



E-ISSN: 2320-7078

P-ISSN: 2349-6800

Impact Factor (RJIF): 5.83

www.entomoljournal.com

JEZS 2025; 13(6): 35-39

© 2025 JEZS

Received: 21-08-2025

Accepted: 26-09-2025

VK PatilDepartment of Zoology,
Shivaji University, Kolhapur,
Maharashtra, India**TM Chougale**Bhogawati Mahavidyalaya,
Kurukali, Maharashtra, India

Diversity and abundance of damselflies from Kumbhoj lake, Hatkangale taluka from Kolhapur, Maharashtra

VK Patil and TM ChougaleDOI: <https://www.doi.org/10.22271/j.ento.2025.v13.i6a.9626>

Abstract

The order Odonata encompasses damselflies (Suborder: Zygoptera), which are thin-bodied, weak-flying insects that are closely related to freshwater environments and renowned for their environmental sensitivity. Their prevalence indicates that the water is of high quality, making them important bioindicators. A comprehensive study on the abundance and diversity of damselfly fauna (Zygoptera) was conducted at Kumbhoj Lake, Hatkanangale, Maharashtra, from June, 2024 to May, 2025. A total of 11 species belongs to 7 genera and 3 families Coenagrionidae, Platynemididae, and Chlorocyphidae were recorded during the study period. Among these, the family Coenagrionidae was found to be the most dominant, comprising 7 species, indicating its ecological adaptability to the lake environment. The family Chlorocyphidae was represented by a single species. *Pseudagrion rubriceps*, while *Agriocnemis pygmaea* was identified as the most abundant species, occurring frequently across seasons. The study reveals significant seasonal variation in both diversity and abundance, with peak richness observed during the monsoon and post-monsoon periods. These fluctuations are closely associated with ecological parameters such as water availability, temperature, and aquatic vegetation. The findings underscore the importance of Kumbhoj Lake as an ideal habitat for damselflies and highlight the value of seasonal monitoring in assessing the health of freshwater ecosystems.

Keywords: Biodiversity, damselfly, Kumbhoj lake, seasonal variation, Zygoptera

Introduction

Freshwater ecosystems including lakes, ponds, and wetlands are among the most ecologically productive and diverse habitats on Earth. These systems support a wide variety of aquatic and semi-aquatic organisms, many of which are highly sensitive to environmental changes. Their role in maintaining ecological balance is critical, as they contribute to essential processes such as hydrological regulation, nutrient cycling, and the preservation of regional biodiversity. Monitoring the health of these ecosystems is therefore vital, for in regulating aquatic insect populations, in particular, serve as effective indicators due to their sensitivity to habitat alterations. Biomonitoring scores and diversity indices are increasingly used to assess ecosystem quality and detect anthropogenic impacts (Das & Maity, 2025) [6]. However, due to increasing anthropogenic pressures such as urbanization, agricultural runoff, and habitat fragmentation, these ecosystems are experiencing significant ecological degradation. Monitoring such impacts requires the use of sensitive bioindicators, and insects of the order Odonata which includes dragonflies (Anisoptera) and damselflies (Zygoptera) have proven to be particularly valuable in this regard. Dragonflies and damselflies, are diverse groups of predatory insects known for their aquatic larval stages and strong flying adult forms. Within the order Odonata, the suborder Zygoptera (damselflies) is particularly notable for their slender bodies, equally sized wings held vertically at rest, and laterally placed compound eyes that do not meet (Corbet, 1999) [5]. These characteristics distinguish them from Anisoptera (dragonflies), which have dissimilar wing pairs and contiguous or nearly contiguous eyes. Globally, approximately 6,324 species of odonates belonging to 45 families have been described (Paulson & Schorr, 2021) [14]. In India, the documented diversity includes 493 species across 18 families, with the Western Ghats a prominent global biodiversity hotspot contributing 196 species to this total. The Western Ghats and adjoining Deccan Plateau, including the Kolhapur region of Maharashtra, is part of a globally recognized biodiversity

Corresponding Author:**VK Patil**Department of Zoology,
Shivaji University, Kolhapur,
Maharashtra, India

hotspot, hosting a rich assemblage of Odonate species (Subramanian *et al.*, 2018) ^[17]. However, while dragonflies have received comparatively greater attention in entomological surveys, studies focusing exclusively on damselfly diversity remain limited, especially in semi-urban, man-made freshwater systems like Kumbhoj Lake. Kumbhoj Lake, situated in the Hatkanangale taluka of Kolhapur district, represents a crucial yet understudied aquatic habitat characterized by semi-permanent water, variable hydrology, and diverse aquatic flora. The lake sustains agricultural and domestic activities in the region, making it prone to anthropogenic disturbances. Despite its ecological significance, there has been no systematic attempt to document the Odonate fauna, particularly damselflies, from this locality. The present study was undertaken to assess the species diversity, abundance patterns, and seasonal variation of damselfly fauna in and around Kumbhoj Lake over a full annual cycle (June, 2024 to May, 2025).

Faunistic surveys conducted in neighbouring South Asian regions such as Bangladesh have provided critical insights into regional odonate diversity and habitat associations. Bashar *et al.* (2014) ^[3] recorded 48 species of Odonata, including 25 species of dragonflies and 23 species of damselflies, across five distinct ecological zones: Dhaka, Moulvibazar, Bandarban, Chuadanga, and Khulna. A two-year study in East Java, Indonesia, reported 30 species of odonates across 7 families and 2 suborders, with 3,270 individuals sampled from ten sites representing varied elevations and land-use categories (Leksono *et al.*, 2017) ^[13]. Harinath *et al.* (2015) ^[11], in their survey of Sri Lankamalleswara Reserve Forest in the Eastern Ghats of Andhra Pradesh, recorded 9 species of damselflies, all belonging to the family Coenagrionidae, the most dominant Zygopteran family in the region. Barpeta district in Assam has been documented to support a rich assemblage of odonates, with 45 species recorded across four habitat types ponds, beels, riverbanks, and open tracts over a two-year period (Baruah & Saikia, 2015) ^[2]. This included 16 damselfly species from 3 families, with *Ceriagrion coromandelianum* identified as the most abundant Zygopteran across all habitats. In the Chakrashila Wildlife Sanctuary, located in Western Assam, Choudhury *et al.* (2020) ^[4] recorded a total of 20 species of damselflies (Zygoptera) from 14 genera and 5 families. Surveys conducted throughout Maharashtra, India, from 2006 to 2014, 134 species from 70 genera and 11 families were found, including 47 Zygopteran species and 87 Anisopteran species (Tiple & Koparde, 2015) ^[18]. According to Aiwal *et al.* (2025) ^[1], in their study, 66 odonate species from 41 genera and 10 families were found in Chandgad Taluka of Kolhapur District in the Northern Western Ghats. Of which, 38 species were dragonflies (Anisoptera) and 28 species were damselflies (Zygoptera).

Materials and Methods

The present study was conducted at Kumbhoj Lake, located in Hatkanangale Taluka, Kolhapur District, Maharashtra, over a period of twelve months from June, 2024 to May, 2025. The lake is a semi-perennial freshwater body, characterized by seasonal inflow during the monsoon and sustained water levels for most of the year, providing a suitable habitat for various aquatic insect taxa including damselflies. Fieldwork was carried out monthly, with random sampling method.

Surveys were performed during peak damselfly activity periods, specifically between 08:00 to 11:00 hours and 4:00 to 6:00 hours, under optimal weather conditions.



Fig 1: Study area showing Kumbhoj Lake and surrounding habitats, Hatkanangale, Maharashtra.

Species collected from lake margin and adjacent vegetative habitat. Adult damselflies were identified visually and photographed by camera Sony A7 M4. In cases where field identification was not possible, individuals were gently captured using an insect sweep net, examined, and released at the point of capture.

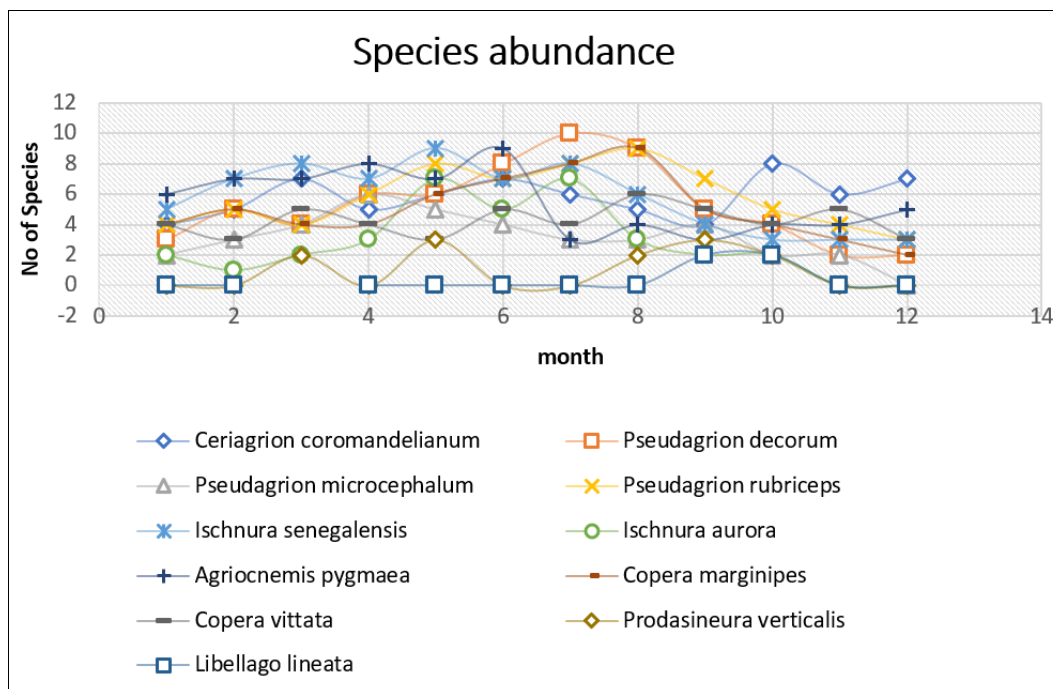
Species identification was carried out using a combination of standard taxonomic resources. In particular, Fraser's monographic series on the Odonata of British India (1933 to 1936) was used as the primary identification key, supplemented by the field guide by Subramanian (2005) ^[15], Emiliyamma *et al.* (2005) ^[7], and the Checklist of Odonata of India (Subramanian & Babu, 2017) ^[16]. Data on species richness and abundance were compiled monthly, and diversity was analysed using standard ecological indices, including the Shannon-Wiener Index (H'), Simpson's Index (1-D), calculated using PAST software (version 4.03) and Microsoft Excel 2019. Seasonal comparisons were conducted to evaluate the influence of ecological conditions on damselfly community dynamics.

Results

A total of 11 species of damselflies belonging to four genera and three families were recorded during the study. The family Coenagrionidae was the most represented, with seven species, including *Ceriagrion coromandelianum*, three species of *Pseudagrion*, two species of *Ischnura*, and small sized *Agriocnemis pygmaea*. The family Platycnemididae contributed three species: *Copera marginipes*, *Copera vittata*, and *Prodasineura verticalis*. The remaining species, *Libellago lineata*, belonged to the family Chlorocyphidae. All recorded species are currently listed as Least Concern (LC) on the IUCN Red List, indicating a stable conservation status globally. Commonly observed species included *Ischnura senegalensis*, *Agriocnemis pygmaea*, and *Ceriagrion coromandelianum*, all of which are known to adapt well to varied aquatic habitats. Species like *Libellago lineata* and *Copera vittata*, although also categorized as Least Concern, were less frequently encountered, suggesting a more habitat-specific distribution. This data highlights a diverse assemblage of damselflies in the study area, dominated by species with wide ecological tolerances and stable population trends as shown in table 1.

Table 1: List of damselfly species recorded from the Kumbhoj lake, along with their respective families, common names, and IUCN conservation status.

Sr. No.	Family	Scientific Name	Common Name	IUCN Status
1	Coenagrionidae	<i>Agriocnemis pygmaea</i> (Rambur, 1842)	Pygmy Dartlet	Least Concern (LC)
2		<i>Ceriagrion coromandelianum</i> (Fabricius, 1798)	Coromandel Marsh Dart	Least Concern (LC)
3		<i>Ischnura aurora</i> (Brauer, 1865)	Aurora Bluetail	Least Concern (LC)
4		<i>Ischnura senegalensis</i> (Rambur 1842)	Senegal Golden Dartlet	Least Concern (LC)
5		<i>Pseudagrion decorum</i> (Rambur, 1842)	Three-lined Dartlet	Least Concern (LC)
6		<i>Pseudagrion microcephalum</i> (Rambur, 1842)	Blue Grass Dart	Least Concern (LC)
7		<i>Pseudagrion rubriceps</i> (Selys, 1876)	Saffron-faced Blue Dart	Least Concern (LC)
8	Platycnemididae	<i>Copera marginipes</i> (Rambur, 1842)	Yellow Bush Dart	Least Concern (LC)
9		<i>Copera vittata</i> (Selys, 1863)	Blue Bush Dart	Least Concern (LC)
10		<i>Prodasineura verticalis</i> (Selys, 1860)	Black Threadtail	Least Concern (LC)
11	Chlorocyphidae	<i>Libellago lineata</i> (Burmeister, 1839)	Golden Gem or Lined Jewel	Least Concern (LC)

**Fig 2:** Monthly species abundance of damselflies recorded from June 2024 to May 2025 in the Kumbhoj Lake, showing seasonal variation in population trends across different species.

Monthly abundance data revealed notable variation in species presence across the year. *Ischnura senegalensis* and *Agriocnemis pygmaea* were consistently observed throughout all twelve months, with peak counts in the post-monsoon and early winter months. *Pseudagrion rubriceps* and *Ceriagrion coromandelianum* also showed year-round occurrence, with higher numbers during the monsoon and winter periods. *Pseudagrion decorum* displayed a significant increase in abundance during November to January, reaching a maximum count of 10 individuals in December. *Copera marginipes* and *Copera vittata* were present year-round, showing relatively stable numbers with peaks in the winter months.

Some species exhibited more seasonal patterns. *Ischnura aurora* was mostly active from September to December, with minimal presence afterward. *Pseudagrion microcephalum* showed reduced counts during the dry summer months, disappearing entirely by May. *Prodasineura verticalis* and *Libellago lineata* had highly restricted occurrences; the former was occasionally recorded during the post-monsoon to early spring period, while the latter was observed only in February and March. Overall, species richness and abundance were highest during the monsoon and early winter months (June to January), with a gradual decline observed from February through May as shown in fig.1.

Table 2: Monthly variation in damselfly diversity indices from June 2024 to May 2025.

	June	July	August	September	October	November	December	January	February	March	April	May
Individuals	34	41	47	49	60	59	57	56	42	38	29	25
Dominance D	0.1228	0.1291	0.1172	0.1195	0.1094	0.1169	0.1265	0.1205	0.11	0.1205	0.1415	0.1744
Simpson 1-D	0.8772	0.8709	0.8828	0.8805	0.8906	0.8831	0.8735	0.8795	0.89	0.8795	0.8585	0.8256
Shannon H	2.143	2.103	2.214	2.158	2.252	2.17	2.123	2.197	2.253	2.208	2.014	1.846
Evenness e ^H /S	0.9469	0.9103	0.9156	0.9618	0.9506	0.9733	0.9285	0.8997	0.9512	0.9099	0.9364	0.9047

The monthly assessment of damselfly populations revealed distinct seasonal variations in both abundance and diversity. The highest numbers of individuals and diversity levels were

observed during the post-monsoon to early winter period (October to December), indicating favorable environmental conditions during these months. In contrast, the late dry

season, especially in April and May, showed a noticeable reduction in both species count and diversity indices, likely due to decreased water availability and habitat quality. These patterns suggest that damselfly communities are influenced by seasonal changes in their habitat and may serve as effective indicators of ecological and environmental fluctuations in freshwater ecosystem.

Discussion

The present study highlights seasonal variations in damselfly abundance and diversity across a 12-month period, with the highest species richness and evenness recorded during the post-monsoon and early winter months. These findings are in line with earlier research conducted in different ecological zones across India and South Asia, suggesting a strong influence of seasonal and habitat factors on odonate communities. Baruah and Saikia (2015)^[2] reported similar seasonal peaks in odonate diversity in Barpeta District, Assam, where post-monsoon conditions provided ideal breeding and foraging habitats due to increased vegetation and water availability. Likewise, Choudhury *et al.* (2020)^[4] observed higher species richness during the monsoon and post-monsoon in Chakrashila Wildlife Sanctuary, attributing it to enhanced aquatic habitat complexity and favorable microclimatic conditions. A study by Harinath *et al.* (2015)^[11] in the Eastern Ghats of Andhra Pradesh also supports this pattern, where damselfly populations surged in areas with flowing water and dense riparian vegetation. In comparison, the lower diversity and abundance recorded in the dry season months of our study mirror findings from Bashar *et al.* (2014)^[3] in Bangladesh, who noted a sharp decline in odonate activity during periods of water scarcity and high temperature. Leksono *et al.* (2017)^[12] further emphasized how altitude and climate influence odonate distribution, with richness declining in less hospitable conditions paralleling the reduced counts we observed during the summer months in our study area. Subramanian and Babu (2017, 2020)^[16] provided comprehensive checklists of Indian Odonata, which serve as vital baselines for regional diversity assessments. Our findings, which include commonly reported species like *Ischnura senegalensis*, *Agriocnemis pygmaea*, and *Ceriagrion coromandelianum*, align well with their national records, indicating these species' broad ecological tolerances and widespread distribution.

The ecological roles of damselflies as bioindicators, as emphasized by Das and Maity (2025)^[6], further validate the use of diversity indices in evaluating freshwater health. The seasonal decline in diversity indices during drier months in our study could reflect stress in aquatic ecosystems, possibly linked to reduced habitat quality and fragmentation.

Finally, the work of Patil and Chougale (2025)^[13] in Kolhapur District provides valuable regional context. Their study showed similar trends in species distribution across varying habitats, reinforcing the role of landscape heterogeneity in shaping damselfly diversity. Our data from Kumbhoj Lake supports their conclusion that wetlands and semi-natural aquatic habitats sustain higher damselfly diversity, particularly when seasonally enriched with vegetation and moisture.

Our findings corroborate the broader consensus across regional and international studies: damselfly communities respond dynamically to environmental gradients, making them effective indicators for monitoring biodiversity and ecological change.

Conclusion

This study reveals distinct seasonal variations in damselfly diversity and abundance, with the highest species richness observed during post-monsoon and early winter months. These trends reflect the critical role of seasonal environmental changes and habitat conditions in regulating odonate communities. Reduced diversity during dry periods highlights the species' sensitivity to water availability and habitat quality. The occurrence of widespread species emphasizes their adaptability and importance as indicators of freshwater ecosystem health. Overall, the findings underscore the need to conserve diverse wetland habitats, supporting damselflies as effective bioindicators and valuable tools for monitoring biodiversity and freshwater ecosystem integrity.

Acknowledgements

The authors are thankful to Head, Dept. of Zoology Y. C. Warana Mahavidyalaya, Warananagar for providing necessary facilities to carry out the present work. Authors are grateful to Chhatrapati Shahu Maharaj Research Training and Human Development Institute (SARTHI) for providing the fundings.

References

1. Aiwal J, Hirgoand N, Patil R, Wander S, Patil S, Sadavar N, *et al.* Studies on the diversity and species composition of Odonata (Arthropoda: Insecta) from Chandgad Taluka of Kolhapur District, Maharashtra, India. *Uttar Pradesh J Zool.* 2025 Mar 31;46(8):95-1120.
2. Baruah C, Saikia PK. Abundance and diversity of Odonates in different habitats of Barpeta District, Assam, India. *Int Res J Biol Sci.* 2015 Sep 30;4(9):17-27.
3. Bashar K, Reza S, Razzak A, Rahman Z, Goda P, Howinder J. Faunistic study of Odonata (dragonfly and damselfly) in some selected regions of Bangladesh. *J Entomol Zool Stud.* 2014;2(2):1-6.
4. Choudhury K, Chakravarty S, Saikiya MK. Diversity and habitat preference of Odonate in Chakrashila Wildlife Sanctuary, Western Assam, India. *Int J Adv Res.* 2020;8:1132-40.
5. Corbet PS. *Dragonflies: behaviour and ecology of Odonata.* Ithaca (NY): Cornell University Press; 1999 Aug 18.
6. Das J, Maity J. Assessing the health of freshwater ecosystems: the role of biomonitoring scores and diversity indices in evaluating aquatic insect populations. *J Appl Entomol.* 2025 Apr 4;5(2):1-10.
7. Emiliyamma KG. On the Odonata (Insecta) fauna of Kottayam District, Kerala, India. *Zoos' Print J.* 2005 Dec 21;20(12):2108-10.
8. Fraser FC. *Odonata. Vol. 1. The Fauna of British India, including Ceylon and Burma.* London: Taylor and Francis; 1933. 423 p.
9. Fraser FC. *Odonata. Vol. 2. The Fauna of British India, including Ceylon and Burma.* London: Taylor and Francis; 1934. 398 p.
10. Fraser FC. *Odonata. Vol. 3. The Fauna of British India, including Ceylon and Burma.* London: Taylor and Francis; 1936. 461 p.
11. Harinath P, Suryanarayana K, Venkata Ramana SP. Diversity and abundance of Odonates (dragonflies and damselflies) at Sri Lankamalleswara Reserve Forest in the Eastern Ghats of southern Andhra Pradesh. *Hist J.* 2015;12(34):52-66.

12. Leksono AS, Feriwibisono B, Arifianto T, Pratama AF. The abundance and diversity of Odonata along an altitudinal gradient in East Java, Indonesia. *Entomol Res.* 2017 Jul;47(4):248-55.
13. Patil VK, Chougale TM. Diversity and distribution of damselflies (Zygoptera) in varied ecological zones of Kolhapur District, Maharashtra. *Int J Innov Res Technol.* 2025;11(12).
14. Paulson D, Schorr M, Deliry C. World Odonata list. 2021 Mar;1.
15. Subramanian KA. Damselflies and dragonflies of Peninsular India: a field guide. Bangalore: Project Lifescape; 2005.
16. Subramanian KA, Babu R. Checklist of Odonata (Insecta) of India. Version 3.0. Kolkata: Zoological Survey of India; 2017 Mar 30. 488 p.
17. Subramanian KA. Atlas of Odonata (Insecta) of the Western Ghats, India. Kolkata: Zoological Survey of India; 2018.
18. Tiple AD, Koparde P. Odonata of Maharashtra, India with notes on species distribution. *J Insect Sci.* 2015 Apr 15;15(1):47.