

## Study on diversity of Odonates in two sites of Barpeta District, Assam, India

Chiranjit Baruah<sup>1\*</sup>, Daisy Brahma<sup>1</sup>, Jimi Das<sup>2</sup>, Sunny Basumatary<sup>2</sup>

<sup>1</sup> Assistant Professor, Department of Zoology, Madhab Choudhury College, Barpeta, Assam, India

<sup>2</sup> Department of Zoology, Madhab Choudhury College, Barpeta, Assam, India

### Abstract

The distribution and abundance of Odonate species near two water bodies with human settlements in Barpeta district of Assam were studied. A total of 30 (thirty) species of Odonata including 18 Anisoptera and 12 Zygoptera were recorded. The common Anisopteran species were *Brachythemis contaminata*, *Crocothemis servilia*, *Diplacodes trivialis*, *Orthetrum sabina* and *Pantala flavescens*. Among the Zygopterans the species *Ceriagrion coromandelianum* and *Pseudagrion microcephalum* were common. Highest number of individuals (184) were recorded during September to November and lowest (41) during the period of December to February. The Shannon-Wiener Diversity Index ( $H'$ ) was 2.07 during March to May, 2.86 during June to August; 2.63 during September-November and 2.62 during December to February. The study indicates that even small water bodies like ponds and seasonal pools of water may support many species of Odonates. Such water bodies should not be destroyed by polluting or by growth of human habitations.

**Keywords:** Odonata, abundance, species richness, diversity

### Introduction

Odonates include the dragonflies and damselflies. These insects are commonly found near water bodies, fields and forests (Basumatary, *et al.*, 2015) [5]. Odonates are active predators and important part of the trophic levels in food chains and maintain a balance in aquatic and terrestrial ecosystems. Loss and degradation of habitats are threats for Odonate population worldwide (Gupta and Veeneel, 2016) [12]. Having specific requirements of habitats and being sensitive to changes in landscape, Odonates can be reliable indicators of health of wetland ecosystems (Andrew, *et al.*, 2008) [2]. There are about 6000 species of living Odonates worldwide and in India there are about 500 species (Subramanian, 2005) [18].

Various works have been done on the Odonates of the state of Assam, India. Baruah and Saikia (2015) [4] studied the abundance and diversity of Odonates in different habitats of Barpeta District of Assam. Basumatary, *et al.*, 2015 [5], recorded 26 species of dragonflies (sub-order *Anisoptera*) and 8 species of damselflies (sub-order *Zygoptera*) from the Bodoland University between May 2013 to November 2014. Kalita, 2014 [13], reported the presence of 18 Anisopteran species and 23 Zygopteran species in the Manas national Park. A total number of 81 species of Odonates representing 54 genera and 11 families have been recorded in Dibrugarh district by Das, *et al.* 2022 [10]. In a study by Das (2016) [9], a total of 39 species of Odonates, including 28 species of dragonflies and 11 species of damselflies were recorded in and around the Vivekananda Kendra Vidyalaya (NEC) Baragolai, Margherita, Tinsukia district of Assam (India). A study was conducted by Choudhury, *et al.*, (2020) [8] in Chakrashila Wildlife Sanctuary of western Assam recorded total 57 species of Odonate of which, dragonfly (Anisoptera) was represented by 37 species and damselfly (Zygoptera) by 20 species. In Kaziranga National Park and Karbi Hills of Assam, 43 species dragonfly (Anisoptera) and 39 species of damselfly (Zygoptera) were recorded by Baruah, *et al.*, (2016) [7].

### Material and Methods

#### Study area

The present study was carried out in the district of Barpeta of Assam, India. The district lies in the Lower Brahmaputra valley (Baruah and Saikia, 2015) [4].

The aim of the study was to generate an idea about the Odonate species distribution and their abundance near water bodies with human settlements in Barpeta district of Assam. The study also tries to find out the variation of diversity of Odonates in different seasons of the year.

#### Sampling method and identification of species

Two sites were selected for the present study. One is the Madhab Choudhury College, Barpeta campus (26°19'41.0"N 91°00'09.0"E) and the other is Gahiya (26°19'57.0"N, 91°08'57.0"E) in Barpeta District. Habitats frequented by adult Odonates such as areas around water bodies like ponds and open tracts of land, were surveyed. Each of the sites were visited at least twice every month. Opportunistic sampling method was employed to record the various species of Odonata. The specimens were identified with the aid of various literatures (Nair, 2011; Subramanian, 2005; Subramanian and Babu, 2017) [14, 18, 19].

Transect sampling method was followed to study the diversity of species during different time of the year. This method has been widely used for quantitative sampling of Odonates (Remsburg 2011; Smallshire & Beynon, 2010) [16, 17]. Sampling was conducted from March 2023 to February 2024.

#### Analysis

The abundance and diversity of species during Mar-May 2023; Jun-Aug 2023; Sep-Nov 2023 and Dec 2023-Feb 2024 were determined. Diversity was calculated using Shannon-Weiner diversity index (Balakrishnana, *et al.*, 2014; Belamkar and Jadesh, 2014; Tewari and Kaushal, 2007) [3, 6, 20].

The Shannon-Wiener Diversity Index,  $H'$ , is calculated using the following equation:

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

where  $P_i$  is the proportion of each species in the sample ( $P_i = S / N$ )  
 $S$  = number of species  
 $N$  = total number of individuals  
 $\ln$  = logarithm to base  $e$

**Results**

A total of 30 (thirty) species of Odonata including 18 Anisoptera and 12 Zygoptera were recorded during the study (Table 1). The common Anisopteran species were *Brachythemis contaminata*, *Crocothemis servilia*, *Diplacodes trivialis*, *Orthetrum sabina* and *Pantala flavescens*. The species *Rhyothemis variegata* was occasional and the rest of the species were rarely encountered. Among the Zygopterans the species *Ceriagrion coromandelianum* and *Pseudagrion microcephalum* were commonly found. *Ceriagrion cerinorubellum*, *Ceriagrion olivaceum* and *Pseudagrion rubriceps* were occasionally found and the other species were rarely encountered.

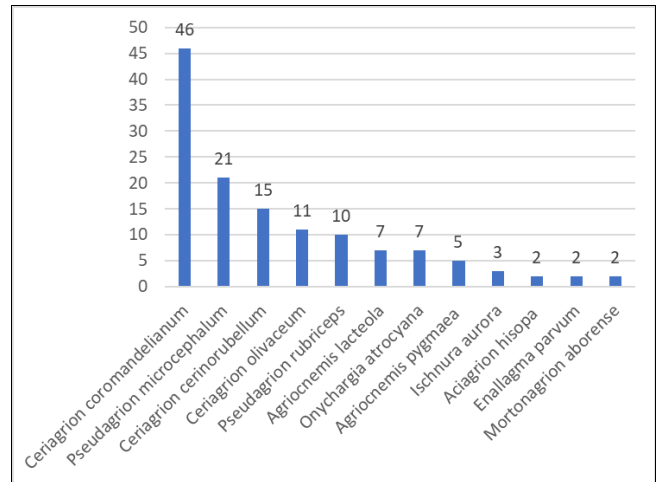
Bar diagrammatic representation of the relative abundance of Anisopteran and Zygopteran the species found in the study area are shown in Figure 1 and 2.

Species Richness during March to May, it was 16; during June to August, it was 30, it was 29 during September-November 2023 and it was 10 during December to February. The total number of individuals was highest (184) during September to November and lowest (41) during the period of December to February. The Shannon-Wiener Diversity Index ( $H'$ ) was 2.07 during March to May, 2.86 during June to August; 2.83 during September-November and 2.62 during December to February (Table 2).

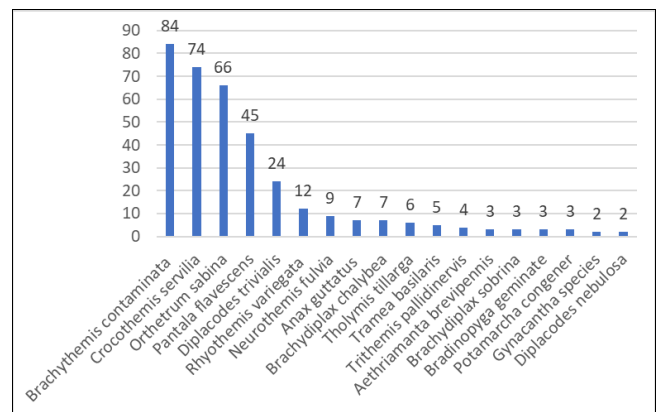
**Table 1:** List of Odonata species and their visual abundance

Family	Sl. No.	Species	Visual Abundance
Anisoptera	1	<i>Anax guttatus</i>	R
	2	<i>Gynacantha species</i>	R
	3	<i>Aethriamanta brevipennis</i>	R
	4	<i>Brachydiplax chalybea</i>	R
	5	<i>Brachythemis contaminata</i>	C
	6	<i>Brachydiplax sobrina</i>	R
	7	<i>Bradynopyga geminate</i>	R
	8	<i>Crocothemis servilia</i>	C
	9	<i>Diplacodes nebulosa</i>	R
	10	<i>Diplacodes trivialis</i>	C
	11	<i>Neurothemis fulvia</i>	R
	12	<i>Orthetrum sabina</i>	C
	13	<i>Pantala flavescens</i>	C
	14	<i>Potamarcha congener</i>	R
	15	<i>Rhyothemis variegata</i>	O
	16	<i>Tholymis tillarga</i>	R
	17	<i>Tramea basilaris</i>	R
	18	<i>Trithemis pallidinervis</i>	R
Zygoptera	19	<i>Aciagrion hisopa</i>	R
	20	<i>Agriocnemis lacteola</i>	R
	21	<i>Agriocnemis pygmaea</i>	R
	22	<i>Ceriagrion cerinorubellum</i>	O
	23	<i>Ceriagrion coromandelianum</i>	C
	24	<i>Ceriagrion olivaceum</i>	O
	25	<i>Enallagma parvum</i>	R
	26	<i>Ischnura aurora</i>	R
	27	<i>Mortonagrion aborensis</i>	R
	28	<i>Onychargia atrocyana</i>	R
	29	<i>Pseudagrion microcephalum</i>	C
	30	<i>Pseudagrion rubriceps</i>	O

R= Rare (< 10 individuals); O= Occasional (10 to 20 individuals); C= Common (> 20 individuals)



**Fig 1:** Bar diagrammatic representation of the relative abundance of Zygopteran species found in the study area.



**Fig 2:** Bar diagrammatic representation of the relative abundance of Anisopteran species found in the study area.

**Table 2:** Table showing species richness, total number of species, average population of species and Shannon Wiener Diversity index ( $H'$ ) of Odonates during different periods of the year

Attributes	Mar-May	Jun-Aug	Sep-Nov	Dec-Feb
Species Richness	16	30	29	18
Total Number of individuals	108	157	184	41
Average Population size	6.75	5.23	6.34	2.28
Shannon-Wiener Diversity Index ( $H'$ )	2.07	2.86	2.63	2.62

**Conclusion**

The sites of study have water bodies like ponds and temporary pools, which almost dry up during the dry winter seasons. Species richness (30) and diversity index ( $H'$ ) 2.86 was highest during June to August. The species richness during September to November was 29 and diversity index ( $H'$ ) was 2.63. These are the monsoon and post monsoon seasons and during this season temporary water bodies are filled with water. Seasonal abundance and diversity is related to amount of water in water bodies and availability breeding places and food resources (Narender, *et al.*, 2016) [15]. There is also a seasonal abundance of vegetation, perching places due to high humidity and rainfall, which favours high abundance of Odonate species (Aghade and Saraf, 2023) [1]. According to Fulan, *et al.*, 2010 [11], marginal vegetation may influence species compositions. The present study indicates that even small water bodies like ponds and seasonal pools of water may support a wide range of species of Odonates including dragonflies (Anisoptera) and damselflies (Zygoptera). Such water bodies should not

be destroyed by polluting or by growth of human habitations.

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