Diversity of Spiders and Seasonal Variation Surrounding "Madosilli Waterfall" Sarangarh-Bilaigarh District, Chhattisgarh, India.

Anita Pandey, Dr. V. M. Agrawal

Assistant Professor, Kirodimal Govt. Arts and Science College, Raigarh, Chhattisgarh, India. Govt. Navin college, Barpali, Korba, Chhattisgarh, India.

DOI: https://dx.doi.org/10.51244/IJRSI.2025.1210000191

Received: 21 October 2025; Accepted: 25 October 2025; Published: 14 November 2025

ABSTRACT

Spiders, classified as invertebrates, belong to the phylum Arthropoda, class Arachnida, and order Araneae. A study was conducted from March 2024 to February 2025 to investigate spider diversity in Madosilli Waterfall the Sarangarh-Bilaigarh District, Chhattisgarh. The primary objective of this survey was to assess the existing spider diversity and seasonal variation within the designated study area. A comprehensive survey of Madosilli Waterfall documented a total of 32 species belonging to28 genera and 12 families. The family Araneidae was the most diverse, with 8 species identified, followed by Salticidae with 7 species. Oxyopidae was represented by 3 species. The families Gnaphosidae, Hersiliidae, Lycosidae, Pholcidae, Sparassidae, Tetragnathidae, and Thomisidae each contributed 2 species to the surveyed fauna, Agelenidae and Theridiidae were represented by a single species each. Seasonal variability is generally highest in post-monsoon (n=31), followed by the monsoon season(n=27), followed by the winter(n=25) season and lowest in the pre-monsoon season(n=14). This research provides relevant and up-to-date data on spider species and sessional variation within the specified region, offering a potentially valuable dataset for future investigations of spider fauna.

.Key Words- Spider Diversity, Madosilli Waterfall, Araneae, Sarangarh, Seasonal Variability

Objectives: This study was conducted with the primary objectives of:

1. Developing a comprehensive checklist of spider species identified at the "Madosilli waterfall"
2. Assessing the seasonal variation in spider species surrounding the "Madosilli waterfall".

INTRODUCTION

Spiders are compelling creatures; this has been a significant point of interest for archaeologists and the public. Araneae constitutes the most extensive order within the class Arachnida and the phylum Arthropoda. A distinctive characteristic of spiders within the Arachnid class is the presence of spinnerets. The fossil record indicates that spiders are ancient organisms, with their origins dating back to the Devonian period approximately 380 million years ago (Shear et al., 1989). Spiders are valuable bioindicators and contribute to pest control, exhibiting sensitivity to subtle alterations in habitat structure, vegetation density, and environmental conditions (Utez, 1991**).** Current estimates suggest that the global spider population comprises 52,168 species, classified into 504 genera and 62 families **(**Caleb & Sankaran, 2024). Singh (2023) provides a comprehensive account of Indian spiders, documenting 2,110 species across 527 genera and 55 families. Furthermore, a survey of Chhattisgarh revealed the presence of 222 spider species, classified into 96 genera within 23 families. Spiders constitute a significant component of terrestrial ecosystems as abundant insectivorous predators (Nyffeler & Benz, 1987; Wise, 1993). Certain arachnid species have demonstrated adaptive capabilities that enable them to thrive in niche habitats and exhibit varied ways of foraging, either by spinning orb webs, net-cast, single dragline snare, sticky blobs, trapdoors and ambushing Spiders play a significant role in integrated pest management by preying on agriculturally damaging insects (Reichert and Lockley, 1984**).** They also serve as a valuable food resource for various avian species, including bark-gleaning birds (Peterson et al., 1989). Furthermore, spider silk is a remarkable biomaterial possessing diverse applications and desirable properties,

This research aims to documentation the spider species and sessional variation found in the Madosilli Waterfall District, Sarangarh-Bilaigarh, Chhattisgarh, India, Madosilli Waterfall is located in the Khamarpali village that

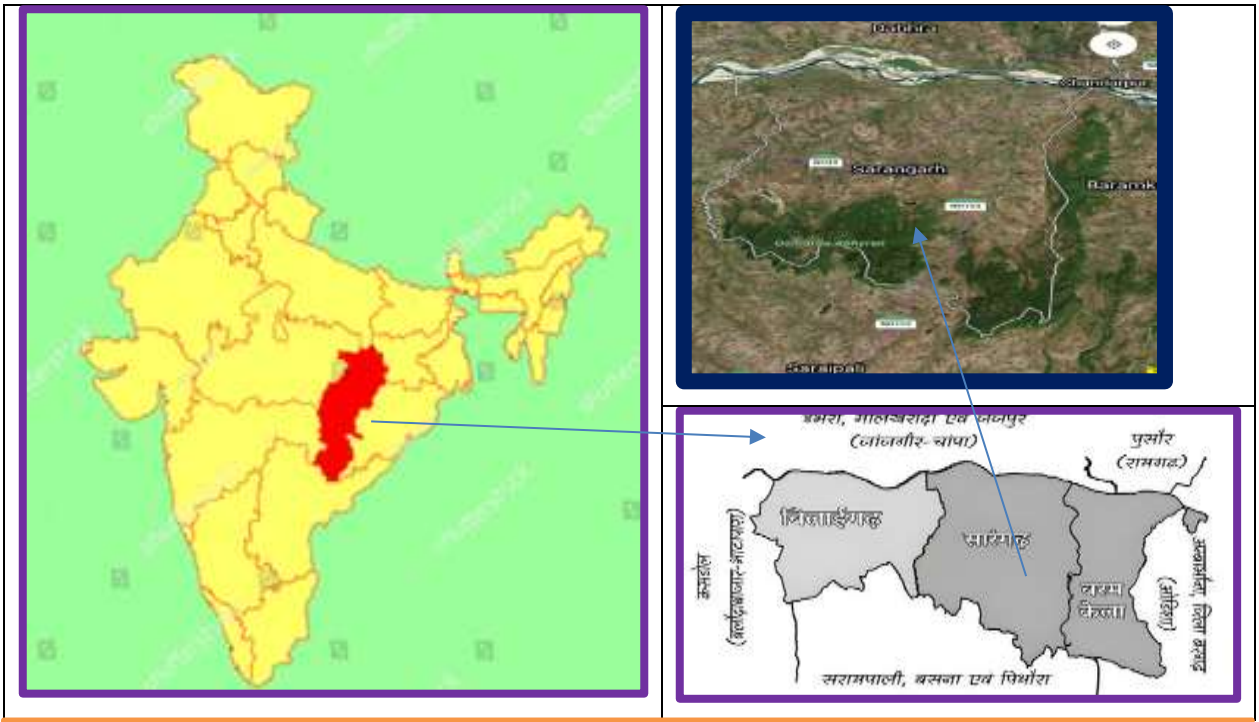
ISSN No. 2321-2705 | DOI: 10.51244/IJRSI | Volume XII Issue X October 2025

comes under the Barmkela tahsil. it is located 30 kilometres from the district headquarters, Sarangarh-Bilaigarh, 150 kilometres from the state Capital Raipur. The waterfall is located within a forest area under the Barmkela forest division. Notably, the waterfall is bordered by hills on two sides, covered in dense, verdant forests, creating a charming scene, particularly during the monsoon season. The waterfall's flow promotes a sense of inner peace and stability. The area's medium-altitude hills and diverse flora make the autumn season especially beautiful and attractive and calm summer. Waterfall presents a diverse ecological environment, encompassing dense Sal and teak forests alongside grasslands featuring medicinal flora and indigenous grasses. This relatively unexplored region of Chhattisgarh is characterized by its abundant tropical dry deciduous forests, riverine ecosystems, and verdant green spaces. Interspersed with hill stream.

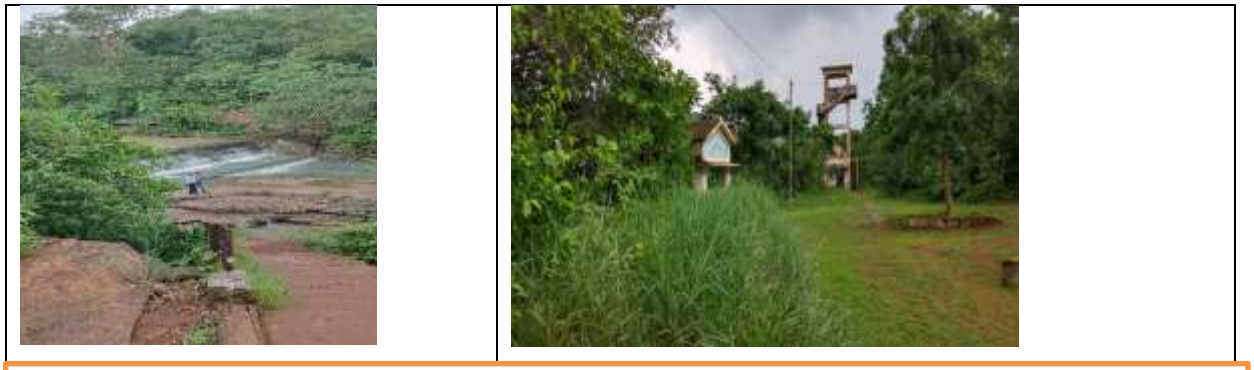
METHODOLOGY

Study Area

The present study was conducted surrounding Madosilli waterfall, located in Baramkela tahsil, Sarangarh–Bilaigarh district, Chhattisgarh, India. The geographical coordinates of this area are 21° 33' 57.5316" N and 83° 15' 54.7128" E. and the elevation is 220 m (712 ft). The waterfall features diverse vegetation and low hills, characterized by deciduous flora such as Phyllanthus emblica, Terminalia, Pterocarpus marsupium, Saccharum spontaneum, Terminalia chebula, Acacia, Terminalia bellerica, and Pongamia pinnata, Azadirachta indica, Aegle marmelos, Neolamarckia cadamba, Mangifera indica, Syzygium cumini, *Psidium guajava.* This vegetation, dense and calm forest, supports the diversity of spiders and other organisms.



Study Area -India-Chhattisgarh-Sarangarh- Madosilli waterfall



Landscape of Madosilli Waterfall a. post-monsoon b. Winters Season

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI | Volume XII Issue X October 2025

Climate Of Study Area- Climate significantly influences spider species diversity and seasonal abundance. Sarangarh is situated at an elevation of 231.33 meters (758.96 feet) above sea level. Sarangarh receives approximately 46.69 mm. (1.84 inches) of precipitation annually, with rainfall occurring on an average of 34.92 days per year (9.57% of the time). The district has an average annual temperature of 30.28ºC (86.5ºF), which is 4.31% higher than the average temperature for India. Sarangarh receives approximately 46.69 millimeter (1.84 inches) of precipitation annually, with rainfall occurring on an average of 34.92 days per year (9.57% of the time).

Sampling Method

A study of spider diversity and seasonal dynamics was conducted at Madosilli Waterfall in the Sarangarh-Bilaigarh district, Chhattisgarh, from March 2024 to February 2025. Data were collected over a one-year period. Data collection spanned Four seasons like pre-monsoon (March-May), monsoon (June-September), post-monsoon (October-November), and winter (December-February). Seasonal classifications followed the definitions of Saikia and Saikia (2015). Depending on the nature of habitats, different methods were adopted for collecting specimens followed by Tikader (1976e & 1987) and Barrion & Litsinger (1995).

The following methods were employed for spider collection:

a. **Ground-Hand Collection**: Spiders observed on the ground surface were collected manually.

b. **Aerial Hand Collection**: Web-building and free-living spiders were manually collected from foliage, herbaceous plants, living or dead shrub stems, and tree bark.

c. Active Visual Surveys: Spiders were visually surveyed and collected from various ground, underground, and above-ground microhabitats, including grassland, plant branches, bark, folded leaves, and rock surfaces, in a collection. into a vial.

d. inverted umbrella or beat sheet method-The beating or inverted umbrella method was employed, whereby an inverted umbrella was positioned beneath a plant branch, which was subsequently shaken vigorously. Spiders inhabiting the plant's aerial components (leaves, stem, and inflorescence) were dislodged into the umbrella and collected in sterile plastic vials. Following photographic documentation and enumeration, the spiders were released back into their native habitat.

Photography And Identification-

All the spiders that were seen were photographed using a DSLR camera and Vivo Mobile app. Following photographic documentation, collected spiders were released back into their natural habitats. Dead specimens were preserved in 70% ethanol. Collected specimen, date and location were recorded, and morphological features were clearly observed and documented. The identification of spiders was conducted with reference to Tikader & Malhotra (1980), Tikader & Biswas (1981), Barrion & Litsinger (1995), Gajbe (2008c), Sebastian & Peter (2009), and WSC (2025).

Table 1. Spider Checklist and Sessional Variation of "Madosilli Waterfall" District, Sarangarh-Bilaigarh, Chhattisgarh India -

S.N.	Family/ Genus	No. of Species	Species Name	Pre-monsoon (March-May),	Monsoon (June-September),	Post-monsoon (October-November),	Winter (December-February).
1.	Agelenidae C.L. Koch, 1837/ Agelena C. A. Walckenaer 1805						
		1.	*Agelena orientalis C. L. Koch, 1837*	-	-	+	+

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2	Araneidae Clerck, 1757						
	Argiope Savigny, 1825	2	*Argiope aemula (Female)* *(Walckenaer, 1842)*	+	+	+	+
		3	*Argiope anasuja Thorell, 1887*	+	+	+	+
		4.	*Argiope pulchella Thorell, 1881*	-	+	+	+
		5	*Argiope versicolor*	-		+	-
		6	*Argiope catenulate* *(Doleschall, 1859)[*	-	+	+	-
	Cyclosa Menge, 1866						
	Cyrtophora Simon, 1864	7	*Cyrtophora cicatrosa*	-	+	+	+
	Neoscona Simon, 1864	8	*Neoscona nautica (L. Koch, 1875)*	-	+	+	+
	Nephila Leach, 1815	9.	*Nephila pilipes (Fabricius, 1793*	+	+	+	+
3	. Gnaphosidae Banks, 1892						
	Drassodes Westring, 1851	**10**	***Drassodes sagarensis Tikader, 1982***	-	+	+	
4.	Hersiliidae Thorell, 1869						
	Hersilia Savigny, 1825	11	*Hersilia savignyi Lucas, 1836*	+	+	+	+
5.	Lycosidae Sundevall, 1833						
	Arctosa C.L. Koch, 184	12	*Trochosa humicola*	-	-	+	+

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	Pardosa C.L. Koch, 1847	13	*Pardosa jabalpurensis Gajbe & Gajbe, 1999*	-	+	+	-
6.	. Oxyopidae Thorell, 1869						
	Oxyopes Latreille, 1804	14.	*Oxyopes javanus*	+	+	+	+
	Peucetia Thorell, 1869	15.	*Peucetia viridana (Stoliczka, 1869)*	+	+	+	+
		16	*Peucetia sp.*			+	+
7.	Pholcidae C.L. Koch, 1850						
	Holocnemus Simon, 1873	17.	*Holocnemus pluchei (Scopoli, 1763)*	+	+	+	+
	Pholcus Walckenaer, 1805	18	*Pholcus phalangioides (Fuesslin, 1775)*	-	+	=	+
8	Salticidae Blackwall, 1841						
	Carrhotus Thorell, 1891	19	*Carrhotus viduus (C.L. Koch, 1846)*	-	+	+	+
	Chrysilla Thorell, 1887	20	*Chrysilla volupe (Karsch, 1879)*	-		+	+
	Menemerus Simon, 1868	21	*Menemerus bivittatus (Dufour, 1831*	+	+	+	+
		22	*Menemerus nigli Wesołowska & Freudenschuss, 2012*	+	+	+	+
	Phintella Strand, 1906	23	*Phintella vittata (C.L. Koch, 1846)*		+	+	

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	Plexippus C.L. Koch, 1846	24	*Plexippus paykulli (Audouin, 1825)*	+	+	+	+
	Telamonia Thorell, 188	25	*Telamonia dimidiata (Simon, 1899)*	+	+	+	+
9	Sparassidae Bertkau, 1872						
	Heteropoda Latreille, 1804	26	*Heteropoda venatoria (Linnaeus, 1767*	-	+	+	+
	Olios Walckenaer, 1837	27.	*Olios lamarcki (Latreille, 1806)*	-	+	+	+
10	Tetragnathidae Menge, 1866						
	Leucauge White, 1841	28	*Leucauge decorata (Walckenaer, 1842)*	+	+	+	+
	Tetragnatha Latreille, 1804	29	*Tetragnatha javana*	+	+	+	+
11	Theridiidae Sundevall, 1833						
	Nesticodes Archer, 1950	30	*Nesticodes rufipes (Lucas, 1846)*	-	+	+	+
12	Thomisidae Sundevall, 1833						
	Misumenoides	31.	*Misumenoides sp.*	+	+	+	-
	Thomisus Walckenaer, 1805	32	*thomisus spe.*		+	+	-

Table 2: Seasonal Occurrence of Spiders from Madosilli.

S. No.	Season	No. of species	Seasonal index
1.	**Pre-Monsoon (March-May)**	**14**	**57.73**
2.	**Monsoon (June-August),**	**27**	**111.34**
3.	**Post-Monsoon (September-November)**	**31**	**127.83**
4.	**Winter (December-February)**	**25**	**103.09**

Average of average-= mean value =24.25

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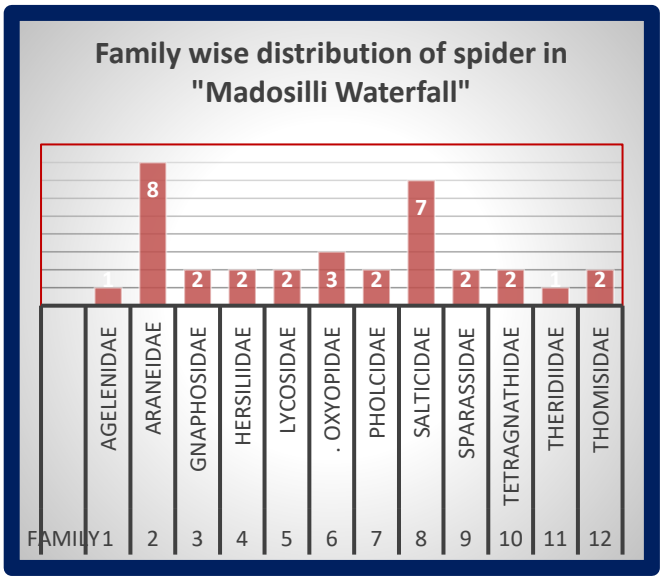

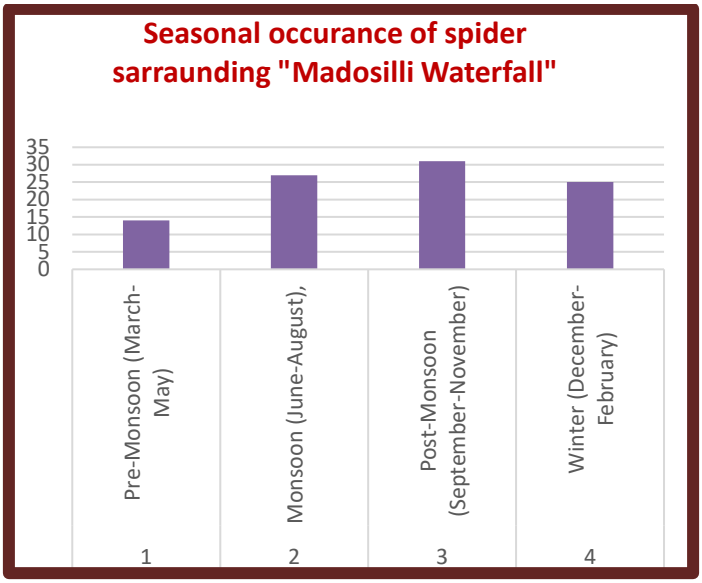

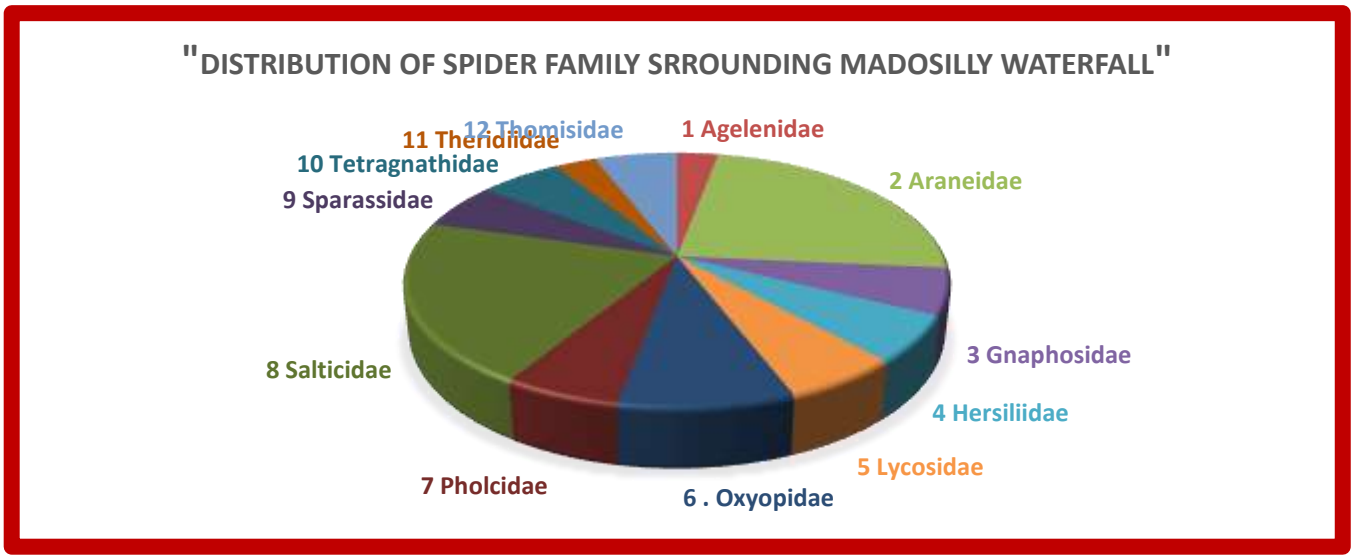

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RESULT AND DISCUSSION

A study was conducted to investigate the spider fauna across four seasons: pre-monsoon (March-May), monsoon (June-August), post-monsoon (September -November), and winter (December-February). A waterfall survey identified 32 spider species, encompassing 28 genera and 12 families. and the study documented 8 species within Araneidae, 7 within Salticidae, 3 species within Oxyopidae and 2 each within Gnaphosidae, Hersiliidae, Lycosidae, Pholcidae, Sparassidae, Tetragnathidae, Thomisidae and Agelenidae and Theridiidae were represented by a single species each (Table 1). Araneidae was the most diverse family observed in this study. While Araneidae and Thomisidae were both dominant spider families in Madhya Pradesh. (Singh and Sharma 2022) However, Thawkar and Ghonmode (2024) found that Salticidae is the most diverse family in the Napur district of Maharashtra Species richness was quantified as 0.000160 per square foot.

A comprehensive checklist by Choudhary S, R. et al. (2023) catalogued 222 spider species from 23 families in Chhattisgarh, whereas Singh et al. documented 336 spider species belonging to 136 genera and 30 families, based on surveys conducted in 36 of the 52 districts of Madhya Pradesh. Prior research includes the work of Ekka and Kujur (2015), who documented 118 species (52 genera, 17 families) in Ram Jharna, Raigarh district, Chhattisgarh, and Gupta and Chandra (2016) identified 33 species (30 genera, 5 families) in Achanakmar Wildlife Sanctuary, Bilaspur, Chhattisgarh, Furthermore, Kujur and Ekka (2016), who described 120 species (49 genera, 16 families), including 16 species within Gomarda Wildlife Sanctuary, Sarangarh, Chhattisgarh. and Sen (2021) reported 55 species (42 genera, 11 families) in the North East Gariaband Forest Regions of Chhattisgarh.

The study demonstrated a significant seasonal variability in spider species within the designated area (Table-2). Seasonal variability is generally highest in post-monsoon (n=31), followed by the monsoon season(n=27), followed by the winter(n=25) season and lowest in the pre-monsoon season(n=14), Findings revealed a notable decrease in spider diversity during the dry season, likely due to increased temperatures and reduced food resources. The elevated diversity observed during the post-monsoon (October-November) seasons, (127.83) attributable to optimal temperatures and ample food resources. Araneidae was the most frequently observed family, with the highest diversity prevalence in all season, However, Anirudhan and Sudhikumar (2023) found that most diversity in monsoon season in Thar desert. Agelenidae family was recorded during the post-monsoon and winter season. *Pholcus phalangioides* species observed only winter season, *Nephila pilipes* represents one of the largest spider species documented in this study, constructing substantial orb-webs that span the space between neighbouring branch. The study indicates that propitious ecological conditions are fostering the biodiversity of spiders within these complex habitats

CONCLUSION

Spiders represent a significant component of invertebrate fauna, with 53000 recognized species in India. The Madosilli waterfall exhibits notable spider diversity. Recent research underscores the ecological indicator value of spiders. This ecosystem, characterized by rich floral diversity, offers a conducive environment for spider fauna, highlights rare and endemic species in this ecological region, proving that this ecosystem needs protection.

Conflict of interest- The authors declare no conflict of interest.

Funding information- The authors did not get any external funding.

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