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## Seasonal variation of odonate diversity in harsul and Salim Ali Lake, Aurangabad, Maharashtra, India

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### Abstract

Odonates are intriguing insects that serve as crucial indicators of the environment's health and water supply. In the form of predators and prey, they are important animals in both the terrestrial and aquatic food webs. In 2021–2022, a study on odonates' variety and seasonal fluctuation were carried out at the Harsul and Salim Ali Lake in Aurangabad, Maharashtra, India. Both locations are popular tourist destinations on the outskirts of Aurangabad, with a sizable pond just next to the palace. The location has luxuriant vegetation and gardens. Photo of adult specimens. The specimens were kept on file. Different identification keys were used to identify species. 11 species of Odonates were found in total, spread across 3 families, according to the study. 8 species were dragonflies and 3 were damselflies. The most prevalent species was *Crocothemis servilia*, and the least prevalent was *Acisoma panorpoides*. The monsoon and post-monsoon seasons saw the highest levels of odonate abundance, whereas summer saw the least amount of reduction. The enhanced abundance can be linked to favorable vegetation, perching places, breeding circumstances, high rainfall, and humidity (83%-94%) with a temperature range of 24.5 °C to 29.5 °C. The findings from the current study serve as the site's baseline for future taxonomy-based research and conservation efforts. Additionally, it will spur interest in odonate diversity studies.

**Keywords:** Aurangabad, diversity, odonates, seasonal variation, species abundance

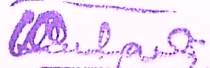
### Introduction

Two of the most varied animals on the planet are dragonflies and damselflies. Of the 5,740 species of odonates that have been identified worldwide, India is home to 474 species across 142 taxa and 18 families (Subramanian, 2014) <sup>[21]</sup>. Beautiful insects called odonates have aquatic larval phases. The food web's top predators and crucial components are present in both the adult and larval phases (Mishra *et al.*, 2019; Babosova *et al.*, 2019) <sup>[16, 21]</sup>. They act as catch-all species for the preservation of biodiversity. According to Jacob *et al.* (2017) <sup>[22]</sup>, Samways *et al.* (2016) <sup>[20]</sup>, Harisha and Hosetti (2017) <sup>[9]</sup>, Sahu and Rai, 2019 <sup>[19]</sup>, and Ilhamdi *et al.* 2020 <sup>[11]</sup>, they are also effective bioindicators of ecological health. India's Maharashtra state includes the semiarid region of Aurangabad. There are numerous water bodies in the area, and these are home to various odonates. In the city of Aurangabad, there are two tourist attractions: Harsul Lake (19.9282° N, 75.3368° E) and Salim Ali Lake (19.8992° N, 75.3423° E). A pond that is always present is next to the palace. Because of the palace's vast gardens and foliage, various Odonates can thrive there. A checklist of the Odonates found on the site has been done in the current study, coupled with a study of the abundance and seasonal fluctuation. The latter has been seen for the first time in the Aurangabad region. At the time, only the adults who lived on land were in the spotlight. Research on the aquatic larval forms may be done in the future. More or less from various regions of India, odonate diversity has been researched (Das, 2016 <sup>[6]</sup>; Debata *et al.*, 2017 <sup>[7]</sup>; Harisha and Hosetti, 2018 <sup>[10]</sup>; Kaur *et al.*, 2020 <sup>[12]</sup>; Mishra *et al.*, 2017, 2019) <sup>[7, 16]</sup> and in other nations (Koneri *et al.*, 2019 <sup>[14]</sup>; Cannings, 2019 <sup>[4]</sup>; Conniff *et al.*, 2020 <sup>[5]</sup>; Ilhamdi *et al.*, 2020) <sup>[11]</sup>. A baseline of the site's data is provided by the current study for future investigation and conservation planning. It is possible to investigate the species' bioindicator value. And last but not least, it will draw attention to the Odonate group.

### Material and Methods

Both locations have lovely gardens and are positioned close to a pond. The study was conducted during the three seasons of November 2021 to December 2022.



  
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The line transect approach was used to take photographs of adult odonates. The hours of all visits and collecting were 9:00 am to 11:00 am. The insects were captured on camera from that specific location each month. Monthly records of temperature and humidity were also kept. Odonates were gathered were Take a picture. With the aid of different Identification Keys, the insects were recognized.

### Results and Discussion

Odonates were found in 11 different species at the Harsul and Salim Ali Lake location in Aurangabad, Maharashtra. Three species of damselflies (suborder Zygoptera) and eight species of dragonflies (suborder Anisoptera) were among the identified species. The most abundant species was the dragonfly, *Crocothemis servilia*, which made up 31.91% of the total abundance. Other species included *Orthetrum sabina*, *Orthetrum glaucum*, *Brachythemis contaminata*, *Aethriamanta brevipennis*, *Trithemis pallidinervis*, *Diplacodes trivialis*, *Ictinogomphus rapax*, and *Acisoma*

*panorpoidea* the most numerous and diverse family was Libellulidae. These findings were somewhat comparable to those of the other investigations (Agrawal, 1957; Harinath *et al.*, 2015; Mandal and Aditya, 2017; Bishnoi and Dang, 2019; Mishra *et al.*, 2019)<sup>[1, 8, 15, 3, 16]</sup>.

Odonates were plentiful, with 453 being counted during the monsoon and dropping to 308 in the winter and 198 in the summer. High rainfall, high humidity (83%-94%), a temperature range of 24-29 °C, favourable vegetation, perching locations, and breeding circumstances during the monsoon are all factors that contribute to higher abundance. This seasonal variation was almost identical to what other writers (Narendra *et al.*, 2016; Thomas *et al.*, 2018; Tuhin, 2018; Nu and Bu, 2019)<sup>[18, 23, 24, 25]</sup> had previously noted. The rare species *Acisoma panorpoidea* was only occasionally seen. On the other hand, summer was when *Orthetrum* sp. and *Brachythemis contaminata* were most prevalent.

Table 1: List of Odonates in Harsul and Salim Ali Lake, Aurangabad, Maharashtra, India

S.No	Sub Order	Family	Commonname	Scientific Name
1	Anisoptera	Libellulidae	Scarlet Skimmer	<i>Crocothemis Servilia</i>
2	Anisoptera	Libellulidae	Trumpet Tail	<i>Acisoma panorpoidea</i>
3	Anisoptera	Libellulidae	Slender Skimmer	<i>Orthetrum sabina</i>
4	Anisoptera	Libellulidae	Ditch Jewel	<i>Branchythemis contaminata</i>
5	Anisoptera	Libellulidae	Slender Skimmer	<i>Orthetrum glaucum</i>
6	Anisoptera	Libellulidae	Scarlet marsh hawk	<i>Aethriamanta brevipennis</i>
7	Anisoptera	Libellulidae	Long leg marsh glider	<i>Trithemis pallidinervis</i>
8	Anisoptera	Gomphidae	Common cubetail	<i>Ictinogomphus rapax</i>
9	Zygoptera	Coenagrionidae	Southern Damselfly	<i>Coenagrion mercuriale</i>
10	Zygoptera	Coenagrionidae	Large red Damselfly	<i>Pyrhosoma nymphula</i>
11	Zygoptera	Coenagrionidae	Small red Damselfly	<i>Ceragrion tenellum</i>

### Conclusion

According to the current study, the Odonate population of Aurangabad, Maharashtra, India's Harsul, and Salim Ali Lake is highly diverse. The monsoon season had the highest species abundance, and the summer season had the lowest. The Libellulidae family of Anisoptera was the most prevalent and numerous family. Utilizing this group of insects as bioindicators for managing different water bodies and also used for monitoring environmental changes requires more research. The current study makes little contribution to Odonata's listing and seasonal variation in Maharashtra, India.

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