

Assessment of Water Pollution using Bioindicator (Odonata and Mollusca) in Narmada basin at Jabalpur : A Developing Smart City

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ABSTRACT

The smart city mission with “Clean Narmada, Green Jabalpur” intends to promote adoption in environment with basic infrastructure to give a decent quality of life. A clean and sustainable environment of Jabalpur using bio indicators species such as Mollusca and Odonata will be applicable as smart solution where environment disturbed through anthropogenic activities. Odonata and Mollusca are biological indicators so without using chemicals we aimed to know the pollution intensity of river Narmada basin. Benthos assemblage from Narmada basin in Jabalpur has been investigated. A total of 37 species of Odonata and 13 species of Mollusca were sampled.

Key words: Smart City, Benthic Macroinvertebrates, Diversity, Jabalpur.

INTRODUCTION

Jabalpur is recently announced under developing smart city. It situated in the bank of the river Narmada basin lies between east longitudes 72° 32' to 81°45' and north latitudes 21°20' to 23°45'. Smart city uses information and communication technologies to improve contact between citizens and government and to enhance quality, performance and interactivity of urban services to reduce cost and resource consumption with waste management. Major technological, economic, climates change and environmental changes caused by pollution enhancement which generate interest in smart city to use biological indicator. Odonata and Mollusca are easy-to-

study groups and are useful to monitor the overall biodiversity of aquatic habitats and had been identified as good indicators of environmental health^{1,2}.

Narmada basin in the Jabalpur region created an excellent habit and source of alteration for many faunal species like insects, reptiles, birds and mammals³. Odonata is good indicator of environmental changes as their larvae and adult both are sensitive to habitat degradation and climate changes⁴. Larval Odonata diversity and abundance was positively correlated with macroinvertebrates diversity and abundance and it was efficient bioindicators of intactness and diversity of overall macroinvertebrates^{5,6}.

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The aim of study of the biodiversity of Odonata and Mollusca species in Narmada valley of Jabalpur region for pollution for the assessment of pollution using bioindicators in the environment to make Jabalpur, the smartest city which included in this paper.

MATERIAL AND METHODS

Sampling stations: The present study was carried out during year September 2013 to September 2015. Four study sites of Narmada valley of Jabalpur region were selected for the

investigation these were Bargi dam, Gwarighat, Tilwaraghat and Bhedaghat shown in (Figure 1). The sites visited from 5 to 9 in the morning and 5 to 7 in the evening for one year during January 2015 to December 2015.

Identification: The adult specimens of Odonata were identified with the help of identification keys provided by⁷⁻¹³. Mollusca were identified by using standard keys, such as¹⁴⁻¹⁶. The collected benthos was categorized as VC - very common, C - common, R - rare, VR - very rare¹⁷.

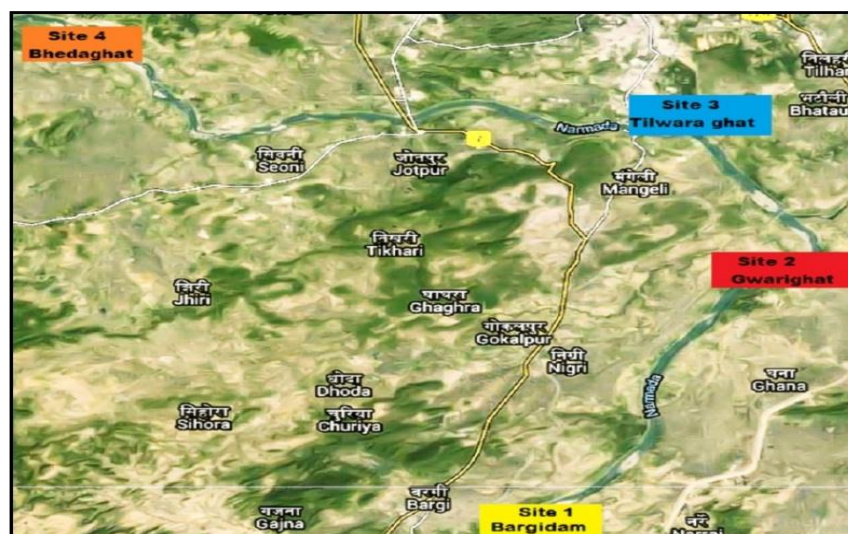


Fig. 1: Map -Narmada basin at Jabalpur region (M.P.)

Table 1. The observed species of Odonata and their Relative Status in Jabalpur district around river Narmada basin

S.No.	Name of Species	Common Name	Status
Order: Odonata			
Sub order: Zygoptera (Damselflies)			
Family: Coenagrionoidae (12 species)			
1.	<i>Agriocnemis femina</i> (Brauer, 1868)	White-backed Wisp	Common
2.	<i>Agriocnemis pygmaea</i> (Rambur, 1842)	Pygmy Dartlet	Very Common
3.	<i>Agriocnemis pieris</i> (Laidlaw, 1919)	White Dartlet	Rare
4.	<i>Ceriagrion coromandelianum</i> (Fabricius, 1798)	Coromandel Marsh Dart	Rare
5.	<i>Disparoneura quadrimaculata</i> (Rambur, 1842)	Black-winged Bamboo-tail	Rare
6.	<i>Enallagma parvum</i> (Selys, 1876)	Azure Dartlet	Rare
7.	<i>Ischnura aurora</i> (Brauer, 1868)	Golden Dartlet	Common
8.	<i>Ischnura senegalensis</i> (Rambur, 1842)	Senegal Golden Dartlet	Very Common
9.	<i>Pseudagrion decorum</i> (Rambur, 1842)	Elegant Sprite	Common
10.	<i>Pseudagrion rubriceps</i> (Selys, 1876)	Saffron Faced Blue Dart	Very common
11.	<i>Pseudagrion spencei</i> (Fraser, 1922)	Brook Sprite	Very Common
12.	<i>Rhodischnura nursei</i> (Morton, 1907)	Pixie Dartlet	Rare

Family: Platycnemididae (1 species)			
13.	<i>Copera marginipes</i> (Rambur, 1842)	Yellow Bush Dart	Common
Family: Lestidae (1 species)			
14.	<i>Lestes umbrinus</i> (Selys, 1891)	Brown Spread-wing	Very Common
Family: Chlorocyphidae (1 species)			
15.	<i>Libellago lineate indica</i> (Fraser, 1928)	Golden Gem	Rare
Sub-order: Anisoptera (Dragonflies)			
Family: Aeshnidae (3 species)			
16.	<i>Anax guttatus</i> (Burmeister, 1839)	Pale Spotted Emperor	Very Common
17.	<i>Gynacantha bayadera</i> Selys, 1891	Small Dusk hawk	Rare
18.	<i>Hemianax ephippiger</i> (Burmeister, 1839)	Vagrant Emperor	Rare
Family: Gomphidae (2 species)			
19.	<i>Macrogomphus annulatus</i> (Selys, 1854)	Keiser's Forktail	Common
20.	<i>Paragomphus lineatus</i> (Selys, 1850)	Lined Hooktail	Common
Family: Libellulidae (17 species)			
21.	<i>Acisoma panorpoides</i> (Rambur, 1842)	Grizzled Pintail	Rare
22.	<i>Brachythemis contaminata</i> (Fabricius, 1793)	Ditch Jewel	Very Common
23.	<i>Bradinopyga geminate</i> (Rambur, 1842)	Granite Ghost	Rare
24.	<i>Crocothemis servilia</i> (Drury, 1770)	Scarlet Skimmer	Very Common
25.	<i>Diplacodes trivialis</i> (Rambur, 1842)	Blue-Ground Skimmer	Common
26.	<i>Neurothemis intermedia</i> (Rambur, 1842)	Paddy Field Parasol	Rare
27.	<i>Neurothemis tullia</i> (Drury, 1773)	Pied Paddy Skimmer	Very Rare
28.	<i>Orthetrum luzonicum</i> (Brauer, 1868)	Slender Blue Skimmer	Rare
29.	<i>Orthetrum prunosum</i> (Burmeister, 1839)	Crimson-tailed Marsh Hawk	Common
30.	<i>Orthetrum sabina</i> (Drury, 1773)	Slender Skimmer	Very Common
31.	<i>Orthetrum taeniolatum</i> (Schneider, 1845)	Small Skimmer	Very Rare
32.	<i>Pantala flavescens</i> (Fabricius, 1798)	Globe Skimmer	Common
33.	<i>Rhyothemis variegata</i> (Linnaeus, 1763)	Common Picture Wing	Rare
34.	<i>Tholymis tillarga</i> (Fabricius, 1798)	Coral Tailed Cloud-wing	Rare
35.	<i>Trithemis aurora</i> (Burmeister, 1839)	Crimson Mars Glider	Very Rare
36.	<i>Trithemis festiva</i> (Rambur, 1842)	Black stream glider	Very Common
37.	<i>Trithemis pallidinervis</i> (Kirby, 1889)	Long-legged Mars Glider	Very Common

Table1. The observed species of Mollusca and their Relative Status in Jabalpur district around river Narmada basin

S. No.	Name of The Species	Abundance status
Class : Gastropoda		
1	<i>Pila globosa</i> (Swainsn, 1822)	Very common
2	<i>Thiara lineate</i> (Gray, 1828)	Common
3	<i>Thiara tuberculata</i> (Mueller, 1774)	Rare
4	<i>Vivipara bengalensis</i> (Lamarck, 1822)	Rare
5	<i>Bellamya bengalensis</i> (Lamarck, 1822)	Common
6	<i>Indoplanobris exustus</i> (Deshayes, 1834)	Common
7	<i>Unio species</i> (Philipsson, 1788)	Very Common
8	<i>Thiara scabra</i> (Mueller, 1774)	Rare
9	<i>Bellamya dissimilis</i> (Mueller, 1774)	Not common
Class : Pelecypoda		
10	<i>Pissidium clarkeanum</i>	Rare
11	<i>Lymnaea acuminata</i> (Lamarck, 1822)	Very common
12	<i>Perreysia favidens</i> (Benson, 1862)	Not common
13	<i>Perreysia caerulea</i>	Rare

RESULTS

During the intensive survey of Insects in Jabalpur district, 37 species of Odonata and 13 species of Mollusca were revealed among

these a total of 7 families belonging to order Odonata and 2 classes belonging to phylum Mollusca recorded from selected sites.

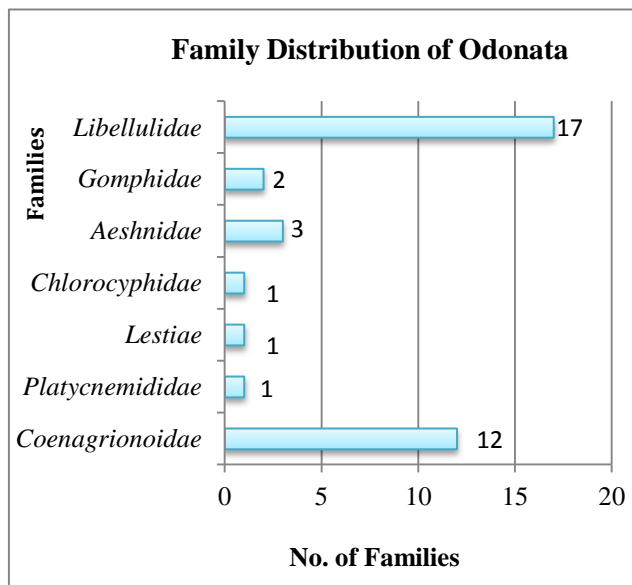


Fig. 2: Families distribution of Odonata in Jabalpur region of river Narmada

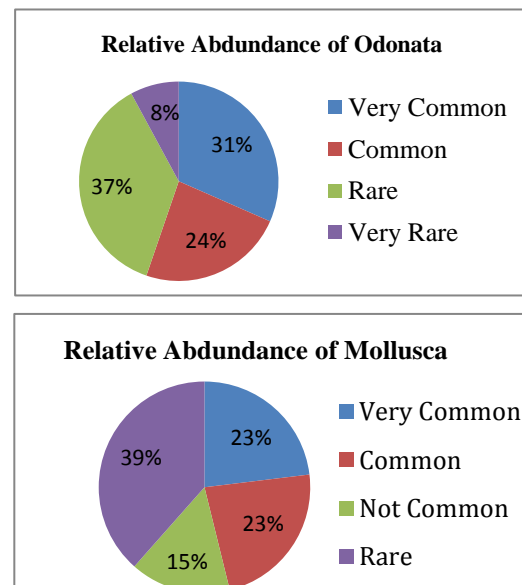


Fig. 3: Relative Abundance of Odonata and Mollusca

Relative Abundance:

The relative abundance showed that among the 37 recorded species of Odonata, 12 species were found to be very common, 9 species were common, 14 species were rare and 3 species were very rare were (Figure 3.) whereas among 13 species of Mollusca 3 species were very common, 3 were common, 2 were not common and 5 were rare species. 37% rare species of Odonata and 39% rare of Mollusca were need strict conservation.

DISCUSSION

Gastropods usually play a dominant role in the ecology of fresh-waters by providing food for many animals and by grazing on vast amounts of algae and detritus¹⁸. It is obviously seen that the groups of Mollusca are different with the study sites; this may have been related to the changes in the environment, to the industrial or organic pollution¹⁹. Bhandari²⁰ studied the diversity of Odonata of river Sone in the surroundings of Bansagar dam and revealed 22 species of Odonata from the catchment of reservoir.

Sharma and Shukla²¹ reported total 25 species of Odonata in southeast region of river Narmada during January 2015 to August 2015 where *Libellulidae* family was the most diverse with 10 species than *Coenagrionoidae* with 7 species but in further study of that same site 5 more species *i.e.*, 30 species were found from Jabalpur region and highlighted the presence of pollution. Odonata indicate input of little organic pollution in the slow moving or standing clean waters and Mollusca are quite intolerant to pollution, while other is tolerant.

CONCLUSION

Pollution in India has now reached to a point of crisis due to unplanned urbanization and rapid industrialization. Urbanization also is associated with habitat degradation including decreased plant species diversity, reduced water quality, and increased air and soil pollutions. In terrestrial ecosystem, insect fauna represent more than 70% and also play an important role in food chain for the natural

balance. Bioindicators will be used for the detection of pollution into the river and its surroundings. Every developing city produces heavy pollution and for making Jabalpur a smart city we have to reduce the pollution status and increase use more biological resources for the treatment of environment and reduction of chemical treatment.

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