



Survey and documentation of dragonfly diversity in the selected areas of Tenkasi District

Subashini K¹, Monizha T², Esakkiammal B², Bangajavalli S², Vasanthi K²

¹Research Scholar, Department of Zoology, Sri Parasakthi College for Women, Courtallam, Tamilnadu, India

²Sri Parasakthi College for Women, Courtallam Affiliated to Manonmaniam Sundaranar University Tirunelveli, Tamilnadu, India

Abstract

A survey was conducted to assess the diversity and distribution of dragonflies in five selected habitats of Tenkasi District, Tamil Nadu, from December 2025 to March 2026. The study sites included Avudaiyanoor, Courtallam, Marudhadiyur, Eco-Park and Ilanji. A total of 523 individuals belonging to 32 species and 7 families were recorded. Among the families, Libellulidae showed the highest species richness with 17 species, followed by Coenagrionidae with 9 species. Courtallam recorded the highest proportion of dragonfly distribution (27.7%), while Ilanji recorded the lowest (13.4%). Cluster analysis showed similarities and differences among the five habitats based on dragonfly distribution. Species diversity was evaluated using the Shannon and Simpson diversity indices, with values of 1.30 and 0.369, respectively. The findings indicate that dragonfly diversity is influenced by habitat characteristics, vegetation, water quality, temperature, humidity and human disturbances. Dragonflies serve as important predators and natural biocontrol agents and are valuable indicators of freshwater ecosystem health. Habitat destruction, pollution, sand mining and loss of breeding sites may negatively affect their diversity.

Keywords: Dragonfly diversity, odonatan, Tenkasi District, biodiversity

Introduction

Dragonflies (Order: Odonata) are important components of biodiversity. They function as predators and prey within food webs and contribute to the natural regulation of insect populations. Both nymphs and adults are predatory; aquatic nymphs feed on small aquatic organisms, while adults' prey on mosquitoes, midges, butterflies, moths, and other insects. Therefore, dragonflies can act as natural pest-control agents (Kandibaneet *et al.*, 2005) [15]. Their sensitivity to environmental changes also makes them valuable bioindicators of habitat quality and water pollution (Das *et al.*, 2012; Kannagi *et al.*, 2016) [16].

Odonates are ancient hemimetabolous insects associated closely with aquatic habitats. They occur in lakes, ponds, rivers, streams, tanks, marshes, temporary pools and other freshwater environments. Their life cycle consists of egg, aquatic nymph and terrestrial adult stages. Nymphs are voracious predators, feeding on aquatic insect larvae, tadpoles and small fish. Adults emerge near water bodies and return mainly for mating and oviposition. Their dependence on aquatic and surrounding terrestrial habitats makes them particularly responsive to changes in habitat structure and environmental conditions (Corbet, 1999) [12].

The order Odonata comprises three suborders: Anisoptera (dragonflies), Zygoptera (damselflies) and Anisozygoptera. Dragonflies are generally robust and strong fliers, with large compound eyes that often meet dorsally and wings held horizontally at rest. Damselflies are slender and weaker fliers, with widely separated eyes and wings generally held vertically at rest. Odonates are characterized by distinctive body structures, specialized wing venation, powerful predatory mouthparts and highly developed visual systems, which are useful for species identification.

Globally, approximately 5,680 species of Odonata are known, comprising 2,739 Zygoptera species and 2,941 Anisoptera species (van Tol, 2005). India supports considerable odonate diversity, with numerous species distributed across diverse habitats. Tropical regions,

particularly forest-associated freshwater ecosystems, support high species richness and endemism. Consequently, changes in habitat conditions can strongly influence odonate abundance, distribution and community structure.

Odonates are widely recognized as indicators of environmental health because their diversity and abundance are closely related to water quality, vegetation, habitat structure and climatic conditions (Dolny *et al.*, 2011; Tiple, 2012;) [14, 19]. Habitat destruction, pollution, eutrophication, acidification, alteration of streams and rivers, and climate change are major threats to odonate populations. Tropical forest destruction is particularly important because many species are habitat specialists with restricted distributions.

Several studies have examined odonate diversity, distribution and their relationship with ecosystem conditions in different regions (Ameilia *et al.*, 2006; Sunit *et al.*, 2012; Kannagi *et al.*, 2016) [4, 5, 16, 18]. However, information on odonate diversity and conservation status remains limited in several habitats. Therefore, the present study was undertaken to assess the species richness, diversity, distribution and conservation concerns of Odonata and to understand their significance as indicators of environmental change.

Materials and Methods

1. Study Area

The Western Ghats are one of the major biodiversity-rich regions of India, characterized by diverse ecosystems including tropical wet evergreen, montane evergreen, moist deciduous and scrub forests. The region exhibits considerable variation in vegetation, ranging from grasslands and scrub jungles at lower elevations to dry and moist deciduous and semi-evergreen forests. The Agasthyamalai Hills and Silent Valley are recognized as important centres of biodiversity.

The complex topography and high rainfall contribute to the rich biological diversity of the Western Ghats. The region supports a wide variety of endemic plant and animal

species. Important vegetation includes teak, jamun, cashew, hog plum, coral tree, jasmine and crossandra. The region also supports diverse wildlife and bird communities.

However, increasing urbanization and developmental activities have resulted in habitat degradation and have threatened several plant and animal species. The study region experiences a tropical climate with distinct winter (December–March), summer (April–June), southwest monsoon (June–September) and northeast monsoon (October–November) seasons. The daily maximum temperature is approximately 32.1°C and may reach up to 43°C during May and June. The average annual rainfall is approximately 814.8 mm.

2. Study Sites

2.1 Avudaiyanoor

Avudaiyanoor is a village in Tenkasi District, Tamil Nadu, located about 15 km east of Tenkasi and 45 km west of Tirunelveli. It lies at the foothills of the Western Ghats at approximately 8°53'48"N, 77°33'12"E. The area has a tropical climate with significant monsoon rainfall and moderate temperatures.

2.2 Courtallam

Courtallam is a town in Tenkasi District situated at the foothills of the Western Ghats, about 5 km west of Tenkasi and approximately 160 m above sea level. It is located at about 8.92°N, 77.25°E and is characterized by lush hills, forests, streams and waterfalls. The Chittar River flows through the region, contributing to its freshwater ecosystem.

2.3 Marudhadiyur

Marudhadiyur is a village in Tenkasi District, situated approximately 15 km east of Tenkasi and 45 km west of Tirunelveli. It is located at about 8°52'48"N, 77°23'12"E, in the foothills of the Western Ghats. The region experiences a tropical climate with considerable monsoon rainfall.

2.4 Eco Park

Eco Park is situated near Five Falls on Five Falls Main Road, Courtallam, Tenkasi District, at approximately 8°55'59"N, 77°14'32"E and about 160 m above sea level. Covering approximately 37.23 acres, the park contains gardens, streams, ponds and diverse vegetation, representing the biodiversity of the Western Ghats.

2.5 Ilanji

Ilanji is located between Tenkasi, Sengottai and Courtallam, at approximately 8°57'27"N, 77°16'43"E and about 160 m above sea level. Situated in the foothills of the Western Ghats, it is bordered by the Sitraru and Kundaru rivers and surrounded by several lakes. The region experiences a

tropical climate and receives rainfall during the monsoon seasons.

3. Statistical analysis

Preliminary observation was conducted to identify areas with large populations of dragonflies, five locations were selected which were visited every week from December to March (4 Month). Species identification was made using various field guides and other available literature.

Species richness as a measure on its own takes on account of the number of individuals of each species present. It gives as much weight to those species which have very few individuals as to those which have many individuals.

There are several keys created to measure species biodiversity. The most popular are,

The Simpson index

In ecology, it is often used to quantify the biodiversity of a habitat. It takes into account the number of species present, as well as the large quantity of each species. It measures the probability that two individuals randomly selected from a sample will belong to the same species. It can be measure with the following formula.

$$D = \frac{\sum n(n-1)}{N(N-1)}$$

n= the total number of organisms of a particular species

N= the total number of organisms of all species

The Shannon index

The Shannon Index (also called the Shannon-Wiener Diversity Index) is a measure of species diversity in a community. It was originally developed in information theory by Claude Shannon and later applied in ecology.

4. Results

A total of 523 individuals belonging to 32 species and 7 families of dragonflies were recorded from the selected study areas of Tenkasi District. Among the recorded families, Libellulidae showed the highest species abundance, followed by Coenagrionidae. The families Gomphidae, Euphaeidae, Platycnemididae, Calopterygidae and Lestidae showed comparatively lower abundance.

The observed species diversity indicates considerable variation in the distribution and abundance of dragonflies among the selected study areas. The presence of 32 species representing 7 families highlights the diversity of Odonata in the study region.

Table 1 List of dragonflies used in cluster analysis

S. No	Scientific Name	Common Name	Dec	Jan	Feb	Mar	Total
1.	Crocothemisservilia	Ruddy Marsh Hawk	5	3	4	5	17
2.	Ceriagrioncoromandelianum	Coromandal Marsh Dart	1	8	4	4	17
3.	Trithemisfestiva	lack Sream Glider	7	4	3	2	16
4.	Neurothemis tullia	Pied Paddy Skimmer	5	4	6	0	15
5.	Ischnura pumilio	Small Bluetail	0	1	5	2	8
6.	Pantala flavescens	Wandering Glider	20	11	10	8	49
7.	Orthetrum luzonicum	Tricolored Marsh Hawk	7	4	5	1	17
8.	Pseudagrionmicrocephalum	Blue Grass Dart	1	8	5	3	17
9.	Ischnura aurora	Golden Dartlet	10	2	9	7	28

10.	<i>Ischnura senegalensis</i>	Common Bluetail	1	7	5	7	20
11.	<i>Ictinogomphus rapax</i>	Common Clubtail	5	3	4	1	13
12.	<i>Euphaea fraesi</i>	Malabar Torrent Dart	0	0	0	20	20
13.	<i>Rhyothemis variegata</i>	Common Picture wing	1	5	1	7	14
14.	<i>Vestalis gracilis</i>	Clear-winged Forest Glory	1	0	1	8	10
15.	<i>Lestes rectangularis</i>	Slender Spreadwing	0	1	1	2	4
16.	<i>Orthetrum pruinosum</i>	Crimson-tailed Marsh Hawk	0	2	4	2	8
17.	<i>Ischnura hastata</i>	Citrine Forktail	4	3	2	1	10
18.	<i>Potamarcha congener</i>	Yellow-tailed Ashy Skimmer	4	3	3	5	15
19.	<i>Platynemispennipes</i>	White legged Damselfly	5	1	4	3	13
20.	<i>Ischnuramburii</i>	Ramburs Forktail	2	4	3	4	13
21.	<i>Tholymistallarga</i>	Coral tailed Cloud Wing	5	4	0	3	12
22.	<i>Diplacodes trivialis</i>	Ground Skimmer	6	4	0	5	15
23.	<i>Brachythemis contaminata</i>	Ditch Jewel	8	6	1	11	26
24.	<i>Trithemis aurora</i>	Crimson Marsh Glider	3	5	3	2	13
25.	<i>Orthetrum glaucum</i>	Blue Marsh Hawk	2	4	3	1	10
26.	<i>Orthetrum Sabina</i>	Green Marsh Hawk	11	8	10	11	40
27.	<i>Agriocnemis pygmaea</i>	Pigmy Dartlet	2	0	5	4	11
28.	<i>Coperamarginipes</i>	Yellow Bush Dart	3	4	3	0	10
29.	<i>Bradinopyga germinata</i>	Granite Ghost	4	3	1	3	11
30.	<i>Aethriamanta brevipennis</i>	Scarlet Marsh Hawk	4	9	2	9	24
31.	<i>Orthetrum cancellatum</i>	Black-tailed Skimmer	3	4	3	2	12
32.	<i>Megalagrion leptodemas</i>	Crimson Hawaiian	5	3	4	3	15
		Total	135	128	114	146	523

Table 1 shows the monthly abundance of 32 dragonfly species. A total of 523 individuals were recorded, with the highest abundance in March (146), followed by December (135),

January (128) and February (114). *Pantala flavescens* showed the highest abundance (49 individuals), followed by *Orthetrum sabina* (40), while *Lestes rectangularis* recorded the lowest (4 individuals).

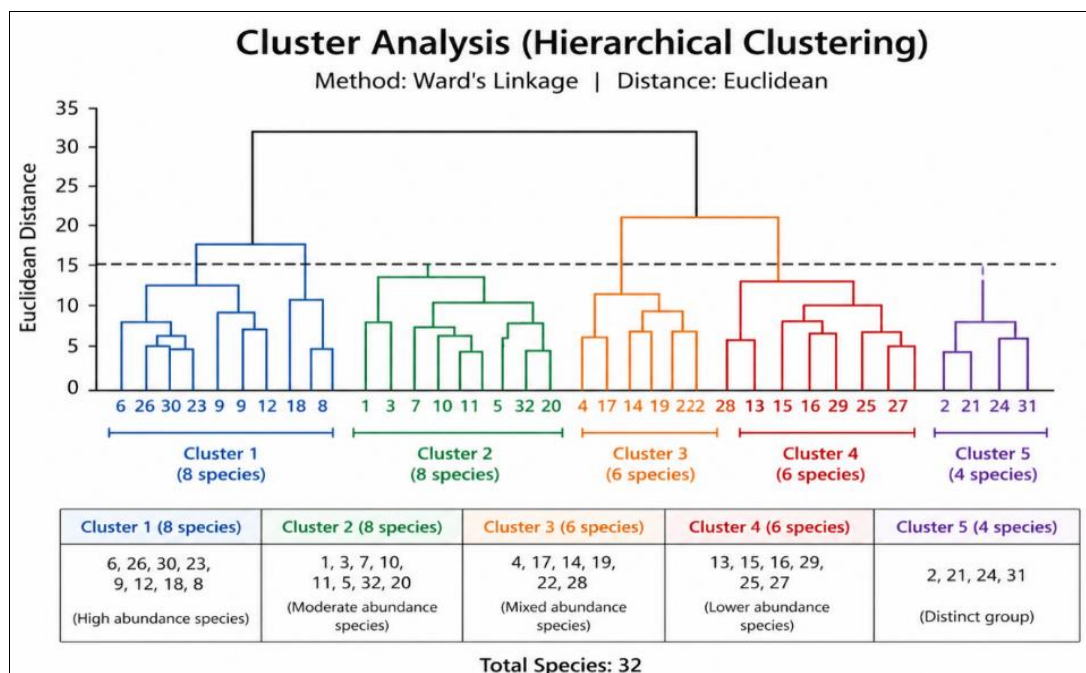


Fig 1: List of dragonflies used in cluster analysis

Figure 1 shows the cluster analysis of the recorded dragonfly species based on their similarity in abundance and distribution across the selected study areas.

Table 2: Five tropical habitats used in cluster analysis

S. No	Five Tropical Habitats
1.	Avudaiyanoor
2.	Courtallam
3.	Marudhadiyur
4.	Eco-park
5.	Ilanji

Table 2 lists the five tropical habitats—Avudaiyanoor, Courtallam, Marudhadiyur,

Eco-Park and Ilanji—used for cluster analysis of dragonfly diversity.

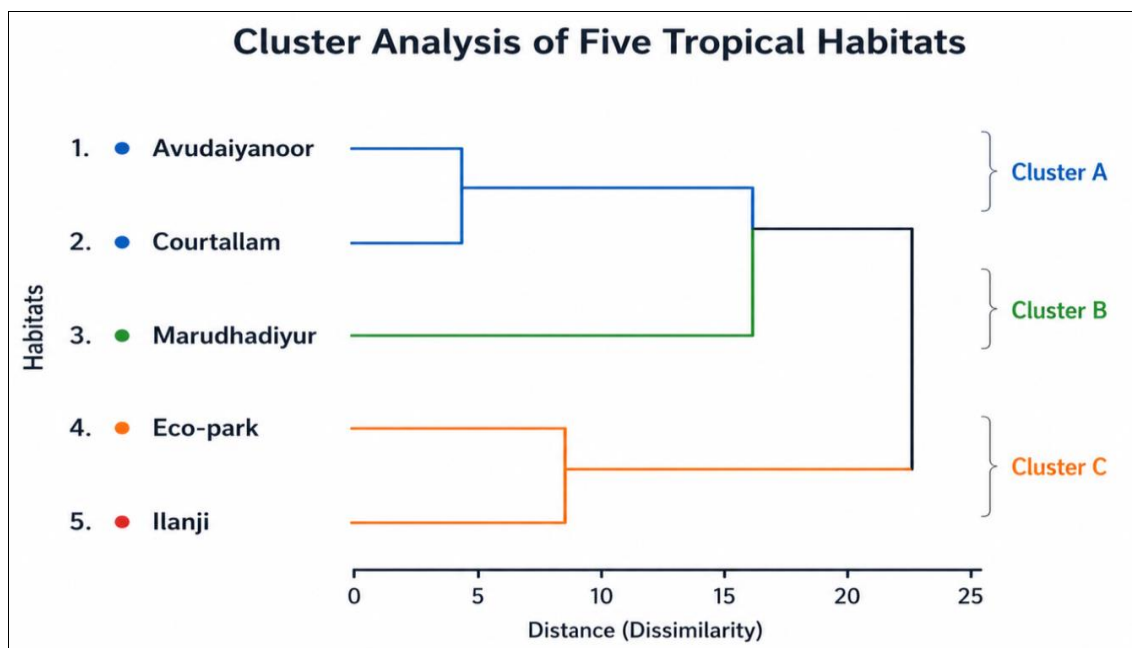


Fig 2:

Figure 2 shows three clusters: Cluster A includes Avudaiyanoor and Courtallam, Cluster B includes

Marudhadiyur, while Cluster C includes Eco-Park and Ilanji, based on habitat dissimilarity.

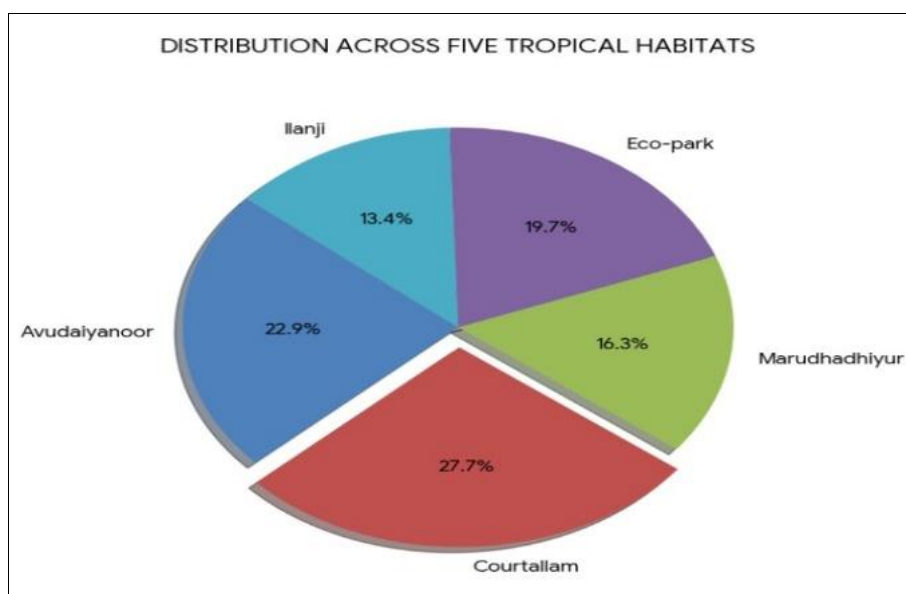


Fig 3:

Figure 3 shows the distribution of dragonflies across five tropical habitats. Courtallam recorded the highest proportion

(27.7%), followed by Avudaiyanoor (22.9%), Eco-Park (19.7%), Marudhadiyur (16.3%), and Ilanji (13.4%).

Table 3: Number of Dragonfly Species by Family

S. No	Family	No. Of Species
1.	Libellulidae	17
2.	Coenagrionidae	9
3.	Gomphidae	1
4.	Euphaeidae	1
5.	Platycnemididae	2
6.	Calopterygidae	1
7.	Lestidae	1
	Total	32

Table 3 shows that Libellulidae had the highest species diversity (17 species), followed by Coenagrionidae (9 species).

Platycnemididae recorded 2 species, while Gomphidae, Euphaeidae, Calopterygidae and Lestidae each recorded 1 species, with a total of 32 species.



Fig 4:

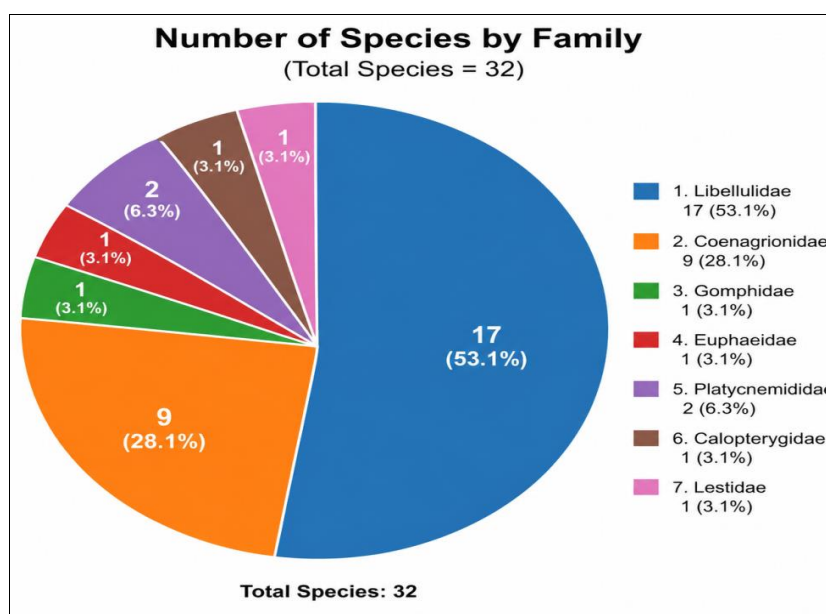


Figure 4 shows the distribution of 32 dragonfly species among seven families. Libellulidae recorded the highest species richness with 17 species (53.1%), followed by Coenagrionidae with 9 species (28.1%). Platycnemididae recorded 2 species (6.3%), while Gomphidae, Euphaeidae, Calopterygidae and Lestidae each recorded 1 species (3.1%).

Table4: Dragonfly diversity

S. No	Family	No. Of Species
1.	Libellulidae	17
2.	Coenagrionidae	9
3.	Gomphidae	1
4.	Euphaeidae	1
5.	Platycnemididae	2
6.	Calopterygidae	1
7.	Lestidae	1

Table 4 presents the dragonfly diversity based on Simpson and Shannon diversity indices. The recorded families comprised 32 species, with Libellulidae showing the highest species richness (17 species), followed by Coenagrionidae (9 species). The Simpson Index (D) was 0.369 and the

Shannon Index (H') was 1.30 for the recorded dragonfly diversity.

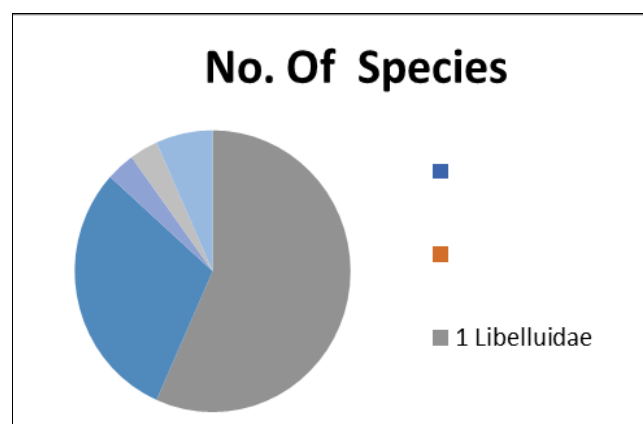


Fig 5:

Figure 5 shows that Libellulidae had the highest species richness (17 species), followed by Coenagrionidae (9

species). Platycnemididae recorded 2 species, while Gomphidae, Euphaeidae, Calopterygidae and Lestidae each recorded 1 species.

Discussion

Libellulidae (Anisoptera) and Coenagrionidae (Zygoptera) were the most abundant and species-rich families recorded in the study. Their wide habitat distribution, adaptability and tolerance to different environmental conditions may contribute to their dominance (Orr, 2003; Kalkman *et al.*, 2008; Kalkman and Orr, 2013).

Orthetrum pruinosum (Libellulidae) was the most abundant species and was frequently observed near rivers and agricultural areas with low vegetation cover. Its activity and distribution were influenced by temperature, with individuals often flying close to water during high temperatures.

Dragonfly diversity was strongly associated with vegetation, water quality, food availability and light intensity. Areas with dense vegetation, good water quality and less human disturbance supported greater species richness and diversity (Dolny *et al.*, 2011;) ^[14]. Aquatic and riparian vegetation also provides important sites for feeding, sheltering, roosting and oviposition.

Environmental factors such as temperature, humidity, pH and chemical conditions also influenced dragonfly activity and distribution. Higher temperatures favour flight activity, while suitable humidity is important for insect physiological processes (Corbet, 1980; Miller, 1995; Sunjaya, 1970). Overall, the findings indicate that habitat quality and environmental conditions play an important role in maintaining dragonfly diversity.

Summary

A survey of dragonfly diversity was conducted in five selected habitats of Tenkasi District—Avudaiyanoor, Marudhadiyur, Courtallam, Eco-Park and Ilanji—from December 2025 to March 2026. A total of 523 individuals representing 32 species and 7 families were recorded. Dragonfly diversity was assessed using the Shannon and Simpson Diversity Indices.

The study showed that odonates are important bioindicators of freshwater ecosystem health due to their sensitivity to environmental changes. Their diversity and abundance were influenced by abiotic factors such as temperature, humidity and rainfall. Lower diversity was observed during summer, while habitat conditions and sunlight influenced dragonfly activity and distribution. Anthropogenic activities such as habitat destruction, water pollution, sand mining, eutrophication and loss of breeding habitats negatively affect odonate diversity.

Dragonflies also play an important role as natural biocontrol agents by controlling insect pests in agro-ecosystems. Therefore, conservation of suitable habitats and increased public awareness are essential for maintaining odonate diversity and freshwater ecosystem health.

References

1. Adarsh CK, Aneesh KS, Nameer PO. A preliminary checklist of odonates in Kerala Agricultural University (KAU) campus, Thrissur district, Kerala, Southern India. *Journal of Threatened Taxa*, 2014;6(8):6127-6137.
2. Afzan AW, Julia J, Amirrudin A. Diversity and distribution of dragonflies (Insecta: Odonata) in Sekayu Recreational Forest, Terengganu. *J. Sustain. Sci. Manage.*, 2006;1:97-106.
3. Ahmad I. The presence of Odonata nymphs at several rice field habitats, Das, S.K., Ahmed, R.A., Sajan, S.K., Dash, N., Sahoo, P.K. and Mohanta, P., 2012. Diversity, distribution and species composition of Odonates in buffer areas of Similipal Tiger Reserve, Eastern Ghats, India. *Acad. J. Ent.*, 1982;5:54-61.
4. Ameilia ZS, Che Salmah MR, Hassan AA. Diversity and distribution of dragonfly (Odonata: Insecta) in the Kerian River Basin, Kedah-Perak, Malaysia. *USU Repository*, 2006, 14.
5. Ameilia ZS, Che Salmah MR, Hassan AA. Diversity and distribution of dragonfly (Odonata: Insecta) in the Kerian River Basin, Kedah-Perak, Malaysia. *USU Repository*, 2006, 14.
6. Andrew RJ, Tembhare DB. Collection of Odonata from Nagpur city, 1997.
7. Arai Y. Adaptation of red dragonflies in Japanese paddy fields. *The Nat. Insec.*, 1996;31:23-26.
8. Arulprakash R, Gunathilagaraj K. Abundance and diversity of odonata in, 2010.
9. Gain BI, Kulkarni RR. Study on Diversity of Odonata fauna of Lohara lake, District-Chandrapur, India. *Environment Conservation Journal*, 2024;25(2):384-387.
10. Clark TE, Samways MF. Dragonflies (Odonata) as indicators of biotope quality in the Kruger National Park, South Africa. *Journal of Applied Ecology*, 1996;33:1001-1012.
11. Clausnitzer V, Joedicke R (eds). Guardians of the watershed. Global status of dragonflies: critical species, threat and conservation. *International Journal of Odonatology*, 2004;7:385-398.
12. Corbet PS. Dragonflies: Behaviour and ecology of Odonata. Cornell University, Ithaca, New York, USA, 1999.
13. Das SK, Ahmed RA, Sajan SK, Dash N, Sahoo PK, Mohanta P. Diversity, distribution and species composition of Odonates in buffer areas of Similipal Tiger Reserve, Eastern Ghats, India. *Acad. J. Ent.*, 2012;5:54-61.
14. Dolny A, Barta D, Lhota S, Rusdianto, Drozd P. Dragonflies (Odonata) in the Bornean rain forest as indicators of changes in biodiversity resulting from forest modification and destruction. *Trop. Zool.*, 2011;24:63-86. *Journal of Threatened Taxa*, 2(8): 1099-1102.
15. Kandibane M, Raguraman S, Ganapathy N. Relative abundance and diversity of Odonata in an irrigated rice field of Madurai, Tamil Nadu. *Zoo'sPrint J.*, 2005;20:2051-2052. <https://doi.org/10.11609/JoTT.ZPJ.1293.2051-2>
16. Kannagi A, Sivakumar V, Santhi V. Diversity of dragonflies (Insecta: Odonata) in a deciduous forest of Thoothukudi District, Tamil Nadu, South India. *J. environs. Protect. Policy*, 2016;4:58-63. <https://doi.org/10.11648/j.ijep.20160403.13>
17. Orr AG. Critical species of Odonata in Malaysia, Indonesia, Singapore and Brunei. In Clausnitzer, V. & R. Joedicke (eds), *Guardians of the Watershed. Global*

- Status of Dragonflies: Critical Species, Threat and Conservation. International Journal of Odonatology, 2004; 7: 371–384.
18. Sunit KR, Ahmed D, Sajan RA, Dash SK, Sahoo N, Mohanta P, *et al.* Diversity, distribution and species composition of Odonates in Buffer Areas of Similipal Tiger Reserve, Eastern Ghat, India. Acad.J. Ent., 2012; 5: 54-61. Temporary water bodies of Coimbatore and Salem districts in Tamil Nadu.
 19. Tiple AD. Dragonflies and Damselflies (Odonata: Insecta) of the Achanakmar Amarkantak Biosphere Reserve, in Chhattisgarh and Madhya Pradesh, with their status in Central India. Int. J. Biotechnol. Bio. Sci., 2012; 2(1): 97-102.
 20. Undergraduate programme, Bandung Institute of Technology. Bandung.
 21. Van Tol J, Rozendaal FG. Records of Calopterygoidea from Vietnam, with description of two new species (Zygoptera: Amphipterygidae, Calopterygidae, Chlorocyphidae, Euphaeidae). Odonatologica, 1995; 24: 89–107.