

## **Diversity of Spiders in Mangalavanam, an Urban Forest of Kochi, Kerala, India**

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### **ABSTRACT**

A study was conducted to document the spider diversity of Mangalavanam, also known as the “Green lungs of Kochi City”, which is a forest patch amidst the thickly populated Kochi City. The study was carried during the period from November 2013 to April 2014. Hand picking method was used for the collection. A total of 21 species of spiders of 20 genera and 11 families were sampled from the area during the study period. Family Salticidae was the dominant family with 4 species recorded during the study. This was followed by Araneidae, which was represented by three species. Other dominant families included Lycosidae, Oxyopidae and Pisauridae, each represented by 2 species. Families Tetragnathidae, Uloboridae, Linyphiidae, Theridiidae, Miturgidae and Sprassidae were represented by one species each. The guild structure analysis revealed 6 feeding guilds. These are orb web weavers, stalkers, ground runners, foliage hunters, sheet web builders and scattered line weavers. In this study orb web weavers constituted the dominant feeding guild. They are followed by stalkers, foliage hunters, ground runners, sheet web builders and scattered line weavers.

Key words: Spiders, Biodiversity, Mangalavanam, Urban Forest

### **INTRODUCTION**

A quick glance at the biological diversity reveals that arthropods are the most diverse group of animals. Among them, spiders form the seventh largest animal order. They form a distinct order Araneae under the class Arachnida. Spiders are unique among all organisms in their mode of silk production. They are geologically very old and extremely abundant throughout the country. They are air breathing animals having the air tubes inside their bodies. Many spiders have both air tubes and booklungs for breathing. These are found near water's edge, on the ground in mountains. This is the most diverse female dominated and entirely predatory order in the arthropod world. Spiders are key components of all ecosystems in which they live. Currently 44600 valid described species of spiders in 3924 genera and 112 families have been described (Plantnick 2014). The estimated total extends of world spider species can only be guessed at; Codrington and Levi (1991) commented that up to 170000 species could exist.

Hundreds of spider species are described but every year the status of spiders taxonomic knowledge is far from adequate. It is a pity that owing to ignorance, man tears many harmless creatures and neglects their study. One such neglected group of animals is the

spiders. From the earliest time man has had an aversion for spiders. The misconception that spiders are highly poisonous, noxious and ugly is purely prejudice. It is proved that spiders are generally harmless to man. Apart from the question of poison acquaintance with spiders reveal that they form fascinating group as birds or butterflies. Among the wonders of natural history few things are more remarkable than is the multitude of these small many legged animals, often of beautiful structure, striking habits and complex life histories, yet seldom observing themselves upon our notice. All aspects of their life, their protective mechanism, web building pattern etc are usefulness to mankind, all present such a range of complexity and variety that they really form engrossing subjects for study. The primary objective of the current study was the documentation of spider diversity in Mangalavanam, also known as the “Green lungs of Kochi City”, which is a forest patch amidst the thickly populated Kochi City.

## MATERIALS AND METHODS

Cochin (cochin city), acclaimed as the commercial capital of Kerala, Queen of the Arabian sea, Gate way of South India etc; is located on the west cost of India at a latitude of 9 degree 58’N and longitude of 76 degree 14 E. Lying at sea level, this port city receives an annual rainfall of 344 cm with 139 rainy days. Temperature ranges from 20 degree celcius to 35 degree celcius. Mangalavanam, popularly known as the Green Lung of Cochin city, is a Mangrove forest located in the north-west area of the city. This Green belt, with an area of 2.4 ha, also supports many variety of rare and endemic mangrove vegetation. *Acanthus ilicifolius* Linnaeus, *Avicennia officinalis* Linnaeus, *Bruguiera gymnor rhiza* (Linnaeus) Lamark, *Kandelia candel* (Linnaeus) Druce, *Rhizophora apiculata* Blume and *Excoecaria agallocha* Linnaeus are a few among them (Ramachandran, Mohanan, 1989) Mangalavanam was in the lime light recently owing to a series of protest by environmentalist to protect this area from the turn in to a parking zone for vehicles coming to the High Court of Kerala State.

Spiders were collected from Mangalavanam in November 2013. Collections were made by a visual searching method. Each plant along the transect was searched for spiders. Smaller spiders were collected by leading them into tubes containing alcohol with the help of a brush dipped in alcohol. Sedentary spiders found on the leaf blades, tree trunks and those on the webs were caught in the jar by holding it open beneath them and by taping thyme spiders into it with the lid. Running and vagabond species such as lycosids were caught by throwing a kerchief over them and carefully holding them with the hands in the folds, then transferring them to the jars. The collected spiders were preserved in 70% alcohol. The adult males and females were identified which up to species level with the help of a available literature (Tikader 1970, 1977, 1980, 1982, 1987, Barrion and Litsinger 1995, Murphy and Murphy 2000)

Immature spiders were identified up to generic level. The scientific names Spiders and their classification follow Platnik (2005). Voucher specimen were deposited in the reference collection housed with the Arachnology Division, Department of Zoology, Sacred Heart College, Cochin, Kerala, India

## RESULTS AND DISCUSSION

A study for a period of four months in Mangalavanam indicates that the study area was occupied by 21 species of spiders belonging to 20 genera distributed in 11 families collected from this habitat (Table 1). Family Salticidae was the dominant family with 4 species recorded during the study. This was followed by Araneidae, which was represented by three species. Other dominant families included Lycosidae, Oxyopidae and Pisauridae, each represented by 2 species. Families Tetragnathidae, Uloboridae, Linyphiidae, Theridiidae, Miturgidae and Sparassidae were represented by one species each.

The study area possesses mangroves, marshy areas and shrubs. These diverse types of habitat play a key role in the species richness. The study area was gifted with plenty of mangroves. Most of the spiders were found on mangrove foliage. New (1990) had demonstrated that the spiders were extremely sensitive to small changes in the habitat structure. Mangalavanam is a protected area and so the habitat is not much disturbed. The guild structure analysis revealed 6 feeding guilds (Uetz et al.1999). These are orb web weavers, stalkers, ground runners, foliage hunters, sheet web builders and scattered line weavers. In this study orb web weavers constituted the dominant feeding guild. They are followed by stalkers, foliage hunters, ground runners, sheet web builders and scattered line weavers.

Table 1. Total number of families, genera and species recorded from Mangalavanam

Sl. No.	Family	No. of Genera	No. of Species	Guild
1	Araneidae	3	3	Orb web weavers
2	Salticidae	4	4	Stalkers
3	Pisauridae	2	2	Foliage hunters
4	Oxyopidae	2	2	Stalkers
5	Tetragnathidae	1	2	Orb web weavers
6	Uloboridae	2	2	Orb web weavers
7	Linyphiidae	1	1	Sheet web builders
8	Theridiidae	1	1	Scattered line weavers
9	Lycosidae	2	2	Ground runners
10	Miturgidae	1	1	Foliage hunters
11	Sparassidae	1	1	Foliage hunters
	<b>Total</b>	<b>20</b>	<b>21</b>	

The guild structure analysis revealed 6 feeding guilds viz., orb web weavers, stalkers, ground runners, foliage hunters, sheet web builders and scattered line weavers.

The ecological guild concept has been of great interest to arachnologists, and the different manner in which spiders forage for common resource, prey arthropods, has led to numerous attempts to classify them into guilds. Guild classification is based on the quantitative analysis of ecological characteristics of spider families. Pattern of similarity in guild composition suggests the possibility of plant habitat structure as an influence on the spider community.

The spider guild classification was done based on the families collected during the study. Designation of spider guild was based on the ecological characteristic known for the family (Young and Edwards, 1990). Ecological characteristics relating to foraging manner, nature of web, prey species, microhabitat use, site tenacity and daily activity were subjected to guild classification. Output of the analysis was organized into tabular form and subsequent guild designations were based on the relative similarity of spider foraging modes.

Spiders live in a well defined environment with limitations set by both physical conditions and biological factors (Foelix, 1996). They can be grouped into specific functional groups based on the relative distribution and predatory methods (Bultman *et al*, 1982). Describing the spider diversity in terms of these groups allows greater insights into how habitat differences may be reflected in life history strategies (Lee and Kim, 2003). Guilds are ecological groupings of organisms which exploit a single or similar resource in a similar manner (Root, 1967). Recently, spiders have been subdivided into increasingly finer guild systems (Uetz, 1991). Unfortunately, the present paucity of knowledge of foraging methods of some families of spiders makes the development of highly resolved guild systems difficult.

The present system delineates six guilds, based upon gross differences in foraging behavior within the resident spider community. Spiders of the guild “orb web builders” construct perfect orb webs for prey capture. Spiders of the family Araneidae, Tetragnathidae and Uloboridae come under this category. Spiders coming under the category “stalkers” actively jump over the prey for feeding. Spiders of the family Salticidae and Oxyopidae exhibit this type feeding behaviour. “Ground runners” are those spiders, which mainly feed on ground layer of the field and rarely come to the foliage or canopy of the plant for prey capture. Spiders of the family Lycosidae constitute this guild.

Spiders of the guild “Scattered line weavers builders” construct irregular space webs for prey capture. Spiders of the family Theridiidae belong to this category. “Ambushers” are those spiders that show a “sit-and-wait” type of behaviour for prey capture. Spiders of the guild “foliage runners” hunt on foliage for phytophagous insect pests. This guild contains families Miturgidae, Pisauridae and Sparassidae. “Sheet web builders” construct sheet like web for prey capture and only one family, Linyphiidae, belongs to this category.

Analysis of the guild structure revealed that orb web weavers, represented by the families Araneidae, Tetragnathidae and Uloborida were the dominant feeding guild in Mangalavanam. The most common explanation for observed pattern of spider guild structure is effects of the host crop, including its structural diversity, micro environment, or the level of disturbance (Young & Edwards, 1990). The web building and plant wandering spiders rely

on vegetation for some part of their lives, either for finding food, building retreats or for web building. The structure of the vegetation is therefore expected to influence the diversity of spiders found in the habitat. Vegetation structure seems to influence the spider composition at the family level because similar families cluster within a similar habitat type. Species responses to particular features of the habitat, or complex community interactions, may also indicate the resulting assortment of species (Moran & Southwood, 1982). The complex vegetational architecture provides varied microhabitats and greater number of niches to minimize interspecific competition and support the survival of diverse functional groups.

## CONCLUSION

This study brought out the fact that Mangalavanam, the urban forest in Koch city which is one of the verge of destruction due to rapid urbanisation, is an abode of spiders in addition to the multitude of the migratory birds nesting in this mangrove forest. This diversity of spiders is also indicative of the overall biodiversity of this urban forest since spiders are considered to be useful indicators of the species richness and health of terrestrial ecosystems and amply emphasises the need for preserving this forest patch intact from a biodiversity conservation perspective.

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