

“Diversity And Seasonal Occurrence of Odonata Along the Gomati River at PSGVPMS ASC College Campus, Maharashtra, India.”

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ABSTRACT

Dragonflies and damselflies (Order: Odonata) play a crucial role in freshwater ecosystems, serving as indicators of biodiversity and ecological health. This study recorded the Odonata diversity at the Gomai River on the PSGVPMS ASC College Campus in Lonkheda, Shahada, Nandurbar District, Maharashtra, India, from July 2024 to June 2025. Observations were conducted twice a week, with photographs taken using a Sony Cybershot DSC-W650. A total of 34 species from 27 genera and six families were identified, with the family Libellulidae being the most diverse (16 species), followed by Coenagrionidae (9 species) and Aeshnidae (4 species). At the suborder level, Anisoptera represented 23 species (67.65%) and Zygoptera 11 species (32.35%), with Orthetrum and Anax being the most represented genera. The findings emphasize that the Gomai River and its riparian habitats are vital for a diverse Odonata assemblage, providing essential baseline data for conservation efforts in the Tapi River basin.

Keywords: Odonata; dragonflies; damselflies; Gomai River; Shahada; Nandurbar; Maharashtra; Libellulidae; freshwater biodiversity; riparian habitat; Tapi River basin.

INTRODUCTION

Odonata, which includes dragonflies and damselflies, are mainly linked to freshwater ecosystems. Their life cycle consists of an aquatic immature phase and an adult stage that is largely terrestrial. Adults are frequently found near rivers, streams, ponds, marshes, reservoirs, wetlands, and other freshwater environments. Larval and adult odonates are both predatory and hold significant roles in aquatic and terrestrial food webs. Odonates are extensively employed in freshwater ecological research, as their distribution and community composition are shaped by habitat structure, water availability, aquatic vegetation, riparian vegetation, and other environmental factors. Because they are sensitive to habitat alteration, they serve as valuable organisms for tracking changes in freshwater ecosystems (Kulkarni & Subramanian, 2013).

The diversity and distribution of Odonata are shaped by multiple environmental factors, such as water permanence, flow characteristics, vegetation structure, availability of breeding sites, surrounding land use, and climatic conditions. Certain species are closely tied to flowing water, while others are typically found in stagnant or slow-moving water bodies. Consequently, habitat heterogeneity can sustain a wider range of odonate species. India hosts a rich Odonata fauna spread across a broad array of biogeographic regions. Maharashtra, specifically, encompasses varied freshwater and terrestrial habitats that sustain considerable odonate diversity. Koparde and Tiple (2015) reported 134 Odonata species from 70 genera and 11 families in Maharashtra, illustrating the order's substantial diversity within the state.

North Maharashtra also harbors diverse odonate assemblages. Sawarkar (2020) documented 52 species from 29 genera and six families across different habitats of Chalisgaon, North Maharashtra. The study recorded 35 Anisoptera and 17 Zygoptera species and found high diversity in agro-forest habitats linked to aquatic bodies and suitable breeding environments.

The Gomati River is a significant tributary of the Tapi River system in northern Maharashtra. The river and its adjoining riparian habitats offer a mix of aquatic and terrestrial environments that could potentially sustain

diverse Odonata communities. However, localized information on Odonata diversity around the PSGVPMS ASC College Campus at Lonkheda, Shahada, is scarce.

Thus, the present study was carried out to document the Odonata diversity of the Gomati River area, determine family, genus, and suborder composition, record the occurrence of dragonflies and damselflies, and provide baseline information for future ecological monitoring and conservation studies.

REVIEW OF LITERATURE

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MATERIALS AND METHODS

Study Area

This study was carried out along the Gomati River at the PSGVPMS ASC College Campus, Lonkheda, Shahada, Nandurbar District, Maharashtra, India. Observations were mainly carried out near the college campus, the library area, the riverbank, and the surrounding vegetation.

The study site was situated at roughly 21°34'08.40" N latitude and 74°28'58.80" E longitude.

The study area comprises riverine habitat, riparian vegetation, open areas, and the surrounding terrestrial vegetation. Water availability and vegetation shift seasonally during the monsoon and post-monsoon periods. These habitats provide potential resources for adult feeding, resting, mating, and oviposition, while the aquatic environment supports immature stages. The Gomati River is part of the Tapi River drainage system, which makes the site ecologically relevant for studies of freshwater-associated biodiversity.

Description of the Maps

The three satellite maps show the **PSGVP Mandal's Arts, Science and Commerce College/Central Library area**, situated along the **Gomati River**.

Map 1: The first map provides a broader satellite view of the study area. The **Gomati River** is visible running across the central portion of the image. The **PSGVP Mandal's Central Library** is located on the northern bank

of the river. Dense vegetation is present along the riverbanks, while built-up areas and structures can be seen on both sides. The map also shows a bridge and surrounding roads.

Map 2: The second map gives a closer view of the **Central Library and its surrounding campus**. The college buildings, internal roads, trees, and open spaces are clearly visible. The Gomati River lies immediately south of the campus, with a belt of vegetation separating the built-up area from the river.

Map 3: The third map highlights the location of **PSGVP Mandal's Arts, Science and Commerce College** using a red location marker. **Road 752G** is visible along the western side of the study area, while the **Gomati River** runs adjacent to the campus. The image also shows buildings and developed areas on the opposite bank.

Map 1:



Map 2: The second map gives a closer view of the **Central Library and its surrounding campus**.



Map 3: The third map highlights the location of **PSGVP Mandal's Arts, Science and Commerce College** using a red location marker



Study Period

The study was carried out over one year, from July 2024 to June 2025.

Field Survey

Field observations were made twice a week, during the morning and evening periods. Observations were taken along the riverbank, in adjacent vegetation, in open areas, and in other suitable habitats within the study area. Dragonflies and damselflies were recorded by means of direct observation and photographic documentation. Special attention was paid to individuals linked with aquatic habitats, riparian vegetation, open areas, and potential breeding sites.

Photographic Documentation

Photographs of the observed individuals were taken with a Sony Cybershot DSC-W650 digital camera. The photographs served as supporting evidence for species identification and documentation.

Species Identification

Species were identified using standard Indian Odonata identification references, especially Subramanian (2005) and Andrew et al. (2008). Identification relied on external morphological features, such as body coloration, abdominal markings, thoracic characteristics, wing characteristics, and other diagnostic traits. The species recorded were cross-checked against published regional Odonata records, including studies from Maharashtra and Central India.

Data Analysis

The percentage contribution of each family was computed using:

Percentage contribution = (Number of species in a family / Total number of species) × 100
The species-to-family ratio was computed as:
Species-to-family ratio = Total number of species / Total number of families
Since individual abundance data for each species were not quantitatively recorded, abundance-based diversity indices such as the Shannon–Wiener index were not calculated.

3.1 Overall Species Richness

In total, 34 Odonata species from 27 genera and six families were recorded in the Gomati River study area during the study period.

The six recorded families were:

- Gomphidae
- Aeshnidae
- Libellulidae
- Coenagrionidae
- Lestidae
- Macromiidae

Checklist of Odonata Recorded

Table 1. Inventory of dragonflies and damselflies documented from the Gomati River close to PSGVPMS ASC College Campus, Lonkheda, Shahada, Nandurbar, Maharashtra

No.	Common name	Family	Scientific name
1	Common Clubtail	Gomphidae	<i>Ictinogomphus rapax</i>
2	Common/Lined Hooktail	Gomphidae	<i>Paragomphus lineatus</i>
3	Vagrant Darner	Aeshnidae	<i>Anax ephippiger</i>
4	Blue-tailed Green Darner	Aeshnidae	<i>Anax guttatus</i>
5	Blue Darner/Magnificent Emperor	Aeshnidae	<i>Anax immaculifrons</i>
6	Common Torrent Hawk	Macromiidae	<i>Epophthalmia vittata</i>
7	Rusty Darner	Aeshnidae	<i>Anaciaeschna jaspidea</i>
8	Asian Pintail	Libellulidae	<i>Acisoma panorpoides</i>
9	Scarlet Marsh Hawk	Libellulidae	<i>Aethriamanta brevipennis</i>
10	Ditch Jewel	Libellulidae	<i>Brachythemis contaminata</i>
11	Granite Ghost	Libellulidae	<i>Bradinopyga geminata</i>
12	Ruddy Marsh Skimmer	Libellulidae	<i>Crocothemis servilia</i>
13	Ground Skimmer	Libellulidae	<i>Diplacodes trivialis</i>
14	Brown-backed Red Marsh Hawk	Libellulidae	<i>Orthetrum chrysis</i>
15	Blue Marsh Hawk	Libellulidae	<i>Orthetrum glaucum</i>

16	Crimson-tailed Marsh Hawk	Libellulidae	<i>Orthetrum pruinsum</i>
17	Green Marsh Hawk	Libellulidae	<i>Orthetrum sabina</i>
18	Wandering Glider	Libellulidae	<i>Pantala flavescens</i>
19	Coral-tailed Cloud Wing	Libellulidae	<i>Tholymis tillarga</i>
20	Crimson Marsh Glider	Libellulidae	<i>Trithemis aurora</i>
21	Black Stream Skimmer	Libellulidae	<i>Trithemis festiva</i>
22	Brown Dusk Hawk	Libellulidae	<i>Zyxomma petiolatum</i>
23	Blue-tailed Black Marsh Skimmer	Libellulidae	<i>Brachydiplax sobrina</i>
24	Pygmy Dartlet	Coenagrionidae	<i>Agriocnemis pygmaea</i>
25	Variable Wisp	Coenagrionidae	<i>Agriocnemis femina</i>
26	Coromandel Marsh Dart	Coenagrionidae	<i>Ceriagrion coromandelianum</i>
27	Golden Dartlet	Coenagrionidae	<i>Ischnura aurora</i>
28	Senegal Golden Dartlet	Coenagrionidae	<i>Ischnura senegalensis</i>
29	Saffron-faced Blue Dart	Coenagrionidae	<i>Pseudagrion rubriceps</i>
30	Blue Grass Dartlet	Coenagrionidae	<i>Pseudagrion microcephalum</i>
31	Rusty Dart	Coenagrionidae	<i>Aciagrion pallidum</i>
32	Brown Dartlet	Coenagrionidae	<i>Mortonagrion varralli</i>
33	Brown Spreadwing	Lestidae	<i>Lestes umbrinus</i>
34	Emerald Spreadwing	Lestidae	<i>Lestes elatus</i>

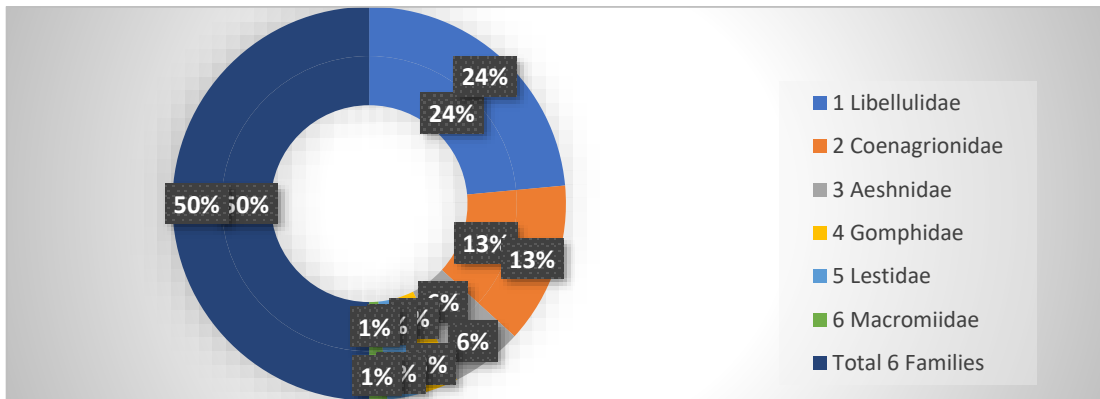
Total: 34 species, 27 genera, and 6 families.

Family-wise Composition

Table 2. Composition by family of the Odonata documented in the study area.

Sr. No.	Family	No. of species	Percentage (%)
1	Libellulidae	16	47.06
2	Coenagrionidae	9	26.47
3	Aeshnidae	4	11.76
4	Gomphidae	2	5.88

5	Lestidae	2	5.88
6	Macromiidae	1	2.94
	Total	34	100.00



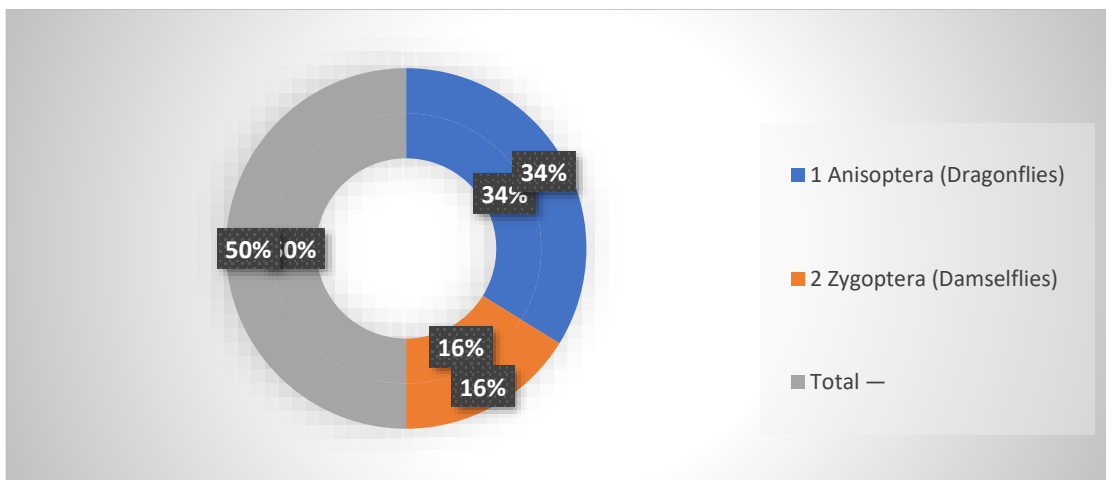
Libellulidae was the most species-rich family, accounting for **47.06%** of the total recorded species, whereas Macromiidae was represented by a single species (**2.94%**).

Libellulidae and Coenagrionidae together accounted for **73.53%** of the recorded species.

Suborder-wise Composition

Table 3. Genus-wise composition of Odonata

Sr. No.	Suborder	No. of species	Percentage (%)
1	Anisoptera	23	67.65
2	Zygoptera	11	32.35
	Total	34	100.00

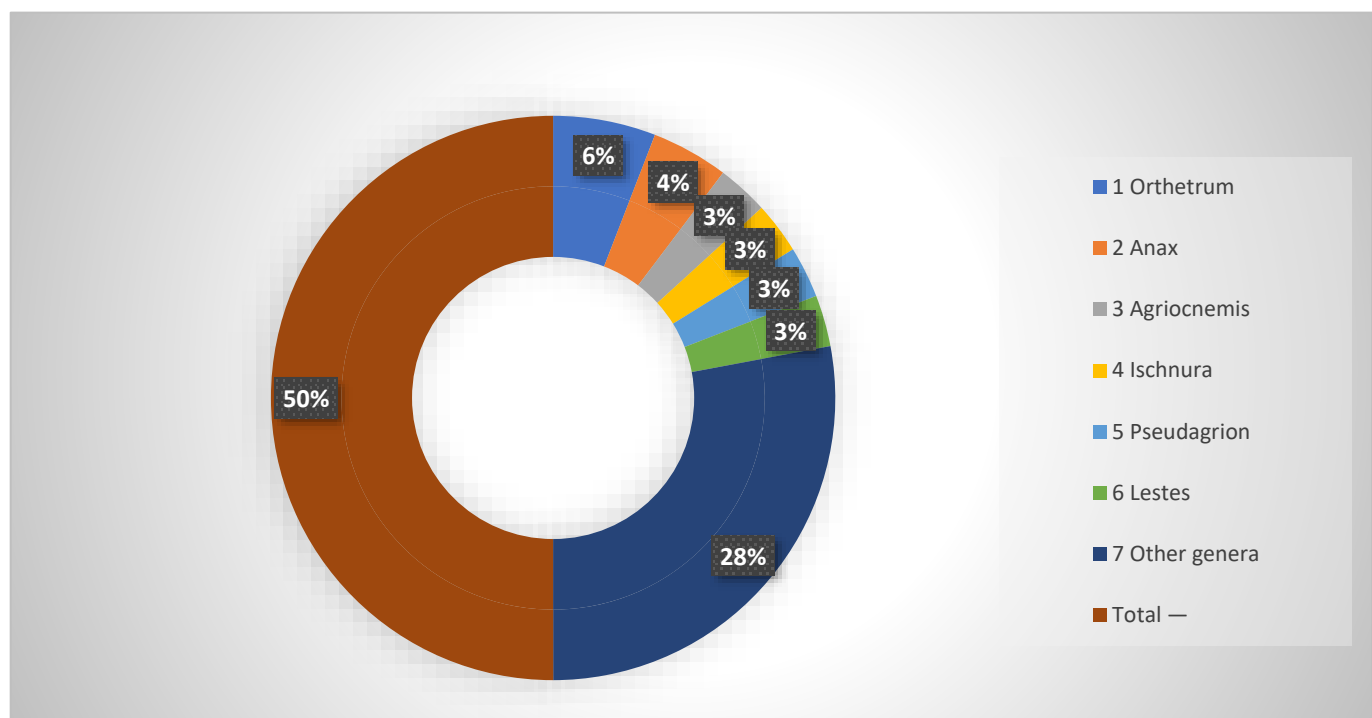


Anisoptera represented 67.65% of the recorded species, while Zygoptera represented 32.35%.

Genus-wise Composition

Table 4. Genus-wise composition of Odonata

Sr. No.	Genus	No. of species	Percentage (%)
1	<i>Orthetrum</i>	4	11.76
2	<i>Anax</i>	3	8.82
3	<i>Agriocnemis</i>	2	5.88
4	<i>Ischnura</i>	2	5.88
5	<i>Pseudagrion</i>	2	5.88
6	<i>Lestes</i>	2	5.88
7	Other genera	19	55.88
	Total	34	100.00



Orthetrum was the most species-rich genus with four species, followed by *Anax* with three species.

Species-to-Family Ratio

The species-to-family ratio was calculated as:

$$34 / 6 = 5.67$$

Thus, the study recorded an average of **5.67 species per family**. However, species were unevenly distributed among families, with Libellulidae contributing 16 species and Macromiidae only one species

DISCUSSION

The present study documented 34 Odonata species belonging to 27 genera and six families from the Gomati River and adjacent habitats at PSGVPMS ASC College Campus, Lonkheda, Shahada. The assemblage included both dragonflies and damselflies associated with flowing and stagnant water, aquatic vegetation, and riparian habitats.

Libellulidae was the most species-rich family, with 16 species (47.06%), followed by Coenagrionidae with nine species (26.47%). This pattern is consistent with the Odonata fauna reported from Maharashtra. Tiple and Koparde (2015) recorded 134 species belonging to 70 genera and 11 families in Maharashtra, with Libellulidae being the most species-rich family (48 species). The dominance of Libellulidae in the present study therefore corresponds with the broader regional pattern.

The high representation of Libellulidae may be associated with the broad habitat tolerance of many species in this family. Species such as *Crocothemis servilia*, *Diplacodes trivialis*, *Orthetrum sabina*, *Pantala flavescens*, and *Trithemis* spp. occur in a range of freshwater-associated habitats. Open water, exposed perching sites, riparian vegetation, and surrounding terrestrial areas may provide suitable conditions for feeding, resting, and reproduction. However, these relationships were not quantitatively tested and should therefore be considered preliminary ecological interpretations.

Coenagrionidae was the second most species-rich family, represented by nine species. The occurrence of genera such as *Agriocnemis*, *Ceriagrion*, *Ischnura*, and *Pseudagrion* indicates the importance of shallow freshwater habitats and vegetated aquatic margins in the study area.

Anisoptera accounted for 23 species (67.65%), whereas Zygoptera comprised 11 species (32.35%). A similar predominance of dragonflies was reported by Sawarkar (2020) in Chalisgaon, North Maharashtra, where 35 Anisoptera and 17 Zygoptera species were recorded. This similarity suggests that dragonflies constitute an important component of Odonata assemblages in freshwater-associated habitats of North Maharashtra.

At the genus level, *Orthetrum* showed the highest richness, with four species, followed by *Anax* with three species. The occurrence of several *Orthetrum* species may reflect the availability of open freshwater habitats and exposed perching sites. Similarly, the presence of three *Anax* species suggests the availability of suitable open spaces for large, active dragonflies.

The record of *Epophthalmia vittata* is notable because Macromiidae was represented by only one species. Its association with flowing-water habitats adds a riverine component to the recorded assemblage. Further studies incorporating flow characteristics, substrate, and water quality are required to test this association.

The presence of *Pantala flavescens* is also noteworthy because of its well-documented migratory and dispersal behaviour. Tiple and Koparde (2015) included this species in the Maharashtra Odonata fauna. Stable-isotope evidence suggests that individuals migrating through the Maldives during October–December may originate from the northern Indian subcontinent (Hobson et al., 2012). Its occurrence at the Gomati River may therefore reflect local habitat use as well as wider seasonal dispersal. However, migration through the study area cannot be confirmed from presence records alone.

Similarly, *Anax ephippiger* is known for migratory and dispersive behaviour. Its occurrence may be associated with the seasonal availability of suitable freshwater habitats. Seasonal abundance monitoring and observations of individual movement would be necessary to determine whether the area functions as a breeding, feeding, or temporary stopover habitat.

The Gomati River and its surrounding riparian vegetation form a heterogeneous landscape comprising flowing water, aquatic margins, vegetation, and open terrestrial areas. Such habitat heterogeneity may provide resources required throughout different stages of the odonate life cycle, including larval development, emergence, feeding, mating, and oviposition.

Seasonal changes in rainfall and vegetation may also influence Odonata activity and composition. Kulkarni and Subramanian (2013) reported seasonal differences in Odonata composition in the Mula and Mutha river basins of Maharashtra, with higher diversity and abundance during the post-monsoon period. Increased water availability and vegetation growth during and after the monsoon may similarly create favourable conditions at the Gomati River site. However, because rainfall, abundance, and environmental variables were not quantitatively measured in the present study, this interpretation remains preliminary.

Despite the relatively small survey area, 34 recorded species indicate considerable local richness. The lower richness compared with statewide studies such as Tiple and Koparde (2015) is expected because statewide surveys encompass larger geographical areas and a greater diversity of habitats. Sawarkar (2020) recorded 52 species across multiple habitats in Chalisgaon, whereas the present study focused primarily on a single river-associated landscape.

Chaudhari Rajeshwar M. and Ishi Sahebrao S. (2020) emphasized that differences in sampling duration, sampling effort, habitat coverage, and methodology should be considered when comparing Odonata datasets. Their study of Daradam, Unapdev, recorded 26 species belonging to 17 genera and four families—Libellulidae, Gomphidae, Aeshnidae, and Cordulidae—during October 2017 to January 2018. The authors associated the observed diversity with the presence of a large aquatic body and surrounding recreational habitats. Differences between their findings and the present study may therefore reflect variation in habitat, sampling period, effort, and methodology.

Overall, the findings highlight the ecological importance of the Gomati River and its associated riparian habitats for maintaining local Odonata diversity. Conservation measures should include maintaining natural riverbank vegetation, protecting aquatic habitats, minimizing pollution, and avoiding excessive modification of riverbanks. Long-term monitoring incorporating quantitative population counts, seasonal sampling, water quality, aquatic and riparian vegetation, and surrounding land-use characteristics would provide stronger evidence for assessing relationships between Odonata diversity and environmental conditions.

CONCLUSION

The present study documented 34 Odonata species representing 27 genera and six families from the Gomati River at PSGVPMS ASC College Campus, Lonkheda, Shahada, during July 2024–June 2025. Libellulidae exhibited the highest species richness (16 species; 47.06%), followed by Coenagrionidae (9 species; 26.47%). Anisoptera comprised 23 species (67.65%), while Zygoptera comprised 11 species (32.35%). The genus *Orthetrum* was the most species-rich, with four species.

The recorded assemblage reflects the habitat heterogeneity of the study area, encompassing riverine, aquatic, riparian, and adjoining terrestrial habitats. The findings provide baseline information on Odonata diversity in the Gomati River region and underscore the importance of conserving aquatic and riparian habitats. Further systematic studies incorporating seasonal abundance, water-quality parameters, and habitat-specific sampling are recommended for a more comprehensive assessment of the riverine ecosystem.

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