

Community turn over of flood water arthropods in an irrigated rice ecosystem of Tamil Nadu, India

M.KANDIBANE

Department of Agricultural Entomology and Nematology, Pandit Jawaharlal Nehru College of Agriculture and Research Institute, KARAIKAL (PUDUCHERRY) INDIA

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An investigation on the community turn over of flood water arthropods in weeded and partially weeded rice ecosystems was carried out in a rice field trial conducted at the wetlands of Agricultural College and Research Institute, Madurai, Tamil Nadu during *kharif* 2000 on four ruling rice varieties. The study revealed that in the first week, the turn over rates of 40.00, 41.17, 33.33 and 47.05 per cent were recorded in weeded plots. But, in partially weeded plots the turn over rates were 42.10, 48.00, 42.85 and 50.00 per cent in MDU 5, ADT 36, ADT 39 and ADT 43, respectively. In the weeded plots there was a decline of community turn over of arthropods, where as the increased trend of turn over was recorded from the first to the last week in partially weeded plots. A total of 23 species of flood water arthropods containing 12, 2, 6 and 3 species of Odonata, Ephemeroptera, Hemiptera and Coleoptera were recorded, respectively, in both the ecosystems. A total of 18 weed species were recorded in partially weeded rice ecosystem. Among them, *Cyperus iria*, *C. rotundus*, *C. difformis*, *Echinochloa colonum*, *E. crus-galli*, *Panicum repens*, *Brachiaria mutica* and *Eclipta alba* were dominant.

Key words : Flood water arthropods, Odonata, Ephemeroptera, Hemiptera, Coleoptera, Community turn over, Weed plants

INTRODUCTION

Numerous species of flood water arthropods are residing in rice aquatic ecosystem of Tamil Nadu. In the philippines, Barrion (1979) recorded the two species of giant water bug viz., *Diplonychus rusticus* (Fabricius) and *Lethocerus indicus* (Lepeletier + Serville) (Hemiptera: Belostomatidae), the species of water measurer, *Hydrometra lineata* Eschsch (Hemiptera: Hydrometridae) and the two species of back swimmer, *Anisops kurawai* Matsumura and *Anisops* sp., (Hemiptera: Notonectidae) in wetland rice conditions. Sridharan *et al.* (2000) recorded *Anisops sardea* species of backswimmer and *H. vittata* species of water measurer in an irrigated rice ecosystem of Tamil Nadu, India. In Tamil Nadu, community turnover of flood water arthropods had not been studied earlier. Hence, the present investigation was taken up with a view to know the community turnover and species of aquatic arthropods between weeded and partially weeded rice ecosystems of Tamil Nadu.

MATERIALS AND METHODS

A field trial was conducted in an irrigated condition at the Wetlands of Agricultural College and Research Institute, Madurai, during *kharif* 2000 at an altitude of 147 m msl with temperature ranging between 24 and 38° C. The study area received water from the Vaigai dam and the

annual rainfall was 928.00 mm in the year, mostly from the northeast monsoon between July and November. The size of the experimental plots was 5 x 5 m during the season. In this season four ruling rice varieties viz., MDU 5, ADT 36, ADT 39 and ADT 43 were grown and each variety was subdivided into weeded (all the weed plants removed) and partially weed plot (10 weed plants per square metre allowed with rice plants). A spacing of 30 cm was allowed between treatments. Twenty five sweeps were made diagonally across each plot with dip net and the collected materials were flushed into coded vials containing 70 % ethyl alcohol. The collection of aquatic arthropods was done at weekly intervals from 30 days after transplanting. The collected arthropods were recorded and the data were used for a statistical analysis.

On each date t after the first sample, to obtain estimates of succession rates in weeded and partially weeded ecosystems, a modification of Sorensen's index of similarity was used (Diamond, 1969).

$$\% T_o(t) = 100. [(a+b) / (c+d-e)].$$

Where, a is the number of taxa in the 1st sample but not in sample t

b is the number of taxa in sample t but not in the 1st sample

c is the number of taxa present in the 1st sample

d is the number of taxa present in sample t and

e is the number of joint taxa occurring in both samples

RESULTS AND DISCUSSION

The study revealed that community turn over rates of taxa for flood water arthropods were comparatively more in partially weeded plots than in weeded plots (Table 1). The reason may be due to presence of more plant density, which may reduce the temperature of water. In the first week, the turn over rates of 40.00, 41.17, 33.33 and 47.05 per cent were recorded in weeded plots. But, in partially weeded plots the turn over rates were 42.10, 48.00, 42.85 and 50.00 per cent in MDU 5, ADT 36, ADT 39 and ADT 43, respectively. In the weeded plots there was a decline of community turn over of arthropods observed,

species in both the ecosystems, but were significantly dominant in partially weeded rice ecosystem. The other species, *Agriocnemis pygmaea* Rambur, *Ishnura* sp. of damselflies, *Neurothemis tullia* (Drury), *Traemea limbata* (Desjardin), *Orthetrum sabina* (Drury), *Rhyothemis variegata* (Linnaeus), *Trithemis* sp., *Anax guttatus* (Burmeister) and *Traemea limbata* (Desjardin) of dragonflies recorded less individuals in both the ecosystems. Of the two species of mayflies, *Procladius harveyi* recorded more individuals in weeded plots than in partially weeded plots. However, *Beatis* sp., exposed less abundance in both weeded as well as partially

Table 1 : Community turnover of flood water arthropod in an irrigated rice ecosystem during kharif 2000

Sr. No.	MDU 5		ADT 36		ADT 39		ADT 43	
	*	**	*	**	*	**	*	**
1.	40.00	42.10	41.17	48.00	33.33	42.85	47.05	50.00
2.	52.63	54.54	47.36	58.06	44.44	52.00	57.14	64.00
3.	36.36	63.15	37.50	60.00	40.00	67.74	42.85	70.83
4.	47.05	69.56	57.14	72.22	60.80	70.96	55.00	71.87

* Weeded rice ecosystem

** Partially weeded rice ecosystem

Value in the columns are sorenson's indices

where as the increased trend of turn over was recorded from the first to the last week in partially weeded plots. Per cent turnover is denoted by the presence of the original species captured in later samples in comparison to early sample which may increase after a period of decline due to newly colonizing species (Myster and Rickett, 1994). Moreover, species turnover increases with time in both the partially weeded and weeded plots with the former increasing faster than the latter on most sampling dates (Schoenly *et al.*, 1998).

The turn over rates of flood water arthropods in the first week were lower in weeded plots (40.00, 41.17, 33.33 and 47.05 %) than in partially weeded plots (42.10, 48.00, 42.85 and 50.00 %). The highest turn over rates of 69.56, 72.22, 70.96 and 71.87 per cent were recorded in partially weeded plots of MDU 5, ADT 36, ADT 39 and ADT 43 in the last week. The gap of turn over was more between weeks in case of weeded plots than in partially weeded plots. However, the gap of turn over between the first and the last weeks was more in partially weeded plots (> 15 %) than in weeded plots (<10%).

A total of 23 species of aquatic insects were recorded in both the ecosystems. Among them, *Agriocnemis femina femina* Brauer of damselfly, *Crocothemis servilia* (Drury), *Pentala flavescens* (Fabricius) and *Diplocodes trivialis* (Rambur) of dragonflies were the dominant

weeded plots. *Laccotrephes ruber* (Linnaeus) of water scorpion and *Hydrometra freeni* Kirkaldy of water measurer were recorded in both the ecosystems and occurred with few individuals. There were the two species of backswimmer, *Anisops bouveri* Kirkaldy and *Anisops cavifrons* Brooks recorded in both the ecosystems. Among them, *A. bouveri* Kirkaldy was found to be a dominant species, where as *A. cavifrons* Brooks was a rare species. The giant water bug, *Lethocerus indicus* (Lepeletier + Serville) and *Hydrophilus* sp., of water beetle were less dominant and occurred in both the ecosystems.

A total of 18 weed species were recorded in partially weeded rice ecosystem. Among them, *Cyperus iria*, *C. rotundus*, *C. diformis*, *Echinochloa colonum*, *E. crus-galli*, *Panicum repens*, *Brachiaria mutica* and *Eclipta alba* were dominant. They prevented penetration of sun light and temperature through canopy and maintained more relative humidity in partially weeded rice ecosystem than in weeded rice ecosystem during tillering stage.

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