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INTERESTING OBSERVATION ON FOOD AND FEEDING BEHAVIOR OF A SPIDER *NEOSCONA MUKERJEI* TIKADER FROM BORTIBEEL NORTH 24 PARGANAS, WEST BENGAL

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INTRODUCTION

All spiders are carnivorous in habit. Their preys consist chiefly of insects. *Neoscona muckerjei* is a true web-building spider of paddy field. Its web act as natural insect trap which catch many more preys than the spider can eat. Prey caught differ in size, from large grass hopper, beetle, moths butterflies to small insects such as leaf hopper, gall wasps, fruit flies and small moths.

During last 4 years while carrying out the ecological investigation on wetland environment of Bortibeel, a 13 km stretched isolated gangetic marsh land covering about 300000 bighas of cultivated land and several agricultural and fishing villages situated between 88.29–88.38 degree East and 22.8–23.0 degree North of West Bengal, the authors came across the experimental spider species *Neoscona muckerjei* Tikader, belonging to the family Araneidae predating it's prey near the paddy field of the wetland. In this field we conducted an extensive behavioural observation in light of potential biological control of various insect pests by *Neoscona*.

The present paper deals with the details of the sites where the spider builds it's web for trapping insects as their prey as well as the way of natural control of the paddy pest population, area of paddy infestation (through illustration) in the wet land. It is also included the food and feeding habits of *N. muckerjei*, the places it stays near the web while retreat, the morphological structure and measurements of the spider and its prey, the time span it needs to capture the prey, and digestive mechanism along with the biological significance. It is well established that all spiders are carnivorous and their preys consist chiefly of insects with very few exceptions. But studies on the feeding behavior of web-building spiders are lacking from Bortibeel wet land area of North 24 parganas, West Bengal. However, Tikader (1961) made an observation on prey capturing and food

of spiders. Kumar *et al.*, (1977) published a note on trapping insects by spider web, Ram *et al.*, (1978) and Majumder (2001) observed some odonate predation by spider. Kulkarni *et al.*, (1999) reported some predatory behavior of *Nephila maculata* (Fabr.) and Chatterjee *et al.*, (1979) made an observation on some predator spiders from India. While Chowdhury *et al.*, (1981) studied on the rice field spiders from Chittagong, Bangladesh. In the present context the authors while conducting the ecological studies on Bortibeel wetland have come across one araneid spider *Neoscona mukerjei* Tikader preying on several insect pests of paddy field as their prey by trapping them in to their orb-web.

The present paper also deals with the prey capturing behavior of *N. mukerjei* in Bortibeel, composition of captured insects observed from September 2001 to January 2005 in their orb-web, population pattern and diversity of entangled insect paddy pests along with area of paddy infestation (through illustration).

MATERIAL AND METHOD

Study Area : Bortibeel, a 13 km stretch of isolated-gangetic-marsh-land crept up on several agricultural and fishing villages covering about 3,00,000 bighas of cultivated land situated between 22.8–23.0 degree Latitude and 88.29–88.38 degree Longitude in 5 assembly segment of Jagaddal, Khardah, Amdanga, Naihati and Barasat. The study area is situated between the 73/A bus road and Nilganj road in North-South and between NH34 and Kalyani high way in East-West. The most important thing of this wetland is the network of several canals namely Ichhapur Khal, Pancha khal, Trimohini khal, Koirapur khal, Basudevpur khal, Hanjana khal and Pakhimara Khal *etc.* The spots from which places we performed our present observations are Dogachi, Panpur, Mukundapur, Uchhegarh, Mahakaltala, Basudevpur, Kadamtala, Uttar Hansia, Dashgaria, Kaliaghata and Mathurapur in the western margin and Ratanpur, Taraberia, Beharia, Boseganchia, Baraganchia, Kushdanga, Tapanpur and Tentulia are in the eastern margin of the wet land. The eastern part of the wet land is lacking canal system while western part is comparatively well irrigated.

Climate : Monsoon prevails for about four months from mid of June to mid of October with high humidity. Annual range of humidity is between 85–95%. July-August are the heavy rainfall months with precipitations as high as 400 mm. Occasional rains are also encountered through out the year. Pre-monsoon is dry and warm with thunder storms. Post-monsoon is apparently cold with negligible rainfall. Maximum temperature reaches up to 45 degree celcius in May while the mean maximum temperature is 30 degree celcius observed in June. In the other hand the minimum temperature drops up to 8 degree celcius in January and the mean minimum temperature is 20 degree celcius.

Collections : Spiders were collected from the study areas directly from the webs by hand picking method, by the sweeping net and by dusting the nearby bushes into an inverted umbrella.

Preservation : Collected spider specimens were anaesthetized, killed in a killing jar and finally preserved in Oudman's preservative (90 parts 70% ethanol, 5 parts glycerol and 5 parts glacial acetic acid) in glass vials.

Identification : Well-preserved spider specimens were transferred in ethyle alcohol and studied under binocular microscope in a petri dish. The specimens were identified upto species level following Tikader (1982).

OBSERVATION

In a post monsoon evening on 29th September, 2001 while returning from the field (Basudevpur), we came across a medium size paddy grass hopper (*Oxya velox*, Fabr.) entangled in a vertically aligned hexagonal spider web of *Neoscona muckerjei* Tikader and the spider measuring about 13 mm rushed at the hopper. The spider is then pierced the hopper with the fangs of its chelicerae and retreated back with fear due to vigorous jerking of the web by the entrapped hopper. Due to lack of light that day we collected both the prey and predator without observing them further in their habitat. In the next very day while consulting literature for taxonomic studies it is revealed that *O. velox* is a destructive pest generally active on leaves and ears of paddy plant. Later on extensive observations were conducted in 19 separate spots (8 in east and 11 in west) to incorporate the prey-predator relationship between food habit of *N. muckerjei* and insects infesting paddy crop. An illustration is incorporated with this context tabulating the information available from the observations throughout the whole study period (Post Monsoon 2001-02 to Post Monsoon 2004-05) on 10 insect preys belong to 6 families were predated by *Neoscona muckerjei*, their systematic position, the part of plant they destroy and their abundance in eastern and western part of the wet land.

From our observation it is revealed that *N. muckerjei* build its snare to trap the prey and wait for them near by out side the web. Drag-line threads of the orb webs are the connecting link. As soon as the prey insect entangled in the web the spider retreats at once without fear at first approach as their instinct behaviour. In this action it pierces the prey with the fang. In maximum cases the spider then took a position of little away from the victim for a short while and watches. In very few occasions we have seen that it retreats, pierces repeatedly when after receiving the first poisonous bite also the prey was very active.

Some times the victim took 30–40 minutes to be totally inactive. In no case we saw a prey fights a little. Condition appears very pathetic to the victim that they entrapped more and more so long they try to escape themselves from the web. Then the spider approaches the prey and pulling out a bunch of thread from it's spinnerets by one of its hind leg first then the other and thrusts the flat bunch against the insect. Spider is then rolls the insect over and over and completely wrapped.

Table 1. : Showing the list of insect pests, the area of plant they destruct and their abundance in the wetland.

ELLUSTRATION-1					
Sl. No.	Scientific Name Common Name	Systematic position	No. of insect observed in east-margin of the wet land	No. of insect observed in west-margin of the wet land	Area of Destruction
1.	<i>Oxya velox</i> Paddy grass hopper	Order : ORTHOPTERA Family : ACEIDIDAE	++	+++	Leaves and ear
2.	<i>Hierolyphus banion</i> Rice Grass hopper	Order : ORTHOPTERA Family ACRIDIDAE	+	++	Leaves and ear
3.	<i>Leptocorisa acuta</i> Rice bug	Order HEMIPTERA Family ATYDIDAE	++	+++	Milky grain and leaf sheath
4.	<i>Nilaparvata lugens</i> Brownplant hopper	Order HEMIPTERA Family : DELPHACIDAE	++	++	Chaffy ears
5.	<i>Nephotettix virescens</i> Greenleaf hopper	Order : HEMIPTERA Family CICADELLIDAE	+	+++	Suck sap from the leaf
6.	<i>Orseolia oryzae</i> Paddy gall fly	Order : DIPTERA Family CECIDOMYIIDAE	0	+	Seedling which fails to bear ears
7.	<i>Atherigona oryzae</i> Paddy stem fly	Order : DIPTERA Family : ANTHOMYIIDAE	++	+++	Seedling
8.	<i>Scirpophaga incertulus</i> Whiteleaf hopper	Order LEPIDOPTERA Family : PYRALIDAE	+	+++	Sucking the green tissues
9.	<i>Anomala dimidiata</i> Shining beetle	Order : COLEOPTERA Family RUTELIDAE	++	+++	Cut ear
10.	<i>Dicladispa armigera</i> Rice hispa	Order COLEOPTERA Family HISPIDAE	++	+++	Green matter of leaves

Maximum = +++; Optimum = ++; Minimum = +; Nil = 0.

After successful wrapping it sucks the fluid from victims body. Perhaps their venomous injecting fluid also contains some digestive enzymes to degrade the polymers of their body. A total action of feeding behavior of *N. mukerjei* requires 20–60 minutes in which juice sucking took only 10–15 minutes. We observed the body of dead prey remains totally intact.

In a pre-monsoon day on June, 2003 we observed some *Neoscona* sucking water from the narrow stream of the paddy field. In another occasion we saw few spider of same group sucking water from the droplets gathers due to shallow pump irrigation on April, 2004.

DISCUSSION AND SIGNIFICANCE

It is revealed from this study that prey of *Neoscona* are chiefly insects both in flying and jumping habit (Table-1). Some times we also saw them feeding other spider species. In one occasion on December 2003 we saw a *Neoscona* adult female measuring about 12.5 mm feeding one male *Neoscona* of 10.2 mm long Showing the habit of cannibalism. More over, *Neoscona* web is a natural insect trap which catch many more prey than spider can eat. It is observed that while retreating young spiders bite repeatedly but relatively large spiders (11–13 mm) bite once to inactivate the prey may be due to high amount of venom injected by the larger spiders. In the present study 10 insect species were found in the paddy fields of Bortibeel which are pest to the crop and naturally controlled by *Neoscona mukerjei* and highly significant as they are potentially biocontrolling natural agent in paddy fields of Bortibeel Wetland.

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