



Diversity of Orb-Weaving Spiders in Sree Kerala Varma College Campus, Kerala

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Abstract: The study aims to assess the diversity of orb-weaving spiders in Sree Kerala Varma College campus. A total of 19 species belonging to 14 included in genera of 4 families were identified. The family Araneidae was the dominant family with 8 species belonging to 6 genera *Anepsiora*, *Argiopa*, *Cyclosa*, *Cryptophora*, *Gastrocanella* and *Neoscana*. The family Tetragnathidae was the second dominant family comprising 6 species belonging to 3 genera *Leucauge*, *Tetragnatha* and *Tylorida*. The family Uloboridae comprises 3 species belonging to the 3 genera *Uloborus*, *Philoponella* and *Zosis* and the family Theridiidae comprises 2 species belonging to the genera *Argyrodes* and *Nihonhimea*.

Keywords: Araneidae, Checklist, Diversity, Orb-weavers, Structural complexity

Of the orb-web weaving spider families (e.g., Araneidae, Tetragnathidae and Uloboridae) are distinct or diverse and well known for their web pattern. As orb-weavers age, they tend to have less production of silk, many adult orb-weavers can then depend on their coloration to attract more of their prey (Galvez et al., 2018). The capacity of orb-web species to catch the prey, led orbicularians to become the most dominant predators in many ecosystems (Blackledge et al., 2009). In orb-weavers, there are two major radiations of three-dimensional web spinning spiders; the cobweb spinning Theridiidae (Agnarsson 2004, Arnedo et al., 2004) and the aerial sheet-web spinning Linyphiidae (Arnedo et al., 2009, Miller 2007).

Araneoidea monophyly is well supported by both morphological and molecular data. Although Griswold et al. (1998) found homoplasious occurrences in non-orb-weaver species of some classic araneoid characters; several unambiguous morphological synapomorphies support Araneoidea, most notably the paracymbium and flagelliform and aggregate silk glands. Mimetidae is placed in Arachnoidea because of the presence of putative vestigial homology (Hormiga and Griswold 2014). Deinopoidea is also called the cribellate orb builder spider. Deinopoid web architecture is unique, web building behavior is homologous to other orb-weavers (Hormiga and Griswold 2014). The family Araneidae, one among the families of orb-weavers exhibits a worldwide distribution (Foelix 1982). It includes 3093 species under 184 genera (WSC 2022). The living fauna of Theridids are classified into 125 genera, constituting 2537 species around the world (WSC 2022). Theridiid webs are those structures of viscid silk lines that are apparently function in one way or another in prey capture (Eberhard et al., 2008).

Synotaxidae are slender and they resemble theridiid. It comprises 11 species under single genus (WSC 2022). Synotaxids occur mostly in the temperate parts of South America, Australia, and New Zealand. They usually build sheet or dome webs beneath which they hang, although some are tiny kleptoparasites that inhabit webs of other spiders (Hormiga and Griswold 2014). Cyatholipidae includes 23 extant genera and 58 extant species scattered across Africa, Madagascar and New Zealand. The family also has a rich European fossil record from Oligocene to Miocene amber deposits from Germany and Baltic (Hormiga and Griswold 2014). Synaphridae is a small (3 genera and 13 species), cryptic, and poorly known group of araneoids from southern Europe, the Middle East, and Africa (WSC 2022). Uloboridae, is a cribellate orb weaver. They are non-venomous spiders and also known as hackled orb weavers. This study, attempts to generate a preliminary checklist of orb-weaving spiders in Sree Kerala Varma College Campus, located in Kanattukara, Thrissur district, Kerala.

MATERIAL AND METHODS

Study area: The study was undertaken in Sree Kerala Varma College Campus. It is located in Kanattukara, west of Thrissur district, Kerala. It has a longitude of 76° 11 '48.84 " E and a latitude of 10° 31' 49.44" N. The campus covers about 30 acres of land and the annual temperature varies from 23° c to 32° c. The major plant communities are *Hibiscus indicus*, *Syzgium cumini*, *Psidium guajava*, *Mangifera indica*, *Delonix regia*.

Sampling: Observations of orb-weaving spiders were undertaken from February 2022 to July 2022. Spiders were collected early morning between 7.30 am - 9.30 am and late evening between 4.00 pm - 6.00 pm. The orb-weaving

spiders were collected by different methods like aerial hand collection, ground hand collection, sweep netting, water spraying method and vegetative beating. The collected specimens were preserved in 70% ethyl alcohol. The identification of adult spiders was done by using taxonomic keys, available literature (Tikder and Malhotra 1980, Barrian and Lister 1995, Sebastian and Peter 2009) and catalogues provided by NMBE (World Spider Catalogue 2022). Preserved specimens were examined under a stereo zoom microscope (Leica-M205C) in the laboratory for taxonomic identification. Photos of live specimens were done by using a digital camera and lens (Canon EOS 5D digital SLR and Canon 180 mm macro lens). Identification and classification were also done on the basis of morphometric characters of various body parts. The identification is also based on salient features like, presence of two or three claws, presence or absence of cribellum, number of cheliceral teeth, presence of one or two pairs of book lungs. Adult specimens were identified up to the species level.

RESULTS AND DISCUSSION

Nineteen species belonging to 14 genera of 4 families from four different families Araneidae, Tetragnathidae,

Table 1. Checklist of orb-weaving spiders

Family: Araneidae (Clerck 1757)
<i>Anepsion maritatum</i> (O. Pickard-Cambridge 1877)
<i>Argiope anasuja</i> (Thorell 1887)
<i>Argiope pulchella</i> (Thorell 1881)
<i>Cyclosa confragra</i> (Thorell 1892)
<i>Cyclosa hexatuberculata</i> (Tikader 1982)
<i>Cyrtophora cicatrosa</i> (Stoliczka 1869)
<i>Gasteracantha geminata</i> (Fabricius 1798)
<i>Neoscona nautical</i> (L. Koch 1875)
Tetragnathidae (Menge 1866)
<i>Leucauge decorata</i> (Blackwell 1864)
<i>Leucauge fastigata</i> (Simon 1877)
<i>Tetragnatha keyserlingi</i> (Simon 1890)
<i>Tetragnatha viridorufa</i> (Gravely 1921)
<i>Tylorida striata</i> (Thorell 1877)
<i>Tylorida ventralis</i> (Thorell 1877)
Theridiidae (Sundevall 1833)
<i>Argyrodes flavescens</i> O. Pickard-Cambridge 1880
<i>Nihonhimea mundula</i> (L. Koch 1872)
Uloboridae (Thorell 1869)
<i>Philoponella feroka</i> (Bradoo 1979)
<i>Uloborus danolius</i> (Tikader 1969)
<i>Zosis geniculata</i> (Olivier 1789)

Theridiidae and Uloboridae were recorded (Table 1). The family Araneidae was the most dominant orb-weaving family. They are typical orb-weavers and the orb-web has particular

1. Araneidae Simon 1895 (Plates 1-5)



Plate 1. *Argiope anasuja*

Plate 2. *Argiope pulchella*

Plate 3. *Cryptophyta cicatrosa*



Plate 4. *Cyclosa confragra*



Plate 5. *Gasteracantha geminata*

2. Tetragnathidae Menge, 1866 (Plates 6-10)



Plate 6. *Leucauge decorata*

Plate 7. *Tetragnatha keyserlingi*

Plate 8. *Leucauge fastigata*



Plate 9. *Tylorida striata*



Plate 10. *Tylorida ventralis*

3. Uloboridae Thorell, 1869 (Plates 11-12)



Plate 11. *Philoponella feroka*

Plate 12. *Zosis geniculata*

4. Theridiidae Sundevall, 1833 (Plates 13-14)



Plate 13. *Argyrodes flave*

Plate 14. *Nihonhimea mundula*

Plates 1-14. Orb weaving spiders identified from Sree Kerala Varma College Campus, Thrissur, Kerala

geometrical precision. Out of the four different families, Araneidae comprises eight species belonging to 6 genera, *Anepsion*, *Argiope*, *Cyclosa*, *Cyrtophora*, *Gastracantha* and *Neoscona*. The family Tetragnathidae was the second dominant family comprising 6 species belonging to 3 genera *Leucauge*, *Tetragnatha* and *Tylorida*. The family Uloboridae comprises 3 species belonging to the 3 genera *Uloborus*, *Philoponella* and *Zosis*. The family Theridiidae comprises 2 species belonging to the genera *Argyrodes* and *Nihonhimea*.

The study of specific diversity of orb-weavers are not common. Lowe et al. (2014) documented a total of 33 species belonging to 6 families in Caribbean Islands. The diversity was assessed by collecting samples from seven Islands in the Caribbean Island. In the present study also the family Araneidae is the most diverse family. The dominance of this family in the study area and the Caribbean Islands is directly proportional to the vegetational architecture (including gaps in the vegetation). Vegetation which is structurally more complex can sustain a higher abundance and diversity of spiders (Andrew and Hughes 2004). Vegetation provides an extensive option of microhabitat selection, web attachment and prey capture, especially among web builders (Haddad et al., 2009). Memah et al. (2014) suggested that the diversity and abundance of spider communities are generally determined by the complexity of the structure of the plant and their environmental conditions. Spiders usually exhibit humidity and temperature preferences that limit them to areas within the range of their physiological tolerances. Presence of large web near water bodies, construction of web in horizontal plane and construction of web over water are the important web characters of the collected genera of Tetragnathidae family. Presence of sticky silk, calamistra hairs are the major web characters of the collected genera of Uloboridae family. Family Theridiidae has web with araneophagy guy lines, viscous silk and suspended egg sac. These web characters of different genera contribute very much to the diversity by ensuring easy prey capture methods

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