

## Abundance and diversity of Odonata in and around Uttarpara, Hoogly, West Bengal

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### Abstract:

Odonata (Dragonflies and Damselflies) constitute a small, well known order of insects that are widely distributed all over the world. The adults are generally predacious insects and acting as an important bio-control agent of many harmful insects and playing a crucial role in controlling pest populations of agro as well as in the forest ecosystems. Their aquatic larvae constitute a natural biological control over mosquito larvae and thus help to control several epidemic diseases. A study on the abundance, species richness and diversity of Odonate fauna in and around Uttarpara, West Bengal was conducted during October 2015 to March 2016. A total of 209 specimens of Odonates belonging to 2 families and 21 species under two suborders were recorded during the entire study period. Highest species richness and diversity were observed in habitat A (21, 1.25) followed by habitat C (19, 1.18) and habitat B (12, 1.04) respectively. We observed that the habitat A is most diverse in Dragonfly and Damselfly fauna.

**Key words:** Dragonfly; Damselflies; Species richness; Diversity

### Introduction:

Dragonflies and damselflies are among the most attractive creatures on earth belonging to the insect order- Odonata. Many people appreciate their striking colors and equilibristic flight. They are widely distributed in aquatic bodies including in ponds, lakes, streams, rivers, and canals. Globally 5,952 species of Odonates under 652 genera have been reported (Schorr and Paulson, 2013). India harbours 474 species and 50 subspecies belonging to 142 genera in 18 families have been reported (Subramanian, 2014). The adults are generally predacious insects and acting as an important bio-control agent of many harmful insects and playing a crucial role in controlling pest populations of agro as well as in the forest ecosystems. Kulkarni *et al.* (2012) recorded 101 species of Odonate in Maharashtra. The distribution pattern of dragonflies and damselflies have also been reported by Williams & Feltmate (1992). Odonates are also good indicators of environmental changes as they are sensitive to changes in the habitats, atmospheric temperature as well as the weather conditions (Tiple, 2012). In aquatic environment their larvae feed upon mosquito larvae, one way of biological control to combat several mosquito-borne epidemic diseases (Mitra, 2002). Thus, they are among the dominant invertebrates predators in aquatic ecosystem. Being predators both at larval and adult stages, they play significant role in the food chain of the forest ecosystem (Vashishth *et.al.* 2002). Dragonflies have been extensively used as indicators of environmental quality in aquatic ecological units (Chovanec and Waringer, 2001).

Odonates are ecologically important as both predators and prey. In general, the distribution and composition of aquatic insects as Odonata, in an insect community always change from time to time following environmental change (Lenat, 1993; Che Salmah *et al.* 2006). Keeping in view this fact here an attempt has been made to study the diversity and distribution of dragonflies in Hoogly, West Bengal.

### Materials and methods:

The present study was conducted at Uttarpara city (22.67°N and 88.35°E) in Hoogly district in the state of West Bengal. The specimens were collected twice in a month at 15 days intervals during October 2015 to March 2016 by insect net. Three habitats were selected for odonata sampling. Habitat A and habitat C were pond sites where as habitat B is not aquatic site. All the specimens counted and brought to the laboratory for identification. All identifications confirmed from Zoological Survey of India, Kolkata. The relative abundance percentage (R.A) of different species in the community was recorded in different months. In each habitat each month was determined using the Shannon- Weaner index ( $H'$ ) and Margalef index ( $D_{Mg} = S-1/\ln N$ ) for species diversity analysis.

**Shannon-Wiener index (H')**

$$H' = - \sum (n_i/N) \ln (n_i/N)$$

Or

$$H' = - \sum P_i \ln P_i$$

Where

 $n_i$  = importance value for each species

N = total importance value

 $P_i$  = importance probability for each species =  $n_i/N$ 

ln = is the log with base 'e' (Natural log)

**Variety index or Margalef's index ( $D_{Mg}$ )**

$$D_{Mg} = S-1/\ln N$$

Where

S = number of species

N = number of individuals

ln = is the log with base 'e' (Natural log)

**Results and discussion:**

Odonates are mainly aquatic insect group and their part of life cycle completed within aquatic environment. In India, Odonata status reflects the wetland ecosystem health. They are among the dominant invertebrate predators in any ecosystem both at larval and adult stages and they play significant role in the food chain of the forest ecosystem (Vashishth *et.al.* 2002). There are two sub-orders (Anisoptera and Zygoptera), two families (Libellulidae and Coenagrionidae), 17 genera, 21 species of Odonata with a total of 209 individuals were observed in and around Uttarpara as shown in table 1.

In our study the most abundant family was Libellulidae (74.2%) followed by family Coenagrionidae (25.8%) represents 15 and 6 species respectively. Libellulidae is the largest family carrying maximum number of species during the study period. The same trends are followed by Tijare & Patil (2012). An abundance of individuals and species richness of dragonflies were obtained at each habitat is different. All the species are present in habitat A but two species i.e. *Agriocnemis sp.* and *I. aurora* are absent in both habitat B and habitat C. The species such as *O. Sabina*, *B. contaminate* and *C. coromandelianum* are highly abundant in all the habitats. Highest species number and diversity were observed in habitat A (21, 1.25) followed by habitat C (19, 1.18) and habitat B (12, 1.04) respectively. Habitat A and C were characterized by aquatic sites where as habitat B is far away from water body. Month wise distribution patterns of dragon flies and damsel flies are shown in table 2. Three species i.e. *O. glaucum*, *M. cora* and *Agriocnemis sp* are only present in the month of February and March. Our observation revealed that *B. contaminate*, *O. sabina* and *C. coromandelianum* are most abundant species during the study period. The similar observation was also recorded by Manwar *et al.* (2012). During the study period the species richness, Shannon indices as a measure of diversity of donates in different study sites as well as different months are shown in Table 3. Maximum species richness was recorded in the month of March (21), followed by February (17 species), January (15 species), October (13), December (12) and November (11). Such differences may be caused by habitat suitability, heterogeneous vegetation, weather condition during sampling and biotic as well as abiotic factors like, physical and chemical factors (Che Salmah *et al.* 2006; Siregar *et al.* 2008, 2009).

Therefore, public awareness is an ultimate necessity to conserve the suitable habitats of these ecologically important invertebrate organisms. Odonata as one of the pivotal components of biological diversity playing dynamic role in the

food web both as herbivores and carnivores. Odonata larvae are predators in the aquatic food chain (Benke, 1982), while the adult of Odonata as predators of pests of crops and plantations (Kandibane *et al.* 2005). Their sensitivity to environmental condition makes Odonates excellent biological indicators (Brown KSJ, 1991). Being as indicators of environment odonates are sensitive towards their surroundings and changes in their ambience may lead to the changes in their status. Recent studies in the Western Ghat of India have indicated that change in land use patterns leads to change in odonates community structure (Nair, 2011).

#### Conclusion:

Odonates are predatory in nature. But they are also good source of energy to different animals, especially for birds and some others such as spiders. Dragonfly nymphs are beneficial to human because they can be used as baits and to assist in the control of aquatic insect pests. Odonates are the important link between aquatic and terrestrial ecosystem and important indicators of both ecosystems. Highest diversity and availability observed near pond site, confirmed their habitat. Dragonflies have been extensively used as indicators of environmental quality in aquatic as well as terrestrial ecological units. Therefore, public awareness is necessary to conserve the suitable habitats of these ecologically important invertebrate organisms.

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Table 2: Community structure of Odonates across different months in and around

Family	Species name
Libellulidae	<i>Acisoma panorpoides</i> Rambur
	<i>Brachydiplax chalybea</i> Brauer
	<i>Brachydiplax sobrina</i> Rambur
	<i>Brachythemis contaminata</i> Fabricius
	<i>Crocothemis servilia</i> Drury
	<i>Diplacodes trivialis</i> Rambur
	<i>Macrodiplax cora</i> Brauer
	<i>Neurothemis tullia</i> Drury
	<i>Orthetrum glaucum</i> Brauer
	<i>Orthetrum pruinosum</i> Rambur
	<i>Orthetrum sabina</i> Drury
	<i>Potamarcha congener</i> Rambur
	<i>Rhodothemis rufâ</i> Rambur
	<i>Rhyothemis variegata</i> Linnaeus
<i>Tholymis tillarga</i> Fabricius	
Coenagrionidae	<i>Aciagrion pallidum</i> Selys
	<i>Agriocnemis sp.</i>
	<i>Ceriagrion cerinorubellum</i> Brauer
	<i>Ceriagrion coromandelianum</i> Fabricius
	<i>Ischnura aurora</i> Brauer
	<i>Onychargia atrociana</i> Selys

Table 2: Community structure of Odonates across different months in and around Uttarpara

Family	Species Name	Relative Abundance (%)					
		October	November	December	January	February	March
Libellulidae	<i>Acisoma panorpoides</i> Rambur	0	4.34	0	3.33	0	3.33
	<i>Brachydiplax chalybea</i> Brauer	3.70	8.69	0	6.66	6.25	3.33
	<i>Brachydiplax sobrina</i> Rambur	11.11	21.73	14.28	13.33	8.33	8.33
	<i>Brachythemis contaminata</i> Fabricius	3.70	0	4.76	0	0	5
	<i>Crocothemis servilia</i> Drury	7.40	8.69	9.52	3.33	6.25	5
	<i>Diplacodes trivialis</i> Rambur	3.70	8.69	4.76	6.66	4.16	6.66
	<i>Macrodiplax cora</i> Brauer	0	0	0	0	4.16	1.66
	<i>Neurothemis tullia</i> Drury	0	0	4.76	3.33	4.16	3.33
	<i>Orthetrum glaucum</i> Brauer	3.70	8.69	0	6.66	4.16	5
	<i>Orthetrum pruinatum</i> Rambur	0	0	0	0	2.08	3.33
	<i>Orthetrum sabina</i> Drury	18.51	17.39	14.28	13.33	12.5	11.66
	<i>Potamarcha congener</i> Rambur	0	8.69	9.52	3.33	6.25	5
	<i>Rhodothemis rufa</i> Rambur	0	0	0	6.66	0	3.33
	<i>Rhyothemis variegata</i> Linnaeus	7.40	0	4.76	6.66	6.25	5
	<i>Tholymis tillarga</i> Fabricius	11.11	0	4.76	6.66	6.25	5
Coenagrionidae	<i>Aciagrion pallidum</i> Selys	3.70	4.34	0	3.33	2.08	3.33
	<i>Agriocnemis</i> sp.	0	0	0	0	4.16	1.66
	<i>Ceriagrion cerinorubellum</i> Brauer	7.40	8.69	0	6.66	6.25	3.33
	<i>Ceriagrion coromandelianum</i> Fabricius	11.11	0	14.28	10	8.33	10
	<i>Ischnura aurora</i> Brauer	0	0	4.76	0	0	1.66
	<i>Onychargia atrocyana</i> Selys	7.40	4.34	9.52	3.33	8.33	5

Table 3: Diversity of Odonata in different months in and around Uttarpara

Ecological Unit	October	November	December	January	February	March
N	27	23	21	30	48	60
S	13	11	12	15	17	21
H'	1.05	0.972	0.91	1.103	1.184	1.26
D <sub>Mg</sub>	3.641	3.189	3.613	4.11	4.133	4.884

N: Total number in percentage; S: Species richness; H': Shannon- Weaner Index; DMg: Margalef's Index

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