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Araneidae: A Remarkable Orb-weaving Group in the Rice Land Ecosystem of South 24 - Parganas, West Bengal, India

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ABSTRACT

As a potential predator the importance of spiders, especially dwelling in rice land, needs to be properly addressed. Till date the information gathered in this field is insufficient. Due to various reasons, members of the family Araneidae Clerck, 1757, exhibit striking variability particularly in Gangetic delta. After sampling for two years, it is found that, *Neoscona theisi* (Walckenaer, 1841) is the most dominant group in the fields of South 24 Parganas, West Bengal, India, amongst araneids and their average sex ratio increases during kharif session due to multiple environmental factors including reproductive strategies.

Keywords: Orb-weavers, Araneidae, Rice Land, South 24 Parganas, West Bengal, *Neoscona theisi*

1. INTRODUCTION

Spiders inhabiting rice land ecosystem necessarily demand serious consideration because of their fascinating adaptability and remarkable predatory efficiency (Nyffeler & Benz, 1987). In India, their role as a proficient bio-control agent is yet to be evaluated. (Sebastian & Chacko,

1994). Interestingly, the coastal ecosystem in the Gangetic Delta at the southern part of West Bengal, India, exhibits a wide variety of predatory spider population because of climatic fluctuation, soil quality and several other factors. Orb-weaving spiders appear to be of special importance in this context, as much more is entrapped than their actual consumption volume.

The present study is aimed at unfolding the diversity of the family Araneidae Clerck, 1757, the remarkably predominant group amongst many other orb-weavers found in rice fields of South 24 Parganas, West Bengal, India. As a result of a two-year sampling, from February 2014 to February 2016, it is found that spiders belonging to the families Tetragnathidae Menge, 1866 and Araneidae Clerck, 1757, (or typical orb-weaving spiders) are predominant. Considering richness and distribution, tetragnathids come before araneids and it is just the reverse when the species diversity is concerned. It is worthwhile to mention that Basu & Raychaudhuri, 2016 have elaborately dealt with the tetragnathids of the said ecosystem.

Being never on the ground, most of the araneids construct webs in the foliage, either high upon the trees or in shrubs, herbs or grass, with considerable geometrical precision and beauty. Many of them build a nest like retreat by folding a leaf or bunch of leaves which is little away from the web but directly connected with the web-centre by threads. Generally the male araneids are much smaller than females and are not commonly found in the webs unlike females (Tikader, 1982 & Barrion *et al.*, 1995).

Out of the 16 araneid species under 7 genera so far recorded from the study site, interestingly, the members of the genus *Neoscona* Simon, 1864, is found to be the dominant group. Altogether, 6 discrete species of the genus are observed to be rotated through the two cropping sessions of paddy, of which, *N. theisi* (Walckenaer, 1841) is identified as the predominant member. Moreover, in terms of abundance, three genera, *Eriovixia* Archer, 1951, *Argiope* Audouin, 1826 and *Cyrtophora* Simon, 1864, come immediately after. In spite of varying environmental condition in the Gangetic delta, these four genera also exhibit a wide range of distribution. However, *Larinia* Simon, 1874 and *Gasteracantha* Sundevall, 1833, are considered as rare. Further, almost for all the genera, sex ratio increases typically during kharif session.

2. STUDY AREA

South 24 Parganas (22.1352° N, 88.4016° E), a district of West Bengal, is located near the confluence of the river Ganges sharing a considerable part of the largest delta of the world. From 6 different blocks, 7 discrete areas are selected as sites for sampling. Fields in different locations are identified in such a manner so that they can provide a pen-picture of the faunal diversity of spiders of the district as a whole. Of them, 3 study areas are located at 3 different regions of Sundarbans where due to the proximity of Bay of Bengal, salinity and nutrient structure of soil vary to a considerable extent affecting the growth and distribution pattern of the agro-ecosystems. The study areas are as follows – 1. Narendrapur [NPUR] (Block-Sonarapur) (22.4391°N and 88.3968°E), 2. Arapanch [ARPH] (Block - Sonarapur) (22.4491°N and 88.3915°E), 3. Sarisha [SRSH] (Block - Diamond Harbour) (22.1987°N and 88.2023°E), 4. Manasadwip [MSDP] (Block - Sagar) (21.753° N and 88.106°E.), 5. Nimpith [NMPT] (Block - Jaynagar II) (22.1772°N and 88.4258°E), 6. Kakdwip [KKDP] (Block –Kakdwip) (21.8760°N and 88.1853°E), 7. Gosaba [GSBA] (Block - Gosaba) (22.1652°N and 88.8079°E) (for further details see Basu & Raychaudhuri, 2016).

Time of study

Field visits were carried out in every month of any calendar year during the crop seasons. It was continued for two consecutive years, February 2014 to February 2016. The annual rainfall (average) in the district was 1796 mm. Temperature in the study areas varied from 10⁰C to 35 °C during the course of study.

3. MATERIALS & METHODS

For collection of spiders, sweep nets, bush beating and collection in inverted umbrella, hand picking techniques were used. Several pit fall traps were laid in the collection localities to trap ground dwelling spiders. Samples after collection [collector: D. Basu] were preserved in 70% alcohol and later transferred to glass vials filled with Audman’s fixative. Necessary labels were used to mark each of the samples. Data regarding locality, date of collection, collector’s name were noted in a note book in the field itself. The samples were then studied under Stereo zoom Binocular Microscopes Olympus SZX 10 and SZX 16.

Deposition

All materials are in the collection of Department of Agricultural Biotechnology, IRDM Faculty Centre, RKM Vivekananda University, Narendrapur.

4. RESULTS AND DISCUSSION

A total number of 557 araneid individuals distributed over 16 species under 7 genera is recorded of which 6 species belong to the genus *Neoscona* Simon, 1864. Genus *Eriovixia* Archer, 1951, contains 3 species while genera *Cyrtophora* Simon, 1864 & *Argiope* Audouin, 1826, have 2 species each. Rest 3 genera i.e. *Areneus* Clerck, 1757, *Larinia* Simon, 1874 and *Gasteracantha* Sundevall, 1833, have single species in each (vide Table 1, Plate 1 & Figure 1). Maximum number i.e. 7 araneid species are found from Narendrapur area and diversity wise Nimpith area is lowest (Figure 2). Moreover, Narendrapur also includes maximum of number of rare species (Figure 4). It is also evident that *Neoscona theisi* (Walckenaer, 1841) is the most dominant group amongst all araneids present in the rice land (Figure 3).

Table 1. Details of the araneid taxa recorded

Family	Genus	Species
Araneidae, Clerck, 1757	(i) <i>Neoscona</i> Simon, 1864	(1) <i>theisi</i> (Walckenaer, 1841)
		(2) <i>punctigera</i> (Doleschall, 1857)
		(3) <i>bengalensis</i> Tikader & Bal, 1981
		(4) <i>yptinica</i> Barrion & Litsinger, 1995

		(5) <i>nautica</i> (L. Koch, 1875)
		(6) <i>vigilans</i> (Blackwall, 1865)
(ii) <i>Eriovixia</i> Archer, 1951		(7) <i>excelsa</i> (Simon, 1889)
		(8) <i>poonaensis</i> (Tikader & Bal, 1981)
		(9) <i>laglaizei</i> (Simon, 1877)
(iii) <i>Areneus</i> Clerck, 1757		(10) <i>ellipticus</i> (Tikader & Bal, 1981)
(iv) <i>Larinia</i> Simon, 1874		(11) <i>phthisica</i> (L. Koch, 1871)
(v) <i>Cyrtophora</i> Simon, 1864		(12) <i>cicatrosa</i> (Stoliczka, 1869)
		(13) <i>moluccensis</i> (Doleschall, 1857)
(vi) <i>Gasteracantha</i> , Sundevall, 1833		(14) <i>kuhlii</i> C. L. Koch, 1837
(vii) <i>Argiope</i> Audouin, 1826		(15) <i>pulchella</i> (Thorell, 1881)
		(16) <i>catenulata</i> (Doleschall, 1859)

It is found that almost for all the genera, sex ratio increases typically during kharif session (October) while the number of male considerably reduces during February-March. In rabi session, the sex ratio in totality (male: female) is calculated as 1:32 which increases upto 1:7 during late monsoon. The possible reason may be the consumption of males by female individuals immediately after mating to fulfill the protein demand in their bodies; the presence of humidity in the environment and the upsurge of pests including other insects in agroecosystems at post rainy season (Figure 5).

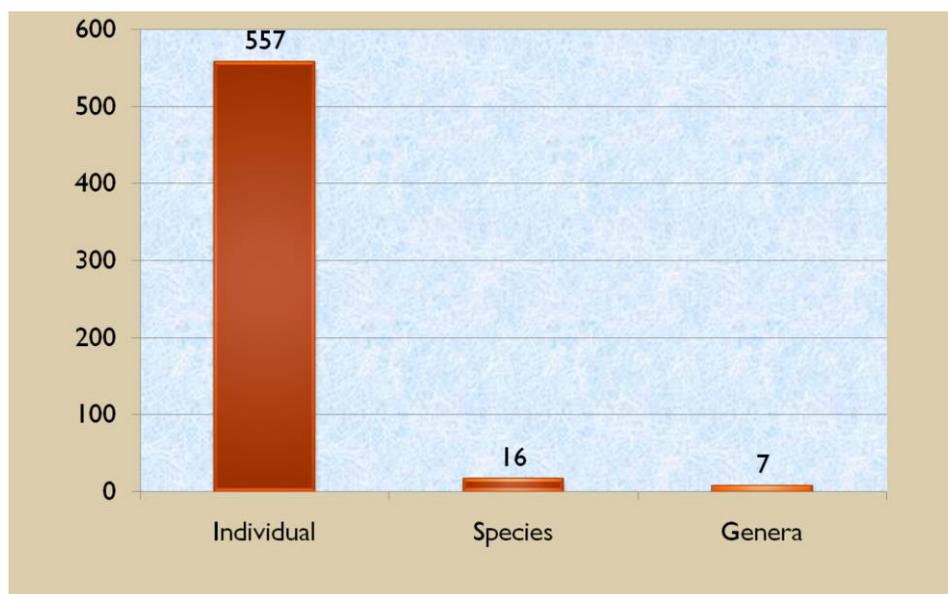


Fig. 1. Critical appraisal of the data showing total no. of araneid spiders Recorded from rice lands of South 24 Parganas

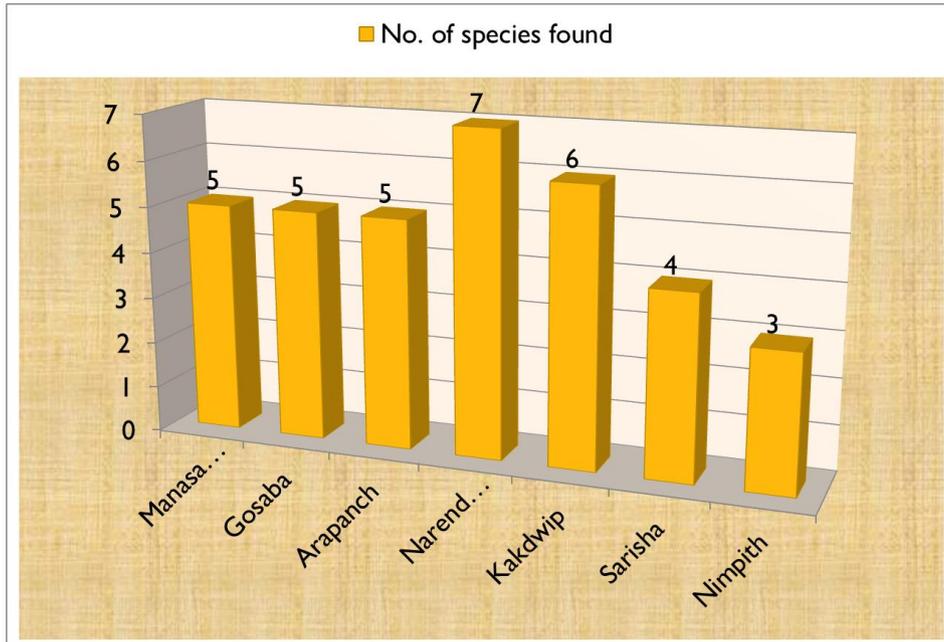


Fig. 2. Showing total no of species recorded from each study site

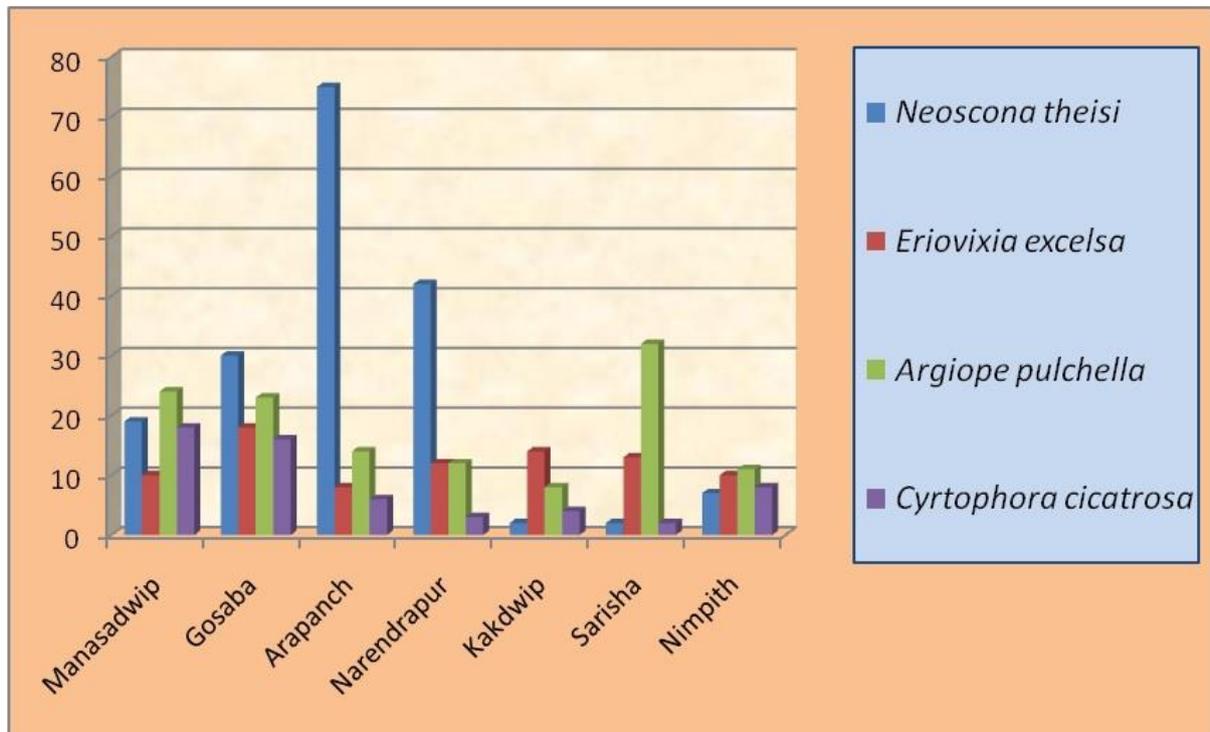


Fig. 3. Showing dominant species in the study sites

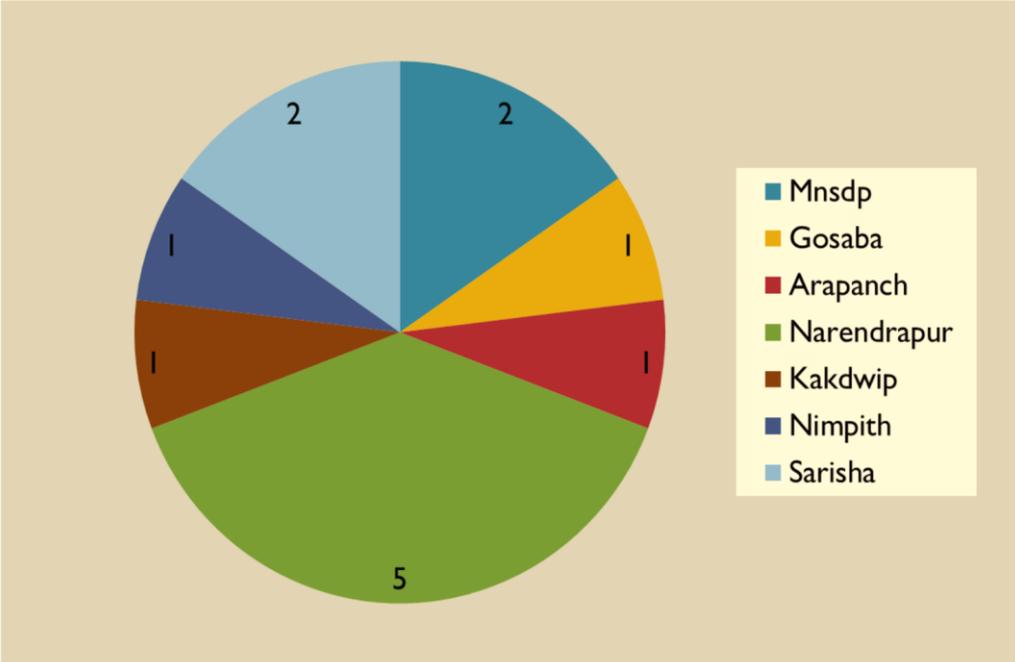


Fig. 4. Showing no of rare species in each of the study site



Fig. 5. Showing the ratio of male & female araneids in 2 cropping sessions

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Plate 1. Representatives of Orb-weaving genera recorded



Neoscona nautica (L. Koch)



Eriovixia excelsa (Simon)



Cyrtophora cicatrosa (Stoliczka)



Gasteracantha kuhii C. L. Koch



Argiope catenulata (Doleschall)



Araneus ellipticus (Tikader & Bal)



Larinia phthisica (L. Koch)