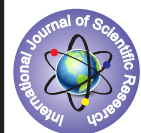


Diversity and Ecology of Spider of the family Araneidae Clerck 1757 from Shivaji College campus, Akola



Zoology

KEYWORDS: Morphology, Araneidae spiders, Argiope aemula, Araneus mitificus, Cyrtophora citricola, Neoscona mukharji, Shri Shivaji college campus Akola

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ABSTRACT

Present study was made on morphology and ecology of Araneidae spiders *Argiope aemula*, *Araneus mitificus*, *Cyrtophora citricola* and *Neoscona mukharji* of Shri Shivaji college campus Akola during 2014-15. During this study four species of family Araneidae were observed in the campus. Female of *Neoscona*, *Cyrtophora*, *Araneus mitificus* and *Argiope aemula* were from the college campus. Morphological studies were made with the help of Stereo zoom microscope and USB digital microscope. Measurements of total body length, length and width of cephalothorax, abdomen, sternum were also recorded. Total length of leg and different parts of leg also measured. Measurements were also made in the present study. Measurements of female *Argiopeaemula*, *Araneusmitificus*, *Neosconamukharji* and *Cyrtophoracitricola*: total body length 38.85 mm, 5.40mm, 38.23 mm, 16.79mm, respectively. Comparatively *Argiopeaemula* is the largest spider were observed in the campus.

INTRODUCTION

Present study was made on morphology and ecology of Araneidae spiders of Shri Shivaji college Akola campus during 2014-15. Latitude of Akola district is 20.7000° N and longitude is 77.0142° E. This college having beautiful campus with botanical garden. Araneidae Spiders are the typical orb-weaver spiders. The Araneidae are three-clawed spiders, having eight eyes in two rows. The lateral eyes are usually adjacent and some distance from the medians; the four medians from a trapezoid. These are small to large size, 1-39 mm total length. Orb-weavers have eight similar eyes, hairy or spiny legs, and no stridulating organs. In the present paper we made little attempt to make faunistic survey of our campus in relation to Araneidae spider. The main purpose of this study is to prepared diversity of Araneidae spider and clear the confusion, as far as possible, regarding the taxonomic identities of the araneid spiders of college campus. Scanty information's are available on Indian forms of araneid spiders from the reports of Stoliczka (1869), Simon (1864, 1889, 1892-1895, 1906), Thorell (1895) and Pocock (1900) Tikader (1982) who were the pioneer workers on this group of spiders. They described many species from different habitat of India, Burma and Sri Lanka, but their descriptions are very inadequate for identification up to the species level.

Materials and Method:-

Spiders were collected from the different habitats of college campus. Latitude of Akola district is 20.70°N and longitude is 77.01°E. This campus is in about 7.5 Acre. Study of diversity and ecology of Araneid spider were done by following steps:

Collection of Spiders: Collection were carried out by visual search, hand picking and net sweeping. Collected spiders were photographed from dorsal, ventral and lateral side. Spiders were preserved after proper stretching into 70 % alcohol. Body and leg measurement were carried out. Morphological characters were noted down. Copulatory organs were dissected and was studied in detail for identification. Identification by using the standard key on the basis of Morphometric characters of various body parts and genitalia (World Spider Catalog Version 16.5 <http://www.wsc.nmbc.ch/>).

• Key to Identify Argiope

Dorsum with transverse bands; shoulder humps absent; Distance between PME less than distance from PLE.....*Argiope*

• Key to Identify Araneus

Thoracic groove transverse; epigyne with distinct scape, often wrinkled and or with lateral lobes.....*Araneus*

• Key to Identify Cyrtophora

LE separated; palpus max. 3mm; Females and males are typically medium brown in color, but may have a darker foliate mark on the dorsum of the abdomen -----*Cyrtophoracitricola*

• Key to Identify Neoscona

The median eyes are grouped together in a trapezoid shape, while the lateral eyes are some distance away. Legs relatively thick and very spiny. Abdomen of female broadly oval.

OBSERVATION AND RESULT:

Present morphological and ecological study made on *Argiopeaemula*, *Araneusmitificus*, *Cyrtophoracitricola* and *Neosconamukharji* from the college campus during 2014-15. Morphological studies were made with the help of Stereo zoom microscope and USB digital microscope. Measurements of total body length (TBL), length and width of cephalothorax (LC) (WC), abdomen (LA) (WA), sternum (LS) (WS) Total length of leg (TLL) length of coxa (LCo), length of trochanter (LT), length of femur (LF), length of patella (LP), length of tibia (LTb), length of metatarsus (LM), and length of tarsus along with claws (LTs) were recorded in the present study.

Argiopeaemula

Cephalothorax silvery yellow, legs yellowish white with dark brown bands and abdomen shows yellowish white transverse bands.

Cephalothorax is slightly longer than wide, narrowing in front, provided with silvery greenish patches, clothed with thick layer of silvery white pubescence and hairs. Cephalic region is slightly elevated than thoracic region; deep groove is formed at the posterior end of cephalic region. Dark black spot is present on this groove.

Eyes Pattern: Ocular quad much longer than wide and slightly wider behind than in front; both anterior and posterior median eyes sub equal in size; lateral eyes are close and both situated on a prominent tubercles; anterior lateral eyes are smaller than posterior lateral eyes; anterior row of eyes procured as seen from front but posterior row of eyes are straight Figure 1.



a

b

c

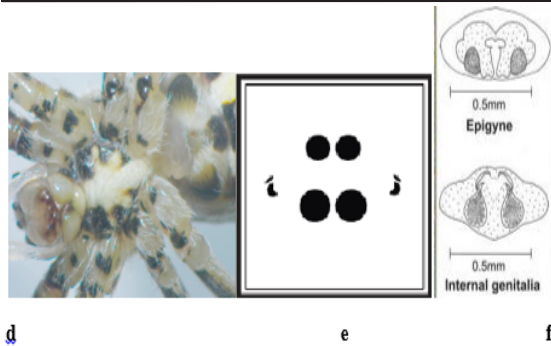


Figure 1.: Argiopaeaemula: a- dorsal view, b- cephalothorax, c- ventral view, d- sternum e- eye pattern, f- Epigyne.

Cephalothorax is slightly longer than wide, narrowing in front, provided with silvery greenish patches, clothed with thick layer of silvery white pubescence and hairs.

Abdomen is longer than wide, oval, slightly broadest in the middle, overlapped anteriorly on the cephalothorax, clothed with hairs, yellowish white. Dorsal side of abdomen provided with six yellowish brown transverse bands. Four pairs of sigilla are present on dorsum. Ventral side brown with yellowish patches. One pair of yellowish longitudinal bands extending from the epigastric furrow up to the posterior end of the abdomen towards ventral side. Epigyne and Internal genitalia are as in Fig.1.

Sternum heart shaped, pointed behind, blackish brown in color provided with big yellowish patch and red spots. It is clothed with hairs and pubescence. Labium is wider than long, deep brown in color. Maxillae longer than wide, yellowish provided with brownish inner margin and having distinct scopulae. Chelicerae small and weak, yellowish brown with rudimentary boss. Legs long and strong, clothed with hairs and spines yellowish white and dark brown bands are seen on all the legs. Metatarsals and Tarsus of legs having row of the black colored spines, mixed with small hairs. Single dark brown spot is present on the coxa of I and II pair of legs. Metatarsus is much longer than tarsus however; there is not distinct separation among them. Leg formula – 1, 2, 4, 3.

Measurements of Argiopaeaemula (Female): Total length of 38.85 mm, cephalothorax 12.81mm long, 11.27mm wide, abdomen 26.30mm long, 17.2mm wide, sternum 9.47mm long, 9.16mm wide and chelicerae 12.62mm long were noted in the specimen. Measurement of leg segments are depicted in (Table 1).

Table 1, Measurement of leg segments (in mm) of female Argiopaeaemula.

Leg segments	Leg 1	Leg 2	Leg 3	Leg 4
Coxa (Co)	2.54	3.08	2.18	3.15
Trochanter (LT)	1.21	1.21	1.87	2.3
Femur (LF)	12.05	13.05	10.89	16.22
Patella (LP)	2.65	3.55	4.8	4.11
Tibia (LTI)	9.81	8.96	4.18	9.73
Metatarsus (LM)	10.95	10.77	5.61	12.56
Tarsus (LTS)	4.2	4.24	4.42	4.59
Total (LTT)	43.41	44.86	33.95	52.66

Araneusmitificus

Cephalothorax brownish green, legs dark green and abdomen chalk white. It is longer than wide, narrowing in front, clothed with pubescence and hairs, brownish green. Cephalic region is slightly high, clothed with black hairs laterally. Thoracic region is wide dorso-laterally and forming a bifid, deep longitudinal groove posteriorly. Eyes are eight in number and are arranged in two rows, both rows of eyes are recurved, anterior row of eyes are deep recurved and

posterior row of eyes are slightly recurved. Ocular quad longer than wide and wider in front than behind. Anterior median eyes are smaller than posterior median eyes, posterior median eyes encircled by black rings. Lateral eyes are close and each situated on black tubercle.

Eyes are eight in number and are arranged in two rows, both rows of eyes are recurved, anterior row of eyes are deep recurved and posterior row of eyes are slightly recurved. Ocular quad longer than wide and wider in front than behind. Anterior median eyes are smaller than posterior median eyes, posterior median eyes encircled by black rings. Lateral eyes are close and each situated on black tubercle.

Abdomen: Slightly wider than long, nearly rounded, narrow anteriorly than posterior, chalk white, clothed with pubescence. Violet coloured broad, procurved transverse patch is present at the anterior side of dorsum. One violet longitudinal broad patch is present below the transverse patch, which trifurcated at posterior end and each of these trifurcations extends mid-dorsally upto the posterior end. Two transverse, dark yellow lines are present on the dorsum, with 6-8 wavy transverse black streaks. Three pairs of sigilla are present on the dorsum of abdomen. Four dark violet squared patches are present at the posteriorodorsal end of abdomen. Ventral side chalk white. Two faint brown longitudinal separate lines are extended from epigastric furrow upto the spinneret. Two yellowish white spots are present at anterior side of abdomen near to the epigastric furrow towards ventrally. Epigyne and Internal genitalia are as in Fig.2.

Sternum heart shaped, narrowing behind, pale yellow, clothed with long black spines, two dark brown spots are present at the anterior side. Labium wider than long, pale brown, clothed with small hairs. Maxillae long, broad and strong, pale yellow, clothed with long, black spines, dark brown anterior margin and provided with distinct scopulae. Chelicerae long and strong, broad, pale brown, provided with moderate boss.

Legs long and strong, dark green, clothed with hairs and spines. One brown, long spine is present on the patella of III leg pair towards dorsally. Trochanter of IV leg pair is reddish colour towards ventrally. Leg formula – 4, 1, 2, 3.

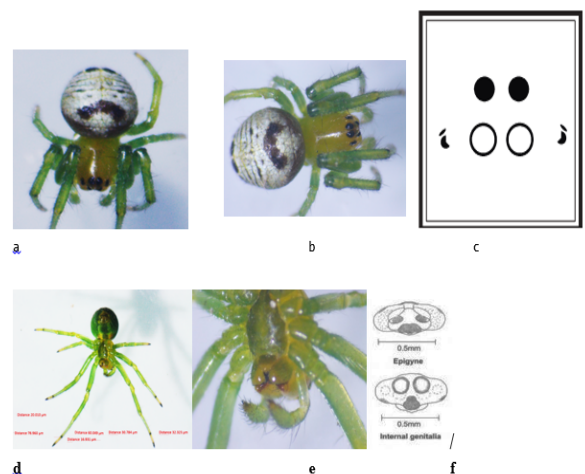


Figure 2 : Araneusmitificus female : a- Dorsal view, b- Lateral view, c- eye pattern, d- ventral view, e- sternum and f- genitalia

Measurements of Araneusmitificus (Female): Total length 6.60 mm, Cephalothorax 2.80 mm long, 2.30 mm wide, Abdomen 4.40 mm long, 4 mm wide, Sternum 5.04 mm long, 4.13 mm wide, and Chelicera 2.18mm long. Measurement of leg segments are depicted in table 2.

Table 2: Measurement of leg segments (in mm) of female Araneusmitificus.

Leg segments	Leg 1	Leg 2	Leg 3	Leg 4
Coxa (Co)	5.23	5.45	4.23	3.58
Trochanter(LT)	2.18	2.03	2.17	2.03
Femur(LF)	13.53	12.71	9.79	10.45
Patella (LP)	3.61	3.97	3.61	2.42
Tibia (LTI)	13.26	7.90	10.45	1.82
Metatarsus (LM)	10.70	7.30	9.19	7.51
Tarsus(LTS)	5.66	4.67	6.13	4.89
Total length (LTT)	54.17	44.03	45.58	32.70

Cyrtophoracitricola

Cephalothorax and legs pale brownish with yellowish patches, abdomen yellowish and brown patches. The genus Cyrtophora is called as Tent spider. It isslightly longer than wide; narrowing anteriorly, very broad posteriorly, densely clothed with yellowish pubescences. Thoracic region provided with a fovea bifid posteriorly. Cephalic region is slightly elevated towards anteriorly.

Ocular quad forming a trapezium situated on an elevation, longer than wide, wider in front than behind, anterior median eyes larger than posterior medians; lateral eyes subequal in size, a little distance in between them, situated on prominent tubercles, posterior lateral eyes are encircled by black rings. Both rows of eyes strongly recurved.

Abdomen isHighly up anteriorly and slightly overlapping on the cephalothorax, dense pubescence on the outside of the dorsum of abdomen. Dorsum of abdomen provided with one pair of shoulder humps, one pair of lateral humps at the middle and one pair of bifid caudal humps. A broad yellowish brown patch runs upto the middle portion of the dorsum. Four pairs of distinct sigilla arranged mid-longitudinally and laterally provided with red outer margin and inner black colour. Epigyne provided with two broad scapes and Internal genitalia are as in Fig.3.

Sternum triangular, very pointed behind, brownish clothed with black hairs. The coxae IV very close to each other, light yellowish brown in colour, comparatively broad than others and clothed with black hairs and yellow pubescence. Labium and maxillae wider than long, dark brown outer margin and yellowish white inner.Clothed with black hairs, provided with distinct scopulae. Chelicerae strong, yellowish, distinctly swollen before the base, fangs are dark brown colour present at the base of chelicerae. Legs long, strong densely clothed with pubescence, hairs. Femur of I and II legs are stouter than the other legs. Transverse brown bands are present on each leg segment. Leg formula – 4, 1, 2, 3.

Measurements of Cyrtophoracitricola (Female): Total length 16.79 mm, Cephalothorax 6 mm long, 2.26mm wide, Abdomen 8.89 mm long, 2.56 mm wide, Sternum 1.56 mm long, 1.05 mm wide, Chelicera 4.49mm long. Measurements leg segments and pal are depicted in table 3.

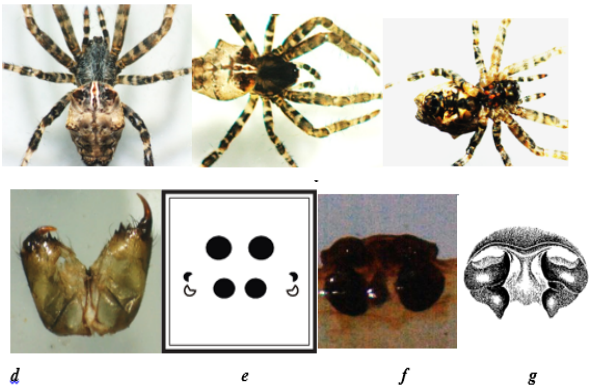


Figure 3. Cyrtophora citricola: a –dorsal view, b-lateral view, c-ventral view, d- chelicera, e-eye pattern, f and g –genitalia.

Table 3:Measurements oflegs of Cyrtophoracitricolain mm

Leg parts	Leg 1	Leg 2	Leg 3	Leg 4
Coxa (Co)	5.29	5.20	5.58	6.25
Trochanter(LT)	1.77	1.32	1.61	2.06
Femur(LF)	12.14	11.83	8.41	11.13
Patella (LP)	4.60	5.17	2.58	3.48
Tibia (LTI)	7.32	6.31	5.57	7.60
Metatarsus (LM)	6.32	6.27	4.20	7.11
Tarsus(LTS)	2.93	3.27	4.09	3.98
Total length (LTT)	40.37	39.37	32.04	41.61

Neosconamukharji

General: Cephalothorax and legs yellowish,abdomen dark brown with grayish patches.

Eyes: Eyes are eight in number, arranged on cephalic area. Ocular quad longer than wide, comparatively wider infront than behind. Eyes are arranged in two rows, both the rows of eyes are recurved; anterior row of eyes are strongly recurved and posterior row of eyes are slightly recurved. Posterior median eyes larger than anterior median eyes and posterior median eyes are pearly white, lateral eyes close equal and each situated on tubercle.

Cephalothorax : Longer than wide andnarrower in front, clothed with pubescence andhairs; cephalic region provided with conspicuous'V' shaped dark brown patches. Thoracic region provided with a deep longitudinal groove. Anterior median eyes slightly larger than posterior medians,encircled by black rings. Lateral eyes close andeach situated on a tubercle. Ocular quad wider infront than behind and both rows of eyes recurvedas in fig. 4. Sternum heart-shaped, pointedbehind, having a median longitudinal white band.Labium wider than long, dark brown, distal marginpale coloured. Maxillae broad and nearly roundish,yellowish with some dark brown patches at theproximal portion and provided with distinctscapulae. Chelicerae strong, yellowish andprovided with moderate boss. Legs long andstrong, clothed with pubescence and spines; distalends of all segments except coxa and trochanter;provided with dark brown transverse bands.

Abdomen: Sub-triangular, slightly longer thanwide, tapering posteriorly and clothed with greypubescence and hairs. Dorsum of abdomenprovided with a club shaped greyish white patch,sarranged longitudinally as in fig. 4Five pairs sigilla, mid-longitudinally on the dorsum. Ventralside brownish grey but having a broad midventral dark brown patch in between the epigastricfurrow and the spinnerets, and guarded laterally by a pair of dumble shaped chalk white bars.Epigyne provided with a moderately long scape,provided with a constriction and a pair of indistinctlateral lobes as in fig. 4. Internal genitaliaas in fig.4.In India Neosconamukharji were first time reported by Tikader (1980);Gajbe, (1982); Singh,(1992, 1991,1994) and Agrawal, 1991.

Measurements of Neosconamukharji (Female):Total length 38.23 mm, Cephalothorax15.11 mm long, 14.14mm wide, Abdomen 23.12 mm long, 17.26mm wide, Sternum 1.56 mm long, 1.05 mm wide, Chelicera 4.49mm long. Measurements leg segments are depicted in table 4.

Table 4: Measurements oflegs ofNeosconamukharjiin mm.

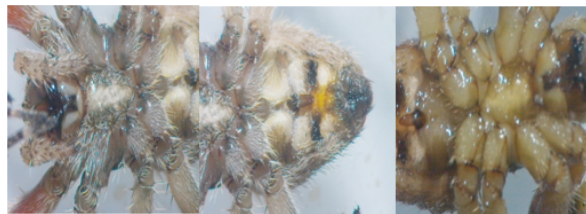
Leg parts	Leg 1	Leg 2	Leg 3	Leg 4	Palp
Coxa (Co)	2.57	2.77	2.13	2.53	0.62
Trochanter(LT)	0.74	1.44	1.11	1.59	0.39
Femur(LF)	8.9	8.39	6.13	9.26	2.72
Patella (LP)	4.35	3.84	2.71	3.13	1.21
Tibia (LTI)	7.64	7.67	3.71	6.36	1.93

Metatarsus (LM)	7.9	7.5	4.08	7.17	2.18
Tarsus(LTS)	2.41	2.52	2.08	2.02	1.42
Total length (LTT)	34.51	34.13	21.95	32.06	10.47

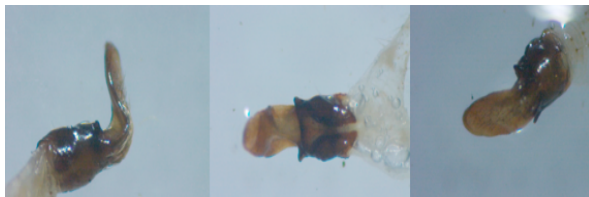
Female 8: *Neosconamukharji* Female : A- Dorsal view of Cephalothorax, B- Dorsal view of Abdomen , C- Lateral view of cepalothorax and abdomen, D- Sternum, E – sternum and external female genitalia, F- sternum and external female genitalia , G – Lateral view of internal epigyne, H – ventral view of internal epigyne and I – dorsal view of epigyne.



abc



def



ghi

Discussion

Orb-weavers live anywhere there are insects and places to put up their webs, where the structures to support the web. These always found on tree branches, tall grasses, and bushes. This study have demonstrated that a correlation exists between the structural complexity of habitats and species diversity (Hawthornth, Kalin-Arroyo 1995). Diversity generally increases when a greater variety of habitat types are present (Ried, Miller 1989). Downie et al. (1999) and New (1999) have demonstrated that spiders are extremely sensitive to small changes in the habitat structure, including habitat complexity, litter depth and microclimate characteristics. Spiders generally have humidity and temperature preferences that limit them to areas within the range of their “physiological tolerances”.

Argiopeaemula: Cephalothorax silvery yellow, legs yellowish white with dark brown bands and abdomen shows yellowish white transverse bands. **Araniusmitificus:** Cephalothorax brownish green, legs dark green and abdomen chalk white. **Cyrtophoracitricola** Female: Cephalothorax and legs pale brownish with yellowish patches, abdomen yellowish and brown patches.

Male: Cephalothorax reddish brown, legs yellowish brown; abdomen pale brownish. **Neosconamukharji** Female: Cephalothorax chocolate brown and marginal area is black in color, first two pair of legs skin color with black transverse bands; abdomen brownish with black spots with spiny hairs.

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