

# Seasonal Favourability of Spiders Belonging to Family Araneidae in Dakshina Kannada District of Karnataka

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**Abstract:** An exhaustive study was conducted for five years to record seasonal favourability of Spiders belonging to the family Araneidae in Dakshina Kannada district, Karnataka, India. Spiders were collected by standard methods and 19 Families were identified of which family Araneidae formed 16% of all the obtained spider fauna with a total of 391 individuals belonging to 11 genus & 28 species. The results of the study showed that majority of the spiders of family Araneidae were obtained during months of June to December (35.71% ) showing seasonal favourability to Monsoon and Winter season and least obtained during months of March, April and May (3.57%) showing least seasonal favourability to Summer season.

**Keywords:** Arachnida, Aranae, Araneidae, Dakshina Kannada, Seasonal favourability, Spiders.

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## I. INTRODUCTION

Spiders are ancient animals and constitute one of the most important components of global ecosystem. Spiders make up the order Aranae in class Arachnida. They are abundant and are found in an extremely wide range of habitats. Spiders have a very significant role to play in ecology by being exclusively predatory and thereby maintaining ecological equilibrium. Many Spiders feed on noxious insects like houseflies and mosquitoes, which are vectors of human diseases. The global list of spider fauna is approximately 42,055 belonging to 3821 genera and 110 families [1]. Currently 39,882 valid described species of Spiders in 3676 genera and 108 families have been described [2]. The spider fauna of India is represented by 1520 spider species belonging to 377 genera and 60 families [3]. However, Coddington and Levi [4] estimated that up to 170,000 species could exist. The most comprehensive description on Indian Spiders are by Tikader (1987), Sebastian and Peter (2009) and the knowledge on diversity and distribution of Spiders in India is sparse as compared to other regions of the world. Comprehensive study of diversity and seasonality of Spiders of Dakshina Kannada region of Karnataka is absent and there is a need for study.

### **Family Araneidae:**

The spider family Araneida or “orb weavers” include more than 3000 described species and nearly 7% of all known species are Araneids. The orb weavers are residents of garden and small woods. The webs they construct are spiral or wheel shaped and hence the name “orb-weavers”. ‘ Orb’ previously meant ‘circular’. They have eight similar eyes, hairy or spiny legs [5]. This family exhibits a wide variation in size, colour, shape and behaviour. They are three clawed , Ceribillate ,entelegyne spiders [3]. Genus *Cyrtophora* is an exception to circular webs and they build Tent webs. *Cyrtophora moluccensis* is commonly known as the tent spider or dome-web and is native to India, Japan, Indonesia, Papua New Guinea, Australia, Fiji, and Tonga [6]. Species of this family are found to adopt themselves to wide range of habitats that include-Tropical forest, paddy fields, gardens, low shrubs, tall shrubs, rain forests, trees, rocks and walls, ground, dry leaves and debris, flowers, seed heads of grasses etc.

## II. MATERIALS AND METHODS

### Study Area:

Dakshina Kannada is a South-western District located in Karnataka state of India. It comprises Mangalore, Sullia, Puttur, Vittal and Bantwal taluks. Bound by Arabian Sea in the west, Udipi encircles the district in the north, Chikmagalur in the north-east, Hassan in the east, Coorg in the southeast, while Kasaragod in Kerala forms the southern boundary. The Region is Located 12.87° N latitude and 74.88° E Longitude at average elevation of 22 meters (72 ft) above mean sea level. Total area is 4559 km<sup>2</sup> with average humidity of 75% that peaks at July (89%). South west monsoon winds bring rainfall from June-September and Average rainfall is 3975 mm. This district enjoys heavy rainfall, moderate winter and moderate summer [7]. Considering the fact that this district encompassing the Western Ghats-a hotspot and coastal areas of Karnataka possess rich bio diversity, high species diversity, the existing and potential biological resources need to be reviewed and assessed well [8]. Field observations were conducted in Dakshina Kannada District. Sampling Places included:

Bantwal Taluk : Alike, Barimar, Sarapady, vital,

Belthangady Taluk : Bangady, Dharmasthala, Shishila, Ujire

Mangalore Taluk : Adyar, Pavanje, Panamboor, Talapady

Puttur Taluk : Balnadu, Bannur, Kabaka, Nelyadi, Panaje, Sameyatka, Savnur, Shirady, Uppinangady

Sullia Taluk : Ajjavara, Balpa, Bellare, Subramanya,

### Study period:

Specimens were collected between July 2012 to July 2017

### Sampling techniques:

- 1. Visual search** : In D.K district, Walk through the habitat and search visually for Spiders, their webs or retreats (curled leaves, silken cases) walls of houses, building and basement, which are spider haunting grounds, i.e active searching of arboreal, terrestrial, aquatic Spiders.
- 2. Small Spiders and medium Spiders in web** can be caught directly by using plastic boxes carefully.
- 3. Sweeping** : Using a heavy insect net sweep through the soft Vegetation or tall grass with vigor. After a few sweeps, dump the content of the net onto a flat sheet and capture the Spiders.
- 4. Beating** : his method is similar to sweeping. In this case spread the cloth sheet, or open inverted umbrella (umbrella method) under a bush or the low branches of tree. Grab the branches and give them a vigorous shaking, alternatively strike them with a stick or stiff branch. Spiders will be dislodged from their location and fall on to the sheet and then Spiders are collected in plastic vials.
- 5. Pitfall trapping** : This method is effective for capturing ground-living Spiders. Any smooth sided container buried within the ground surface will work. Inside the pit, place a second cup so that the contents can be removed without disturbing the edge of the pit. Pits are normally filled with auto antifreeze. This will kill and preserve the captives with minimal evaporation. Antifreeze is available in two forms: ethylene glycol-based and propylene glycol-based. Propylene glycol was preferred because it is not that toxic [9].

Freshly collected specimen were anaesthetised in Ethyl Acetate and observed on stereomicroscope. Photographs were taken. The Data-location of collections and other morphological features were noted. The collected Spiders were preserved in 70 % alcohol solution in glass vials, labeled with date of collection and identified using standard identification keys of Platnick [10], Tikader [11], [12], [13], Tretzel [14], Biswas and Biswas [15], Barrion and litsinger [16].

## III. RESULTS

Regular survey for five years resulted obtaining 107 species of Spiders of 19 families which included Araneidae, Corinnidae, Eutichuridae, Gnaphosidae, Hersiliidae, Lycosidae, Miturgidae, Nephilidae, Oxyopidae, Pholcidae, Pisauridae, Salticidae, Sparassidae, Tetragnathidae, Theraphosidae, Theridiidae, Thomisidae, Trachelidae, Uloboridae. Araneidae formed 16% of all the obtained spider fauna with total of 391 individuals belonging to 11 genus & 28 species.

A] Total number of 391 individuals of family Araneidae belonging to 11 genera and 28 species were collected during the study as Tabulated (**Table-1**)

TABLE: 1

<u>Sl. No</u>	<u>Genus</u>	<u>SLNo</u>	<u>Species</u>	<u>Common name</u>	<u>Number of Individuals</u>	<u>Season</u>	<u>Images</u>
<b>1</b>	<i>Arachnura</i>						
		1	<i>Arachnura angura</i> Tikader	Scorpion - tailed spider	14	S	
<b>2</b>	<i>Araneus</i>						
		2	<i>Araneus bilunifer</i> Pocock	Orb-Weaver	26	S,M	
		3	<i>Araneus bituberculatus</i> Simon	Orb-Weaver	8	M	
		4	<i>Araneus mitificus</i> Simon	Kidney garden	13	M	
		5	<i>Araneus nympha</i> Simon		21	M	
<b>3</b>	<i>Argiope</i>						
		6	<i>Argiope aemula</i> Walckenaer	Garden spider cross	14	M,W	
		7	<i>Argiope anasuja</i> Thorell	Garden spider cross	19	M,W	

		8	<i>Argiope catenulata</i> Doleschall	Garden spider	cross	15	M,W	
		9	<i>Argiope picta</i> L.Koch	Garden spider	cross	27	M,W	
		10	<i>Argiope pulchella</i> Thorell	Garden spider	cross	22	M,W	
4	<i>Cyclosa</i>							
		11	<i>Cyclosa bifida</i> Doleschall			8	M	
		12	<i>Cyclosa confragra</i> Thorell			4	M	
		13	<i>Cyclosa ginnaga</i> yaginuma			7	M	
		14	<i>Cyclosa hexatuberculata</i> Tikader			2	M	
5	<i>Cyrtarachne</i>							
		15	<i>Cyrtarachne keralyensis</i> Thorell	Grass spider	jewel	11	S,M,W	

		16	<i>Cyrtarachne raniceps</i> Pocock	Grass spider jewel	17	S,M,W	
6	<i>Cyrtophora</i>						
		17	<i>Cyrtophora citricola</i> Forsskal	Jungle tent web spider	14	M,W	
		18	<i>Cyrtophora moluccensis</i> Simon		11	S,W,M	
		19	<i>Cyrtophora unicolor</i> Doleschall	Garden tent web spider	15	W,M	
7	<i>Eriovixia</i>						
		20	<i>Eriovixia laglazei</i> Simon	Grey bird dropping spider	11	M	
8	<i>Gasteracantha</i>						
		21	<i>Gasteracantha geminata</i> Fabricius	Garden spiny spider	26	M,W	
	<i>Neoscona</i>						
		22	<i>Neoscona bengalensis</i> Tikader and Bal		11	W	
		23	<i>Neoscona crucifera</i> Lucas		23	W,S	

		24	<i>Neoscona mokerjei Tikader</i>	Common garden spider	13	W,S	
		25	<i>Neoscona nautica L.Koch</i>		17	W,S	
		26	<i>Neoscona vigilans Simon</i>		12	W,M	
<b>10</b>	<b><i>Parawixia</i></b>						
		27	<i>Parawixia dehaanii Doleschall</i>	Abandoned web spider	4	M,W	
<b>11</b>	<b><i>Thelacantha</i></b>						
		28	<i>Thelacantha brevispina Doleschall</i>	False gasteracantha	6	W	

Legend: S - Summer - ( March, April, May)

M - Monsoon - ( June, July, August, September, October)

W - Winter - (November, December, January, February)

**B]** Seasonal Favourability of Species of family Araneidae obtained (**Table-2**)

**TABLE: 2**

Seasons	Species
<b>1) Monsoon &amp; Winter</b>	<i>Argiope aemula</i> Thorell <i>Argiope anasuja</i> Thorell <i>Argiope catenulata</i> Doleschall <i>Argiope picta</i> L.Koch <i>Argiope pulchella</i> Walckenaer <i>Cyrtophora citricola</i> Simon <i>Cyrtophora unicolor</i> Forsskal <i>Gasteracantha geminata</i> Fabricius <i>Neoscona vigilans</i> Simon <i>Parawixia dehaanii</i> Doleschall

2) Monsoon	<i>Eriovixia laglazei</i> Simon <i>Cyclosa bifida</i> Doleschall <i>Cyclosa confragra</i> Thorell <i>Cyclosa ginnaga</i> Yaginuma <i>Cyclosa hexatuberculata</i> Tikader <i>Araneus bituberculatus</i> Simon <i>Araneus mitificus</i> Simon <i>Araneus nympa</i> Simon
3) Winter & Summer	<i>Neoscona crucifera</i> Lucas <i>Neoscona mukerjei</i> Tikader <i>Neoscona nautica</i> L.Koch
4) Throughout the year	<i>Cyrtarachne keralyensis</i> Thorell <i>Cyrtarachne raniceps</i> Pocock <i>Cyrtophora moluccensis</i> Simon
5) Winter	<i>Thelacantha brevispina</i> Doleschall <i>Neoscona bengalensis</i> Tikader and Bal
6) Summer & Monsoon	<i>Araneus bilunifer</i> Pocock
7) Summer	<i>Arachnura angora</i> Tikader

C] Amongst the Genus, *Argiope* -97 individuals (24.80%) was the most abundant followed by *Neoscona* -76 individuals (19.43%), *Araneus* -68 individuals (17.39%), *Cyrtophora* -40 individuals (10.23%), *Cyrtarachne* -28 individuals (7.16%), *Gasteracantha* -26 individuals (6.64%), *Cyclosa* -21 individuals (5.37%), *Arachnura* -14 individuals (3.58%), *Eriovixia* -11 individuals (2.81%), *Thelacantha* -6 individuals (1.53%), *Parawixia* -4 individuals (1.02%) (**Fig. 1**)

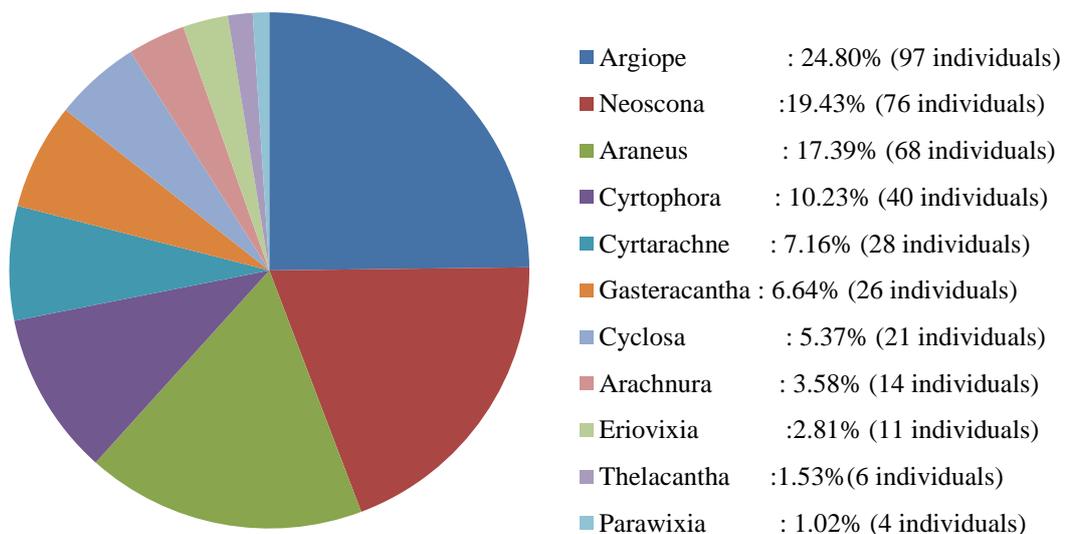
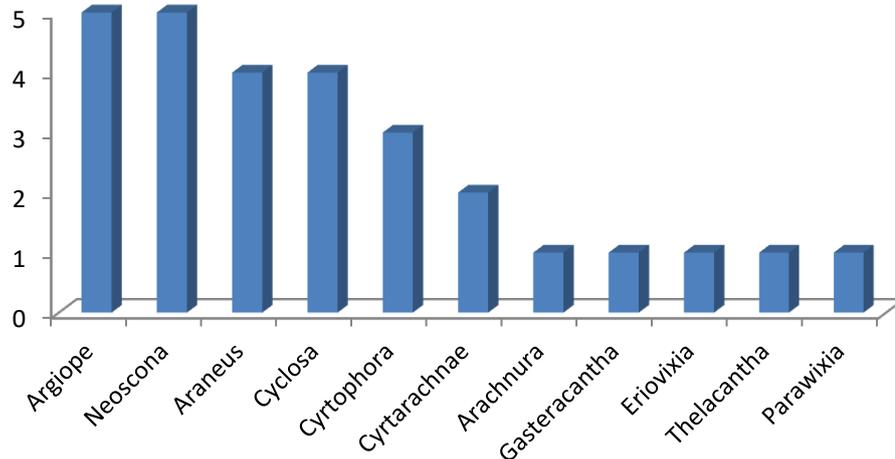


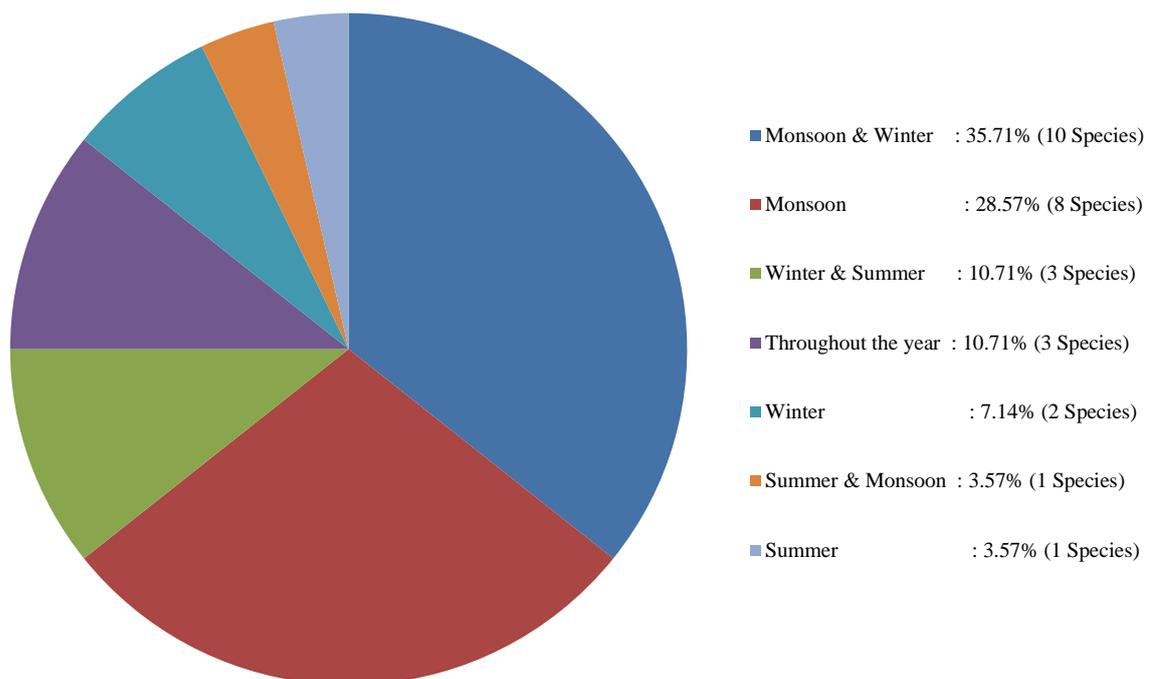
Figure 1: Percentage distribution of Genus of Spiders belonging to family Araneidae Collected in Dakshina Kannada district

**D]** Based on number of Species in the Genera, *Argiope* & *Neoscona* had highest species (5 each); followed by *Araneus* & *Cyclosa* (4 each); *Cyrtophora* (3); *Cyrtarachne* (2) and *Arachnura*, *Eriovixia*, *Gasteracantha*, *Parawixia* & *Telacantha* with one Species each (**Fig. 2**)



**Figure 2: Bar diagram showing total number of species obtained genus of Araneidae spiders collected**

**E]** The analysis of 28 species of Spiders belonging to different feeding guild and population regarding seasonal variation showed favourability of highest of 10 species (35.71%) to Monsoon and Winter season, 8 Species (28.57%) only to Monsoon season, 3 species (10.71%) Winter and Summer season, 3 species (10.71%) throughout the year without seasonal specificity, 2 species (7.14%) only to Winter season, 1 species (3.57%) Summer and Monsoon season and 1 species (3.57%) only to Summer season (**Fig. 3**)



**Figure 3: Seasonal Favourability of Family Araneidae population studied in Dakshina Kannada**

#### IV. DISCUSSION

- The number of spider species existing in a place is directly proportional to the abundance of prey in the place and also the prey being mainly the insect fauna. Insect fauna varies according to vegetations of changing seasons, and hence, the change of seasons directly affects the spider population of a place.
- At the onset of monsoon, extending from months of June to October, the vegetation turns lushy green with bloomed flowers attracting and triggering insect activities. These activities favour the spider population contributing as to why second highest number of obtained species of Araneidae had seasonal favourability to Monsoon season.
- In winter, the spider activity is in its peak due to activities of male and female involved in reproduction and laying eggs. The October and November peak is produced both by male and female individuals, though the late monsoon peak is formed mainly by the male activity. Immatures are more abundant during October, November and December [17]. This behavioural pattern and natural life cycle of the spiders is one of the largest factors to find maximum number of species of Araneidae obtained in the study to have a seasonal favourability to late monsoon and winter season.
- During summer, the months of March, April and May, the activity of Spider is lowered since vegetation also suffers scarcity of water and high temperature. Among the Spiders of family Araneidae, as per the study, only *Arachnura* was found to be exclusively found during summer in Dakshina Kannada.
- Araneidae feed on small insect larvae and nymphs which they get throughout the year and survive on wide range of food habitats. Few species of these families survive even on hot summer at 40°C -43°C and cold winters of 12°C-15°C and tend to withstand both extremes of temperature and hence *Cyrtarachne* and *Cyrtophora* species of Araneidae were found to be present throughout the year without a particular seasonal favourability.

#### V. CONCLUSION

This Study Showed majority of the spiders of family Araneidae were obtained during months of June to December (35.71%) showing seasonal favourability to Monsoon and Winter season and least obtained during months of March, April and May (3.57%) showing least seasonal favourability to Summer season in Dakshina Kannada District Of Karnataka.

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