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ODONATA DIVERSITY IN THE GANGETIC PLAIN OF WEST BENGAL

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ABSTRACT

The diversity and abundance of the Odonata documented from the Gangetic plain of West Bengal covering two types of habitats revealed its primarily aquatic nature (Oxbow Lake, Purbasthali). The other sites were predominantly grasslands, with smaller water bodies around (RRS, Chinsurah and DVC canal, Baidyabati). A total of 40 species were documented belonging to 31 genera and 5 families, with dominant families under the suborders Anisoptera and Zygoptera being Libellulidae and Coenagrionidae, respectively. Shannon-Wiener diversity index indicates that Oxbow Lake, Purbasthali has the most diverse fauna, with a higher relative abundance for Anisoptera compared to the Zygoptera.

Key words: Anisoptera, Zygoptera, diversity indices, genera, families, relative abundance, aquatic, dominance status, Libellulidae, Coenagrionidae, Shannon- Wiener index

The order Odonata, comprising of dragonflies and damselflies, is one of the fascinating insect groups. These are important components of freshwater ecosystems as well as good indicators of ecosystem health (Clark and Samways, 1996). Till date, globally 5,680 species of odonates are known, of which 588 species are found in India. Of these 251 species are endemic (Kalkman et al., 2020). Odonates occur close to fresh water habitats viz. rivers, streams, lakes, pools and rice fields (Tiple et al., 2012), and form one of the important invertebrate predators (Sharma et al., 2007). The Odonata studies in West Bengal were initiated by Selys (1891) who described 22 species from Kolkata. Later, Mitra (2002) recorded 65 species from Kolkata and its adjoining area, mainly Howrah District. Srivastava and Sinha (1993) reported 178 species from West Bengal. Later on several studies were carried out neighboring this locality by Dwari and Mondal **(**2017), Dawn P (2014; 2021), Pahari et al. (2019), Mandal and Aditya (Bandopadhyay) (2017), Payra and Tiple (2019) etc. Research on the Odonata diversity in the Gangetic plain in West Bengal is limited. The present study was undertaken in this locality to document their diversity and relative abundance.

MATERIALS AND METHODS

This study was conducted in the Rice Research Station (RRS), Chinsurah, (Site 1- 22˚52'N, 88˚24'E, 8.62 masl) (Bhowmick et al., 2014). DVC Canal, Baidyabati (Site 2) is located in between Bhadreswar and Badyabati railway station (22˚47'N, 88˚19'E). This area has a canal connected to river Ganges and agricultural fields mainly paddy fields. Oxbow Lake, Purbasthali, Burdwan (Site 3) lies on the Tropic of Cancer in the quaint town of Purbasthali, in Burdwan, West Bengal (23˚27'N, 88˚20'E, 16 masl). The study was conducted from March 2018 to March 2021. All the sites were visited twice monthly from premonsoon to post monsoon, from March to November. Common species were identified and photographed in the field; some doubtful specimens were captured with butterfly net, and identification done following the keys of Fraser (1933; 1934; 1936), Subramanian (2009), Mitra (2002) and Nair (2011). Field photographs were taken using Canon 80D camera with 100 mm prime macro lens (Canon). The odonates were categorized into four groups (very common, common, rare and very rare) on the basis of their frequency of sightings in all the study areas.

RESULTS AND DISCUSSION

A total of 40 species of Odonata representing 31 genera from 5 families were observed (Table 1; Figs. 2-25. Among the dragonflies (suborder Anisoptera), the most diverse and abundant family was Libellulidae represented by 25 species (62.5%), followed by the Aeshnidae represented by two species (5%). Such a preponderance of Libellulidae over other families was also well established in different regions of India-Arulprakash and Gunathilagaraj (2010), Tiple et al. (2012), Pahari et al. (2019) and Nayak and Roy (2016). The third family of the Anisoptera is the Gomphidae, represented by a solitary species (2.5%). Among the

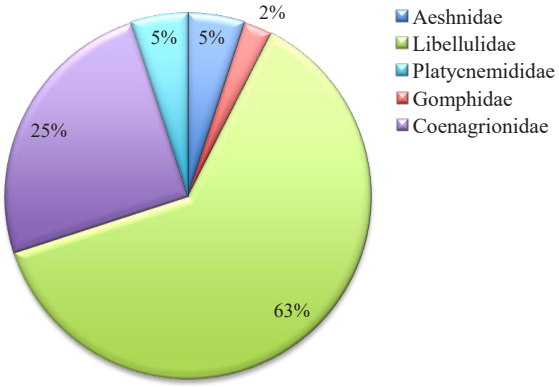


Fig. 1a. Family wise distribution

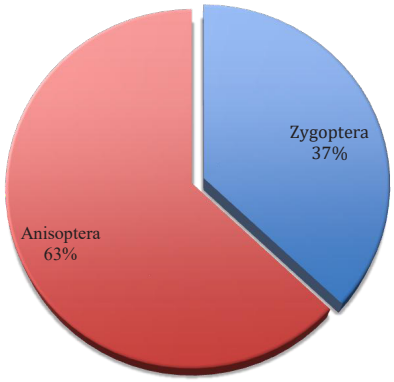
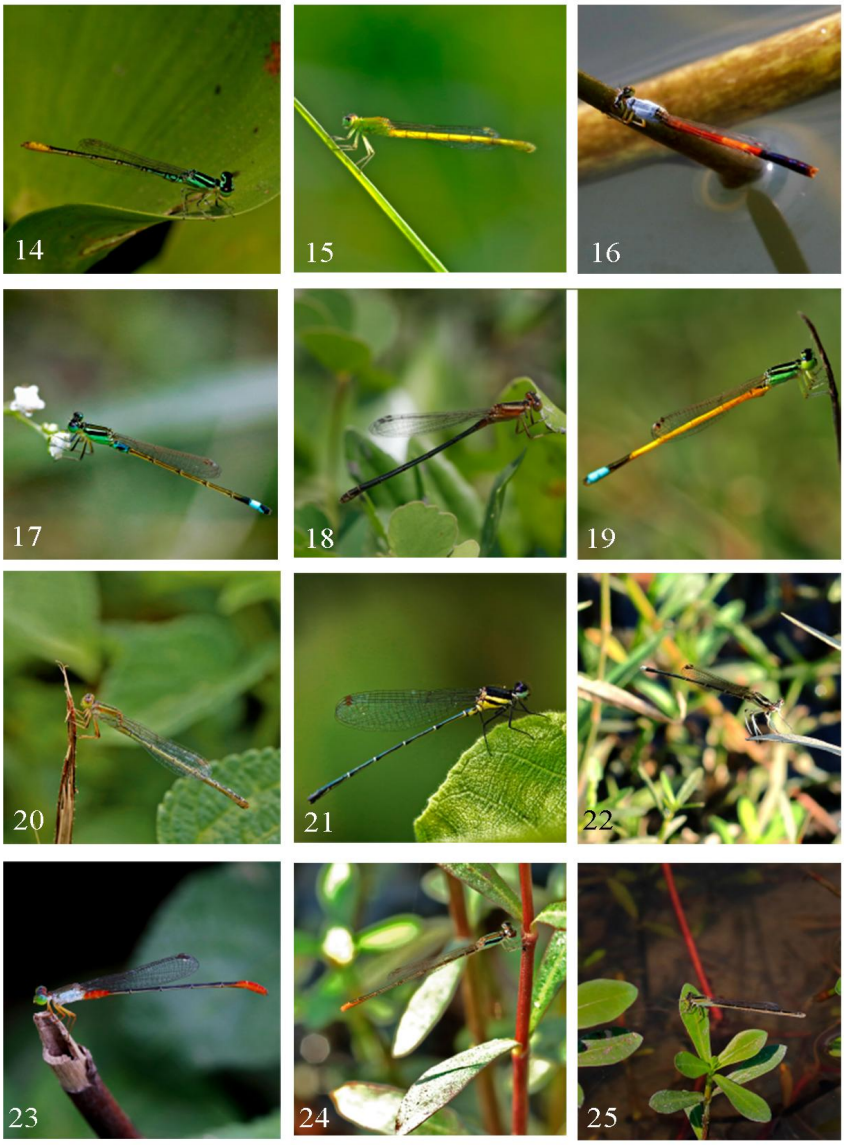


Fig. 1b. Relative abundance of Anisoptera and Zygoptera

Figs. 2-13. Some representative Anisopteran specimens found in this study; 2. *Acisoma panorpoides,* male; 3. *Acisoma panorpoides,* female; 4. *Pantala tlavescens,* male; 5. *Brachythemis contaminata,* male; 6. *Brachythemis contaminata,* female; 7. *Pantala tlavescens,* female; 8. *Crocothemis seiVilia,* male; 9. *Crocothemis seiVilia,* female; 10. *Diplacodes trivialis,* male; 11. *Macrodiplax cora,* male; 12. *Macrodiplax cora,* female; and 13. *Zyxomma petiolatnm,* female



Figs. 14-25. Some representative Zygopteran specimens found in this study; 14. *Agriocnemis kalinga,* male; 15. *Agriocnemis kalinga,* female; 16. *Ischnura nursei,* ma1e; 17. *Isclrnura senegalensis,* ma1e; 18. *Ischnura senegalensis,*female; 19. *Ischnura rubilio,* male; 20. *Ischnura rubilio,* female; 21. *Onychargia atrocyana,* male; 22. *Copera ciliata,* ma1e; 23. *Ceriagrion cerinorubellum,* male; 24. *Agriocnemis pygmaea,* male; and *Agriocnemis pygmaea,* female.

damselflies (suborder Zygoptera), Coenagrionidae was the dominant with 10 species (25%), followed by Platycnemididae (2 species- 5%) (Fig. 1a). It was found that the damselfly *Pseudagrion coromandelianum* was the most abundant species, followed by the dragonflies *Pantala flavescens*, *Crocothemis servilia*, and *Orthetrum sabina*. The relative abundance of the Anisoptera was fairly high (63%) than Zygoptera (37%) (Fig. 1b). This may be due to their larger body size and wider distributional pattern (Norma-Rashid, 2001). Of all the species, 32.5% were very common, 22.5% each fell into common, rare and very rare category. Most of the odonates documented now belonged to the least concern category according to the IUCN red data list. In 75% of the cases both the male and female specimens of the same species were photographed, for the rest either sex was photographed. One species that is *Hydrobasileus croseus,* Brauer was recorded for the first time from this region (Shee et al., 2020). Of the three-study areas, the Ox-bow Lake in Purbasthali seems to be more stable as a habitat for Odonata with lesser threat, indicated by the highest Shannon-Wiener diversity index (Table 2). When relative abundance was calculated it was found that of all the species 8 belonged

Table 1. List of Odonata documented in study areas

S. No.	Scientific Name	Site 1	Site 2	Site 3	RA	Status
Family: Gomphidae						
1.	*Ictinogomphus rapax* Rambur	+++	+++	++	0.77	SR
Family: Aeshnidae						
2.	*Anax guttatus* Burmeister	-	-	+	0.09	SR
3.	*Anaciaeschna jaspidea* Burmeister	+	-	+	0.06	SR
Family: Libellulidae						
4.	*Acisoma panorpoides* Rambur	++++	++++	+++	2.65	R
5.	*Crocothemis sevilia* Drury	++++	++++	++++	11.14	D
6.	*Diplacodes trivialis* Rambur	++++	++++	++++	1.67	R
7.	*Diplacodes nebulosa* Fabricius	++	+	++	0.15	SR
8.	*Macrodiplax cora* Brauer	++	++	+	3.32	SD
9.	*Brachudiplax chalybdea* Brauer	+++	+++	++	2.32	R
10.	*Brachydiplax sobrina* Rambur	+++	+++	++	1.35	R
11.	*Brachythemis contaminata* Fabricius	++++	++++	++++	8.59	SD
12.	*Bradinopyga geminate* Rambur	+	+	-	0.07	SR
13.	*Neurothemis fulvia* Drury	++	+	-	0.36	SR
14.	*Neurothemis tullia* (Drury)	+++	+++	++	1.43	R
15.	*Orthetrum sabina* Drury	++++	++++	+++	5.38	SD
16.	*Orthetrum triangulare* Selys	+	-	-	0.02	SR
17.	*Pantala flavescens* Fabricius	++++	++++	+++	13.10	D
18.	*Potamarcha congener* Rambur	++	++	+	0.83	SR
19	*Rhodothemis rufa* Rambur	++	++	+	0.64	SR
20.	*Rhyothemis variegate* Linnaeus	+++	++++	++++	4.06	SD
21.	*Tholymis tillarga* Fabricius	++	++	++	0.94	SR
22.	*Trithemis pallidinervis* Kirby	+++	+++	++	2.69	R
23.	*Urothemis signata* Rambur	+	+++	-	0.94	SR
24.	*Cratilla lineata* (Brauer)	+	-	-	0.01	SR
25.	*Zyxomma petiolatum* Rambur	+	+	+	0.17	SR
26.	*Orthetrum pruinosum* Burmeister	+	-	-	0.08	SR
27.	*Hydrobasileus croseus* (Brauer)	+	-	-	0.03	SR
28.	*Tramea limbata* Desjardins	+	-	+	0.11	SR
Family: Coenagrionidae						
29.	*Ceriagrion cerinorubellum* Brauer	++	+++	+++	0.95	SR
30.	*Agriocnemis kalinga* Nair & Subramanian	+	+	++	0.60	SR
31.	*Agriocnemis pygmaea* Rambur	++++	++++	++++	6.54	SD
32.	*Ischnura nursei* Morton	-	-	++	0.26	SR
33.	*Ischnura rubilio* Selys	+	+	+++	0.54	SR
34.	*Ischnura senegalensis* Rambur	+++	+++	++++	3.51	SD
35.	*Paracercion malayanum* Selys	-	+	++++	2.53	R
36.	*Ceriagrion coromandelianum* Fabricius	++++	++++	++++	14.88	D
37.	*Pseudogrion microcephalum* Rambur	+	+	++++	4.34	SD
38.	*Pseudogrion rubriceps* Selys	+	++	++++	1.67	R
Family: Platycnemididae						
39.	*Copera ciliate* Selys	+	-	++	0.26	SR
40.	*Onychargia atrocyana* Selys	+	+++	++	0.96	SR

*Abundance of different species in different locations are indicated with the help of + sign. Very rare species is given '+', for rare '++' is used, for common species '+++' is used and '++++' is used for very common species. The absence of any specimen from any site is given '-' symbol.

[Relative abundance (RA) <1 = subrecedent (SR); 1–3.1 = recedent (R); 3.2–10 = subdominant (SD); 10.1–31.6 = dominant (D); >31.7 = eudominant (ED)]. (Engelmann 1973).

Table 2. Species Diversity, Evenness and Dominance indices in the Study area

Location	Indices			
	Shannon Wiener	Margalef's species richness	Pielou evenness (J')	Simpson's species dominance (D)
Site 1	2.73	4.466	0.756	0.094
Site 2	2.772	3.634	0.807	0.089
Site 3	2.806	3.913	0.802	0.085

The Pielou Evenness index or J' value ranges from 0 to 1. Higher the diversity greater is the value. For Simpsons dominant index (D), the value zero means infinite diversity and the value 1 means no diversity at all. Simpson's index is usually expressed as its inverse (1/ *D*) where greater the number more the diversity.

to recedent, 7 belonged to subdominant, 3 were from dominant category and rest 22 was subrecedent types (Table 1).

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CONFLICT OF INTEREST

No conflict of interest.

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