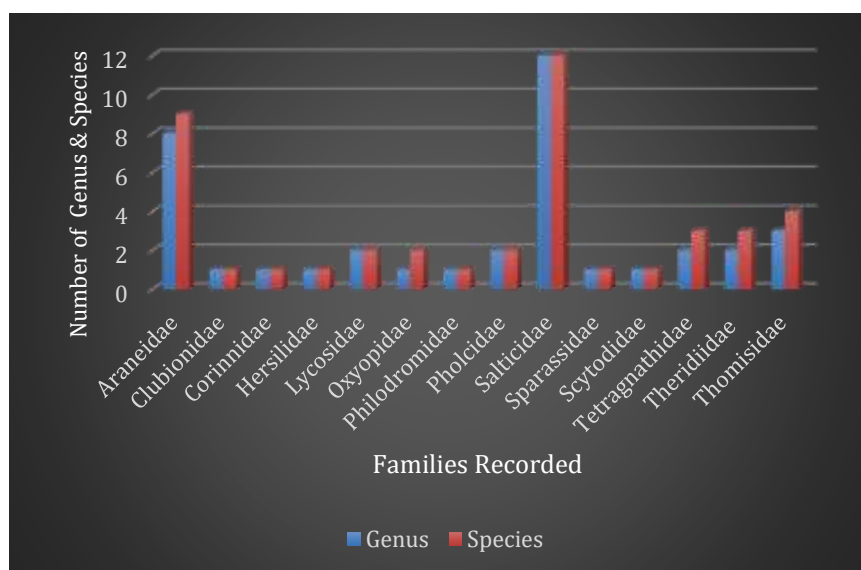


Figure 2: Species-richness pattern of families in the study area

Table 1: Check list of spiders collected from study area

Family	Genus	Species	Natural History
Araneidae	Anepsion	<i>Anepsion maritatum</i>	Orb weaver spider
	Araneus	<i>Araneus bilunifer</i>	Orb weaver spider
	Argiope	<i>Argiope anasuja</i>	Orb weaver spider
		<i>Argiope keyserlingi</i>	Orb weaver spider
	Cyrtophora	<i>Cyrtophora citricola</i>	Orb weaver spider
	Eriophora	<i>Eriophora pustulosa</i>	Orb weaver spider
	Gasteracantha	<i>Gasteracantha geminata</i>	Orb weaver spider
	Neoscona	<i>Neoscona mukerji</i>	Orb weaver spider

	Nephila	<i>Nephila pilipes</i>	Orb weaver spider
Clubionidae	Clubiona	<i>Clubiona drassodes</i>	Patchy Sac spider
Corinnidae	Castineria	<i>Castianeria zetes</i>	Corinnid Sac spider
Hersiliidae	Hersilia	<i>Hersilia savignyi</i>	Bark Spider
Lycosidae	Hippasa	<i>Hippasa agelenoides</i>	wolf spider
	Pardosa	<i>Pardosa sumatrana</i>	wolf spider
Oxyopidae	Oxyopes	<i>Oxyopes javanus</i>	Plant dwelling spider
		<i>Oxyopes Shweta</i>	Plant dwelling spider
Philodromidae	Tibellus	<i>Tibellus elongatus</i>	Crab spiders
Pholcidae	Crossopriza	<i>Crossopriza lyoni</i>	Tailed cellar spider
	Holocnemus	<i>Holocnemus pluchei</i>	Marbled cellar spider
Salticidae	Hasarius	<i>Hasarius adansoni</i>	Jumping spider
	Hyllus	<i>Hyllus semicupreus</i>	Jumping spider
	Indopadilla	<i>Indopadilla insularis</i>	Jumping spider
	Menemerus	<i>Menemerus bivittatus</i>	Jumping spider
	Phintelloides	<i>Phintelloides jesudasi</i>	Jumping spider
	Plexippus	<i>Plexippus petersi</i>	Jumping spider
	Asemonea	<i>Asemonea tenuipes</i>	Jumping spider
	Chalcotropis	<i>Chalcotropis pennata</i>	Jumping spider
	Asemonea	<i>Chrysilla volupe</i>	Jumping spider
	Epeus	<i>Epeus indicus</i>	Jumping spider
	Myrmarachne	<i>Myrmarachne plataleoides</i>	Jumping spider
	Telamonia	<i>Telamonia dimidiata</i>	Jumping spider
Sparassidae	Heteropoda	<i>Heteropoda venatoria</i>	Huntsman spider
Scytodidae	Scytodes	<i>Scytodes thoracica</i>	Spitting spider
Tetragnathidae	Leucauge	<i>Leucauge decorate</i>	Orb-weaver spider
		<i>Leucauge fastigata</i>	Orb-weaver spider
	Tetragnatha	<i>Tetragnatha extensa</i>	Orb-weaver spider
Theridiidae	Nesticodes	<i>Nesticodes rufipes</i>	Red house spider
	Steatoda	<i>Steatoda grossa</i>	False widow
		<i>Steatoda nobilis</i>	Noble false widow
Thomisidae	Camaricus	<i>Camaricus Formosus</i>	Crab spiders
	Indoxysticus	<i>Indoxysticus minutus</i>	Crab spiders
	Thomisus	<i>Thomisus kitamurai</i>	Crab spiders
		<i>Thomisus pugilis</i>	Crab spiders
14	38	43	

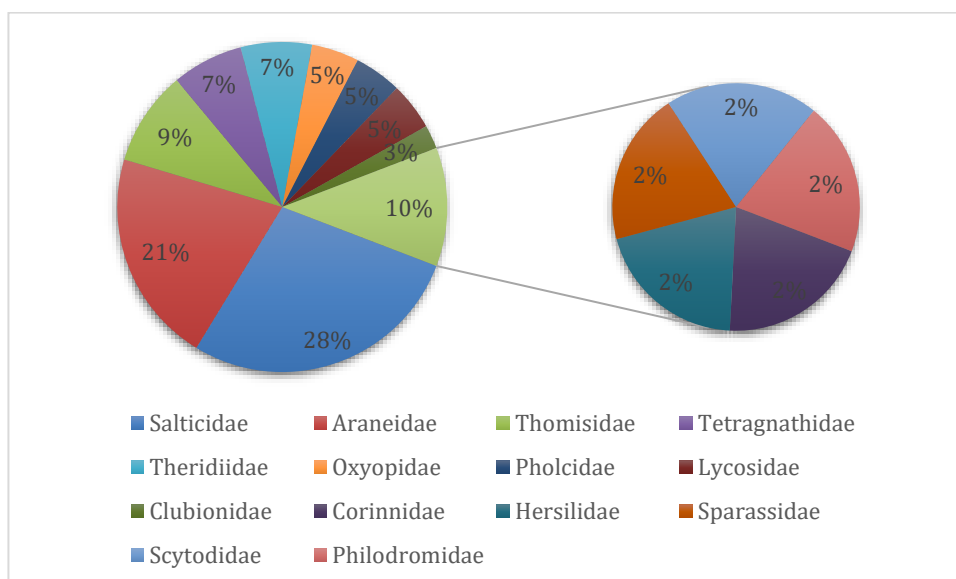


Figure 3: Species-richness pattern families in the study area.

Out of 43 species identified, 28% belong to the Salticidae, followed by Araneidae (21%), Thomisidae (9%), Theridiidae and Tetragnathidae (7%), Oxyopidae, Lycosidae, and Pholcidae (5%), Clubionidae (3%), Corinnidae, Hersiliidae, Philodromidae, Sparassidae, and Scytodidae (2%). A similar dominant pattern of the family Salticidae and Araneidae was observed by Deshmukh and Raut (2014) in their studies in Maharashtra. According to Kazim et al. (2014), the Salticidae family is the most prevalent and has the greatest species diversity, followed by the Araneidae family, which has the second-highest species diversity, and the remaining families, which are all equally abundant.



Telamonia dimidiata



Steatoda nobilis



Hippasa agelenoides



Tetragnatha exstensa



Thomisus kitamurai



Myrmarachne platalaeoides



Argio peanasuja



Phintelloides jesudasi



Camaricus formosu



Menemerus bivittatus



Leucauge decorate



Chrysilla volupe



Nephila pilipes



Leucauge fastigata



Gasteracantha geminata



Hyllus semicupreus



Castianeria zetes



Chalcotropis pennata



Clubiona drassodes



Indoxysticus minutus



Anepsion maritatum



Hasarius adansoni



Steatoda grossa



Indopadilla insularis



Epeus indicus



Eriophora pustulosa



Argiope keyserlingi



Plexippus petersi



Cyrtophora citricola



Nesticodes rufipes



Araneus bilunifer



Crossopriza lyoni



Neoscena mukerji



Thomisus pugilis



Hersilia savignyi



Heteropoda venatoria



Oxyopes shweta



Tibellus elongatus



Oxyopes javanus



Scytodes thoracica



Pardosa sumatrana



Asemonea tenuipes



Holocnemus pluchei

Figure 4: Photographs of the Spider species observed in the study area.

GUILD STRUCTURE

Six feeding guilds namely, orb weavers, foliage hunters, ground runners, stalkers, Ambushers and scattered line weavers were identified based on the foraging behaviour (Uetz et al.,). The most dominant guild was of the Orb web weavers constituting 35% of the total species (*Anepsion maritatum*, *Araneus bilunifer*, *Argiope anasuja*, *Argiope keyserlingi*, *Cyrtophora citricola*, *Eriophora pustulosa*, *Gasteracantha geminate*, *Neoscona Mukerji*, *Nephila pilipes*, *Leucauge decorate*, *Leucauge fastigata*, *Tetragnatha exstensa*, *Nesticodes rufipes*, *Steatoda grossa* and *Steatoda nobilis*). Stalkers observed as second dominant guild (32%). It is followed by Ambushers (12%), Foliage hunters (9%) and Ground Runners (7%). The least abundant guild structure observed in Scattered line Weavers (Table- 2 &Figure-5).

Table -2 : Table 1. List of the spiders collected and their guild

Family	Species	Guild
Araneidae	<i>Anepsion maritatum</i>	Orb weaver spider
	<i>Araneus bilunifer</i>	Orb weaver spider
	<i>Argiope anasuja</i>	Orb weaver spider
	<i>Argiope keyserlingi</i>	Orb weaver spider
	<i>Cyrtophora citricola</i>	Orb weaver spider
	<i>Eriophora pustulosa</i>	Orb weaver spider
	<i>Gasteracantha geminata</i>	Orb weaver spider
	<i>Neoscona mukerji</i>	Orb weaver spider
	<i>Nephila pilipes</i>	Orb weaver spider
Clubionidae	<i>Clubiona drassodes</i>	Foliage hunters
Corinnidae	<i>Castianeria zetes</i>	Ground runner
Hersilidae	<i>Hersilia savignyi</i>	Foliage hunters
Lycosidae	<i>Hippasa agelenoides</i>	Ground runner
	<i>Pardosa sumatrana</i>	Ground runner
Oxyopidae	<i>Oxyopes javanus</i>	Stalkers
	<i>Oxyopes shweta</i>	Stalkers
Philodromidae	<i>Tibellus elongatus</i>	Ambushers
Pholcidae	<i>Crossopriza lyoni</i>	Scattered line weavers
	<i>Holocnemus pluchei</i>	Scattered line weavers
Salticidae	<i>Hasarius adansoni</i>	Stalkers
	<i>Hyllus semicupreus</i>	Stalkers
	<i>Indopadilla insularis</i>	Stalkers

	<i>Menemerus bivittatus</i>	Stalkers
	<i>Phintelloides jesudasi</i>	Stalkers
	<i>Plexippus petersi</i>	Stalkers
	<i>Asemonea tenuipes</i>	Stalkers
	<i>Chalcotropis pennata</i>	Stalkers
	<i>Chrysilla volupe</i>	Stalkers
	<i>Epeus indicus</i>	Stalkers
	<i>Myrmarachne plataleoides</i>	Stalkers
	<i>Telamonia dimidiata</i>	Stalkers
Sparassidae	<i>Heteropoda venatoria</i>	Foliage hunters
Scytodidae	<i>Scytodes thoracica</i>	Foliage hunters
Tetragnathidae	<i>Leucauge decorata</i>	Orb weaver spiders
	<i>Leucauge fastigata</i>	Orb weaver spiders
	<i>Tetragnatha exstensa</i>	Orb weaver spiders
Theridiidae	<i>Nesticodes rufipes</i>	Orb weaver spiders
	<i>Steatoda grossa</i>	Orb weaver spiders
	<i>Steatoda nobilis</i>	Orb weaver spiders
Thomisidae	<i>Camaricus formosus</i>	Ambushers
	<i>Indoxysticus minutus</i>	Ambushers
	<i>Thomisus kitamurai</i>	Ambushers
	<i>Thomisus pugilis</i>	Ambushers

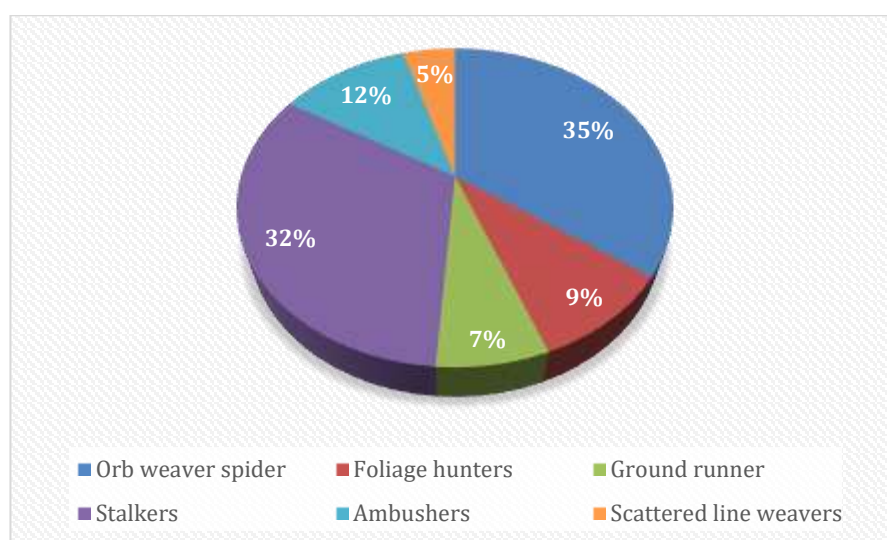


Figure-5: Composition (%) of guild structure of spiders collected during the study

Study revealed that the web spider was dominant in the study area followed by Stalkers. The feeding guild structure investigation by Gayathri et al., (2022) revealed five types of foraging functional groups in which Orb-web builders were the most popular feeding guild, followed by Stalkers. Study conducted by Anindita et al., (2017) reported the presence of highest number orb web spider followed by the foliage dwelling spider.

The host plant, microenvironment, and level of disturbance all influence the structure of the spider guild (Uetz et al., 1999).

Conclusion

In the present investigation, high species diversity was observed in Kottayi Panchayath, Palakkad district of Northern Kerala. A total of 43 species of spiders under 38 genera belonging to 14 families were collected from this area. With 12 species, the Salticidae family was the most abundant, followed by the Araneidae family with 8 species. The families Clubionidae, Corinnidae, Philodromidae, Sparassidae, Scytodiidae, and Hersiliidae, each with one species, were the least abundant during the study period. Six feeding guilds were identified through a guild structure analysis of the collected spiders: orb-weaver spider, foliage hunters, ground hunters, Stalkers, scattered line weavers, and ambushers. The most dominant guild was the orb web weavers, constituting 35% of the total species. Out of 43 species, 24 were wandering spiders, and 19 were web-builder spiders. The Kottayi panchayath of Palakkad district of Kerala showed high spider diversity because of the combination of geographical features, high vegetation (such as paddy fields and vegetable cultivation), and meteorological factors.

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