RELATIVE ABUNDANCE AND DIVERSITY OF ODONATA IN AN IRRIGATED RICE FIELD OF MADURAI, TAMIL NADU

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Abstract

A total of 12 taxa of odonata of nine Anisoptera and three Zygoptera were recorded during kharif 2000 in an irrigated rice field of Madurai. Among anisopterans, four species, Pantala flavescens *(Fabricius),* Diplocodes trivialis *(Rambur),* Crocothemis servilia *(Drury) and* Tramea limbata *(Desjardins) were dominant. Among zygopterans,* Agriocnemis femina femina *Brauer was the dominant species recorded in weeded and partially weeded ecosystems. The four species of dragonflies and one species of damselfly had comparatively more abundance in partially weeded rice ecosystem than in weeded rice ecosystem. Rare species like* Orthetrum sabina *(Drury),* Rhyothemis variegata *(Linnaeus),* Neurothemis tullia *(Drury),* Anax guttatus *(Burmeister) and* Trithemis *sp. with fewer individuals occurred only at the tillering stage of crop growth.*

Keywords

Anisoptera, diversity, Madurai, Odonata, relative abundance, rice ecosystem, weeding, Zygoptera

Odonata is the largest insect order, which is entirely predaceous in rice ecosystem. Both naiads and adults are voracious predators on other insects. Gunathilagaraj *et al*. (1999) recorded 16 species of Odonata in rice fields of Coimbatore, Tamil Nadu, India. Barrion and Litsinger (1994) listed 14 species of Odonata in rice fields of Asia and Africa. As for their predatory role in rice fields, the damselflies *Ishnuera senegalensis*, *Agriocnemis pygmaea*, *Ishnuera delicata* and *Ceriagrion coromandelianum* (Krishnasamay *et al*., 1983) were reported to be predating upon leaf- and planthoppers. They also reported the dragonflies *Orthetrum Sabina, Crocothemis servilia*, *Pantala flavescens* and *Diplocodes nubulosa* as effective predators of rice Lepidoptera. The present paper deals with the diversity of Odonata in rice ecosystem of Madurai, Tamil Nadu.

Materials and Methods

The diversity and relative abundance of Odonata was studied at the Wetlands of Agricultural College and Research Institute, Madurai, Tamil Nadu. The study area receives water from the Vaigai dam. The minimum and maximum temperatures of the experimental area were 28^{0}C and 40^{0}C, respectively, during Kharif (2000). The average rainfall of study area recorded was 928mm. Four popular rice varieties, *viz.,* MDU 5, ADT 36, ADT 39 and ADT 43 were used during this season. Each variety was replicated into two treatments namely weeded plots (all the weeds removed) and partially weeded plots (10 weeds allowed/ m^2). The size of the experimental plot was 8 x 6m. The collection of adult dragonflies and damselflies in rice canopy ecosystem was done with sweep net. The collected adults were sorted out into respective taxa based on taxonomic characters and number of individuals in each taxon recorded. Sampling was taken at weekly intervals and a total of nine samplings taken during Kharif (2000). In the present investigation, Jaccard coefficient index of similarity (Jaccard, 1908) was used to study the diversity of Odonata between weeded and partially weeded rice ecosystems.

Jaccard index (Cj) = j/(a + b – j)

j = Number of taxa occurring in both samples A (weeded) and B (partially weeded)
a = Number of taxa in sample A (weeded) and
b = Number of taxa in sample B (Partially weeded)

Results

The present study revealed that a total of 12 taxa of Odonata comprising of nine Anisoptera and three Zygoptera were recorded (Table 1). Among the Anisoptera, *Pantala flavescens* (Fabricius.), *Diplocodes trivialis* (Rambur), *Crocothemis servilia* (Drury) and *Tramea limbata* (Desjardins) were the dominant species. Other species, *Orthetrum Sabina* (Drury), *Rhyothemis variegata* (Linnaeus), *Neurothemis tullia* (Drury), *Anax guttatus,* and *Trithemis* sp. were recorded only at the tillering stage of the crop. Among the three species of Zygoptera, *Agriocnemis femina femina* Brauer was the dominant species than *Agriocnemis pygmaea* Rambur and *Ishnura* sp. The similarity statistics of dragonfly exhibited the similarity values between 0.77-0.88 in the first week and showed greater diversity (0.50) during fourth, fifth, sixth, seventh and eighth weeks (Table 2). Damselfly registered higher diversity (0.50) from the second week to seventh week. Both the dragonfly and damselfly exhibited 0.50 similarity index during the fourth week sampling. The present study revealed that the dragonfly showed perfect similarity in the first week while the damselfly registered perfect similarity in the last week. The diversity of both dragonfly and damselfly did not show variations between the varieties. The diversity of adults was more in partially weeded plot, which had 18 species of weed plants. Among them *Echinochloa colonum, Cyperus rotundus*, *Cyperus iria*, *Cyperus difformis, Panicum repens* and *Bracharia mutica* were dominant.

Discussion

This study indicates that *P. flavescens* (Fabricius.), *D. trivialis* (Rambur), *C. servilia (*Drury), *T. limbata* (Desjardin) and *A. femina femina* Brauer showed greater dominance in all the week samplings. This was in accordance with the statement of Shelton and Edward (1983) who stated that common species had more individuals than rare species and had the ability to

Manuscript 1293; Received 20 November 2004; Revised received 04 May 2005; Finally accepted 29 August 2005; Date of publication 21 October 2005

Table 1. Relative abundance of Odonata in irrigated rice ecosystem.

	Weeded *	Partially weeded *
Zygoptera		
Coenagrionidae		
1. *Agriocnemis femina femina* Brauer	42	64
2. *Agriocnemis pygmaea* Rambur	16	22
3. *Ishnura* sp.	7	10
	65	**96**
Anisoptera		
Libellulidae		
4. *Pantala flavescens* (Fabricius.)	16	31
5. *Diplocodes trivialis* (Rambur)	14	24
6. *Crocothemis servilia* (Drury)	12	18
7. *Orthetrum sabina* (Drury)	-	5
8. *Trithemis* sp.	2	4
9. *Rhyothemis variegata* (Linnaeus)	4	6
10. *Neurothemis tullia* (Drury)	4	5
Aeshnidae		
11. *Anax guttatus* (Burmeister)	2	4
12. *Tramea limbata* (Desjardin)	9	12
	63	**109**

* Values in the columns are the total number of individuals collected during *kharif* 2000.

Table 2. Taxonomic similarity of Odonata between weeded and partially weeded rice ecosystems.

Fauna	I week				II week			
	MDU5	ADT36	ADT39	ADT43	MDU5	ADT36	ADT39	ADT43
Dragonfly	0.88	0.77	0.83	0.80	0.71	0.75	0.75	0.75
Damselfy	1.00	1.00	1.00	1.00	0.50	0.50	0.50	0.50

Fauna	III week				IV week			
	MDU5	ADT36	ADT39	ADT43	MDU5	ADT36	ADT39	ADT43
Dragonfly	0.60	0.66	0.71	0.66	0.57	0.50	0.50	0.50
Damselfy	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50

Fauna	V week				VI week			
	MDU5	ADT36	ADT39	ADT43	MDU5	ADT36	ADT39	ADT43
Dragonfly	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Damselfy	0.48	0.40	0.45	0.40	0.41	0.42	0.41	0.42

Fauna	VII week				VIII week			
	MDU5	ADT36	ADT39	ADT43	MDU5	ADT36	ADT39	ADT43
Dragonfly	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Damselfy	0.42	0.45	0.42	0.44	0.60	0.70	0.75	0.75

Fauna	IX week			
	MDU5	ADT36	ADT39	ADT43
Dragonfly	1.00	1.00	1.00	1.00
Damselfy	0.71	0.83	0.83	0.83

* Values are Jaccard indices

survive in existing environmental conditions. The Odonata showed greater diversity during successional age of the crop growth. This is probably due to canopy closure and availability of relative humidity and weed plants as suggested by Lawton (1983).

The adults of dragonfly and damselfly were present through out the season. But, neither showed higher diversity with reference to number of individuals. Hurd *et al.* (1971) stated that the abundance of one group of insects is to have little effect on the other species in a stable ecosystem. In the fourth week of sampling, both dragonfly and damselfly exhibited same level of similarity. Species of dragonfly and damselfly preferred tillerring stage of the diversified ecosystem because the canopy of weed plants and rice crop covered the entire surface area to create a favourable microclimate for the abundance of dragonfly and damselfly species. This is in consonance with the view of Mac Arthor (1965) who stated that the adjustment in species abundance is more in diversified ecosystem.

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