



Preliminary study on diversity of Odonata in an urban green space of Indira Vihar, Raigarh, Chhattisgarh, India

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Abstract

Odonata (dragonflies and damselflies) are important bioindicators of freshwater ecosystems. The present study was conducted at Indira Vihar from January 2025 to December 2025 to assess the diversity and distribution of Odonata across different habitats. A total of 34 species belonging to 7 families were recorded during the study period. Among these, Libellulidae was the most dominant family with 18 species (52.94%), followed by Coenagrionidae with 10 species (29.41%). Platycnemididae was represented by 2 species (5.88%), whereas the remaining families—Gomphidae, Aeshnidae, Protoneuridae, and Chlorocyphidae—were represented by one species each (2.94% each). Diversity indices showed that the study area has rich biodiversity. The Shannon–Wiener diversity index ($H' = 3.30$) indicated high species diversity, while Simpson's index ($1 - D = 0.96$) reflected low dominance and a high degree of evenness among species. The Margalef richness index ($d = 5.644$) indicates high species richness. The dominance of Libellulidae suggests their greater adaptability to a wide range of freshwater habitats. The availability of both permanent and seasonal water bodies, including stagnant as well as flowing waters, along with surrounding vegetation, creates favourable ecological conditions that support diverse Odonata assemblages. The present study provides baseline information on the diversity and distribution of Odonata in the region, which can be useful for future ecological monitoring and conservation planning.

Keywords: Odonata, species diversity, freshwater habitats, bioindicators, diversity indices

Introduction

Odonata, comprising dragonflies (Anisoptera) and damselflies (Zygoptera), are widely distributed insects closely associated with freshwater ecosystems. They inhabit a wide range of freshwater ecosystems, including rivers, streams, lakes, ponds, wetlands, and temporary water bodies. Recent updates from the World Odonata List indicate that approximately 6,400–6,500 valid species of Odonata are reported worldwide (Paulson *et al.*, 2026) [16]. In India, nearly 520–530 species have been documented, highlighting the country's rich odonate diversity (Joshi *et al.*, 2026) [7]. Odonates exhibit a complex life cycle consisting of three stages—egg, larva, and adult. The egg and larval stages are aquatic, whereas the adult stage is terrestrial (Nire, 2019). Based on habitat preference, some species are associated with stagnant water bodies such as ponds, lakes, reservoirs, and temporary rainwater pools, while others inhabit flowing water systems including rivers, streams, and hill rivulets (Nire, 2019).

Their species richness and distribution are influenced by factors such as water availability, habitat type, vegetation structure, and surrounding landscape (Subramanian, 2009) [2]. Odonata exhibit high species diversity in ecologically rich regions and are considered reliable indicators of habitat quality and biodiversity (Nagaraj, 2024) [10]. In addition, they play a significant ecological role as predators, regulating mosquito populations and other small insects, thereby contributing to ecological balance and indirectly benefiting human health (Corbet, 1999; Tennessen, 2009) [3, 26].

Urban green spaces and small freshwater habitats provide suitable habitats for odonates by offering breeding, feeding, and perching sites. Even small urban ponds can support considerable diversity when habitat quality and vegetation are maintained (Dey & Das, 2025) [14]. Odonates help in

maintaining ecosystem balance by living at different trophic levels, supporting species diversity, and aiding in the recycling of organic matter in aquatic habitats (Rana *et al.*, 2025) [19]. The present study was conducted in Indira Vihar, an urban green area with natural and artificial small ponds, check dam, seasonal water bodies, and surrounding vegetation. The objective was to document the diversity and distribution of Odonata across different habitat types in the study area and analyse. Recent studies conducted in Rajnandgaon district have revealed a high diversity of paddy insect pests, with significant spatial and temporal variability influencing crop health and productivity. A total of 74 insect species belonging to multiple orders were documented, highlighting the ecological complexity and the need for region-specific pest management strategies. (Pandey *et al.*; 2024) [15]. Recent comprehensive reviews indicate that India supports nearly 498 species of Odonata distributed across diverse ecological regions, reflecting significant biogeographical heterogeneity and endemism. These patterns emphasize the importance of habitat quality, climatic gradients, and conservation strategies in sustaining freshwater biodiversity and ecological balance. (Pandey *et al.*; 2025) [14]

Materials & Methods

Study Area: Indira Vihar is a green space covering nearly 100 acres and represents an important semi-natural habitat within the urban landscape. The area contains a perennial natural pond that retains water throughout the year. In addition, several seasonal swamps occur in the area, which hold water only during the monsoon season. Two artificial ponds, one large and one small, have also been constructed within the site. Furthermore, a small check dam has been built to store rainwater flowing from the surrounding forest and adjacent areas during the rainy season. This temporary

water channel is locally known as a “Sukha nala.” The continuous availability of water and the presence of

vegetation creates suitable habitats and breeding grounds, which support a rich diversity of Odonata in the study area.



Fig 1: Map & Different habitats of Indira Vihar

Study Period and Sampling Methods

Field surveys were conducted from January 2025 to December 2025 [14] at Indira Vihar, covering different aquatic habitats, open and forest present in the area. Sampling was carried out around permanent and seasonal water bodies, including a natural pond, artificial ponds, seasonal swamps, and a check dam, with a focus on adult Odonata only.

A mixed sampling approach was adopted to document Odonata diversity. Visual Encounter Surveys (VES) were conducted by actively searching along the edges of water bodies where dragonflies and damselflies are commonly found. Line transect methods were used to record species occurrence and abundance along defined stretches, while point count sampling was carried out at selected locations with observations lasting 15 minutes at each point. Opportunistic observations were also included to record species encountered outside fixed sampling points (Sutherland, 1996; Pollard, 1977) [17, 25]. Species that could not be identified in the field were temporarily captured

using a sweep net, identified with the help of taxonomic references, and subsequently released back into their natural habitat.

All individuals were photographed for documentation, and captured specimens were released after identification. Adult individuals were photographed using a Canon 700D digital camera with an EF-S 55–250 mm lens

Species identification was carried out using standard taxonomic keys and relevant literature, including the works of Frederick Charles Fraser (1934, 1936), R. K. Varshney (1995), K. A. Subramanian (2005), T. R. Mitra (2006), R. J. Andrew *et al.* (2008) [1, 4, 5, 9, 22, 27], M. Prasad and K. A. Subramanian (2009), and M. V. Manoj Nair (2011) [11, 18]. In addition, online resources such as Odonata of India website (Joshi *et al.*, 2026) [7] and India Biodiversity Portal (IBP, 2016) were also consulted. A field guide notebook was prepared following the method described by K. A. Subramanian (2009) [2]

Observations

Table 1: Number of species identified

S.N.	Name of species	No of species	Percentage
1	Libellulidae	18	52.94%
2	Gomphidae	01	2.94%
3	Aeshnidae	01	2.94%
4	Coenagrionidae	10	29.41%
5.	Platycnemididae	02	5.88%
6.	Protonuridae	01	2.94%
7.	Chlorocyphidae	01	2.94%
	Total	34	100%

Table 2: The observed Odonates are listed in following table

S. No.	Genus and Species of Odonata	Family	Relative abundance	Status	IUCN status	
1.	<i>Acisoma panorpoides</i>	Libellulidae	0.87	LC	lc	3
2.	<i>Brachythemis contaminata</i>	Libellulidae	5.80	VC	lc	20
3.	<i>Brachydiplax chalebea</i>	Libellulidae	2.90	C	lc	10
4.	<i>Brachydiplax farinosa</i>	Libellulidae	2.61	C	lc	9
5.	<i>Bradinyopyga geminata</i>	Libellulidae	0.87	R	lc	3

6.	Anisoptera	<i>Crocothemis Servilia</i>	Libellulidae	5.22	VC	lc	18	
7.		<i>Diplocodes trivilis</i>	Libellulidae	7.25	VC	lc	25	
8.		<i>Diplacodes nebulosa</i>	Libellulidae	1.74	LC	lc	6	
9.		<i>Neurithemis fulvia</i>	Libellulidae	2.03	C	lc	7	
10.		<i>Neurithemis intermedia</i>	Libellulidae	0.87	R	lc	3	
11.		<i>Orthetrum Sabina</i>	Libellulidae	6.38	VC	lc	22	
12.		<i>Pantala flavescense</i>	Libellulidae	6.67	VC	lc	23	
13.		<i>Potamarch congener</i>	Libellulidae	4.64	C	lc	16	
14.		<i>Rhyothemis variegata</i>	Libellulidae	3.48	C	lc	12	
15.		<i>Tholymis tillarga</i>	Libellulidae	1.16	LC	lc	4	
16.		<i>Tramea limbata</i>	Libellulidae	1.45	LC	lc	5	
17.		<i>Trithemis aurora</i>	Libellulidae	0.58	R	lc	2	
18.		<i>Trithemis festiva</i>	Libellulidae	0.58	R	lc	2	
19.		<i>Trithemis pallidinervis</i>	Libellulidae	2.32	VC	lc	8	
20.		<i>Ictinogamphus rapax</i>	Gomphidae	1.45	LC	lc	5	
21.		<i>Anax guttatus</i>	Aeshnidae	1.16	R	lc	4	
22.		Zygoptera	<i>Agriocnemis femina</i>	Coenagrionidae	2.90	VC	lc	10
23.			<i>Agriocnemis pygmaea</i>	Coenagrionidae	3.48	VC	lc	12
24.			<i>Ceriagrion coromandelian</i>	Coenagrionidae	4.64	VC	lc	16
25.			<i>Ceriagrion olivaceum</i>	Coenagrionidae	2.32	C	lc	8
26.			<i>Ischnura aurora</i>	Coenagrionidae	8.12	VC	lc	28
27.	<i>Ischnura senegalansis</i>		Coenagrionidae	3.48	VC	lc	12	
28.	<i>Pseudagrion decorum</i>		Coenagrionidae	0.87	R	lc	3	
29.	<i>Pseudagrion microcephalum</i>		Coenagrionidae	2.90	C	lc	10	
30.	<i>Pseudagrion rubriceps</i>		Coenagrionidae	2.03	C	lc	7	
31.	<i>Disproneura quadrimaculata</i>		Protoneuridae	1.45	LC	lc	5	
32.	<i>Copera marginipes</i>		Platycnemididae	4.06	LC	lc	14	
33.	<i>Copera vittata</i>		Platycnemididae	2.90	LC	lc	10	
34.	<i>Libellago indica</i>		Chlorocyphidae	1.16	R	lc	4	

NOTE: Detail of terminologies used in the table.

Status: C= Common, VC= very common, LC = less common, R= rare, VR= Very rare, IUCN Status: *lc* = least concern



Brachythemis contaminata



Orthetrum Sabina



Orthetrum Sabina (mating pair)



Ictinogamphus rapax



Ischnura aurora



Pseudagrion rubriceps



Rhyothemis variegata



Pseudagrion microcephalum



Mating pair

Conclusion

Based on our findings, it is evident that Indira Vihar, Raigarh, provides an essential habitat for Odonata, with the community being largely represented by the Libellulidae and Coenagrionidae families. The Shannon-Wiener and Simpson indices observed during the study indicate a highly diverse and well-balanced ecological system, while the Margalef Index results point toward a significant species richness. We found that the combination of seasonal water bodies and local vegetation creates a stable environment that prevents any single species from becoming overly dominant. This research provides a crucial baseline for future biodiversity tracking in the region. To expand on this, we suggest that future investigations should examine how seasonal shifts and water quality (physicochemical parameters) impact the Odonata population in such urban green spaces.

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