

Spiders (Arachnida: Araneae) of Kanyakumari Wildlife Sanctuary, Tamil Nadu, India

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Abstract

The present study provides a checklist of spiders from the Kanyakumari Wildlife Sanctuary, which includes 82 species of spiders belonging to 58 genera and 16 families. Of the reported spiders, sixteen species are endemic to India, and two species are endemic to Tamil Nadu. Araneidae was the most dominant family, constituting 21% of all reported species. Guild structure analysis revealed seven feeding guilds, the most dominant of which were orb-web weavers, followed by stalkers and ambushers.

Keywords: Araneae, Diversity, Guilds, Endemic, Southern Western Ghats

Introduction

Spiders are among the most abundant and diverse terrestrial predators on earth (Coddington & Levi, 1991). The current global list of spiders includes 50,165 species belonging to 4,259 genera and 132 families (World Spider Catalog, 2022). Presently, 1,905 species under 492 genera in 61 families are known from India (Caleb & Sankaran, 2022), of which 226 species under 120 genera in 33 families have been reported from Tamil Nadu (Karthikeyani *et al.*, 2017). Spiders are a valuable surrogate for assessing predatory arthropod diversity and studying general spatial and temporal biodiversity patterns (Marc *et al.*, 1999; Cardoso *et al.*, 2004). They play a vital role in controlling the insect populations of the ecosystem and proved as useful indicators of the overall species richness and health of terrestrial communities (Norris, 1999).

The present study was conducted in the Kanyakumari Wildlife Sanctuary, which is situated in the Southern Western Ghats, one of India's most diversified wildlife habitats. The sanctuary has a rich biodiversity with several microhabitats due to its exposure to a wide range of climatic conditions and its geographic location at the

southernmost tip of the Indian subcontinent (Sujana & Vadhyar, 2021). The spider fauna of the Kanyakumari Wildlife Sanctuary has never been thoroughly studied. Mohammed *et al.* (2017) are the only contributors who recorded 24 species of spiders from this sanctuary. This study aims to document the spider fauna of the sanctuary from the primary data (collected from 2019 to 2020) and the available published literature.

Material and Methods

Study Area

Kanyakumari Wildlife Sanctuary is located in the Kanyakumari district of Tamil Nadu. It lies between 8°03' to 8°35' N and 77°05' to 77°36' E and forms the southern part of the Agasthyamalai Biosphere Reserve (Kothandaraman & Sundarapandian, 2017). The sanctuary is bounded to the North by the Kalakkad-Mundanthurai Tiger Reserve, the East by Tirunelveli District, the South by the Kodayar and Thovalai channels, and to the West by the Neyyar Wildlife Sanctuary of Kerala state. The entire sanctuary is mountainous, steep, and rocky, with elevation ranges from 10m to 2000m

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above sea level (Sujana & Vadhyar, 2021). The natural vegetation of the region mainly includes southern thorn bushes, dry deciduous forests, moist deciduous forests, semi-evergreen forests, and grassland evergreen hills (Champion & Seth, 1968).

Methods

Spiders were collected from different localities of the sanctuary during the period from April 2019 to March 2020. An all-out search method was used for spider collection, and the collection was done mainly by following Sebastian and Peter (2009). The collected specimens were stored in 70% alcohol and labelled with the location, date of collection, and other relevant information. The specimens were identified by using Leica M205A stereomicroscope. The related literature available in the World Spider Catalog (2022) was used for

this study. The studied samples were deposited at Western Ghat Regional Centre (WGRC), Zoological Survey of India, Kozhikode, Kerala.

Results

A total of 82 species of spiders belonging to 58 genera and 16 families were recorded during the study (Table 1 & Figure 2). Sixteen of the recorded species are endemic to India, and two are endemic to Tamil Nadu state (Table 2). The orb-web spiders of the family Araneidae were the most diverse, represented by 17 species, followed by the jumping spiders (Salticidae) and crab spiders (Thomisidae) with 13 species each, the lynx spiders (Oxyopidae) with 8 species, long-jawed orb weavers (Tetragnathidae) with 7 species. The rest of the families contributed less than five to the overall species richness (Table 1 & Figure 3). The maximum generic diversity was

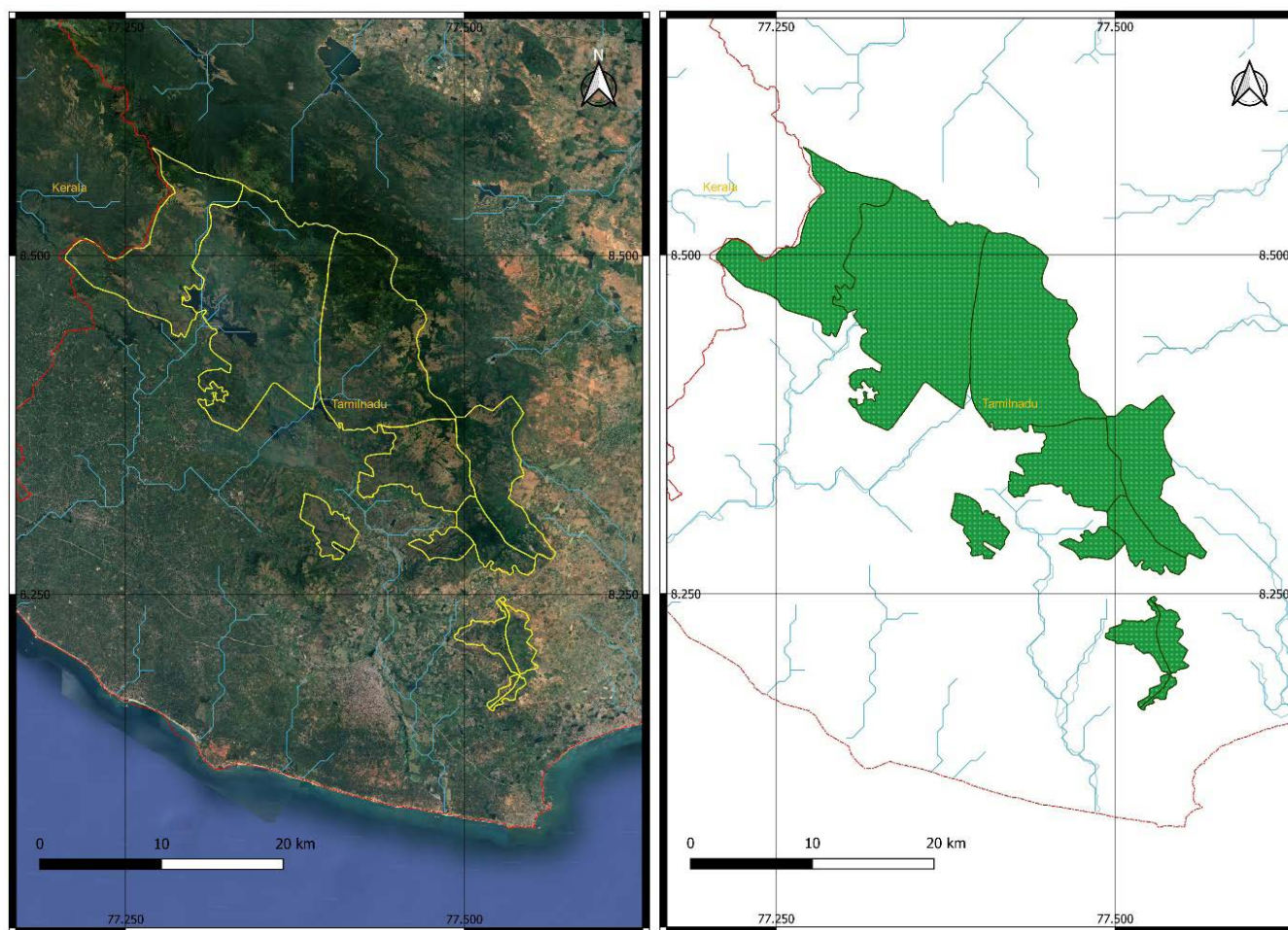


Figure 1. Map of Kanyakumari Wildlife Sanctuary, Tamil Nadu.

found in the family Salticidae (13), followed by Araneidae (11) and Thomisidae (10), and the remaining families represent less than four of the total generic diversity (Table 1 and Figure 3). The families like Cheiracanthiidae, Clubionidae, Hersiliidae, Gnaphosidae and Psecridae are represented by a single genus (Table 1 and Figure 3). Guild structure analysis (following Uetz *et al.*, 1999) revealed the existence of seven feeding guilds: orb-web weavers,

stalkers, ambushers, foliage hunters, ground runners, scattered line weavers, and sheet web builders (Table 1). Orb-web weavers (24 species), stalkers (21 species), and ambushers (20 species) were the most species-rich guilds, accounting for 85% of the total spider species collected. They are followed by foliage hunters (6 species), scattered line weavers (5 species), ground runners (4 species) and sheet web builders (2 species) (Table 1 & Figure 4).

Table 1. The total number of families, genera, species composition and feeding guilds of spiders, reported from Kanyakumari Wildlife Sanctuary

Sl. No.	Families	Genera	Species	Guild
1	Araneidae	11	17	Orb-web weavers
2	Cheiracanthiidae	1	1	Foliage hunters
3	Clubionidae	1	1	Foliage hunters
4	Hersiliidae	1	2	Ambushers
5	Gnaphosidae	1	1	Ground runners
6	Lycosidae	3	3	Ground runners
7	Oxyopidae	2	8	Stalkers
8	Philodromidae	2	2	Ambushers
9	Pholcidae	3	3	Scattered line weavers
10	Pisauridae	3	3	Ambushers
11	Psecridae	1	2	Sheet web builders
12	Salticidae	13	13	Stalkers
13	Sparassidae	2	4	Foliage hunters
14	Tetragnathidae	2	7	Orb-web weavers
15	Theridiidae	2	2	Scattered line weavers
16	Thomisidae	10	13	Ambushers
Total		58	82	

Table 2. List of Spiders recorded from Kanyakumari Wildlife Sanctuary

Sl. No.	Species	Registration No.	Remarks
Family Araneidae Clerck, 1757 (Orb web spiders)			
1	<i>Acusilas coccineus</i> Simon, 1895	ZSI/WGRC/I.R-INV. 14347-14348.	F ₁ , PS
2	<i>Anepsion maritatum</i> (O. Pickard-Cambridge, 1877)	ZSI/WGRC/I.R-INV. 14343-14346.	F ₁ , PS
3	<i>Argiope aemula</i> (Walckenaer, 1841)	-	E ₂
4	<i>Argiope anasuja</i> Thorell, 1887	-	E ₂
5	<i>Argiope pulchella</i> Thorell, 1881	ZSI/WGRC/I.R-INV. 14189-14190.	E ₂ , PS
6	<i>Bijoaraneus mitificus</i> (Simon, 1886)	ZSI/WGRC/I.R-INV. 14768-14769.	F ₁ , PS
7	<i>Cyclosa bifida</i> (Dolleschall, 1859)	ZSI/WGRC/I.R-INV. 15067-15071.	F ₁ , PS
8	<i>Cyrtophora cicatrosa</i> (Stoliczka, 1869)	ZSI/WGRC/I.R-INV. 14763-14767.	F ₁ , PS
9	<i>Cyrtophora</i> sp.	-	E ₂

10	<i>Eriovixia laglaizei</i> (Simon, 1877)	ZSI/WGRC/I.R-INV. 15072-15076.	F ₁ , PS
11	<i>Herennia multipuncta</i> (Doleschall, 1859)	ZSI/WGRC/I.R-INV. 14334-14335.	F ₁ , E ₂ , PS
12	<i>Larinia phthisica</i> (L. Koch, 1871)	ZSI/WGRC/I.R-INV. 14353-14354.	F ₁ , PS
13	<i>Neoscona mukerjei</i> Tikader, 1980	ZSI/WGRC/I.R-INV. 14671-14673.	F ₁ , PS
14	<i>Neoscona theisi</i> (Walckenaer, 1841)	ZSI/WGRC/I.R-INV. 14675-14676; ZSI/WGRC/I.R-INV.15064- 15066.	F ₁ , PS
15	<i>Neoscona yptinika</i> Barrion & Litsinger, 1995	ZSI/WGRC/I.R-INV. 14349-14352.	F ₁ , PS
16	<i>Neoscona</i> sp.	-	E ₂
17	<i>Nephila pilipes</i> (Fabricius, 1793)	-	E ₂
Family: Cheiracanthiidae Wagner, 1887 (Yellow sac spiders)			
18	<i>Cheiracanthium murinum</i> (Thorell, 1895)	ZSI/WGRC/I.R-INV. 14372-14373.	F ₁ , PS
Family: Clubionidae Wagner, 1887 (Sac spiders)			
19	<i>Clubiona</i> sp.	-	E ₂
Family: Gnaphosidae Banks, 1892 (Mouse spiders)			
20	<i>Zelotes</i> sp.	-	E ₂
Family: Hersiliidae Thorell, 1870 (Two-tailed spiders)			
21	<i>Hersilia savignyi</i> Lucas, 1836	ZSI/WGRC/I.R-INV. 14184-14185.	F ₁ , E ₂ , PS
22	<i>Hersilia tibialis</i> Baehr & Baehr, 1993	ZSI/WGRC/I.R-INV. 14300-14303; ZSI/WGRC/I.R-INV. 14304-14306; ZSI/WGRC/I.R-INV. 14661-14667.	F ₁ , PS
Family: Lycosidae Sundevall, 1833 (Wolf spiders)			
23	<i>Hippasa greenalliae</i> (Blackwall, 1867)	ZSI/WGRC/I.R-INV.14178-14183; ZSI/WGRC/I.R-INV.14307- 14310.	F ₁ , PS
24	<i>Lycosa phipsoni</i> Pocock, 1899	ZSI/WGRC/I.R-INV. 14691- 14692.	F ₁ , PS
25	<i>Pardosa</i> sp.	-	E ₂
Family: Oxyopidae Thorell, 1869 (Lynx spiders)			
26	<i>Oxyopes ashae</i> Gajbe, 1999	-	E ₁ , E ₂
27	<i>Oxyopes hindostanicus</i> Pocock, 1901	ZSI/WGRC/I.R-INV.14311- 14312.	F ₁ , PS
28	<i>Oxyopes javanus</i> Thorell, 1887	ZSI/WGRC/I.R-INV. 14169-14171.	F ₁ , PS
29	<i>Oxyopes shweta</i> Tikader, 1970	ZSI/WGRC/I.R-INV. 14230- 14234.	F ₁ , PS
30	<i>Peucetia jabalpurensis</i> Gajbe & Gajbe, 1999	ZSI/WGRC/I.R-INV. 14228- 14229.	F ₁ , E ₁ , PS
31	<i>Peucetia latikae</i> Tikader, 1970	ZSI/WGRC/I.R-INV. 14226- 14227.	F ₁ , PS
32	<i>Peucetia pawani</i> Gajbe, 1999	ZSI/WGRC/I.R-INV. 14213.	F ₁ , E ₁ , E ₂ , PS
33	<i>Peucetia phantasma</i> Ahmed <i>et al.</i> , 2015	ZSI/WGRC/I.R-INV. 14159-14168.	F ₁ , E ₁ , PS
Family: Philodromidae Thorell, 1897 (Running crab spiders)			
34	<i>Philodromus bhagirathai</i> Tikader, 1966	ZSI/WGRC/I.R-INV. 14225.	F ₁ , E ₁ , PS
35	<i>Psellonus planus</i> Simon, 1897	ZSI/WGRC/I.R-INV. 14207-14210; ZSI/WGRC/I.R-INV.14222-14223.	F ₁ , E ₁ , PS
Family: Pholcidae C. L. Koch, 1850 (Cellar spiders)			
36	<i>Artema atlanta</i> Walckenaer, 1837	ZSI/WGRC/I.R-INV. 14776-14782.	F ₁ , PS
37	<i>Crossopriza lyoni</i> (Blackwall, 1867)	-	E ₂
38	<i>Pholcus phalangioides</i> (Fuesslin, 1775)	-	E ₂

Family: Pisauridae Simon, 1890 (Nursery web spiders)			
39	<i>Perenethis venusta</i> L. Koch, 1878	ZSI/WGRC/I.R-INV. 14214-14215.	F ₂ , PS
40	<i>Polyboea vulpina</i> Thorell, 1895	ZSI/WGRC/I.R-INV. 14693-14697; ZSI/WGRC/I.R-INV. 15077-15083.	F ₁ , PS
41	<i>Pisaura</i> sp.	-	E ₂
Family: Psecridae Simon, 1890 (Jungle cribellate spiders)			
42	<i>Psechrus hartmanni</i> Bayer, 2012	ZSI/WGRC/I.R-INV. 17211.	F ₁ , E _O , PS
43	<i>Psechrus torvus</i> (O. Pickard-Cambridge, 1869)	ZSI/WGRC/I.R-INV. 17213.	F ₁ , PS
Family: Salticidae Blackwall, 1841 (Jumping spiders)			
44	<i>Brettus cingulatus</i> Thorell, 1895	ZSI/WGRC/I.R-INV. 14668-14669.	F ₁ , PS
45	<i>Chalcotropis pennata</i> Simon, 1902	ZSI/WGRC/I.R-INV. 14359-14363.	F ₁ , E ₁ , PS
46	<i>Epeus indicus</i> Prószyński, 1992	ZSI/WGRC/I.R-INV. 14670.	F ₁ , PS
47	<i>Hasarius adansoni</i> (Audouin, 1826)	ZSI/WGRC/I.R-INV. 15111.	F ₁ , PS
48	<i>Hyllus semicupreus</i> (Simon, 1885)	ZSI/WGRC/I.R-INV. 14355-14358.	F ₁ , PS
49	<i>Indopadilla insularis</i> ((Malamel, et al., 2015)	ZSI/WGRC/I.R-INV. 14186.	F ₂ , E ₁ , PS
50	<i>Myrmaplata plataleoides</i> (O. Pickard-Cambridge, 1869)	ZSI/WGRC/I.R-INV. 14195-14197.	F ₁ , PS
51	<i>Phaeacius fimbriatus</i> Simon, 1900	ZSI/WGRC/I.R-INV. 14281-14284; ZSI/WGRC/I.R-INV. 14285-14291; ZSI/WGRC/I.R-INV. 14292-14299; ZSI/WGRC/I.R-INV. 14797-14802.	F ₁ , PS
52	<i>Phintella vittata</i> (C. L. Koch, 1846)	ZSI/WGRC/I.R-INV. 14313- 14315.	F ₁ , PS
53	<i>Plexippus paykulli</i> (Audouin, 1826)	ZSI/WGRC/I.R-INV. 14677-14684.	F ₁ , PS
54	<i>Rhene flavigera</i> (C. L. Koch, 1846)	ZSI/WGRC/I.R-INV. 14796.	F ₁ , PS
55	<i>Siler semiglaus</i> (Simon, 1901)	ZSI/WGRC/I.R-INV. 15114.	F ₁ , PS
56	<i>Telamonia dimidiata</i> (Simon, 1899)	ZSI/WGRC/I.R-INV. 14211-14212.	F ₁ , E ₂ , PS
Family: Sparassidae Bertkau, 1887 (Giant crab spiders)			
57	<i>Heteropoda nilgirina</i> Pocock, 1901	-	E ₁ , E ₂
58	<i>Heteropoda venatoria</i> (Linnaeus, 1767)	ZSI/WGRC/I.R-INV. 15086-15088.	F ₁ , E ₂ , PS
59	<i>Olios lamarki</i> (Latreille, 1806)	ZSI/WGRC/I.R-INV. 14187-14188.	F ₁ , PS
60	<i>Olios milleti</i> (Pocock, 1901)	-	E ₂
Family: Tetragnathidae Menge, 1866 (Long-jawed spiders)			
61	<i>Leucauge decorata</i> (Blackwall, 1864)	ZSI/WGRS/I.R-INV 13219-13220	E ₂
62	<i>Leucauge fastigata</i> (Simon, 1877)	ZSI/WGRC/I.R-INV. 14685-14690.	F ₂ , PS
63	<i>Leucauge tessellata</i> (Thorell, 1887)	-	E ₂
64	<i>Tetragnatha hasselti</i> Thorell, 1890	ZSI/WGRC/I.R-INV. 14772-14775.	F ₁ , PS
65	<i>Tetragnatha javana</i> (Thorell, 1890)	ZSI/WGRC/I.R-INV. 14367-14369.	F ₁ , PS
66	<i>Tetragnatha mandibulata</i> Walckenaer, 1841	ZSI/WGRC/I.R-INV. 14370-14371.	F ₁ , PS
67	<i>Tetragnatha</i> sp.	-	E ₂
Family: Theridiidae Sundevall, 1833 (Comb-footed spiders)			

68	<i>Chikunia nigra</i> (O. Pickard-Cambridge, 1880)	ZSI/WGRC/I.R-INV. 15107-15110.	F ₁ , PS
69	<i>Chrysso angula</i> (Tikader, 1970)	ZSI/WGRC/I.R-INV. 14783-14795.	F ₁ , PS
Family: Thomisidae Sundevall, 1833 (Crab spiders)			
70	<i>Amyciaea forticeps</i> (O. Pickard-Cambridge, 1873)	ZSI/WGRC/I.R-INV. 15084-15085.	F ₁ , PS
71	<i>Angaeus</i> sp.	ZSI/WGRC/I.R-INV. 14191.	F ₁ , PS
72	<i>Bomis calcuttaensis</i> Biswas & Mazumder, 1981	ZSI/WGRC/I.R-INV. 14219.	F ₁ , PS,
73	<i>Camaricus formosus</i> Thorell, 1887	ZSI/WGRC/I.R-INV. 14192-14193; ZSI/WGRC/I.R-INV. 14336-14340.	F ₁ , E ₁ , PS
74	<i>Epidius parvati</i> Benjamin, 2000	ZSI/WGRC/I.R-INV. 14204-14206.	F ₁ , PS
75	<i>Heriaeus chareshi</i> Sen & Sureshan, 2022	ZSI/WGRC/I.R-INV. 15590 - 15592.	E ₁ , E _O , F ₁ , PS
76	<i>Indoxysticus minutus</i> (Tikader, 1960)	ZSI/WGRC/I.R-INV. 14224.	F ₁ , PS
77	<i>Strigoplus netravati</i> Tikader, 1963	ZSI/WGRC/I.R-INV. 14177; ZSI/WGRC/I.R-INV. 14216- 14217; ZSI/WGRC/I.R-INV. 14341-14342.	E ₁ , F ₁ , PS
78	<i>Thomisus andamanensis</i> Tikader, 1980	ZSI/WGRC/I.R-INV. 14218.	E ₁ , F ₁ , PS
79	<i>Thomisus projectus</i> Tikader, 1960	ZSI/WGRC/I.R-INV. 14176.	E ₁ , F ₁ , PS
80	<i>Thomisus telanganaensis</i> Pravalikha & Srinivasulu, 2015	ZSI/WGRC/I.R-INV. 14172-14175.	E ₁ , F ₁ , PS
81	<i>Thomisus</i> sp.	-	E ₂
82	<i>Tmarus kotigeharus</i> Tikader, 1963	ZSI/WGRC/I.R-INV. 14220-14221.	E ₁ , F ₁ , PS

Abbreviations used: PS – Present study, F₁ – First report from Kanyakumari Wildlife Sanctuary, E₁ - Endemic to India, E₂ - Reported by Mohammed *et al.*, 2017, E_O - Reported from Tamil Nadu State only.

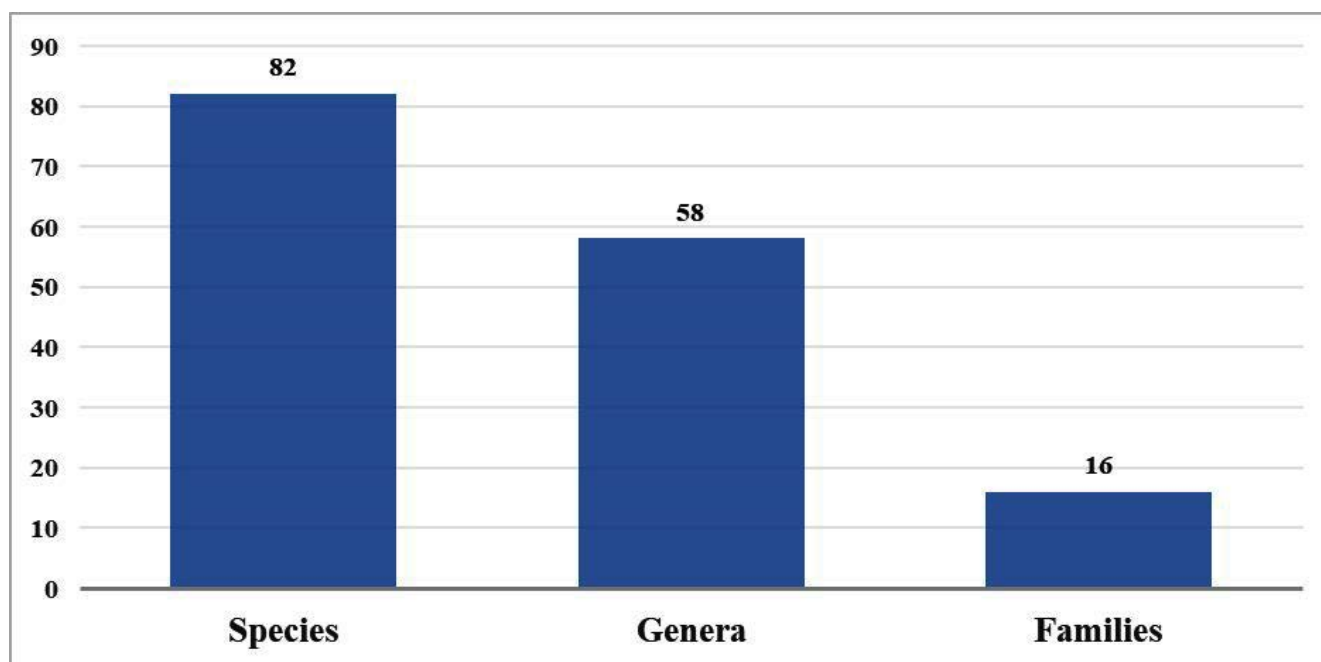


Figure 2. Number of total species, genera, and families recorded from Kanyakumari Wildlife Sanctuary.

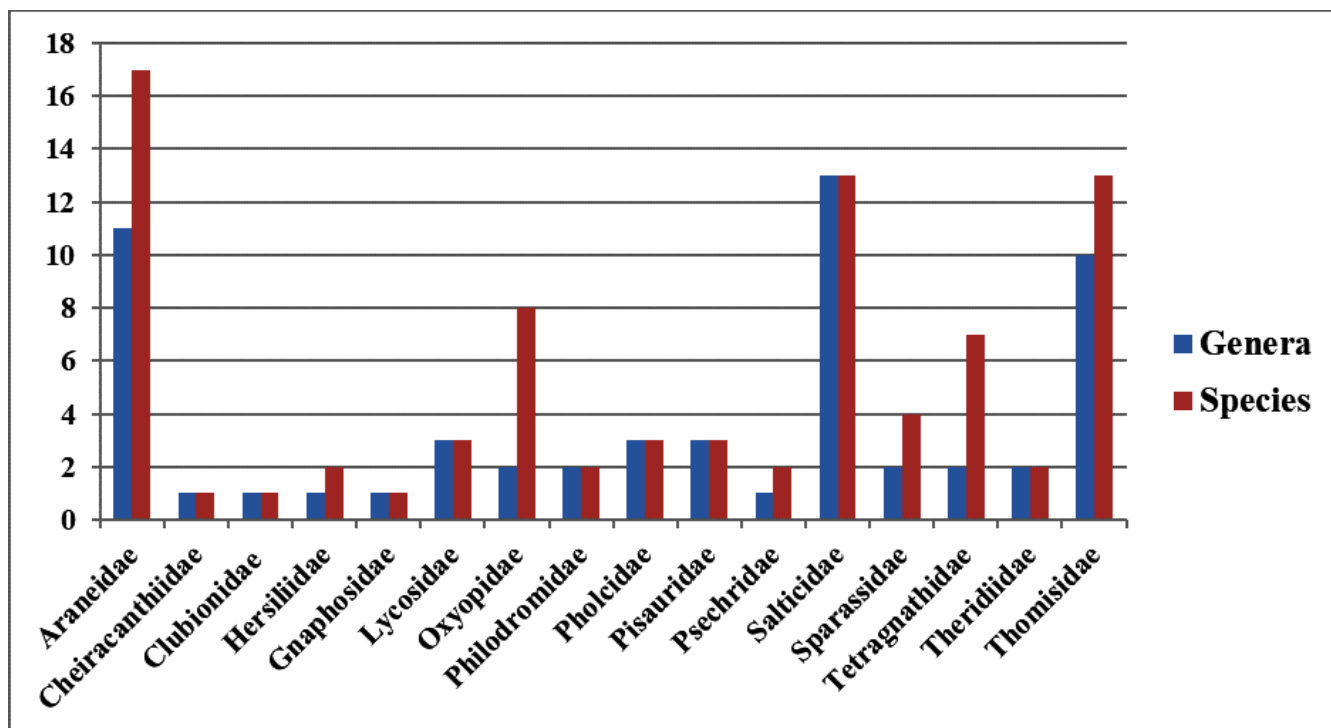


Figure 3. Number of genera and species reported under different spider families from Kanyakumari Wildlife Sanctuary.

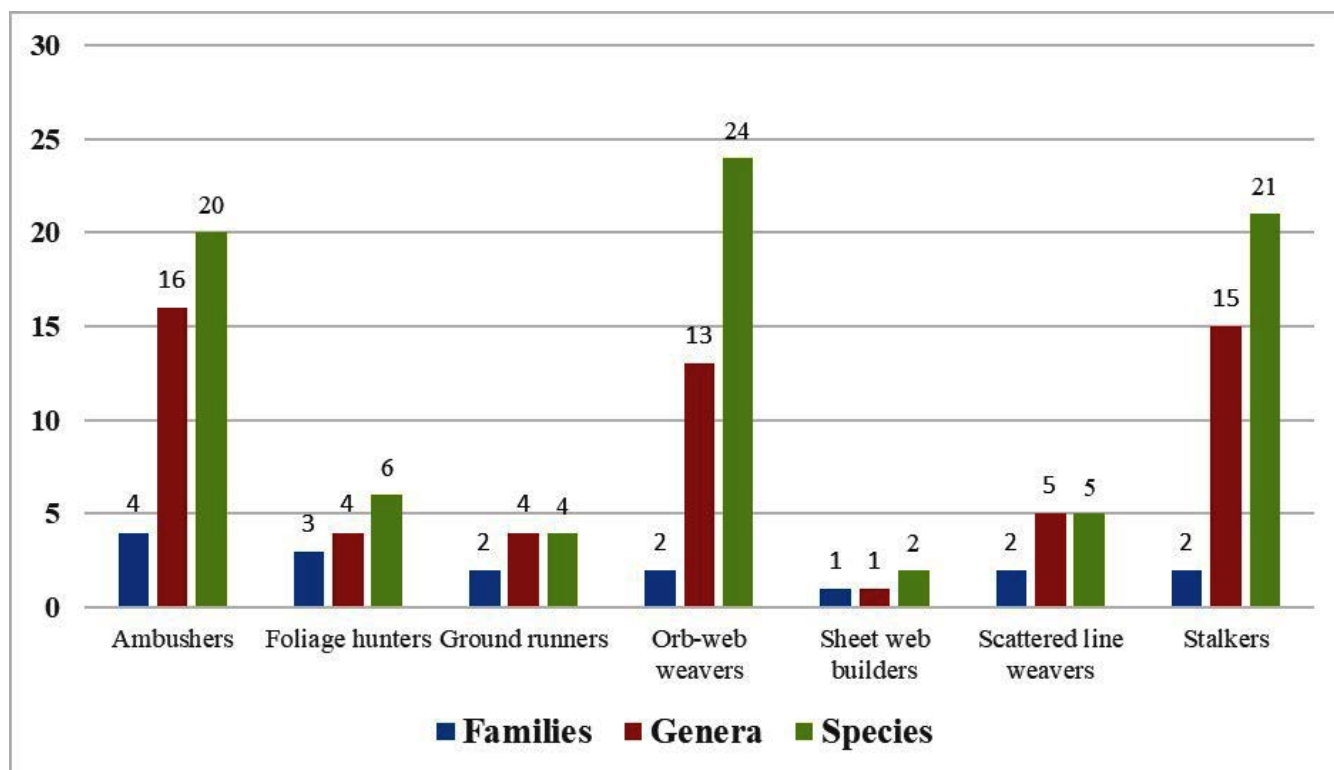


Figure 4. Number of families, genera and species representing feeding guilds of spiders reported from Kanyakumari Wildlife Sanctuary.

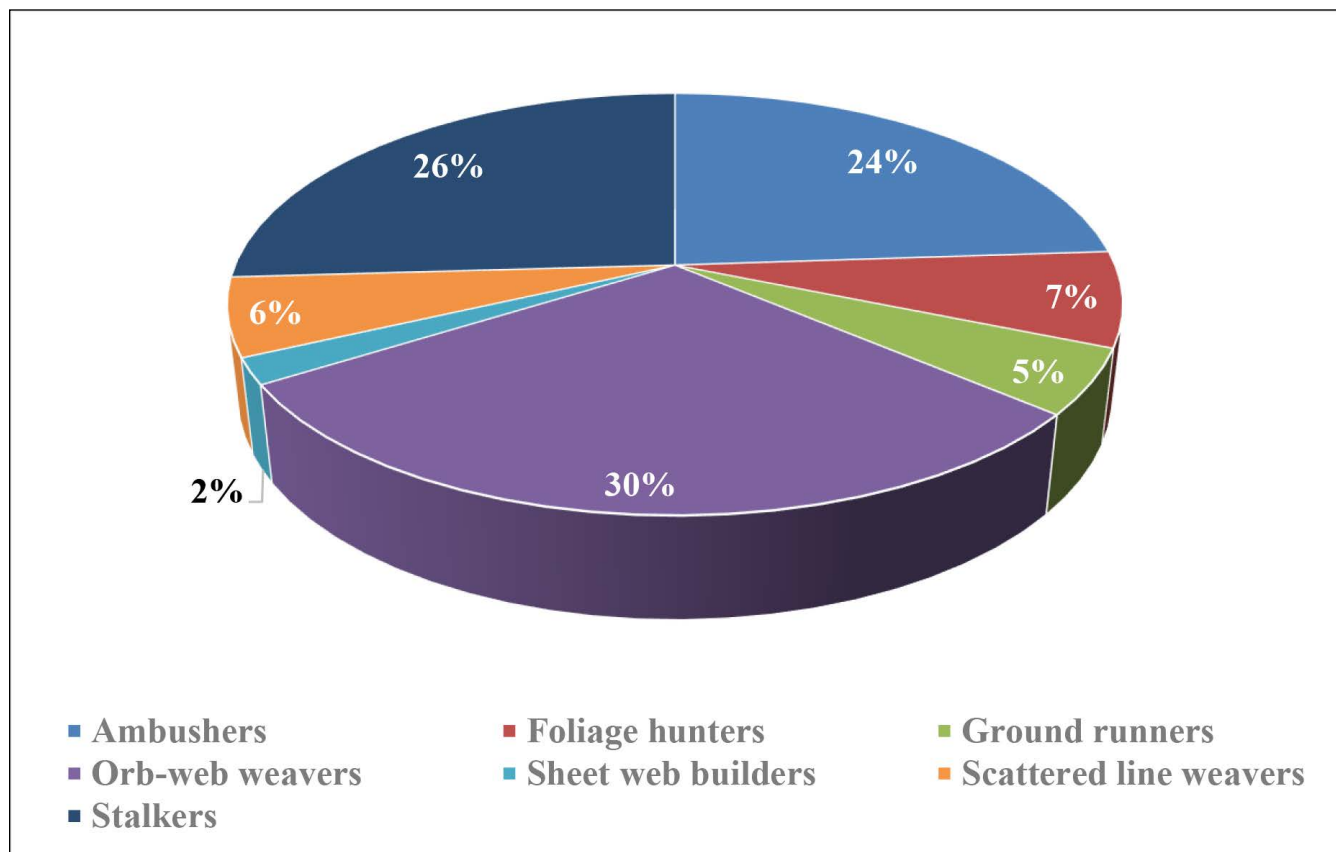


Figure 5. Guild structure analysis based on species richness of spiders reported from Kanyakumari Wildlife Sanctuary.

Discussion

The present study provides an updated checklist of spiders of Kanyakumari Wildlife Sanctuary. The study shows that the spider fauna of the sanctuary is diverse with 82 species of spiders from 58 genera and 16 families. The total spider diversity of Kanyakumari Wildlife Sanctuary represents 4% of total species, 12% of total genera, and 26% of total families recorded from India (Caleb & Sankaran, 2022) and it accounts for 36% of total species, 49% of total genera, and 48% of total families from Tamil Nadu state (Karthikeyani *et al.*, 2017). The high species diversity of spiders in this forest ecosystem can be attributed to the high floral diversity, which sustains a high faunal diversity by providing diverse microhabitats especially for invertebrates (Sudhikumar *et al.*, 2005).

Orb weavers of the family Araneidae is found to be the most dominant family in the study area. The presence of large number of trees, shrubs and understory plants

that provide a suitable habitat for web building spiders. Complex vegetations provide extensive options for micro-habitat selection and prey capture, especially among web building spiders (Haddad *et al.*, 2009). The present study confirmed that structurally complex habitats offer a greater variety of web-attachment sites, resulting in increased habitat suitability for web-building spiders. Their high density, diversity and ease of collection make them an effective environmental monitoring tool in almost all the ecosystems. The second most species rich family is Salticidae. Their keen sense of sight, ability to track prey even when the line of sight is broken and unique jumping ability enable them to adapt to a wide variety of environments (Enders, 1975; Jackson, 1986). Similar kind of observations on high diversity of araneids and salticids from protected areas of India were made by Chetia and Kalita (2012), Basumatary and Brahma (2017) and Solanki *et al.*, (2020).



Figure 6. View of different collection localities in Kanyakumari Wildlife Sanctuary.



Figure 7. General habitus of some spiders collected from Kanyakumari Wildlife Sanctuary.

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