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DISTRIBUTION AND ABUNDANCE OF ODONATES, IN PALAKMATI STREAM OF NARMADA RIVER BASIN

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ABSTRACT

During the present study, odonatan diversity of Palakmati stream was evaluated, using Shannon-Weiner diversity index and Margalef's richness index. Within a 100 m transect, encircling the variety of habitats, odonates were sampled from all the major habitats. A total of 11 species, belonging to 6 families of odonates were recorded, during the study. It was observed during the investigation that, aquatic vegetation forms the favorable habitat for odonates, while it gets negatively affected by the limited shade cover and less riparian vegetation, along the stream banks. During the present survey, low species diversity and richness of odonates were observed in Palakmati stream, possibly due to limited shade cover.

KEYWORDS: Odonates, Stream, Narmada River, Riparian Zone

INTRODUCTION

Odonates are one of the ancient orders of insects, found flying over forest, fields, meadows, ponds and rivers. The dragonflies and damselflies make up this single order in the class Insecta. It first appeared during the Carboniferous era, about 250 million years ago along with mayflies-Ephemeroptera (Subramanian, 2005). However, first attempt to use dragonflies as indicators have been made in South Africa (Clark and Samways, 1996). Odonata nymphs occupy an important position in the aquatic insect community (Kaushik *et al.*, 1990a; 1990b). The adults are terrestrial and the larvae are aquatic. Nowadays, they are explicitly used as an ideal candidate for biomonitoring (Needham *et al.*, 2000 and Bhawsar et al., 2015). Globally 5,740 species of odonates are known of this 470 species in 139 genera and 19 families exist in India. Based on morphology, the order Odonata are divided into three groups, *viz*. damselflies (Zygoptera), Anisozygoptera and dragonflies (Anisoptera). However, recent studies groups Anisozygoptera with Anisoptera, or some authors brings them together, under a new name Epiprocta (Anisoptera + Anisozygoptera) (Subramanian, 2005). The predatory nymphs of odonates are an important part of aquatic food webs. Also, the aquatic stages of mosquitoes comprise a significant part of the diet of many immature odonates (Ward, 1992). Indeed, odonates were one of the first arthropods to be examined as biological control agents against mosquitoes, but difficulties with colonization, production and handling impeded their deployment (Legner, 1995). The present study was conducted on the Palakmati stream in order to know the diversity of odonates with respect to their habitat. Earlier, only a few works was done on the diversity of odonates in water bodies of Madhya Pradesh (Kaushik *et al.*, 1990a and1990b). This preliminary compilation of the dragonfly and damsefly fauna may serve as a baseline for future studies and to understand the ecology of odonates.

MATERIALS AND METHODS

Study Area

The major tributaries of Barn stream network of Narmada River basin are Barna, Satdhar, Jamner, Narheri, Chamarsil and Palakmati. The present study was conducted on Palakmati. The Palakmati stream flows through the town Sultanpur, Madhya Pradesh, India. It is located at latitude 23^0 2' 02.1" N, longitude 77^0 56' 11.7" E at an elevation of 364msl. The Palakmati stream, drains into the Barna reservoir – a wetland of national importance and forms a treasure of aquatic biodiversity. Thus, it becomes important to study the biodiversity of the stream.

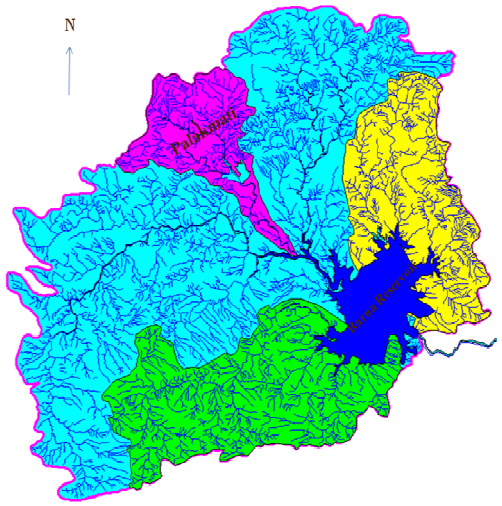

Figure 1: Map Showing Study Area

Collection of Odonates

During the present study, two sampling sites within a 100 m transect was established encircling the variety of habitats present in the Palakmati stream. Site-I encompasses aquatic vegetation and good riparian zone whereas the site-II comprised of less riparian vegetation with grazing land along the stream banks. A standard D-net (35 cm dia. and 70 cm ht.) was used in macrophytes to catch the odonates (Subramanian and Sivaramakrishnan, 2005; Hofmann and Mason, 2005). These samples were brought to the laboratory for sorting and identification. Floating vegetation in the stream was also searched with binoculars in order to include species that preferentially rest on aquatic vegetation. All samples were sorted in the laboratory within 2-3 days and were identified under stereo dissecting microscope by using appropriate identification keys viz., Fraser (1934) and Subramanian (2005).

Data analysis

Odonata diversity was computed for Shannon's diversity index and Margalef's richness index by using PAST software.

RESULTS AND DISCUSSIONS

Odonates species diversity and percentage composition

Overall 158 ind.m^{-2} belonging to 11 species and 6 families were collected throughout the study period. Out of which 104 ind.m^{-2} (65.82%) were collected from site-I and 54 ind.m^{-2} were collected from site-II (34.17%). A total of 7

species belonging to anisoptera and 4 species, belonging to zygoptera were found during the present survey. Among anisoptera, the density of Aeshnidae (47.91%) was found dominating followed by Gomphiidae (34.37%) and least reported were Libellulidae (17.70%). Among zygoptera, Coenagrionidae (50%) was found in abundance followed by Platycnemididae (46.77%) and least recorded were Calopterygidae (3.22%). However, Aeshnidae contributing 29.11% was the dominant family, followed by Gomphiidae (20.88%), Coenagrionidae (19.65%), Platycnemididae (18.35%), Libellulidae (10.75%) and least found were Calopterygidae, with a contribution of 1.26% to the overall population, recorded during the present study (Fig.2). Similar results with 10 species (seven zygoptera and three anisoptera) were recorded, along the low land river catchment England (Hofmann and Mason, 2005) and 21 species belonging to 4 families in certain water bodies of Madhya Pradesh (Kaushik *et al.*, 1990a). Detailed structure of odonates is listed below (Table:1 and Fig.3).

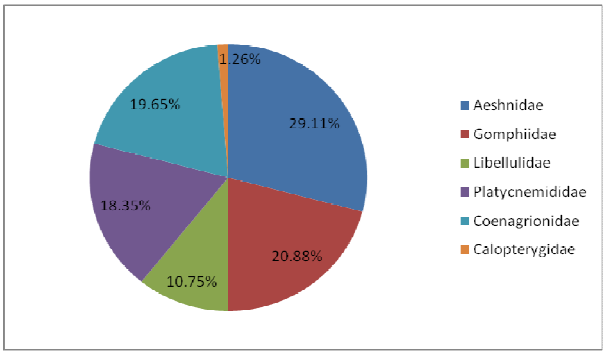

Figure 2: Percentage Composition of Odonatan Families during the Study in Palakmati Stream

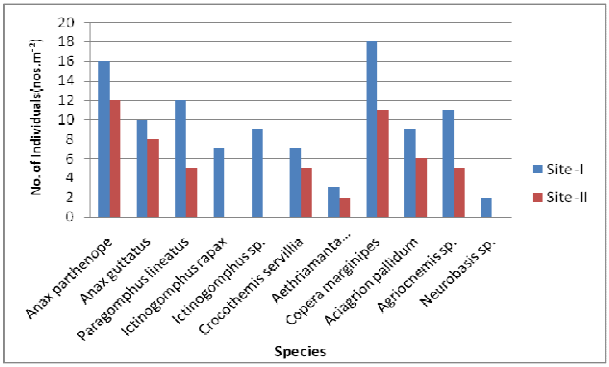

Figure 3: Composition of Odonates (ind.m^{-2}) During the Study in Palakmati Stream

Table 1: Diversity of Odonates during the Study at Palakmati Stream

S. No.	Family	Species	Site -I	Site -II
1	Aeshnidae	Anax parthenope	+	+
2		Anax guttatus	+	+
3	Gomphiidae	Paragomphus lineatus	+	+
4		Ictinogomphus rapax	+	_
5		Ictinogomphus sp.	+	_
6	Libellulidae	Crocothemis servillia	+	+
7		Aethriamanta brevipennis	+	+
8	Platycnemididae	Copera marginipes	+	+
9	Coenagrionidae	Aciagrion pallidum	+	+
10		Agriocnemis sp.	+	+
11	Calopterygidae	Neurobasis sp.	+	_
	Total	**11**	**11**	**8**

Shannon Diversity Index

The values of Shannon diversity index were found 1.968 and 2.269. The highest value was obtained for site-I and lowest at site-II.

Margalef's Index

The Margalef's index was found 2.153 at site- I and 1.755 at site-II, which shows that, there is rich species diversity at site-I and comparatively low at site-II, which is also reflected in values obtained from Shannon's diversity index.

During the present study, the rich diversity of odonates at site-I was attributed to the favorable habitat formed by the presence of aquatic vascular plants (Kaushik *et al.*, 1990a and 1990b; Ameilia, 2006; Arulprakash and Gunathilagaraj, 2010) while the minimum diversity of odonates at site-II was due to no or limited shade cover and less availability of food sources (Arulprakash and Gunathilagaraj, 2010), discharge of sewage water (Che Slamah *et al.*, 1998) and presence of insectivorous fishes (Blaustein, 1992). The abundance of Aesnhidae in the present study was, due to their short life cycle and wide spread distribution (Norma-Rashid *et al.*, 2001). The low diversity of odonates recorded in the present survey was due to the removal of riparian vegetation and discharge of sewage transmitting high nutrient loads to the stream water which affected the food availability and disturbed the habitats of the odonates as reasoned by Adams and Fitch (1998) and Hornung and Rice (2003). The anthropogenic activities observed near the stream were also found responsible for disturbing the habitats of odonates consequently poor diversity was recorded in Palakmati.

CONCLUSIONS

It was observed during the study that aquatic vegetation forms the favorable habitat for odonates while the diversity gets negatively affected by the sewage water and grazing lands along the stream. Odonates in the Palakmati stream face threats to their survival as clearly seen from low species diversity and richness observed during the study and it may be due to the human impacts which have destroyed their pristine habitats (Norma-Rashid, 2001). Even this diversity level may not prevail in future, if conservation measures regarding habitat restoration and afforestation will not be entertained all along the Palakmati stream. Dragonflies and damselflies are aesthetic as well as ecologically conspicuous insects and are important biological indicators for monitoring freshwater and wetland habitats (Hornung and Rice, 2003) and thus be protected from anthropogenic threats in Palakmati streams.

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