



SPECIES COMPOSITION AND DIVERSITY OF ODONATA FAUNA IN GANDHISAGAR WILDLIFE SANCTUARY, MANDSAUR AND NEEMACH DISTRICT OF MADHYA PRADESH, INDIA

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ABSTRACT:

The present study was carried out to reveal the odonate diversity in from Gandhisagar Wildlife Sanctuary. During the study period of 2022–2024 a total of 41 species of Odonata from 25 genera and eight families were recorded. Among these, 26 species and 17 genera were Anisoptera (dragonflies), and 15 and 8 genera were Zygoptera (damselflies). The species compositions are in the suborder Anisoptera (63.41%) and in suborder Zygoptera (36.58%). The family Libellulidae had the maximum species richness 18 (43.90%), followed by Coenagrionidae 5 (12.19%). The study presented only a preliminary study of Odonata in the area, suggesting the need for further exploration of the region to discover more species.

Keywords: - Diversity, Odonata, Anisoptera, Zygoptera, bioindicator, Gandhisagar Wildlife Sanctuary

INTRODUCTION:

Odonata, an order of insects, comprises three sub-orders: Zygoptera (damselflies), Anisoptera

(dragonflies), and Anisozygoptera (mixed characteristics of dragonflies and damselflies) The Odonates are distributed in all geographical realms, but their greatest numbers and diversity occur in the tropics. They are among the most ancient-winged insects, featuring two pairs of wings and compound eyes (Corbet and Brooks, 2008). The Insect order Odonata predatory insects viz., dragonflies and damselflies (Kalkman *et al.*, 2008; Subramanian, 2009).

They are usually sighted flying over aquatic bodies (such as lakes, ponds, and streams) and terrestrial areas (like gardens, paddy fields, and forests). Odonata is distributed worldwide (Boudot and Kalkman, 2015). Globally, 6392 extant species in 46 families are known (Paulson *et al.*, 2022)

and distributed globally except in the poles. In India a total 504 species belong to 157 genera, seventeen families, three Genera and three suborders are known (Kalkman *et al.*, 2020). The Western Ghats, Western and Eastern Himalaya have maximum number of species (Subramanian and Babu, 2024). In Madhya Pradesh 88 species of Odonata (damselflies and dragonflies) were compiled along with 11 species are endemic to state by Subramanian and Babu, (2024).

They are excellent bioindicators of water quality, aquatic ecosystems and environmental change as they show a wide range of reactions to environmental stresses (Pinto *et al.*, 2012; Tiple and Koparde 2015). They act as an umbrella species and play the role of both prey and predators in aquatic ecosystem. They are one of the dominant invertebrate predators in the freshwater ecosystem and feed on wide range of aquatic invertebrates (Tiple *et al.*,

2012; Das *et al.*, 2021). Being predator in both larval and adult stage, they play a vital role in the food chain in wetland ecosystem (Andrew *et al.*, 2009; Nair 2011; Tiple *et al.*, 2022). The habitat loss and degradation are major threats to Odonata, which are caused by water pollution, water extraction, eutrophication, acidification, urbanization, and tourism activities (Simaika and Samway. 2011; Tiple *et al.*, 2012; May, 2019; Subramanian and Babu, 2020). Odonates are extensively studied and explored worldwide (Kalkman, *et al.*, 2020; Subramanian and Babu, 2024).

The current state of knowledge regarding the Odonata of Madhya Pradesh has been documented by various researchers, including Fraser (1933, 1934, 1936). After Fraser's work, some additions of Odonata fauna were made by Mitra (1988, 1995), Srivastava and Suri Babu (1997), Prasad and Varshney (1995), Ramakrishna, (2006); Mishra, (2007), Raju and Narayanan, (2008), Prasad and Mishra, (2009), Tiple *et al.*, (2011, 2012); Talmale, (2011), Tiple and Chandra, (2013); Das, (2013); Talmale, (2016ab), Talmale, (2022), Tiple & Payra (2020) and Tiple *et al.*, (2022). Recently, Paunikar and Talmale (2024) and Paunikar (2024) have been also reported Odonata fauna from the National Park of and Wildlife Sanctuaries of Madhya Pradesh. Many additions have been made to the

Gandhi Sagar Sanctuary is one of the most important wildlife sanctuary situated on the northern boundary of Mandsaur and Nimach districts in Madhya Pradesh, India. But, this is one of the unexplored areas regarding the information on faunal diversity of this sanctuary including Odonata diversity. The study was undertaken to explore the Odonata

(Dragonflies and Damselflies) species composition and diversity from the area.

MATERIALS AND METHODS:

2.1 Study area

The study was performed in Gandhisagar Sanctuary (24.670556 N, 75.788056 E) and area 368.62 km² is a wildlife sanctuary situated on the northern boundary of Mandsaur and Nimach districts in Madhya Pradesh. It is spread over an area of 368.62 km² (142.32 sq mi) adjoining Rajasthan state in India. It was notified in 1974 and more area was added in 1983. The Chambal River passes through the sanctuary dividing it into two parts. The western part is in Nimach district and eastern part is in Mandsaur district. It is in the Khathiar-Gir dry deciduous forests ecoregion. This region is known as Nimar region which touches its border with Rajasthan thus more or less knows as dry region thus vegetation is also not so dry and we will find many rocky patches during safari drive. The forest of this sanctuary is part of Khathiar-Gir dry deciduous forest thus here we will find trees like Salai (*Boswelliaserrata*), Kardhai (*Anogeissuspendula*), Dhawda (*Terminaliaanogeissiana*), Tendu (*Diospyrosmelanoxylon*), Palash (*Buteamonosperma*) etc. It is part of World famous Chaturbhuj Nala rock shelters are also part of same Gandhi Sagar wildlife sanctuary. This sanctuary is spread over the area surrounding to Gandhi Sagar dam backwater. It is known for some rare wildlife species like Wild Dogs (Dholes), Chinkara, Leopard, Otter, Mugger crocodile. In addition to this, we can also have sighting of common animals like Spotted Deer, Sambar, Gray Langur etc.



Source: Web-Map of Gandhisagar Wildlife Sanctuary, Neemach and Mandsaur district of Madhya Pradesh

2.2. Data collection

Odonata was surveyed using the direct observation method during March 2022 to December 2024 all the season period along various potential habitats such as water bodies, forests and agricultural lands. The

survey was conducted during sunny days (10:00 am to 3:00 pm), as Odonata are active during the daytime. The different species of Odonata collected in different water bodies of the sanctuary with the help of Insect net. The species encountered were closely photographed using by Nikon Camera. The adult specimens were identified with the help of identification keys provided by Fraser (1933, 1934, and 1936), Mitra (2006), Subramanian (2009), Andrew *et al.* (2009), and internet references

(<http://odonatanepal.blogspot.com>;

<https://www.indianodonata.org>), and

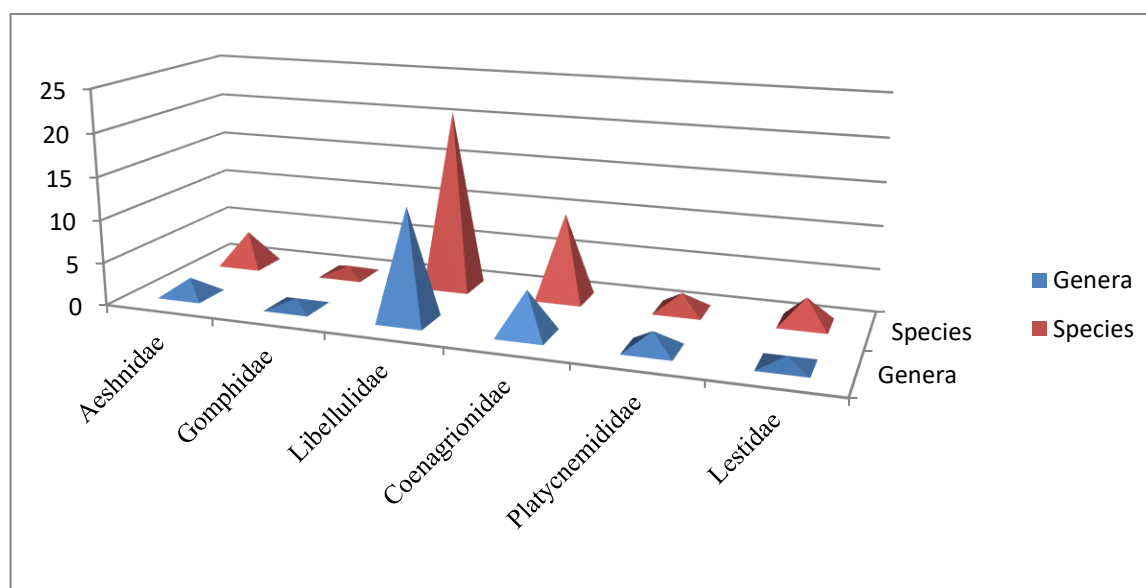
compiled to make a checklist.

Table 1: List of Odonata (dragonflies and damselflies) recorded from Gandhisagar Wildlife Sanctuary, Madhya Pradesh

S.N	Scientific Name	Common Name	Family	IUCN Status
1	<i>Anaxephippiger</i> (Burmeister, 1839)	Vagrant Emperor	Aeshnidae	LC
2	<i>Anaxguttatus</i> (Burmeister, 1839)	Blue-Tailed Green Darner	Aeshnidae	LC
3	<i>Anaximmaculifrons</i> Rambur, 1842	Magnificent Emperor	Aeshnidae	LC
4	<i>Gynacanthabayadera</i> Selys, 1891	Parakeet Darner	Aeshnidae	LC
5	<i>Ictinogomphusrapax</i> (Rambur, 1842)	Common clubtail	Gomphidae	LC
6	<i>Acisomapanorpoides</i> Rambur, 1842	Trumpet tail	Libellulidae	LC
7	<i>Brachythemiscontaminata</i> (Fabricius, 1793)	Ditch jewel	Libellulidae	LC
8	<i>Brachydiplaxsobrina</i> (Rambur, 1842)	Little Blue Marsh Hawk	Libellulidae	LC
9	<i>Bradinopygageminata</i> (Rambur, 1842)	Granite ghost	Libellulidae	LC
10	<i>Diplacodesnebulosa</i> (Fabricius, 1793)	Blacktipped Ground Skimmer	Libellulidae	LC
11	<i>Diplacodesrivialis</i> (Rambur, 1842)	Ground skimmer	Libellulidae	LC
12	<i>Crocothemisservilia</i> (Drury, 1770)	Ruddy marsh skimmer	Libellulidae	LC
13	<i>Neurothemisfulvia</i> (Drury, 1773)	Fulvous forest skimmer	Libellulidae	LC
14	<i>Orthetrumglaucaum</i> (Brauer, 1865)	Blue Marsh Hawk	Libellulidae	LC
15	<i>Orthetrumpruinsum</i> (Rambur, 1842)	Crimson -Tailed Marsh Hawk	Libellulidae	LC
16	<i>Orthetrumluzonicum</i> (Brauer, 1868)	Tricolor Marsh Hawk	Libellulidae	LC
17	<i>Orthetrumsabina</i> (Drury, 1770)	Green marsh hawk	Libellulidae	LC
18	<i>Orthetrumtaeniolatum</i> (Schneider, 1845)	Small Skimmer	Libellulidae	LC
19	<i>Pantalaflavescens</i> (Fabricius, 1798)	Wandering Glider	Libellulidae	LC
20	<i>Potamarcha congener</i> (Rambur, 1842).	Yellow-tailed Ashy Skimmer	Libellulidae	LC
21	<i>Rhyothemisvariegata</i> (Linnaeus, 1763)	Common Picture Wing	Libellulidae	LC
22	<i>Tholymistillarga</i> (Fabricius, 1798)	Coral tailed Cloud wing	Libellulidae	LC
23	<i>Trameabasilarisburmeisteri</i> Kirby, 1889	Red Marsh Trotter	Libellulidae	LC
24	<i>Trithemis aurora</i> (Burmeister, 1839)	Crimson marsh Skimmer	Libellulidae	LC
25	<i>Trithemisfestiva</i> (Rambur, 1842)	Black Stream Skimmer	Libellulidae	LC
26	<i>Trithemiskirbyi</i> Selys, 1891	Scarlet Roack Glider	Libellulidae	LC

Table 2: List of damselflies recorded from Gandhisagar Wildlife Sanctuary

S.N	Scientific Name	Common Name	Family	IUCN Status
1	<i>Lesteselatus</i> Hagen in Selys, 1862	Emerald Spreadwing	Lestidae	LC
2	<i>Lestesumbrinus</i> Selys, 1891	Brown Spreadwing	Lestide	DD
3	<i>Lestesviridulus</i> Rambur, 1842	Emerald-striped Spreadwing	Lestidae	LC
4	<i>Agriocnemispygmaea</i> (Rambur, 1842)	Pygmy dartlet	Coenagrionidae	LC
5	<i>Agriocnemissplendidissima</i> Laidlaw, 1919	Splendid dartlet	Coenagrionidae	LC
6	<i>Amphiallagmaparvum</i> Selys, 1876	Azure dartlet	Coenagrionidae	LC
7	<i>Ceragrioncoromandelianum</i> (Fabricius, 1798)	Coromandel marsh dart	Coenagrionidae	LC
8	<i>Ischnura aurora</i> (Brauer, 1865)	Golden dartlet	Coenagrionidae	LC
9	<i>Ischnuranursei</i> (Morton, 1907)	Pixie dartlet	Coenagrionidae	LC
10	<i>Ischnurasenegalensis</i> (Rambur, 1842)	Senegal golden dartlet	Coenagrionidae	LC
11	<i>Pseudagrion decorum</i> (Rambur, 1842)	Three- line Sprite	Coenagrionidae	LC
12	<i>Pseudagrionmicrocephalum</i> (Rambur, 1842)	Blue Grass dartlet	Coenagrionidae	LC
13	<i>Pseudagrionrubriceps</i> Selys, 1876	Saffron-faced Bluedart	Coenagrionidae	LC
14	<i>Coperamarginipes</i> (Rambur, 1842)	Yellow -bushdart	Platycnemididae	LC
15	<i>Disparoneuraquadrimalculata</i> (Rambur, 1842)	Black- wing Bombaootail	Platycnemididae	LC

**Fig.1: Graph showing families wise number of genera and species in Gandhisagar Wildlife Sanctuary, Madhya Pradesh****RESULT & DISCUSSION:**

The present study documented a total of 41 species of Odonata from 25 genera and 8 families from the study area. Among them, 26 species and 17 genera were dragonflies under three families, while 15 species and 8 genera were damselflies under three families presented in Table 1 and Table 2. The family-Libellulidae represented the maximum number of species 18 with 13

genera, followed by Coenagrionidae 10 with 5 genera, Aeshnidae 4 with 2 genera, Lestidae 3 with 1 genus, Platycnemididae 2 with 2 genera and Gomphidae 1 with 1 genus (Fig:1).

The species compositions are in the suborder Anisoptera (63.41%) and in suborder Zygoptera (36.58%). The family Libellulidae had the maximum species

richness 18 (43.90%), followed by Coenagrionidae 5 (12.19%), Aeshnidae 4 (9.75%), Lestidae 3 (7.31%), Platycnemididae 2 (4.87%) and Gomphidae 1 (2.43%) respectively. The family Libellulidae showed the greatest number of species among all the families. The majority of species, comprising 40 in total, are classified under the Least Concern category, while one species, *Lestes umbrinus*, is listed as Data Deficient by the IUCN.

This study provided a list of 41 species under 25 genera and 6 families of Odonata from the Gandhisagar Wildlife Sanctuary, Mandasaur and Neemach districts of Madhya Pradesh. Among the Odonata, Anisoptera comprised more species than Zygoptera. The result showed that the findings agree with Keize and Kalkman (2009), Payra *et al.*, (2020), Tiple (2020) and Tiple *et al.*, (2022a), who concluded that Coenagrionidae and Libellulidae are the dominant Odonata fauna in standing water worldwide. Tiple *et al.* (2008) also recorded the Odonata fauna of Nagpur city and observed that the Libellulidae dominated with 30 species followed by Coenagrionidae (16 species). In central India, Odonata fauna is mostly dominated by the Libellulidae and Coenagrionidae (Tiple and Chandra 2013; Tiple *et al.*, 2022; Paunikar and Talmale, 2024). The present study also corroborates this as Libellulidae (18 species), the most dominant, followed by Coenagrionidae 5 species in the study area.

The maximum number of species from Libellulidae may be due to their higher dispersal ability (Corbet, 1999) as well as tolerance to the wide range of habitats. The wide range of distribution of Libellulidae is also favored by the large and bulky body size (Tiple *et al.*, 2022). This finding

indicates a variety of habitats and microhabitats suitable for Libellulidae and their tolerance and adaptability (Kalkman *et al.*, 2008). The Zygoptera has limited dispersal ability, which might be the reason for the lower species number compared to Anisoptera in the study area (Kalkman *et al.*, 2008; Tiple and Chandra, 2013; Paunikar and Talmale 2024). Zygoptera, with limited dispersal capacity, are more sensitive to habitat fragmentation and may require more connected and contiguous habitats for their viability in the area.

Various Odonatologists recorded number of species of Odonata from the different National Parks, Wildlife Sanctuaries and Biosphere Reserves of the Madhya Pradesh. Ramakrishna *et al.* (2006) conducted the surveys in Pench as well as Satpura National Parks and reported 24 and 11 species of Odonates respectively. Mishra (2009) reported 32 species of Odonata was documented from Bandhavgarh Tiger Reserve of Madhya Pradesh. Prasad and Mishra (2009) recorded 14 species from Panchmarhi Biosphere Reserve. Talmale (2011) reported 26 species from Singhori Wildlife Sanctuary. Tiple *et al.* (2011) recorded 36 species of Odonates belonging to 2 suborders and 7 families from Kanha National Park. Tiple (2012) also recorded 70 species of Odonates belonging to 47 genera of 2 Suborders and 12 families from Achanakmar- Amarkantak Biosphere Reserve. Das *et al.* (2013) recorded 47 species from three Tiger Reserves of Madhya Pradesh, Central India, including Kanha, Pench and Bandhavgarh, within 7 families and 31 genera. They recorded 44 species from Kanha, 41 species from Pench and 37 species from Bandhavgarh Tiger Reserve. Thirty-five species were recorded in all three tiger reserves. Talmale (2022) documented

50 species belonging to 33 genera of 7 families of Odonates from Nauradehi Wildlife Sanctuary. Recently, Paunikar and Talmale (2024) reported 38 species belonging to 24 genera under 7 families and 38 species belonging to 18 genera of 6 families of Odonata from Sanjay- Dubri National Park, Sidhi districts and Paunikar (2024) recorded 38 species belonging to 18 genera of 6 families of Odonata from Ghghuwa Fossil National Park of Dindori district of Madhya Pradesh. The study showed that the diversity of Odonata in the different National Parks, Wildlife Sanctuaries and Biosphere Reserves of the Madhya Pradesh very rich and diverse.

landfills, contributing to an eco-friendlier waste management strategy. Overall, comparing the NPK content of vermicompost derived from vegetable and temple waste provides valuable insights into maximizing the potential of both waste streams for sustainable agriculture, promoting resource utilization and minimizing environmental impact.

CONCLUSION:

Altogether 41 species (including 26 dragonflies and 15 damselflies) and 25 genera of Odonata under 6 families were recorded from the study area. Anisoptera comprised more species and genera than Zygoptera. Among all the families, the Libellulidae family comprised the maximum number of species. The family Libellulidae had the maximum species richness followed by Coenagrionidae 5 Aeshnidae 4, Lestidae 3, Platycnemididae 2 and Gomphidae 1 respectively. The study presented only a preliminary study of Odonata in the area, suggesting the need for further exploration of the region to discover more species. The present study infers that the Gandhisagar WLS, Mandsaur and Neemach district is rich diversity in Odonata species.

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