

Species composition and diversity of Odonata fauna in Cauvery River of Mettur dam, Salem district, Tamil Nadu, India

V. Anbalagan* and M. Ishwarya

PG and Research Department of Zoology, Vivekanandha College of Arts and Sciences for women (Autonomous), Tiruchengode 637 205, Tamil Nadu, India
Email: anbueri@gmail.com

ABSTRACT: Odonata diversity study was carried out from September 2020 to October 2022 in the Mettur Dam, Salem District. Among the total 40 different species, 27 species were in Anisoptera (dragonflies) and 13 species in Zygoptera (damselflies) under five families. Libellulidae was the largest family recorded (16 species), followed by Coenagrionidae (11), Aeshnidae (2), Lestidae (2) and Gomphidae (1). A migratory species, *Pantala flavescens*, was the most dominant in numbers throughout the year. Maximum number of individuals was found during September 2020 to September 2021. Odonata diversity was higher in the first season of 2021 than in next second season. Both dragonflies and damselflies mainly used wetlands of the dam ecosystem and agricultural fields rather than shrubland.

© 2024 Association for Advancement of Entomology

KEY WORDS: *Pantala flavescens*, damselflies, dragon flies, richness, wetlands

INTRODUCTION

Dragonflies and damselflies are important components of biodiversity, and in the food web of ecosystems, they act as effective carnivores and detritivores (Das *et al.*, 2012; Siregar and Bakti, 2016). In all of their life-cycle stages, dragonflies act as predators and eat a wide variety of insects and other organisms. Dragonfly nymphs are predators in the aquatic ecosystem, while adult dragonflies are predators of agricultural crop pests as natural pest control agents (Kandibane *et al.*, 2005). Adult Dragonflies and damselflies are also used as bio-indicators of forest environment and water quality (Corbet, 1999; Dolny *et al.*, 2011; Das *et al.*, 2012). Dragonflies are important

biological control agents for mosquito larvae (Spencer *et al.*, 1999; Mandal *et al.*, 2008). Around 6,000 species and subspecies of Odonata have been described under 630 genera in 28 families throughout the world (Tsuda, 1991). In India, 499 species, 139 genera, and 17 families of dragonflies and damselflies have been documented (Prasad and Varshney, 1995; Sharma, 2010). Odonata diversity has been extensively studied in different forest areas. (Emiliyamma, 2005) has recorded 31 species of dragonflies and damselflies from the southern Western Ghats in the Kottayam district of Kerala. Gunathilagaraj *et al.* (1999), Kandibane *et al.* (2005) and Anbalagan *et al.* (2013) have studied the Odonata diversity in agricultural fields.

* Author for correspondence

Odonata is freshwater insects because the females lay eggs on water or submerged plants and the larval development occurs under water (Hornug and Rice, 2003). Unlike the larva, the adults are aerial. Odonata assemblage is higher in aquatic habitats (Oppel, 2005). Besides water reservoirs, Odonata diversity varies in different climatic zones. They occur worldwide in varied ecological niches extending from seashores, brackish, marshy areas, and mangroves to semi-arid areas (Kalkman *et al.*, 2008). The majority of the species are highly sensitive to changes in habitat quality (Smith *et al.*, 2007; Silva *et al.*, 2010). Besides, these insects also play an important role as prey-predator of natural ecosystems (Das *et al.*, 2021). The Dragonflies are used for food and medical resources at a local scale (Kalkman *et al.* 2008; Shantibala *et al.*, 2012). A study was conducted on the species composition and diversity of Odonata fauna in the agricultural areas and water bodies of the villages in Cauvery River of Mettur dam, Salem district, Tamil Nadu, India.

MATERIALS AND METHODS

Dragonflies and damselflies were recorded in Mettur Dam, Kolathur and Madhanyankuttai of Salem district. The geocordination of Mettur Dam is 11°47'59.99"N; 77°47'59.99"E with elevation 1,341m. The study was conducted in the agricultural areas and water bodies of the villages adjacent to Mettur town (Kolathur, Madhanyankuttai and Thottilpatt). In each village, dragonflies and damselflies were observed in three different locations by quadrat method. Quadrates of 25m x 10m size were laid down with threads inside grasses. Totally five quadrates were put in each village area. Perched dragonflies and damselflies found inside the quadrates were collected by sweep net (25cm in diameter) during day times (between 10.00 AM to 3.00 PM). Flying Odonates inside the quadrat area were also caught with a sweep net. Sampling was done weekly once a month from September 2020 to October 2022. Specimens from replications were pooled together. The species diversity from all these habitats was recorded and species composition of significant differences of diversity among the three parts of the area studied.

The specimens were identified using taxonomic keys provided by Fraser (1933) and Subramanian (2009). After identification and counting the total number of specimens, a few specimens from each taxa were retained and others were left behind alive in the field. Specimens that were not identified in the field were brought to the laboratory for identification. Collected species were sorted out into families, genera, and specimens. A total number of individuals collected under each family were used for diversity analysis. Species richness Menhinick (R1), Margalef (R2), evenness, and diversity indices such as Shannon's index and Simpson index were calculated by using PAST software.

RESULTS AND DISCUSSION

A total of 40 species of Odonata belonging to five families were recorded. Among the five families, Libellulidae was the dominant member (60%) followed by the Coenagrionidae (28%), Lestidae (5%) and Aeshnidae (5%). Out of the 40 species, 27 species belong to the suborder Anisoptera (dragonflies) and 13 to the suborder Zygoptera (damselflies). Libellulidae family recorded maximum of 24 species and two species each in Aeshnidae and Lestidae, and one under Gomphidae. *Diplacodes trivialis* (Rambur) was abundant under Anisoptera and *Pseudagrion microcephalum* (Rambur) among Zygoptera in Mettur dam (Table 1). The dragonflies, *Crocothemis servilia* (Drury), *Diplacodes trivialis* (Rambur), and *Orthetrum sabina* (Drury) (Libellulidae) were recorded from all three villages. Only *Ceriagrion coromandelianum* (F) (Coenagrionidae) among Zygoptera was present in all three villages. Totally nine species of Anisoptera viz., *Brachythemis contaminata*, *Bradinopyga geminata*, and *Crocothemis servillia*, *Diplacodes trivialis*, *Orthetrum pruinosum*, *O. sabina*, *Pantala flavescens*, *Trithemis aurora* and *T. festiva*, and among the Zygoptera *Agriocnemis femina*, *Ceriagrion coromandelianum*, *Ischnura aurora* and *I. rubilio* were present in all three habitations. *Ceriagrion coromandelianum* and *Agriocnemis femina* were confined to Mettur dam and Madhanyankuttai and Kolathur Lakes. The abundance of Libellulidae dragonflies and



Fig. 2 Odonates collected from Mettur Dam, Salem District

Coenagrionidae damselflies in the present study might be due to their shorter life cycle and widespread distribution (Norma-Rashid *et al.*, 2001) and tolerant to a wide range of habitats (Gentry *et al.*, 1975; Samways, 1989).

Odonata recorded were categorized family wise into four on the basis of their abundance such as VC- very common (70-100%), C-common (40-70%), R-rare (20-40%) and VR-very rare (below 20%) (Table1). The total number of individuals recorded in Mettur Dam was 1513. Maximum total abundance (878) was recorded from September 2020 to September 2021. Maximum Shannon-Wiener diversity index (1.49) and evenness (0.89) are recorded during the first season of 2021. Odonata diversity in the first season was higher

than in the second season. The Margalef index (0.61) was calculated as (0.59) for each study year. Among the five families encountered during the study period, the maximum dominance and contribution of the species diversity accounted for 24 species in Libellulidae followed by Coenagrionidae which contributed 11 species. The minimum species was recorded to belong to two families each two species Lestidae, Aeshnidae and Gomphidae only one species respectively. In the study, the distribution and abundance of dragonfly species have higher dominance than damselfly species. The abundance of dragonflies in Mettur Dam could be attributed to the presence of shade over the habitat from the trees and shrubs present in the water bodies and to the presence of aquatic

Table 1. Odonata species recorded during September 2020 to October-2022 in Mettur Dam

No.	Species	Common name	Status
Sub order: Anisoptera; Family: Libellulidae			
1.	<i>Diplacodes trivialis</i> (Rambur)	Ground skimmer	VC
2.	<i>Tholymis tillarga</i> (F)	Coral-tailed cloud wing	C
3.	<i>Pantala flavescens</i> (F)	Wandering glider	C
4.	<i>Crocothemis servilia</i> (Drury)	Ruddy marsh skimmer	C
5.	<i>Brachythemis contaminata</i> (F)	Ditch jewel	VC
6.	<i>B.chalybea</i> (Brauer)	Rufous-backed Marsh	C
7.	<i>D. nebulosa</i> (F)	Black tipped ground skimmer	VC
8.	<i>D. trivialis</i> (Rambur)	Ground skimmer	R
9.	<i>Bradinopyga geminata</i> (Rambur)	Granite ghost	R
10.	<i>Orthetrum sabina</i> (Drury)	Green marsh hawk	C
11.	<i>O. glaucum</i> (Brauer)	Common Blue Skimmer	R
12.	<i>O. testaceum</i> (Burmeister)	Scarlet Skimmer	VR
13.	<i>Sympetrum flaveolum</i> (Linn)	Yellow-winged darter	VR
14.	<i>S. vulgatum flavum</i> (Barteneff)	<i>Southern Migrant Hawker</i>	C
15.	<i>O. pruinosum</i> (Burmeister)	Crimson-tailed marsh hawk	R
16.	<i>Neurothemis tullia</i> (Drury)	Pied paddy skimmer	C
17.	<i>Rhodothermis rufa</i> (Rambur)	Common red bolt	C
18.	<i>Hylaeothemis indica</i> (Fraser)	Blue hawkelet	R
19.	<i>O. chrysis</i> (Selys)	Brownbacked red marsh hawk	C
20.	<i>Tetrathemis platyptera</i> (Selys)	Pigmy skimmer	VR
21.	<i>Trithemis aurora</i> (Burmeister)	Crimson marsh glider	C
22.	<i>T. festiva</i> (Rambur)	Black stream glider	R
23.	<i>T. pallidinervis</i> (Kirby)	Long-legged Marsh Glider	R
24.	<i>Rhyothemis variegata</i> (Linn)	Common picture wing	R
Family: Aeshnidae			
25.	<i>Anaciaeschna jaspidea</i> (Burmeister)	Rusty darner	VR
26.	<i>Anax immculifrons</i> (Rambur)	Magnificent emperor	R
Family: Gomphidae			
27.	<i>Gomphus vulgatissimus</i> (Linn)	Club-tail	VR
Sub order: Zygoptera; Family: Coenagrionidae			
28.	<i>Ischnura aurora</i> (Brauer)	Golden Dartlet	C
29.	<i>Ceriagrion coromandelianum</i> (F)	Coromandel marsh dart	VR
30.	<i>Agriocnemis pygmaea</i> (Rambur)	Pigmy dartlet	C

31.	<i>A. splendidissima</i> (Laidlaw)	Splendid dartlet	C
32.	<i>I. senegalensis</i> (Rambur)	Senegal golden dartlet	R
33.	<i>Paracercion malayanum</i> (Selys)	Malay illy squatter	R
34.	<i>Agriocnemis femina</i> (Brauer)	Pinhead wisp	C
35.	<i>I. rubilio</i> (Selys)	Western golden dartlet	VC
36.	<i>Pseudagrion microcephalum</i> (Rambur)	Blue sprite	C
37.	<i>P. decorum</i> (Rambur)	Elegant sprite	C
38.	<i>P. indicum</i> (Fraser)	Yellow striped blue dart	R
Family: Lestidae			
39.	<i>Lestes elatus</i> (Selys)	Emerald spread wing	R
40.	<i>L. viridulus</i> (Rambur)	Emerald striped spread wing	VR

*(VC-Very common; C- common; R- Rare; VR- Very rare)

vegetation. This is confirmed by the findings of Fraser (1933) and Subramanian (2005) who revealed that shade and aquatic vegetation could favour Zygoptera more than Anisoptera. In the three areas of the study in Mettur area has the maximum richness and abundance of the dragonfly species followed by Kolathur and Madhanyankuttai. Arulprakash and Gunathilagaraj (2010) recorded twenty-one species of Odonata (14 species of Anisoptera and seven species of Zygoptera) belonging to 17 genera under four families from 13 temporary water bodies of Coimbatore and Salem districts in Tamil Nadu.

There were 635 individuals in the first year, while it was 878 in the second year. Shannon-Wiener Diversity Index(H) was 1.493 and 1.488 respectively for first and second year. Simpson 1-D was 0.7517 and 0.7489 during the first and second year. Margalef Index (R1) was 0.6198 in the first year, while it was 0.5902 in the second year. Menhinick (R2) showed marked difference in the first year (0.1984) and in the second year (0.1687). Evenness (I year = 0.8902 and II year - 0.8856) and Berger-Parker Index (I year = 0.8902 and II year = 0.8856) showed a small difference between the two years. Odonata diversity was higher during 2020 – 2021 than in 2021-2022. The diversity of Odonata species was highest in the monsoon period. The abundance of dragonflies and damselflies was widely distributed all over the

month, November month was more active, and the lower proportion was during January. The Odonata are mainly seen in the pond ecosystem and agricultural lands because the availability of food is higher in the surface of water bodies mainly in the standing waters.

ACKNOWLEDGEMNT

The authors are thankful to Department of Zoology, Vivekanandha College of arts and Sciences for women (Autonomous), Elayampalayam, Tiruchengode, Namakkal District, Tamil Nadu for providing the opportunity and facilities

REFERENCES

- Anbalagan V., Gabriel Paulraj M. and Ignacimuthu S. (2013) Odonata diversity in paddy and vegetable ecosystems in north-eastern Tamil Nadu, India. *International Journal of Research in Biology* 3(4): 977–983.
- Arulprakash R. and Gunathilagaraj K. (2010) Abundance and diversity of Odonata in temporary water bodies of Coimbatore and Salem districts in Tamil Nadu. *Journal of Threatened Taxa* 2(8): 1099–1102.
- Corbet P.S. (1999) *Dragonflies: Behavior and Ecology*, Cornell University Press, Ithaca, New York. 829pp.
- Das S., Mahato P. and Mahato S.K. (2021) Disease control prey–predator model incorporating prey refuge under fuzzy uncertainty. *Modeling Earth*

- Systems and Environment 7: 2149–2166. doi:10.1007/s40808-020-00892-wREVI.
- Das S.K., Ahmed R.A., Sajan S.K., Dash N., Sahoo P., Mohanta P., Sahu H.K., Rout S.D. and Dutta S.K. (2012) Diversity, distribution and species composition of Odonates in buffer areas of Similipal Tiger Reserve, Eastern Ghat, India. *Academic Journal of Entomology* 5(1): 54–61.
- Dolny A., Barta D., Lhota S., Rusdianto. and Drozd P. (2011) Dragonflies (Odonata) in the Bornean rain forest as indicators of changes in biodiversity resulting from forest modification and destruction. *Tropical Zoology* 24: 63–86.
- Emiliyamma K.G. (2005) On the Odonata (Insects) fauna of Kottayam District, Kerala, India. *Zoos Print Journal* 20(12): 2108–2110.
- Fraser F. (1933) *The Fauna of British India, Including Ceylon and Burma, Odonata*. Volume I. Taylor and Francis Ltd., London.
- Gentry J.B., Garten Jr C.T., Howell F.G. and Smith M.H. (1975) Thermal ecology of dragonflies in habitats receiving reactor effluent. In: *Environmental Effect of Cooling Systems at Nuclear Power Plants*. International Atomic Energy Agency, Vienna Proceedings series 187(12): 563–574.
- Gunathilagaraj K., Soundarajan R.P., Chitra N. and Swamiappan M. (1999) Odonata in the rice fields of Coimbatore. *Zoo's Print Journal* 14(6): 43–44.
- Hornung J.P. and Rice C.L. (2003) Odonata and wetland quality in southern Alberta, Canada: a preliminary study. *Odonatologica* 32(2): 119–129.
- Kalkman V.J., Clausnitzer V., Dijkstra K.D.B., Orr A.G., Paulson D.R. and Tol J.V. (2008) Global diversity of dragonflies (Odonata) in freshwater. *Hydrobiologia* 595: 351–363. doi:10.1007/978-1-4020-8259-7_38.
- Kandibane M., Raguraman S. and Ganapathy N. (2005) Relative abundance and diversity of Odonata in an irrigated rice field of Madurai, Tamil Nadu. *Zoo's Print Journal* 20(11): 2051–2052.
- Mandal S.K., Ghosh A., Bhattacharjee I. and Chandra G. (2008) Biocontrol efficiency of odonat nymphs against larvae of the mosquito, *Culex quinquefasciatus* Say, 1823. *Acta Tropica* 106(2): 109–114.
- Norma-Rashid Y., Mohd-Sofian A. and Zakaria-Ismail M. (2001) Diversity and distribution of Odonata (dragonflies and damselflies) in the fresh water swamp lake, Tasek Bera, Malaysia. *Hydrobiologia* 459: 135–146.
- Oppel S. (2005) Habitat associations of an Odonata community in a lower montane rainforest in Papua New Guinea. *International Journal of Odonatology* 8(2): 243–257.
- Prasad M. and Varshney R.K. (1995) A checklist of odonata of India including data on larval studies. *Oriental Insects* 29(1): 385–428.
- Samways M.J. (1989) Taxon turnover in odonata across a 3000 m altitudinal gradient in Southern Africa. *Odonatologica* 18: 263–274.
- Shantibala T., Lokeshwari R.K. and Sharma H.D. (2012) Entomophagy practices among the ethnic communities of Manipur, north-east India. *International Journal of Integrative Sciences, Innovation and Technology* 1(5): 13–20.
- Sharma G. (2010) Studies on Odonata and lepidoptera (Insecta: Arthropoda) fauna of Mount abu, Rajasthan, India. *Hexapoda* 17: 136–141.
- Silva D.P., DeMarco P. and Resende D.C. (2010) Adult odonate abundance and community assemblage measures as indicators of stream ecological integrity: a case study. *Ecological Indicators* 10: 744–752.
- Siregar A.Z. and Bakti D. (2016) Diversity and distribution of Odonata in University Sumatera Utara, Medan, Indonesian. *International Journal of Scientific and Technology Research* 5: 229–234.
- Smith J., Samways M.J. and Taylor S. (2007) Assessing riparian quality using two complementary sets of bioindicators. *Biodiversity Conservation* 16: 2695–2713.
- Spencer M., Blaustein L., Schwartz S.S. and Cohen J.E. (1999) Species richness and the proportion of predatory animal species in temporary freshwater pools: relationships with habitat size and permanence. *Ecology Letters* 2(3): 157–166.
- Subramanian K.A. (2005) *Dragonflies and Damselflies of Peninsular India: A Field Guide*. Project Lifescape, Indian Academy of Science, Bangalore, India. 118pp.
- Tsuda S. (1991) *A Distributional List of World Odonata*. Privately Published, Osaka, Japan. 362pp.