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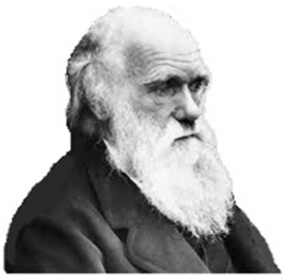

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Importance of Ecopark, Kolkata in the context of sustainability, compare to Rajarhat grassland, as a habitat for Odonata (Dragonflies and Damselflies) diversity

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ABSTRACT

The study was carried out from June 2021 to May 2022, to know the status and diversity of the Odonata (Dragonfly and Damselfly) fauna at Ecopark, West Bengal. They are essential for environmental monitoring and serve as biological indicators of the health of the ecosystem. During the study period, 34 species of odonates from 26 Genera and 5 Families were identified in the study area. Three families made up Suborder Anisoptera, while two families made up Suborder Zygoptera. Among them, 29 species of dragonflies belonged to the Aeshnidae, Gomphidae and Libellulidae families, while 11 species of damselflies belonged to the Coenagrionidae and Platycnemididae families. The family Libellulidae had the highest species composition (62%) followed by the family Coenagrionidae (29 %). Among all Odonates, 35% were very common (VC), 44% Common (C) 15% rare (R) and 6% were very rare (R) on the presence of their abundance. Such observation can provide insightful data on the status of Odonate populations in context to Rajarhat grassland.

***Keywords*:** Odonata, dragonfly, damselfly, diversity, urban park, Ecopark

1. INTRODUCTION

Odonata (Dragonflies and damselflies) are among the earliest known flying insects, having existed in Kansas as far back as the Lower Permian [1]. Due to their evolutionary history

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in the tropics and their adaptations to temperate conditions, the Odonata constitute a taxon that has numerous significant linkages to these abiotic elements [2]. The majority of dragonflies and damselflies are found close to various freshwater ecosystems, including rivers, streams, marshes, lakes, ditches, and even small pools and rice fields [3, 4]. Odonates are excellent indicators because this insect group is very much sensitive to changes in the freshwater aquatic ecosystem [5, 6] and perform an important predatory function in the food chain as both larval and adult stages [7, 8].

Despite the fact that most species are highly habitat-specific, some have adapted to urbanization and utilize artificialwater sources [4]. Larval odonates Populations are found in the littoral zone of an abandoned pond [7]. Around 6,324 different Odonata species have been identified worldwide and India is home to 498 different odonate species [9]. Throughout West Bengal total of 239 species were recorded which belong to114 genera and 17 families [10].

There are so many researchers who documented Odonata from Kolkata and surrounding areas at 1982, 1983, 1996, 2002, 2014 [11-15]. But Ecopark was not listed in their study area. The listed study areas were Central Park, Nalban fisheries, Victoria Memorial Garden, Subhas Sarovar, Joka, Chintamanikar Bird Sanctuary, Acharya Jagadish Chandra Bose Botanical Garden etc. [15].

Over the past few decades, Indian cities have experienced severe environmental issues as a result of their fast-growing urbanization, including pollution, a loss of urban green space, an increase in the phenomenon of heat islands, and the degradation of the urban ecology [16]. Changes in land use can have an impact on dragonfly larval stages by changing the environments and adults are being affected by the losses of perches, shade, and hunting grounds [17]. Man-made parks and gardens along with sufficient waterbodies and submerged aquatic reeds, shade of trees, and level of human disturbance in the city are essential for sustaining the diversity of urban insects [18].

So, we concentrated our research on urban Odonata diversity within Ecopark (22°36’11”N 88°28’01”E), one of the largest park of India, with a particular emphasis on the relative importance of urban green spaces (primarily urban forests, grasslands and gardens) and waterbodies (Lake and ponds).

Ecopark (Area- 480 acres) is present at the center of the Rajarhat wetland, which is rich in biodiversity and was part of the East Kolkata wetland [19]. This wetland provides a variety of ecosystem services. However, the wetland is continuously shrinking due to rapid urbanization. Ecopark is the last stronghold of protected grasslands and its distance from Dum Dum Airport near about 6 km.

The knowledge of the Odonata community present within the park is crucial for developing species-specific conservation plans.

2. RESULT

2. 1. Materials and methods

The survey was performed from June 2021and May 2022 in nearby ponds, lake side, grassland, and small patches of forest in the study area by using direct observation method. Data were collected randomly throughout the park.

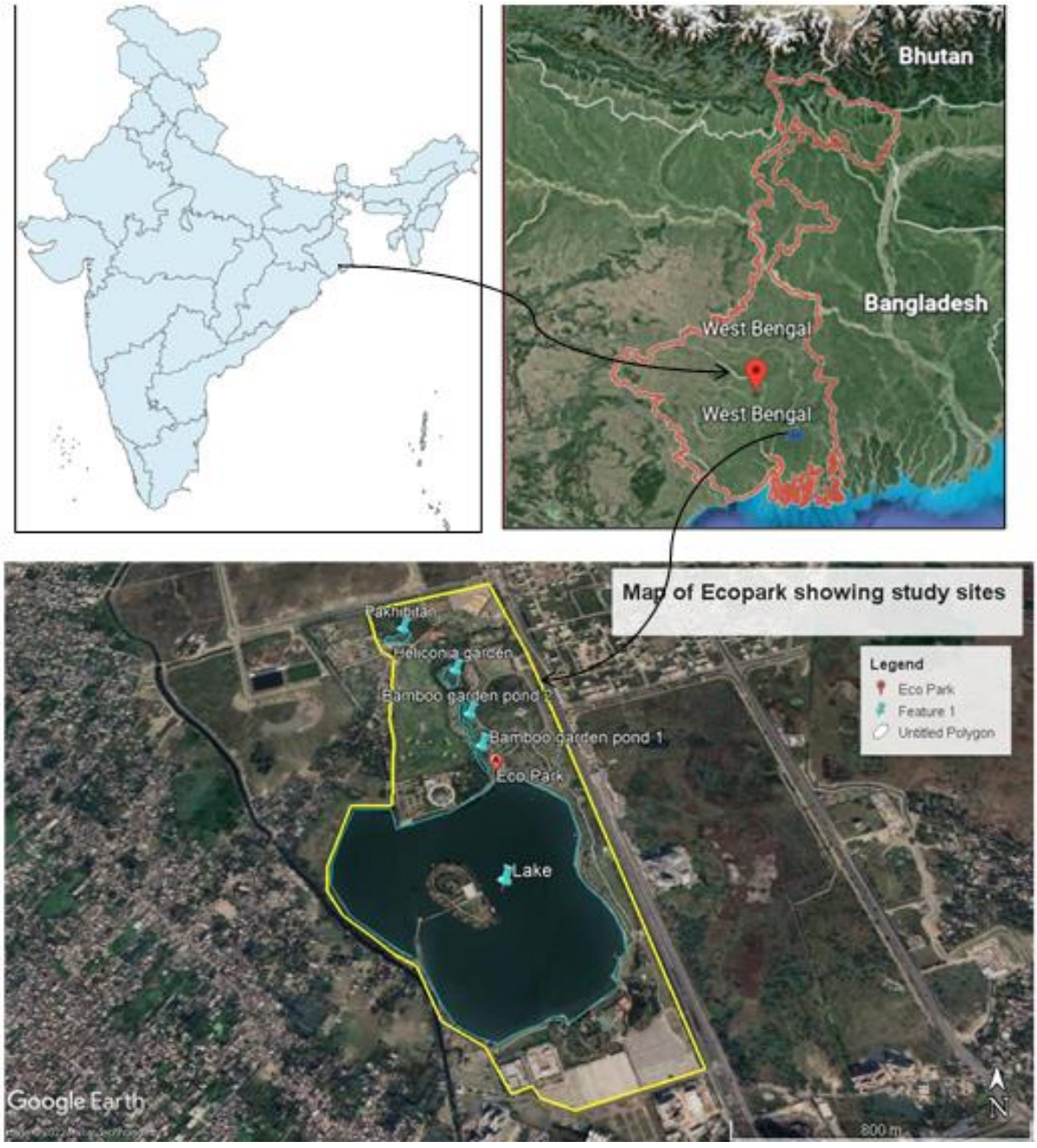

Figure 1. Map of the study site

For photography of the species Nikon Coolpix P900 and P600 were used. The identification of the species a Bengali guidebook "Sundarbaner Kichhu Parichito Foring" [20] was used. The unidentified species were identified with the help of expert guides and the Citizen Science forum (Inaturalist, Odonata of India). Species names were listed following 'Checklist of Odonata of India' [21]. The Odonates were categorized into VC (very common), C (common), R (rare), and VR (Very rare) on the basis of their frequency. And wanted to see which category the species fall under in the IUCN red list.

2. 2. Data Analysis

A total of 34 species of Odonates belonging to 5 families and 26 genera were recorded throughout the year from the study area (Table 1). Among them, 23 were the dragonflies (Suborder - Anisoptera) and under three families. On the other hand, 11 were damselflies (Suborder-Zygoptera) under two families. The family of dragonflies were Libellulidae (21), Aeshnidae (1), and Gomphidae (1) and the family of damselflies were Coenagrionidae (10) and Platycnemididae (1) (Fig. 2). Family Libellulidae (62%) was the most diverse and abundant family, followed by the Aeshnidae and Gomphidae (3%) represented one species each. Thismay be due to their larger body size and wider distributional pattern [22, 23]. Coenagrionidae (29%) was the most dominant family of damselflies, followed by Platycnemididae (3%). Among all the Odonates, 35% were very common (VC), 44% were Common (C), 15% were rare (R) and 6% were very rare (VR) category on the basis of the study site (Fig. 3). According to the IUCN Red Data List, all the odonates were the least concern (LC) category.

Table 1. Checklist of Odonates recorded from the study site.

Sl. No	Common Name	Scientific Name	Status	IUCN status
	Suborder: Anisoptera (Selys, 1854)			
Family - Aeshnidae (Leach, 1815)				
1	Rusty Darner	*Anaciaeschna jaspidea* (Burmeister, 1839)	R	LC
Family - Gomphidae (Rambur, 1842)				
2	Common Clubtail	*Ictinogomphus rapax* (Rambur, 1842)	C	LC
Family - Libellulidae (Leach, 1815)				
3	Trumpet Tail	*Acisoma panorpoides* (Rambur, 1842)	C	LC
4	Scarlet Marsh Hawk	*Aethriamanta brevipennis* (Rambur, 1842)	R	LC
5	Rufous-backed Marsh Hawk	*Brachydiplax chalybea* (Brauer, 1868)	C	LC
6	Little Blue Marsh Hawk	*Brachydiplax sobrina* (Rambur, 1842)	C	LC
7	Black-tailed Dasher	*Brachydiplax farinosa* (Krüger, 1902)	C	LC
8	Ditch Jewel	*Brachythemis contaminata* (Fabricius, 1793)	VC	LC
9	Granite Ghost	*Bradinopyga geminata* (Rambur, 1842)	R	LC
10	Ruddy Marsh Skimmer	*Crocothemis servilia* (Drury, 1770)	VC	LC

11	Blue Ground Skimmer	*Diplacodes trivialis* (Rambur, 1842)	VC	LC
12	Estuarine Skimmer	*Macrodiplax cora* (Brauer, 1867)	C	LC
13	Fulvous Forest Skimmer	*Neurothemis fulvia* (Drury, 1773)	C	LC
14	Pied Paddy Skimmer	*Neurothemis tullia* (Drury, 1773)	VC	LC
15	Green Marsh Hawk	*Orthetrum sabina* (Drury, 1770)	VC	LC
16	Wandering Glider	*Pantala flavescens* (Fabricius, 1798)	VC	LC
17	Yellow-tailed Ashy Skimmer	*Potamarcha congener* (Rambur, 1842)	C	LC
18	Common Picturewing	*Rhyothemis variegata* (Linnaeus, 1763)	VC	LC
19	Rufous Marsh Glider	*Rhodothemis rufa* (Rambur, 1842)	C	LC
20	Coral-tailed Cloud Wing	*Tholymis tillarga* (Fabricius, 1798)	C	LC
21	Black Marsh Trotter	*Tramea limbata* (Desjardins, 1832)	R	LC
22	Long-legged Marsh Glider	*Trithemis pallidinervis* (Kirby, 1889)	C	LC
23	Greater Crimson Glider	*Urothemis signata* (Rambur, 1842)	C	LC
	Suborder: Zygoptera (Selys, 1854)			
Family - Coenagrionidae (Kirby, 1890)				
24	Pygmy Dartlet	*Agriocnemis pygmaea* (Rambur, 1842)	VC	LC
25	Hooded Dartlet	*Agriocnemis kalinga* (Nair & Subramanian 2015)	C	LC
26	Orange-tailed Marsh Dart	*Ceriagrion cerinorubellum* (Brauer, 1865)	VC	LC
27	Coromandel Marsh Dart	*Ceriagrion coromandelianum* (Fabricius, 1798)	VC	LC
28	Western Golden Dartlet	*Ischnura rubilio* (Selys, 1876)	C	LC
29	Common Bluetail	*Ischnura senegalensis* (Rambur, 1842)	C	LC
30	Black Marsh Dart	*Onychargia atrocyana* (Selys, 1865)	VC	LC
31	Saffron-faced Blue Dart	*Pseudagrion rubriceps* (Selys, 1876)	VR	LC
32	Three-lined Dart	*Pseudagrion decorum* (Rambur, 1842)	VR	LC
33	Blue Grass Dart	*Pseudagrion microcephalum* (Rambur, 1842)	VC	LC

Family - Platycnemididae (Yakobson & Bainchi, 1905)				
34	Pied Bush Dart	*Pseudocopera ciliata* (Selys, 1863)	R	LC

Note: VC- Very Common, C- Common, R- Rare, VR- Rare; LC- Least Concern

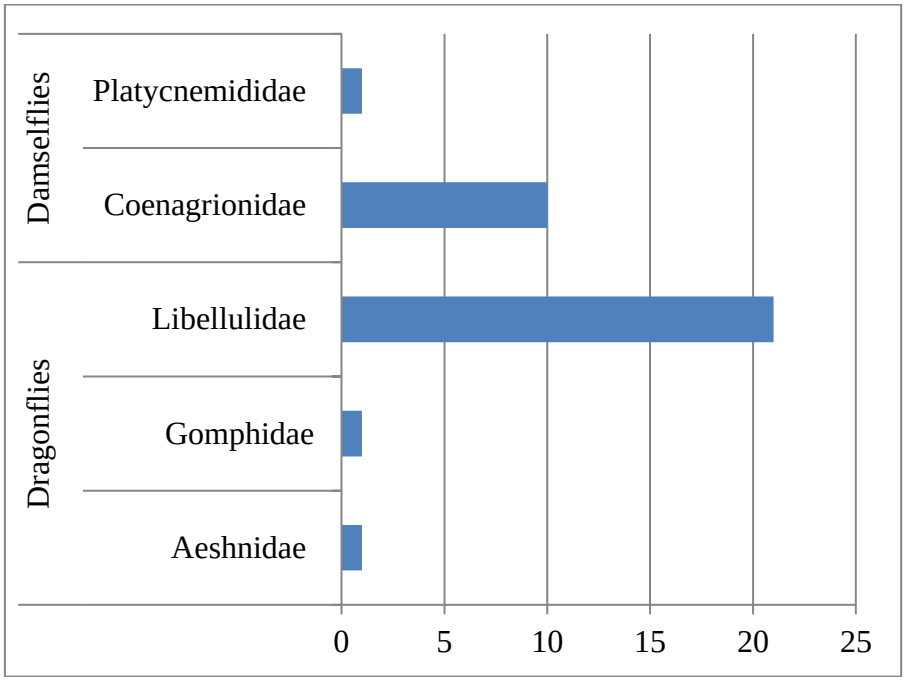

Figure 2. Abundance of different families

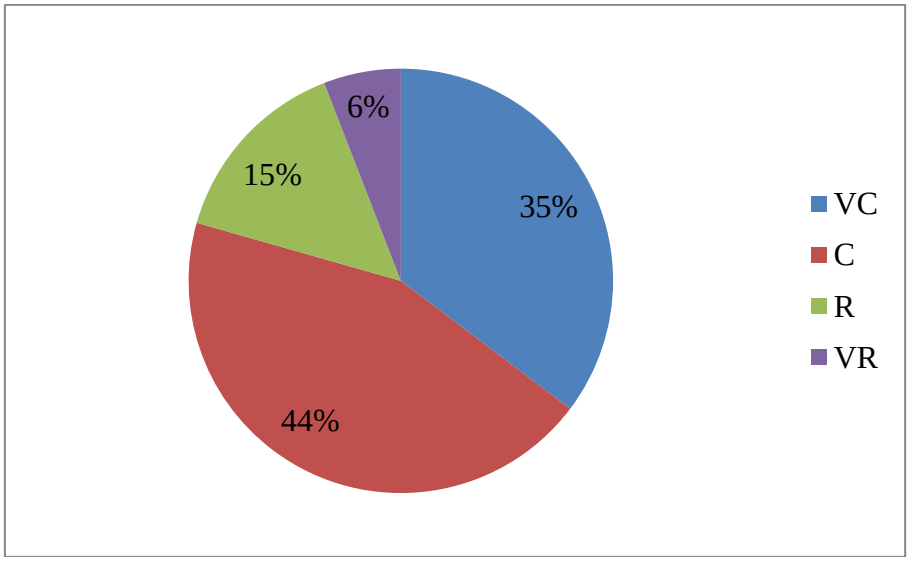

Figure 3. Local Status of Odonat

Photo Plate 1. Dragonflies of study area- A. *Anaciaeschna jaspidea*, B. Crocothemis servilia, C. *Urothemis signata*, D. *Brachythemis contaminate*, E. *Tholymis tillarga*, F. *Pantala flavescens*, G. *Trithemis pallidinervis*, H. *Brachydiplax chalybea*, I. *Brachydiplax sobrina*, J. *Acisoma panorpoides*, K. *Diplacodes trivialis*, L. *Orthetrum Sabina*, *M. Potamarcha congener*, N. *Brachydiplax farinose*, O. *Macrodiplax cora*, P. *Neurothemis tullia*, Q. *Rhyothemis variegate*, R1, *Rhodothemis rufa* (Male), R2. *Rhodothemis rufa* (Female), S. *Ictinogomphus rapax*.

Photo Plate 2. Some pictures of Damselflies: A. *Onychargia atrocyana*, B. *Ischnura senegalensis*, C. *Ceriagrion cerinorubellum*, D. *Ceriagrion coromandelianum*, E. *Agriocnemis kalinga*, F1. *Agriocnemis pygmaea* (Male), F2. *Agriocnemis pygmaea* (Female), G. *Pseudagrion microcephalum*, H. *Pseudocopera ciliate*.

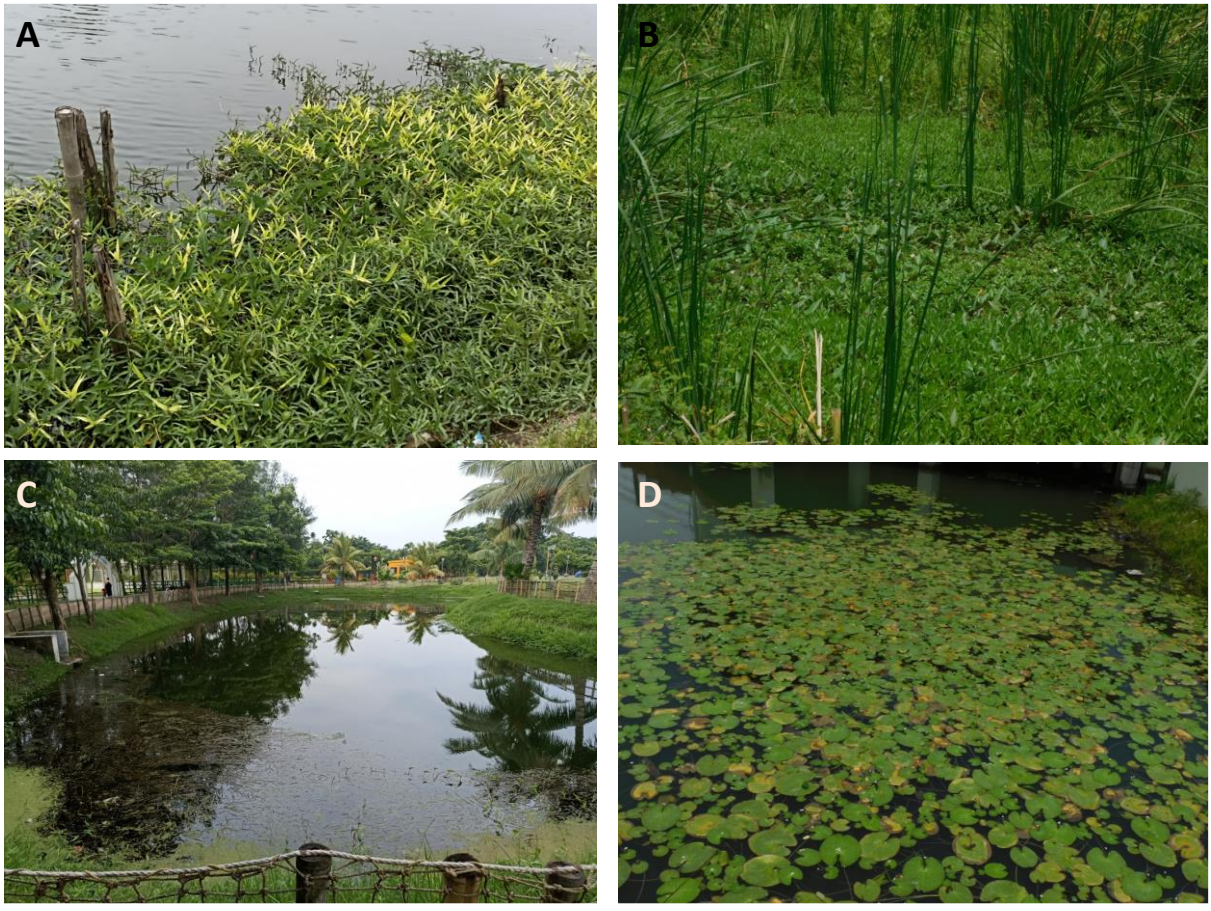

Figure 4. Different type of habitats in the study area

3. CONCLUSIONS

Our finding highlights the value of urban green spaces in protecting the local Odonata biodiversity. Odonates, of which there are 34 species, indicated that healthy environment in the area. Previously Dawn [15] studied out different urban parks and gardens of Kolkata, like Central park (34 species), Victoria Memorial Garden (19 species), Subhas Sarovar (13species), Botanical Garden (33 species), Chintamanikar Bird sanctuary (39 species) but not doing research in Ecopark. Among these 34 species, the highest number of Genera was *Brachydiplax* (3) in the suborder of Anisoptera and *Pseudagrion* (3) of suborder Zygoptera. *Anaciaeschna jaspidea* (Burmeister, 1839) was very rare in Ecopark and found in the shaded area of bushy trees. *Ictinogomphus rapax* (Rambur, 1842) was common, found to roam, and took rest on stick on waterbodies. Species of the family Libellulidae was common all over the area. Among them *Macrodiplax cora* (Brauer, 1867), *Trithemis pallidinervis* (Kirby, 1889) sighted beside the ponds. *Neurothemis fulvia* (Drury, 1773), *Tholymis tillarga* (Fabricius, 1798)were generally found inside well-shaded forested areas. *Bradinopyga geminate* (Rambur, 1842) is a camouflage species and was seen in the oldest cemented wall. Rest of the species of Libellulidae were found grassland, marshyland, beside ponds of well vegetated at side. The Coenagrionidae family of suborder Zygptera, *Agriocnemis pygmaea* (Rambur, 1842),

Ceriagrion cerinorubellum (Brauer, 1865), *Pseudagrion microcephalum* (Rambur, 1842) were very common and found in grasses beside the pond, marshy grassland. *Pseudagrion rubriceps* (Selys, 1876), *Pseudagrion decorum* (Rambur, 1842) were very rare in respect to Ecopark. *Pseudocopera ciliate* (Selys, 1863) of Platycnemididae family was seen two times in the study site.

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