

SPIDER DIVERSITY IN IISc. BANGALORE, INDIA

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ABSTRACT

A survey of the spider fauna of Indian Institute of Science (IISc), Bangalore, was carried out from November 2009 to December 2010. A total of 40 species of spiders belonging to 33 genera under 14 families viz. Araneidae, Ctenidae, Deinopidae, Eresidae, Hersilidae, Lycosidae, Nephilidae, Oxyopidae, Pholcidae, Salticidae, Tetragnathidae, Theridiidae, Thomisidae, and Uloboridae were recorded within the premises of IISc. Practically no one has tried to explore spider fauna of this region. Amongst these families the most dominated family was orb weavers, the Araneidae represented by 5 Genera & 10 species. The second dominated family was salticidae represented by 9 genera & 9 species. Occurrence of high number of Araneids could be due to thick vegetation, which provides enough space to build webs of different sizes and protection from their predators. 6 families were represented by single species. Out of the recorded spiders *Cyclosa spirifera*, *Zosis geniculatus*, *Argyrodes flavescens*, *Amyciaea forticeps*, *Runcinia acuminata* are rare species. The survey result shows that the spider diversity is much higher and further studies may yield more information about the diverse Araneae fauna of this area.

Key words: Indian Institute of Science, orb weavers, Araneidae, spider.

INTRODUCTION

Our knowledge of Indian spider fauna is extremely fragmentary. Indian spiders from all regions have been studied earlier by several European workers and later by Indian Archnologists. The earliest contributions on Indian spiders were by Stoliczka(1869) and Karsch (1873). Gravely (1921) added considerably to the knowledge of Indian spiders. Major contributions to Indian arachnology were made by .Pocock and Tikader who made other researchers to take interest in research on spiders.Pocock, described 112 new species of spiders from India. His book in 1900 provided the first list of spiders, along with enumeration and new descriptions in British India and is referred and still referring by arachnologist of India. Tikader (1987) also published the first comprehensive list of Indian spiders, which included 1067 species belonging to 249 genera in 43 families. A number of species from Lahore were described by Dyal (1935). Spiders of many families were practically unknown from Karnataka before Tikader (1980, 1982) who described many species of the families (Lycosidae, Aranidae, Thomisidae, Gnaphosidae, Philodromidae) from all over India. Spider fauna of Gujrat has been studied by Patel (1973). Biswas and Biswas (1992) have described spiders from Bengal. Gajbe (1983) has described many new species of spiders from Madhya Pradesh.

The order Araneae which include Spiders ranks seventh in total species diversity among all other groups of organisms. The first spider to be described from India was *Shasus lepidus* Blackwall 1864 (Manju Siliwal *et al.*, 2005). He was the first taxonomist to publish new descriptions in India. The spider is placed in the Phylum Arthropoda, Class - Arachnida, Order- Araneae. They constitute largest order of arachnids. They rank seventh in total species diversity. Currently 43,678 species in 3,898 genera and 112 families have been described (Platnick, 2013). Updated checklist of Indian spiders includes 1,686 species, 438 genera and 60 families (Keswani *et al.*, 2012). Order Araneae is further divided into 3 sub-orders, the Mesothelae (most primitive spiders), the Mygalomorphae (the primitive spiders), the Aranaeomorphae (the modern spiders).

We know so little about how many spiders are there, where and when they can be found. It is difficult to know which species are threatened and which may already have been extinct. What spider play, what role in ecosystem? No documentation work has been done on spider fauna of IISc. Bengaluru. My work provides list of spiders located in the premises of IISc. The researchers interested in spiders can select particular species for their research studies, and can work on their web construction, food and feeding habits, physiology, reproduction and life history.

STUDY AREA

The capital of the state of Karnataka, Bangalore occupies the heart of the Mysore Plateau with an average elevation of 920 m (3,018 feet). It is located at 12.97° N 77.56° E. Bangalore has a large number of lakes -the prominent among which are Sankey lake, Ulsoor lake and Yediyur lake. It receives adequate rainfall from the Northeast Monsoon as well as the Southwest Monsoon. In summer the maximum and minimum temperatures hover between 36°C and 20°C, while in winter the temperatures range between 27°C and 17°C. Average rain fall will be 859mm (annual). Bangalore shows tropical Savannah Climate- March to May (hot) December to January (winter) June to September and November to December (rainy).

The premises of Indian Institute Science (IISc.) is selected for the minor research project due to the wide coverage of dense vegetation which supports lot of spider species. The IISc is a research institution of higher learning located in Bangalore, India. It was established in 1909. IISc is considered as the premier institute for scientific research in India and is typically ranked higher than any other Indian university in world university rankings. The IISc campus harbors both exotic and indigenous plant species with about 110 species of woody plants, including quite a number of trees. The roads on the campus are named after the dominant avenue tree species. It is situated in Bangalore Urban, Karnataka, India and its geographical coordinates are 13° 1' 1" North, 77° 34' 1" East. Original name (with diacritics) of the place is Malleswaram.

MAP OF IISc. Bangaluru

The area surveyed is as follows:



Four marked areas shown in the Map are surveyed in the IISc, campus.

Area 1 covers 10.35 acres, area 2 covers 65.80 acres, area 3 covers 32.86 acres, and area 4 covers 11.92 acres. Total area surveyed 120.93 acres approximate out of 400 Acres.

Following are the details of four areas surveyed.

Area 1- Mini forest area in front of CES department.

Area 2- Area surrounded by javanica marg, leading to CAOS Department, pathway to Madhura marg, Tala marg.

Area 3- Area surrounded by Tala marg, mahagani marg, Gulmohar marg, road leads to R block, M.S.R. road, and C.V. Raman road.

Area 4- Area surrounded by Tala marg, Madhura marg, Gulmohar marg, Silveroa Marg.

LIST OF SPECIES RECORDED FROM IISC

I Family: Araneidae

Genus *Argiope* Audouin, 1826

1. *anasuja* Thorell, 1887
2. *pulchella* Thorell, 1881
3. *aemula* Walckenaer, 1841

Genus *Cyrtophora* Simon, 1864

4. *ciatrosa* (Stoliczka, 1869)
5. *citricola* (Forsskal, 1775)

Genus *Cyclosa* Menge, 1866

6. *spirifera* Simon, 1889

Genus *Gasteracantha* Sundevall, 1833

7. *germinata* (Fabricius, 1798)
8. *Gasteracantha* sp.

Genus *Neoscona* Simon, 1864

9. *mukerjei* Tikader, 1980
10. *nautica* (L. Koch, 1875)

II Family Ctenidae

Genus *Ctenus* Walckenaer, 1805

11. *cochinensis* Gravely, 1931

III Family Deinopidae

Genus *Deinopis* MacLeay, 1839

12. *goalparaensis* Tikader and Malhotra, 1978

IV Family Eresidae

Genus *Stegodyphus* Simon, 1873

13. *sarasinorium* Karsch, 1891

V Family Hersiliidae

Genus *Hersilia* Audouin, 1826

14. *savignyi* Lucas, 1836

VI Family Lycosidae

Genus *Hippasa* Simon, 1885

15. *agelenoides* (Simon, 1884)

Genus *Pardosa* C. L. Koch, 1847

16. *pseudoannulata* (Bosenberg and Strand, 1906)

VII Family Nephilidae

Genus *Nephila* Leach, 1815

17. *maculata* (Fabricius, 1793)

18. *pilipes* (Fabricius, 1793)

VIII Family Oxyopidae

Genus *Oxyopes* Latreille, 1804

19. *birmanicus* Thorell, 1887

IX Family Pholcidae

Genus *Artema* Walckenaer, 1837

20. *atlanta* Walckenaer, 1837

Genus *Crossopriza* Simon, 1893

21. *lyoni* (Blackwall, 1867)

Genus *Pholcus* Walckenaer, 1805

22. *phalangioides* (Fuesslin, 1775)

X Family Salticidae

Genus *Epeus* Peckham and Peckham, 1886

23. *indicus* Proszyn'ski, 1992

Genus *Hasarius* Simon, 1871

24. *adansoni* (Audouin, 1826)

Genus *Hyllus* C. L. Koch, 1846

25. *semicupreus* (Simon, 1885)

Genus *Menemerus* Simon, 1868

26. *bivittatus* (Dufour, 1831)

Genus *Myrmarachne* MacLeay, 1839

27. *plataleoides* (O.P.-Cambridge, 1869)

Genus *Phintella* Strand, 1906

28. *vittatus* (C.L. Koch, 1846)

Genus *Plexippus* C.L. Koch, 1846

29. *petersi* (Karsch, 1878)

- Genus *Rhene* Thorell, 1869
 30. *Rhene* sp.
 Genus *Telamonia* Thorell, 1887
 31. *dimidiata* (Simon, 1889)
- XI Family Tetragnathidae
 Genus *Leucauge* White, 1841
 32. *decorata* (Blackwall, 1864)
 Genus *Opadometa* Archer, 1951
 33. *fastigata* (Simon, 1877)
- XII Family Theridiidae
 Genus *Ariamnes* Thorell, 1869
 34. *flagellum* (Doleschall, 1857)
 Genus *Argyrodes* Simon, 1864
 35. *flavescens* O.P.-Cambridge, 1880
- XIII Family Thomisidae
 Genus *Amyciaea* Simon, 1885
 36. *forticeps* (O. P.-Cambridge, 1873)
 Genus *Runcinia* Simon, 1875
 37. *acuminata* (Thorell, 1881)
 Genus *Thomisus* Walckenaer, 1805
 38. *lobosus* Tikader, 1965
 39. *pugilis* Stoliczka, 1869
- XIV Family Uloboridae
 Genus *Zosis* Walckenaer, 1841
 40. *geniculatus* (Olivier, 1789) Walckenaer

RESULTS

The spider diversity of IISc. Bengaluru is found to be rich. During the present study we have recorded 40 species belonging to 33 genera under 14 families (Table-1). Among these 40 species orbweavers (Araneidae, Tetragnathidae, Uloboridae), irregular web builders (Pholcidae, Theridiidae), funnel web builders (Lycosidae) as well as non-web builders (Salticidae, Thomisidae) were observed. The recorded spiders were dominated by spiders of Araneidae (10 species from 5 genera) followed by salticids representing 9 species from 9 genera. The number of genera and species representing each family are given in the table 1.

DISCUSSION AND CONCLUSION

The spiders of IISc. is rich in number and types of species represented by 40 sps. belonging to 33 genera under 14 families. Among the 40 sps. were orbweavers (Araneidae, Tetragnathidae, Uloboridae), irregular web builders (Pholcidae, Theridiidae), funnel web builders (Lycosidae) and non web builders

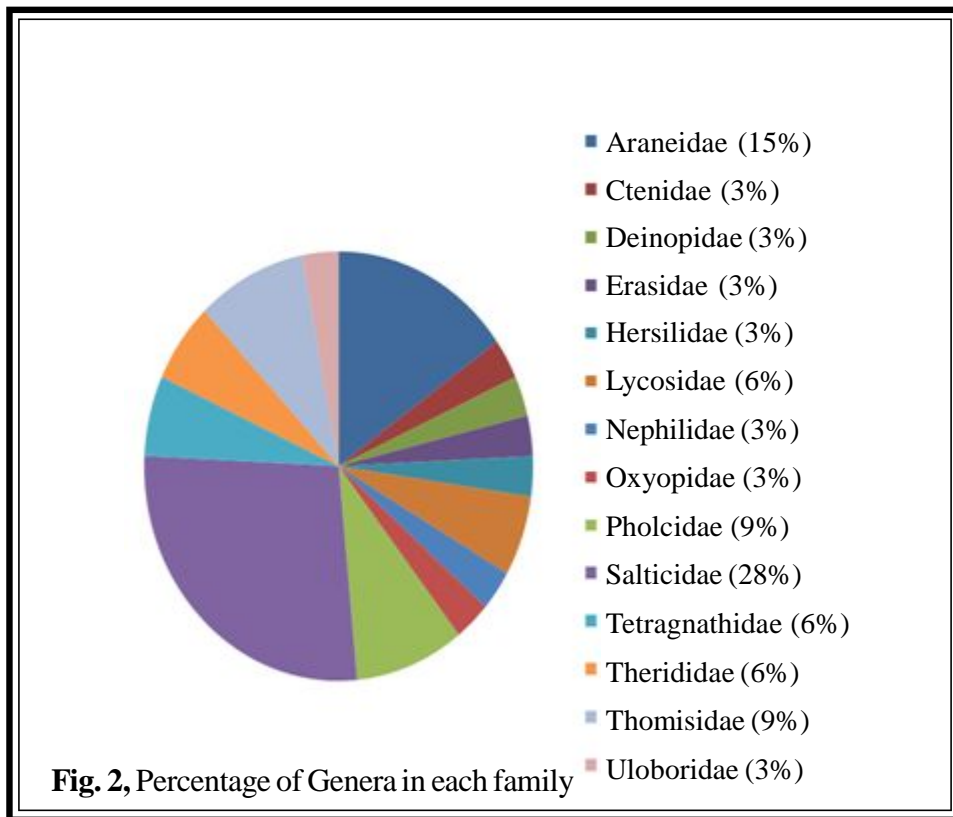
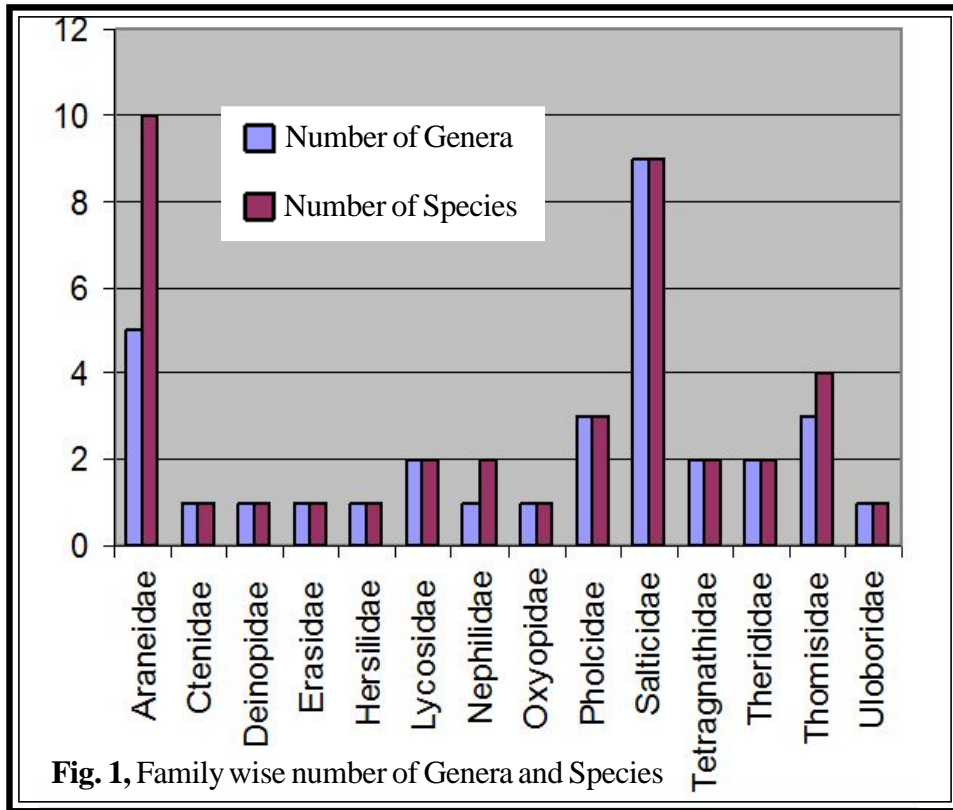
Table-1, Number of genera and species of spiders from IISc.

Sr.No.	Families	No. og Genera	No. of Species
1.	Araneidae	5	10
2.	Ctenidae	1	1
3.	Deinopidae	1	1
4.	Eresidae	1	1
5.	Hersiliidae	1	1
6.	Lycosidae	2	2
7.	Nephilidae	1	2
8.	Oxyopidae	1	1
9.	Pholcidae	3	3
10.	Salticidae	9	9
11.	Tetragnathidae	2	2
12.	Theridiidae	2	2
13.	Thomisidae	3	4
14.	Uloboridae	1	1
	TOTAL	33	40

(Salticidae, Thomisidae). The first largest number of species belongs to family Araneidae which is represented by 10 species in 5 genera. Second is family Salticidae, represented by 9 species, in 9 genera. The number of genera and species representing each family are given in the table 1.

The spiders live in different types of habitats. Spiders belonging to families Thomisidae, Salticidae, Eresidae, Tetragnathidae, Oxyopidae, Theridiidae, Deinopidae were mainly found in vegetation. Thomisid spiders were mainly found on flowering plants and seeds of tall grasses, while oxyopids were found on the grasses. The species *Cyrtophora citricola* was found on the three dimensional web on the iron fencing and the species *Hersilia savignyi*(family Hersiliidae) was found on the barks of trees. Lycosids , Ctenids and some Salticids were located on the ground between dry leaves. The species *Zosis geniculatus* was sited in the large broken cement pipes on tangled horizontal webs at a height of about 3ft on the moist debris. Their number was more during winter and was not sighted during summer. *Hippasa agelenoides* found in sheet-like webs with a funnel retreat made close to the base of tree trunks and over holes in the ground. The spiders belonging to family Pholcidae were occurred in the corners and walls of the buildings.

Majority of spiders living on ground and vegetation exhibitng protective coloration for camouflage. Some best examples of mimics among these species include an ant like salticid *Myrmarachne plataleoides* and thomisid *Amyciaea forticeps*; *Hersilia savignyi* which resembles the bark of the tree, it inhabits; *Runcinia acuminata* located on the dry seed heads of native grasses difficult to locate; *Ariamnes flagellum* resembles the dry tips of twigs; *Hippasa agelenoides* and *Ctenus cochinchinensis* are difficult to locate between the dry leaves on the ground.



Among the araneids, the species *Nephila maculata* and *Nephila pilipes* were found to be constructing the largest orbweb. The web of *Nephila maculata* appeared golden in sunshine. *Argiope aemula* was found to construct a large web with X- shaped stabilimentum.

Spiders are exclusively carnivorous. The sociality among spiders is rare. However, a single social species *Stegodyphus sarasinorium* (Family Eresidae) is reported in the spider fauna of IISc.

Cyclosa spirifera (Family Araneidae), *Zosis geniculatus*(Family Uloboridae), *Amyciaea forticeps* and *Runcinia acumineta* (Family Thomisidae), *Argyrodes flavescens*(Family Theridiidae), *Rhene* sps (Family Salticidae) are among very rare species documented in the IISc.

The behavior of some species namely *Hersilia savignyi*, *Myrmarachne platalaeoides*, *Menemerus bivittatus*, *Argiope aemula*, *Cyrtophora citricola*, *Amyciaea forticeps* and *Stegodyphus sarasinorium* was studied and recorded. *Hersilia savignyi* do not build webs but attack pedestrian prey. They encircle and fix it to the bark with bands of silk emanating from the long spinnerets. They rotate rapidly clockwise and anti-clockwise so as to encapsulate the prey. *Myrmarachne platalaeoides* make a thick oval silken retreat under leaves with front and back doors (two oppositely situated flexible openings) for the in and out movement. Polymorphism is found in this species(Rhene M.Borges, 2007). *Menemerus bivittatus* actively moves in a criss-cross pattern in search of small insects, often vibrates the hairy palps up and down while walking. *Argiope aemula* moves to the opposite of the stabelimentum to conceal when troubled. *Cyrtophora citricola* vibrates continuously for a period of about 1-2 minutes when disturbed. *Amyciaea forticeps* found holding the red ant *Oecophylla* in its jaws and feeding on it. The first two pairs of legs are often jerkly held up and down during its movement. *Stegodyphus sarasinorium* is gregarious in habit. All the members of the colony share the same alive prey. Not a single species of poisonous spider was found among the species recorded from IISc. Bangalore.

The species that are found abundant in number are orb-weaving spiders namely *Neoscona nautica*, *Argiope pulchella*, *Argiope aemula*, *Nephila pilipes*, *Nephila maculata*, *Opadometa fasticata*, *Leucauge decorata*, *Cyrtophora citricola*, *Cyrtophora cicastroa*. Among lycosids, *Hippasa agelenoides* are very commonly seen. *Myrmarachne platalaeoides*, *Hasarius adansoni* were also sited in abundance among the salticids. *Oxyopes birmanicus* among lynx spiders, *Ctenus cochinchinensis* a false lycosid endemic to India were found more in number. Futher survey may yield new species of spiders, which may be unknown or new to science.

The result of the present study showed that, great variety of spiders exists in the study area. One can undertake research work on individual species as the climatic conditions supports the spider fauna to multiply as there is no human interference in their habitats. Research work on the biology of spiders including their web construction, food and feeding habits, physiology, reproduction and life

history can be done here. A comprehensive account of any single species has not been available so far. So it is suggested that, studies on the biology of individual spider species should be undertaken in IISc. This project adds records to the fauna of IISc. Among the 40 species of spiders, two are probably new species (*Gasteracantha sp.*, *Rhene sp.*) which will be published separately after comparative taxonomic work. A further thorough systematic study is required to understand the complete spider fauna of this area.

SUMMARY

Overall 40 species of spiders belonging to 33 genera under 14 families, viz., Araneidae, Ctenidae, Deinopidae, Eresidae, Hersiliidae, Lycosidae, Oxyopidae, Pholcidae, Salticidae, Tetragnathidae, Theridiidae, Thomisidae and Uloboridae have been described from IISc. in Bengaluru, Karnataka, India. 40 species are documented for the first time from this area.

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