

Damselflies (Zygoptera) of Bhavnagar, Gujarat: A Checklist

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Abstract

Zygoptera (damselflies) play a critical role in freshwater ecosystems and serve as sensitive indicators of wetland health. However, information on their distribution and diversity from semi-arid coastal regions of western India remains limited. This study documents the damselfly assemblage of Bhavnagar district, Gujarat, through systematic surveys conducted across diverse aquatic habitats including ponds, marshes, irrigation canals, and temporary monsoon pools. A total of 10 species representing 7 genera and Z families were recorded, with the family Coenagrionidae comprising the majority of taxa, followed by Lestidae. Widespread generalist species such as *Ischnura* spp. and *Agriocnemis pygmaea* were abundant across human-modified waterbodies, reflecting high ecological tolerance and adaptability to anthropogenic conditions. In contrast, habitat-restricted taxa including *Lestes* spp. were confined to seasonal marshes and vegetated wetland margins, underscoring the ecological significance of ephemeral habitats. The observed community structure indicates a predominance of disturbance-tolerant damselflies, accompanied by a subset of species associated with relatively intact aquatic environments. The study provides baseline information for future ecological assessments and emphasizes the need for conservation of remnant wetlands in the Bhavnagar landscape to sustain odonate diversity. These findings contribute to regional biodiversity knowledge and support odonates as bioindicators in semi-arid coastal ecosystems.

Keywords: Zygoptera, Bhavnagar, Odonata diversity, freshwater ecosystems, bioindicators

Introduction

Damselflies (suborder Zygoptera) are an ecologically significant group of aquatic insects within the order Odonata, widely recognized for their sensitivity to environmental changes and their role as bioindicators of freshwater ecosystem health (Chankapure & Barsagade, 2020; Patel *et al.*, 2016) [2, 3]. The Indian subcontinent, with its diverse climatic and ecological zones, supports a rich odonate fauna, including both dragonflies (Anisoptera) and damselflies (Zygoptera), with over 470 species documented nationally (Veera mani *et al.*, 2018). Within India, the state of Gujarat harbours considerable odonate diversity, with recent surveys reporting more than 80 species, of which a significant proportion are damselflies (Rathod *et al.*, 2016) [4].

The semi-arid coastal plains of Saurashtra, including Bhavnagar district, are characterized by a mosaic of lentic and slow-flowing freshwater habitats such as lakes, ponds, and wetlands. These habitats are particularly favourable for Zygoptera, which often exhibit strong habitat specificity and are highly responsive to changes in water quality and vegetation structure (Patel *et al.*, 2016; Rathod *et al.*, 2016) [3, 4]. Previous studies in Gujarat and adjacent regions have highlighted the dominance of the family Coenagrionidae among damselfly assemblages, with genera such as *Ischnura*, *Ceriagrion*, and *Agriocnemis* frequently reported as common and widespread (Patel *et al.*, 2016; Rathod *et al.*, 2016; Rohmare *et al.*, 2017) [3, 4, 5].

Despite their ecological importance, comprehensive studies on the diversity and distribution of Zygoptera in Bhavnagar district remain limited. Existing research from Victoria Park, Bhavnagar, and other parts of Gujarat has provided baseline data, but broader surveys encompassing multiple habitats and seasons are needed to better understand the region's damselfly fauna (Patel *et al.*, 2016; Rathod *et al.*, 2016) [3, 4]. The present study aims to address this gap by systematically documenting the species richness, assemblage structure, and habitat associations of Zygoptera

in Bhavnagar, thereby contributing to the growing body of knowledge on odonate diversity in western India.

Materials and Methods

Study Area

The study was conducted in different wetlands bodies in Bhavnagar, Gujarat, India, located along the western coast of the Gulf of Khambhat. The region falls within a semi-arid climatic zone characterized by hot summers, mild winters, and a monsoonal rainfall regime. Bhavnagar comprises a mosaic of aquatic habitats including permanent ponds, irrigation reservoirs, village tanks, marshes, agricultural canals, mangrove-associated creeks, saltpan wetlands, and temporary rain-filled pools. Such habitat heterogeneity provides suitable larval and adult niches for a range of Odonata taxa.

Sampling Design and Duration

Field surveys were carried out from June to October 2023, covering both monsoon and post-monsoon periods when damselfly activity is highest. A stratified habitat-based survey design was adopted to ensure representation across major aquatic microhabitats. At each site, visual encounter surveys and opportunistic sampling were performed.

Each site was sampled between 0900–1200 hrs and 1500–1730 hrs, corresponding to peak Zygoptera flight activity periods. Surveys were avoided during heavy rain, high wind, and low-light periods to minimize detection bias.

Field Methodology

At each sampling location, adult Zygoptera were recorded using:

- **Line-transect observations** (100–200 m length along wetland margins)
- **Sweep netting**, where required, for confirmation of cryptic or fast-moving species

Individuals were observed for morphological characters, wing venation, coloration, abdominal markings, and

terminal appendages. Whenever necessary, specimens were captured briefly, examined with a handheld magnifier, and released unharmed. Adult damselflies were identified in the field using standard taxonomic keys and field guides (Subramanian, 2009; Patel *et al.*, 2016) [3, 6]. When field identification was uncertain, individuals were photographed or, if necessary, gently captured using an aerial insect net for closer examination and then released. All species records were supported by photographic documentation to ensure accuracy (Chandran *et al.*, 2021) [1].

Results

A total of 10 species of Zygoptera (damselflies) belonging to 7 genera and 2 families were documented from Bhavnagar district during the survey period (Table 1). The assemblage was dominated by members of the family Coenagrionidae, which accounted for the majority of species occurrences, followed by Lestidae. This pattern reflects the typical dominance of lentic and slow-flowing

freshwater-associated damselfly taxa in semi-arid coastal plains of western India.

Among Coenagrionidae, the genera *Ischnura*, *Ceriagrion*, *Pseudagrion*, *Agriocnemis*, *Amphiallagma*, and *Paracercion* were well represented. *Ischnura* species, particularly *Ischnura senegalensis*, *I. rubilio*, and *I. nursei* (Pixie Dartlet), showed widespread distribution across surveyed wetlands and anthropogenic waterbodies, indicating their high ecological tolerance and adaptability to disturbed habitats. The presence of *Agriocnemis pygmaea* (Pygmy Dartlet) further supports this observation, as it is typically associated with nutrient-rich and temporarily wet microhabitats.

In contrast, representatives of Lestidae such as *Lestes concinnus* exhibited localized occurrence, primarily recorded in seasonally inundated marshes and vegetated peripheral wetland zones. This restricted distribution may be attributed to their preference for ephemeral, shallow waterbodies and emergent macrophyte stands, which were comparatively limited in extent in the sampling region.

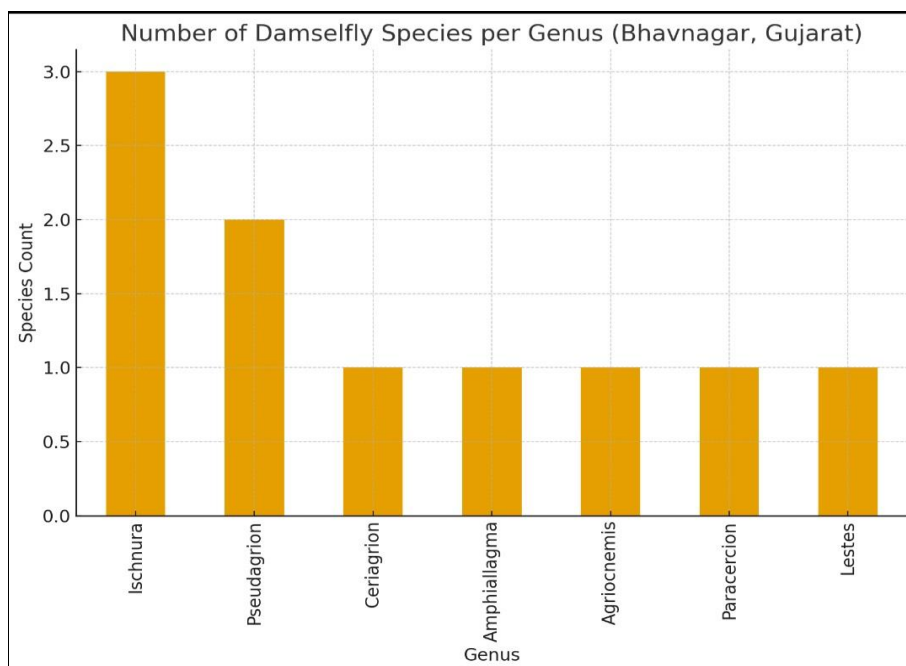


Fig 1: Number of Damselfly Species per Genus from Bhavnagar, Gujarat

Species such as *Pseudagrion rubriceps* (Saffron-faced Blue Dart) and *Amphiallagma parvum* (Azure Dartlet), being sensitive to habitat quality and water clarity, were documented at fewer, ecologically intact locations. Their presence suggests localized pockets of relatively undisturbed wetland habitat within the urban-rural matrix of Bhavnagar.

Overall, the composition of Zygoptera fauna in Bhavnagar indicates a community structured around generalist species tolerant to anthropogenic disturbance, alongside a smaller subset of habitat-specific taxa that serve as bioindicators of wetland health. The predominance of Coenagrionidae aligns with patterns observed in semi-arid South Asian landscapes, where permanent ponds, irrigation tanks, and agricultural canals form the principal larval habitats for damselflies.

Table 1: Taxonomic checklist of Zygoptera (Order: Odonata) recorded in Bhavnagar, Gujarat

Sr No.	Sub Order	Family	Scientific Name	Common Name
1	Zygoptera	Coenagrionidae	<i>Ischnura senegalensis</i>	Common Bluetail
2	Zygoptera	Coenagrionidae	<i>Ceriagrion coromandelianum</i>	Coromandel Marsh Dart
3	Zygoptera	Coenagrionidae	<i>Ischnura rubilio</i>	Western Golden Dartlet
4	Zygoptera	Coenagrionidae	<i>Ischnura nursei</i>	Pixie Dartlet
5	Zygoptera	Coenagrionidae	<i>Pseudagrion decorum</i>	Three-lined Dart
6	Zygoptera	Coenagrionidae	<i>Amphiallagma parvum</i>	Azure Dartlet
7	Zygoptera	Coenagrionidae	<i>Agriocnemis pygmaea</i>	Pygmy Dartlet
8	Zygoptera	Coenagrionidae	<i>Pseudagrion rubriceps</i>	Saffron-faced Blue Dart
9	Zygoptera	Coenagrionidae	<i>Paracercion melanotum</i>	Eastern Lilysquatter
10	Zygoptera	Lestidae	<i>Lestes concinnus</i>	Dusky Spreadwing

Discussion

The present survey in Bhavnagar district, Saurashtra, Gujarat, documented 10 species of Zygoptera (damselflies) across 7 genera and 2 families, with a clear dominance of the family Coenagrionidae, followed by Lestidae. This pattern aligns with regional and subcontinental trends in damselfly assemblages, particularly in semi-arid and coastal plains of western India.

Regional Context and Family Dominance

The dominance of Coenagrionidae in Bhavnagar mirrors findings from other parts of Gujarat and western India, where this family is frequently the most speciose among Zygoptera in lentic and slow-flowing freshwater habitats. For example, studies in southern Gujarat and central Gujarat have consistently reported Coenagrionidae as the leading family among damselflies, with Lestidae also present but less diverse, reflecting similar ecological preferences for still or slow-moving water bodies typical of the region's semi-arid landscape (Rathod *et al.*, 2016; Rohmare *et al.*, 2017) [4, 5]. The prevalence of genera such as *Ischnura*, *Ceriagrion*, *Agriocnemis*, and *Pseudagrion* in Bhavnagar is also consistent with surveys from Victoria Park, Bhavnagar, and other parts of Gujarat, where these genera are regularly encountered in comparable habitats (Patel *et al.*, 2016; Rathod *et al.*, 2016) [3, 4].

Habitat Associations and Assemblage Structure

The observed assemblage structure, with a majority of species associated with lentic and slow-flowing freshwater systems, is characteristic of damselfly communities in the semi-arid and coastal plains of western India. Studies from central and southern Gujarat, as well as from other Indian states with similar ecological settings, have shown that such habitats support higher damselfly diversity compared to fast-flowing streams or highly disturbed urban water bodies (Rohmare *et al.*, 2017; Rathod *et al.*, 2016; Patel *et al.*, 2016) [3, 4, 5]. The seasonal peak in damselfly diversity during the monsoon and post-monsoon months, as observed in Bhavnagar, is also a well-documented phenomenon in the region, attributed to increased water availability and vegetation cover (Patel *et al.*, 2016; Rohmare *et al.*, 2017) [3, 5].

Conclusion

The composition and diversity of Zygoptera in Bhavnagar contribute valuable data to the broader understanding of odonate biogeography in western India. The presence of both widespread and regionally common genera underscores the ecological connectivity of Bhavnagar's wetlands with other parts of Gujarat. Given the ecological sensitivity of damselflies to habitat quality, the documented diversity in Bhavnagar highlights the conservation value of its freshwater habitats, especially in the face of increasing anthropogenic pressures and habitat modification.

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