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DIVERSITY OF SPIDER FAUNA OF BORTIBEEL NORTH 24 PARGANAS, WEST BENGAL, THEIR POSSIBLE UTILITIES AS SIGNIFICANT BIOLOGICAL PESTCONTROL IN THE PADDY FIELD-ECOSYSTEM

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INTRODUCTION

Information on spiders from Bortibeel wetland area was first reported by Talukdar and Majumder (2006) by their studies on web-building and food and feeding behavior of two araneid spiders. Taxonomic studies on paddy field spiders are lacking from this potential wetland. Reports on population fluctuation of spiders from wetland agriculture fields are very scanty. However, Alam *et al.* (1981), Chawdhury & Nagari (1981), Chawdhury & Pal (1984), Kamal *et al.* (1999 and 1992), Biswas (1990), Biswas *et al.* (1993) enlightened the studies of spiders in paddy field ecosystem.

During last 5 years while executing the ecological investigations on the wetland of Bortibeel, a 13 km stretched isolated Gangetic marsh land covering about 300 thousand bighas of cultivated land comprising several agricultural farms and fishing villages situated between 88.29–88.38 degree east and 22.80–23.00 degree north of West Bengal, the authors came across 3000 Acres and 1500 Acres of land for cultivation of paddy in Kharif and Boro seasons respectively yielding at least an average of 3.6 lack metric tones of paddy every year. During the study period 5507 specimens of spiders belonging to 39 families under 16 genera were recorded from the paddy plants, border weeds and ratoons as three micro habitats to predate about 10 potential destructors of paddy crop of the wetland during pre and post monsoon cultivations.

The present paper deals with the seasonal fluctuations of populations in different micro-habitats of paddy field spiders especially in the breeding seasons of insect and during the application of pesticide in the field thus left significant recommendation regarding awareness on environmental hazards and its natural control through conservation of spider population.

MATERIALS AND METHOD

Bortibeel : A 13 km stretch of marsh land crept up on several agricultural and fishing villages covering about 300000 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 87/A bus root and Nilganj road in North-South and between NH34 and Kalyani high way in East-West. Several rail stations like Halisahar, Naihati, Kankinara, Jagaddal, Shyamnagar, Ichhapur, Palta, Barrackpur and Barasat connect the large wetland area. Many villages like Ratanpur, Taraberia, Beharia, Boseganchia, Baraganchia, Kushdanga, Tapanpur and Tentulia are bordering the east while Dogachi Panpur, Mukundapur, Uchhegarh, Mahakaltala, Basudevpur, Kadamtala, UttarHansia, Dashgaria, Kaliaghata and Mathurapur are bordering the West of the Wetland. 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. are connecting Noai Khal (or Noai River) which was previously connecting the Vidyadhari River and also included in the riverine net work of GANGA which is now almost disconnected.

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 throughout 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°C in May while the mean maximum temperature is 30°C. observed in June. On the other hand the minimum temperature drops up to 8°C in January and the mean minimum temperature is 20°C.

Agriculture : Several paddy fields have grown in this wetland that are accessible only in the dry season up to early monsoon till the heavy rain stops and the stagnant water have dried up considerably. Rice of different varieties, Jute, Sugarcane and vegetable of almost all varieties possible to cultivate in this type of environment (on the comparatively uplands besides the fishery ponds) and are grown in this wetland. In Kharif season about 3000 Acres of total 6000 Acres of cultivated land of the wetland and 1500 Acres in Boro season produce approximately about 3.6 lacks metric tonne of paddy every year. Collections were made only from the paddy field in different seasons. Presence of wandering and sedentary spider species were recorded from the paddy foliage and from the Ratoons after harvesting the crop.

Aquaculture : Hundreds of reservoirs have been developed within the wetland area for the purpose of irrigation and aquaculture. Besides canal fisheries fishermen also developed the art of captive aquaculture with those man made and natural reservoirs.

Border weeds : Land scape of Bortibeel covers different types of vegetations. Paddy fields are scattered throughout the wetland mainly along the both sides of the canals. Unlike other rice

field these cultivated grounds are surrounded by bushy vagitations of different varieties of wild terrestrial and amphibious plants. A very good number of spiders were reported from these adjacent areas.

Instruments : Collections were performed by an inverted umbrella, forceps with soft-tension, small brush and with a standard hand sweeping net (129 cm in diameter). Sunca electronic emergency lamp was used during collection. Taxonomic studies have been made by a Olympus dissecting type binocular microscope with ocular micrometer while behavioral observations were done by a Samsung's field binocular (B-10 × 25N), an electronic stop watch. Black velvet paper and tabulated data sheets were used.

Collections : Spiders were collected from the selected plots of rice fields, associated host plants on border weeds and ratoons after harvesting the crops. They were simultaneously collected by hand picking and standered hand sweeping net (29 cm in diameter) and by dusting the nearby bushes into an inverted umbrella from the study areas directly from the webs and other habitats during pre and post monsoon paddy cultivations. The random sampling was done making 100 sweeps in each sampling site twice a month from paddy plants and border weed while only two sampling from ratoons considering early days and later days after harvesting the crops. The volume of collection was restricted by noting down the numbers against species after gathering morpho-taxonomical knowledge through early studies. Paddy pest insects also simultaneously collected from the study areas and incorporated in a table (Table 2) for better understanding.

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 sorted transferred in ethyle alcohol and studied under binocular microscope in a petridish. The specimens were identified upto species level.

OBSERVATIONS

A total of 39 species under 8 families were recorded from the rice plants, border weeds and ratoons after harvesting the crops. The occurrence of a total of 5507 spider specimens of 39 species were recorded in which 1223 examples from paddy field itself, 3855 from adjacent wild border weeds and 429 examples from the ratoon included 39 species altogether throughout the study period during Kharif and Boro seasons broadly as pre and post monsoon varieties of rice from Bortibeel and charted in Table 1. In other hand two species of Orthoptera, three species of Hemiptera, two species of Diptera, one species of Lepidoptera and two species of Coleoptera were recorded populations of which were incorporated in the table (Table 2).

Table 1. : Showing the list of spiders and their pattern of abundance in different micro habitats of paddy field ecosystem of Borti Beel among the pre and post monsoon varieties of rice during 2001-2005.

Name of the Species	Family	Pre-monsoon rice field			Post-monsoon rice field		
		Rice plant	Border weeds	Ratoons	Rice plant	Border weeds	Ratoons
<i>Argiope sillongensis</i>	ARANEIDAE	11	27	00	19	33	00
<i>A. pulchella</i>	"	14	36	00	17	46	00
<i>A. anasuja</i>	"	00	25	08	09	35	07
<i>Neoscona nautica</i>	"	12	61	03	26	68	00
<i>N. rumpfi</i>	"	03	29	06	11	39	00
<i>N. elliptica</i>	"	10	26	09	19	36	00
<i>N. mukerjei</i>	"	18	59	02	25	49	06
<i>N. bengalensis</i>	"	03	23	00	11	35	04
<i>Neoscona sp.</i>	"	11	20	05	21	45	03
<i>Leucauge decorate</i>	"	14	63	08	18	53	08
<i>Leucauge sp.</i>	"	02	32	00	13	37	05
<i>Larinia phtistica</i>	"	11	51	01	16	53	06
<i>Cyrtophora cicatrosa</i>	"	24	96	10	31	76	08
<i>C. bidenta</i>	"	15	85	08	18	55	05
<i>Tetragnatha mandibulata</i>	TETRAGNATHIDAE	17	58	11	14	52	15
<i>Lycosa kempfi</i>	LYCOSIDAE	16	95	04	21	85	06
<i>L. choudhuryi</i>	"	14	79	11	18	54	10
<i>Hippasa holmerae</i>	"	11	58	07	13	47	04
<i>Pardosa kupupa</i>	"	22	86	12	16	89	09
<i>P. leucopalpis</i>	"	06	61	05	31	65	00
<i>Arctosa indica</i>	"	13	42	03	18	34	02
<i>Oxyopes sunandae</i>	OXYOPIDAE	25	58	11	24	47	12
<i>O. shweta</i>	"	14	63	00	37	89	03
<i>O. ratnae</i>	"	33	43	00	39	65	10
<i>O. sakuntalae</i>	"	26	29	12	25	34	00
<i>Cheiracanthium trivialis</i>	CLUBIONIDAE	06	25	12	12	32	00
<i>C. melanostoma</i>	"	10	16	14	15	21	12
<i>Cheiracanthium sp.</i>	"	09	06	05	13	08	07

Table 1. : (Cont'd.).

Name of the Species	Family	Pre-monsoon rice field			Post-monsoon rice field		
		Rice plant	Border weeds	Ratoons	Rice plant	Border weeds	Ratoons
<i>Phidippus indicus</i>	SALTICIDAE	07	88	14	21	82	08
<i>P. bengalensis</i>	"	13	76	07	19	43	03
<i>Marpissa bengalensis</i>	"	08	59	09	26	36	06
<i>M. decorate</i>	"	00	51	08	49	64	09
<i>M. tigrina</i>	"	14	28	05	13	35	02
<i>M. calcutensis</i>	"	13	26	11	30	53	00
<i>Salticus ranjitus</i>	"	12	55	16	23	63	05
<i>S. sp.</i>	"	10	21	04	12	48	00
<i>Thomisus pugilus</i>	THOMISIDAE	06	25	03	03	26	02
<i>T. projectus</i>	"	02	20	06	06	49	00
<i>Uloborus sp.</i>	ULOBORIDAE	15	32	04	11	41	03
Number of examples		460	1933	249	763	1902	180
Number of Species		37	39	33	39	39	28

Table 2. : Showing the list of insect pestes and their patern of abundance in different micro habitats within the paddy plant ecosystem as the area of destruction in Borti Beel among the pre and post monsoon varieties of rice during 2001-2005.

Sl. No.	Scientific Name/ Common Name	Systematic position	No. of insect observed in pre-monsoon crop	No. of insect observed in post-monsoon crop	Area of Destruction
1.	<i>Oxya velox</i> / Paddy grass hoper	Order ORTHOPTERA Family ACRIDIDAE	+++	++	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> / Brown plant hopper	Order HEMIPTERA Family DELPHACIDAE	++	++	Chaffy ear
5.	<i>Nephotetix virescens</i> / Green leaf hopper	Order HEMIPTERA Family CICADELLIDAE	+++	+	Suck sap from the leaf

Table 2. : (Cont'd.).

Sl. No.	Scientific Name/ Common Name	Systematic position	No. of insect observed in pre-monsoon crop	No. of insect observed in post-monsoon crop	Area of destruction
6.	<i>Orseolis 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> / White leaf hopper	Order LEPIDOPTERA Family PYRALIDAE	++	+	Sucking the green tissues
9.	<i>Anomala dimidiata</i> / Shining beetle	Order COLEOPTERA Family RUTELIDAE	+++	++	Cut ear
10.	<i>Dicadispa armigera</i> / Rice hispa	Order COLEOPTERA Family HISPIDAE	+++	++	Green matter of leaves

Maximum = +++; Optimum = ++; Nil = 0

DISCUSSION AND SIGNIFICANCE

It is revealed from this study that spiders are commonly observed in all the three micro habitats in the paddy fields of Bortibeel in both the crops of pre and post monsoon. In border plants the population is higher than the paddy plants might be due to restrictions of feeding habit, less diversity in foliage habitat, variation in intensity of light (which help the spiders to hide before attack), higher influx of pesticide in paddy plants and higher availability of prey in border plants. In pre-monsoon paddy crops 460 spiders from 37 species of 16 genera were recorded from the rice plant itself whereas 1933 number of individual from 39 species of 16 genera were recorded from the border weeds. The picture is same in other season crops also.

Though post monsoon crop, spider population is almost two fold higher *i.e.*, 763 individuals from 39 species of 16 genera in paddy plants and 1922 number of individuals from 39 species of genera have been recorded may be due to lower temperature and rainfall, less pesticide influx greater availability of prey population. About the population of spiders in ratoons the picture is almost same. In pre-monsoon crop the post harvesting environment instead of decreasing spider habitat the ratoons grow once again due to presence of water in the field and increase the habitat. The number of spiders recorded are 249 and 180 in pre and post monsoon ratoons respectively. The 10 insect species belonging to Orthoptera (Acrididae), Hemiptera (Atydidae, Delphacidae and Cicadellidae), Diptera (Cecidomyiida and Anthomyiidae), Lepidoptera (Pyralidae) and Coleoptera (Rutelidae and Hispidae) which destruct different parts of paddy have been recorded in the field

were devoured by the spider species indicating that the spiders have significant potentiality as biological pest controlling agent in the paddy fields of Bortibeel wetland.

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REFERENCES

- Alam, S., Catling, H.D., Kalam, R., Alam, M.S. and Qurashi, N. 1981. Checklist of rice insects in Bangladesh, *Bangladesh J. Zool.*, **9**(2) : 91-96.
- Biswas, V. 1990. *The ecological studies on the population of rice field spiders*. M.Phil. Thesis. Dept. of Zoology, University of Dhaka, Bangladesh, 1-277.
- Biswas, V., Kamal, N.Q. and Begam, A. 1993. A preliminary study of the rice field spiders in Jhanidah, Bangladesh, *Bangladesh J. Zool.*, **21**(2) : 84-92.
- Chawdhury, S.H. and Nagari, S. 1981. Rice field spiders from Chittagong, *Proc. Zool. Soc. Bangladesh*, 53-72.
- Chawdhury, S.H. and Pal, S.K. 1984. Further report on rice field spiders from Bangladesh. *Chittagong Univ. Studies*, II. **8** : 25-39.
- Kamal, N.Q., Begam, A. and Biswas, V. 1992. Studies on the abundance of spiders in rice field eco-system, *J. insect. sci.*, **5**(1) : 30-32.
- Majumder, S.C. and Talukdar, S. 2006. Some Interesting observation on Food & Feeding behavior of a true weaving spider (*Neoscona nautical* (L. Koch)) from BortiBeel, North 24 Parganas, West Bengal. *Proceeding of the 93rd Session of Indian Science Congress* (Hyderabad, 3-7 January) : Animal, Veterinary and Fishery Sciences, Advance Abstract No. 133 : p. 100.
- Talukdar, S. and Majumder, S.C. 2006. Some aspects of Web Building Mechanism by an araneid spider (*Argioe pulchella* Thorell) from BortiBeel, North 24 Parganas, West Bengal. *Proceeding of the 93rd Session of Indian Science Congress* (Hyderabad, 3-7 January) : Animal, Veterinary and Fishery Sciences, Advance Abstract No. 132 : p.