

Research Article

Preliminary Studies on the Diversity and Abundance of Odonates in the selected sites of southern Kerala

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ABSTRACT

Biodiversity forms the foundation of the vast array of ecosystem that critically contributes to human well-being. Odonates are considered to be indicator of ecological balance and are commonly seen in and around water bodies. The present study was carried out to assess the Diversity and Abundance of Odonates in the selected sites of Kollam and Trivandrum districts, Kerala, India in 2020-2021. A total of 25 species belonging to 16 genera and 6 families were recorded during the entire study. Suborder Anisoptera was represented by the families Libellulidae, comprising 10 species and Gomphidae, with 1 species; and the suborder Zygoptera was represented by the families Calopterygidae, with 2 species; Platynemididae, with 3 species; Coenagrionidae, with 8 species; and Chlorocyphidae, with 1 species. Libellulidae was the dominating family with 40% of the total observations, followed by Coenagrionidae family. The only way to save the Odonata fauna and its habitats is creating awareness among the people. In this context, knowledge of Odonata fauna of a region is the first step towards conservation.

Key words: Biodiversity, Family, Odonata, Kerala

INTRODUCTION

Biodiversity is the variability among living organisms from all sources, including terrestrial, marine and other aquatic ecosystems and ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems. Biodiversity forms the foundation of the vast array of ecosystem services that critically contribute to human well-being. Biodiversity is important in human managed as well as natural ecosystems (Kalliyil *et al.*, 2020). The changing status of insects and other invertebrates is a key indicator of biodiversity and the environment that shapes it. Estimates of the total number of species or those within specific orders are often highly variable. Globally; averages of these predictions estimate there are around 5.5 million insect species with around 1 million insect species currently found. Very occasionally the record also shows mass extinctions of insects. There are around 5680 species of odonata known from all over the globe. Many species often have small distributions and are habitat specific; hence they are often successfully used as indicators for environmental health and conservation management. Approximately 503 species of odonates occur in India with approximately 186 species being endemic. Endemic odonate fauna of India is largely concentrated in two biodiversity hotspots of India, viz., Western Ghats and north east India (Kalliyil *et al.*, 2020).

Insects are tracheate arthropods in which the body is divided into head, thorax and abdomen. A single pair of antennae (homologous with the antennules of the crustacea) is present and the head also bears a pair of mandibles and two pairs of maxillae, the second pair fused medially to form the labium. The thorax carries three pairs of legs and usually one or two pairs of wings. The abdomen is devoid of ambulatory appendages, and the genital opening is situated near the posterior end of the body. Postembryonic development is rarely

direct and a metamorphosis usually occurs (Kalliyil *et al.*, 2020). Dragonflies and damselflies collectively called odonates are one of the most common insects flying over forest, fields, meadows, ponds and rivers (Jeevan and Vivek, 2020). The Odonates are distributed in all geographical realms, but their greatest numbers and diversity occur in the tropics. About 7000 species of Odonata belonging to 630 genera and 28 families are reported from the world over (Emiliyamma *et al.*, 2005). India is highly diverse with 474 species in 142 genera and 18 families (Subramanian, 2014) 28% of the species recorded from India, while 154 species of odonates have been reported from Kerala (Kiran and Raju 2011, 2013), spread over 79 genera and 12 families are met with in Kerala (Emiliyamma *et al.*, 2005)

Odonates are considered as an important component of freshwater ecosystems as well as good indicators of ecosystem health (Corbet, 1993; Clark and Samways, 1996; Ramos *et al.*, 2020). There are numerous studies from the world, which have documented that odonates respond to anthropogenic activity and thus may serve as useful indicators of habitat quality in terms of species occurrence and distribution (Kadoya *et al.*, 2004; Flenner and Sahlen, 2008). Jaffer *et al.* (2005) studied the odonata diversity of rice field habitat in Palakkad district, Kerala. Rice fields are excellent habitats for the study of odonates as such areas are ideal foraging grounds with more open environment providing a large number of insect pests for to odonates to predate upon.

MATERIALS AND METHODS

The study was conducted for a period of six months spanning from October, 2020 to March, 2021. Field study was done on sunny days and during two time periods of the day in which odonates are found to be most active. Large number of odonate species can be identified without collecting them. However, females young

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adults are difficult to identify in the field. Most of the damselflies can be collected by hand (Subramanian, 2009). For collecting dragonflies, a butterfly net with dark coloured clothing is the best. Odonates are very delicate insects and they get easily killed while handling, especially when they are held by abdomen or the thorax. So, while handling odonates avoid holding by abdomen or the thorax. The wings are relatively tough and odonates can be held by wings between fingers for a short time. A detailed sketch of the live insect with colour and patterns is very important for accurate identification (Subramanian, 2009). Study on Odonata Diversity and Abundance was carried out in three sites; Mukhathala, Kollam; SN College, Kollam; Kallambalam, Trivandrum District, Kerala. Areas are of open in nature and are of wetland and grassland ecosystem.

RESULTS

The study was conducted to determine the occurrence of Odonates in the selected site of two districts of southern Kerala, Kollam and Thiruvananthapuram. As a result of the present study, a total of 25 species belonging to 6 families and 16 genera were recorded. 11 species belong to suborder Anisoptera, coming under 4 families and 8 genera. The remaining 14 species belongs to suborder Zygoptera, coming under 4 families and 9 genera. Libellulidae was the most abundant family followed by Coenagrionidae. Their taxonomic classification is given in the table (Table 1). Their scientific name, common name, local names and their IUCN status are shown in the table (Table 2).

Pie chart shows the percentage distribution of Odonate families in the selected study areas (Fig.15), 40% of the species comes under Libellulidae family, 32% species belonging to Coenagrionidae family, followed by 12% Platynemididae family, 8% Calopterygidae family and 4% Chlorocyphidae and Gomphidae family each. Species wise distribution of suborder Anisoptera (Fig.19) shows that 91% are of family Libellulidae and 9% Gomphidae family. Species wise distribution of suborder Zygoptera (Fig. 21) shows that 57% of them comes under Coenagrionidae family, 22% Platynemididae family, 14% Calopterygidae family and finally 7% Chlorocyphidae family. Libellulidae is the most abundant family with 10 species, followed by Coenagrionidae family with 8 species. The bar diagram shows the number of species of dragonflies (Fig.18) and damselflies (Fig. 20).

The number of species in each recorded family is given in (Fig.16), which shows that Libellulidae family consist of 10 species, Coenagrionidae with 8 species, Gomphidae with 1 species, Chlorocyphidae with 1 species, Calopterygidae with 2 species, and Platynemididae with 3 species. The species wise distribution in each genus of Odonates is given in (Fig.17), which shows 3 species in *Neurothemis* genera, 1 *Pantala* species, 3 *Orthetrum* species, 1 *Rhyothemis* species, 1 *Tetrathemis* species, 1 *Diplacodes* species, 1 *Paragomphus* species, 1 *Aciagrion* species, 2 *Vestalis* species, 2 *Copera* species, 1 *Prodasineura* species, 2 *Agriocnemis* species, 2 *Ceriagrion* species, 1 *Ischnura* species, 2 *Pseudagrion* species, and 1 *Libellago* species. The conservation status was assigned based on IUCN Red Data List (IUCN, 2019). According to the IUCN status, all the recorded 24 species are Least Concern (LC), (Table. 2) No endemic species were observed during the study period. The odonate species were categorised into the fine relative

abundance categories such as very common (VC), those which were sighted during 80-100% of the field days, common (C) (60-79%), Locally common (LC) Rare (R) (20-39%).

In Kallambalam, 6 families of odonates- 2 families of Anisoptera, and 4 families of Zygoptera, were found. Zygopteran families- Calopterygidae, Platynemididae, Chlorocyphidae, and Anisopteran family Gomphidae were recorded only from this study site. A total of 14 species were recorded out of which 12 were recorded only from this site; 2 species of Calopterygidae family, 3 species of Platynemididae family, 6 species of Coenagrionidae family, 1 species of Chlorocyphidae family, 4 species of Libellulidae family and 1 species of Gomphidae family were recorded. Zygopteran family Coenagrionidae was the most abundant in Kallambalam. *Neurothemis fulvia* (Drury, 1773), *Neurothemis intermedia* (Rambur, 1842) and *Pantala flavescens* (Fabricius, 1798) from Libellulidae family were only recorded in Kallambalam. Libellulidae was the most abundant family in the study site Mukhathala followed by Coenagrionidae. 7 species of Libellulidae family belonging to 5 genera and 4 species of Coenagrionidae family belonging to 2 genera was also recorded from Mukhathala. 4 species were recorded only from this site; the species found in this area were common, widespread species except *Tetrathemis platypera*. Only 2 families were recorded from Sree Narayana College Campus. 3 species of Coenagrionidae family and 3 species of Libellulidae family. *Ischnura rubilio* was observed during the study period from the site.

The relative abundance analysis shown that, 9 species out of 24 species were very common. Among Anisoptera, *Orthetrum sabina* (Drury, 1770), *Rhyothemis variegata* (Linnaeus, 1763), *Diplacodes trivialis* (Rambur, 1842), *Orthetrum luzonicum* (Brauer, 1868), and *Neurothemis tullia* (Drury, 1773), were the most common in Mukhathala while among Zygoptera, *Agriocnemis pieris* (Laidlaw, 1916), *Agriocnemis pygmaea* (Rambur, 1842) and *Ceriagrion coromandelianum* (Fabricius, 1798), were more common. *Copera vittata* (Selys, 1863), *Copera marginipes* (Rambur, 1842), were the most common Zygopteran species found in Kallambalam and common Anisopteran species include *Pantala flavescens* (Fabricius, 1798) and *Neurothemis tullia* (Drury, 1773), *Diplacodes trivialis* (Rambur, 1842) was the most common Anisopteran species and *Ischnura rubilio* (Selys, 1876) was the common Zygopteran species found in Sree Narayana College Campus .

Species diversity varied across the localities selected for the study. Paddy fields of Kallambalam showed maximum species richness when compared to other regions, followed by Mukhathala and the maximum odonate diversity and abundance were possibly due to the least anthropogenic disturbances, better water quality, shade cover and rich floral diversity in these habitats. The Sree Narayana College campus show least species richness and abundance. Anthropogenic disturbances may be the primary reason.

The family Libellulidae of suborder Anisoptera is the most species-rich and widely distributed family. Dragonflies such as *Neurothemis tullia* (Drury, 1773), *Orthetrum Sabina* (Drury, 1770), *Diplacodes trivialis* (Rambur, 1842), *Orthetrum luzonicum* (Brauer, 1868), *Rhyothemis variegata* (Linnaeus, 1763) were the abundant species. Gomphidae species was found across

Table 1. Taxonomic classification of recorded Odonates.

SCIENTIFIC NAME	CLASS	ORDER	SUBOR- DER	FAMILY	GENUS	SPECIES
<i>Neurothemis tullia</i> (Drury, 1773)	Insecta	Odonata	Anisoptera	Libellulidae	<i>Neurothemis</i>	<i>N. tullia</i>
<i>Rhyothemis variegata</i> (Linnaeus, 1763)	Insecta	Odonata	Anisoptera	Libellulidae	<i>Rhyothemis</i>	<i>R. variegata</i>
<i>Orthetrum Sabina</i> (Drury, 1770)	Insecta	Odonata	Anisoptera	Libellulidae	<i>Orthetrum</i>	<i>O. sabina</i>
<i>Neurothemis fulvia</i> (Drury, 1773)	Insecta	Odonata	Anisoptera	Libellulidae	<i>Neurothemis</i>	<i>N. fulvia</i>
<i>Diplacodes trivialis</i> (Rambur, 1842)	Insecta	Odonata	Anisoptera	Libellulidae	<i>Diplacodes</i>	<i>D. trivialis</i>
<i>Orthetrum chrysis</i> (Selys, 1891)	Insecta	Odonata	Anisoptera	Libellulidae	<i>Orthetrum</i>	<i>O. chrysis</i>
<i>Orthetrum luzonicum</i> (Brauer, 1868)	Insecta	Odonata	Anisoptera	Libellulidae	<i>Orthetrum</i>	<i>O. luzonicum</i>
<i>Libellago indica</i> (Fraser, 1928)	Insecta	Odonata	Zygoptera	Chlorocyphidae	<i>Libellago</i>	<i>L. indica</i>
<i>Pseudagrion rubriceps</i> (Selys, 1876)	Insecta	Odonata	Zygoptera	Coenagrionidae	<i>Pseudagrion</i>	<i>P. rubriceps</i>
<i>Ceriagrion cerinorubellum</i> (Brauer, 1865)	Insecta	Odonata	Zygoptera	Coenagrionidae	<i>Ceriagrion</i>	<i>C. cerinorubellum</i>
<i>Ceriagrion coromandelianum</i> (Fabricus, 1798)	Insecta	Odonata	Zygoptera	Coenagrionidae	<i>Ceriagrion</i>	<i>C. coromandelianum</i>
<i>Ischnura rubilio</i> (Selys, 1876)	Insecta	Odonata	Zygoptera	Coenagrionidae	<i>Ischnura</i>	<i>I. rubilio</i>
<i>Neurothemis intermedia</i> (Rambur, 1842)	Insecta	Odonata	Anisoptera	Libellulidae	<i>Neurothemis</i>	<i>N. intermedia</i>
<i>Vestalis apicalis</i> (Selys, 1873)	Insecta	Odonata	Zygoptera	Calopterygidae	<i>Vestalis</i>	<i>V. apicalis</i>
<i>Vestalis gracilis</i> (Rambur, 1842)	Insecta	Odonata	Zygoptera	Calopterygidae	<i>Vestalis</i>	<i>V. gracilis</i>
<i>Agriocnemis pieris</i> (Laidlaw, 1916)	Insecta	Odonata	Zygoptera	Coenagrionidae	<i>Agriocnemis</i>	<i>A. pieris</i>
<i>Pantala flavescens</i> (Fabricus, 1798)	Insecta	Odonata	Anisoptera	Libellulidae	<i>Pantala</i>	<i>P. flavescens</i>
<i>Copera vittata</i> (Selys, 1863)	Insecta	Odonata	Anisoptera	Platycnemididae	<i>Copera</i>	<i>C. vittata</i>
<i>Paragomphus lineatus</i> (Selys, 1850)	Insecta	Odonata	Anisoptera	Gomphidae	<i>Paragomphus</i>	<i>P. lineatus</i>
<i>Pseudagrion microcephalum</i> (Rambur, 1842)	Insecta	Odonata	Zygoptera	Coenagrionidae	<i>Pseudagrion</i>	<i>P. microcephalum</i>
<i>Tetrathemis platypera</i> (Selys, 1878)	Insecta	Odonata	Anisoptera	Libellulidae	<i>Tetrathemis</i>	<i>T. platypera</i>
<i>Copera marginipes</i> (Rambur 1842)	Insecta	Odonata	Zygoptera	Platycnemididae	<i>Copera</i>	<i>C. marginipes</i>
<i>Agriocnemis pygmaea</i> (Rambur, 1842)	Insecta	Odonata	Anisoptera	Libellulidae	<i>Agriocnemis</i>	<i>A. pygmaea</i>
<i>Prodasineura verticalis</i> (Selys, 1860)	Insecta	Odonata	Zygoptera	Platycnemididae	<i>Prodasineura</i>	<i>P. verticalis</i>
<i>Aciagrion occidentale</i> (Laidlaw, 1919)	Insecta	Odonata	Zygoptera	Coenagrionidae	<i>Aciagrion</i>	<i>A. occidentale</i>

streams and water bodies. Damselflies of the family Coenagrionidae were widely distributed in the selected sites. Platycnemididae family was found only in streams. *Pseudagrion microcephalum* (Rambur, 1842), *Copera Vittata* (Selys, 1863), *Copera marginipes* (Rambur, 1842), *Prodasineura verticalis* (Selys, 1860), *Pseudagrion rubriceps* (Selys, 1876) were found across water bodies.

There are numerous studies dealing with diversity and abundance of odonates. The present study on

the Odonates of selected sites, revealed the presence of 24 species, which accounts 16 % of total species of odonates found in Kerala. Kiran and Rajan (2011) reported 154 species of odonates from Kerala. The studies of odonates of KAU main campus, Thrissur district revealed the presence of 52 species, which accounts 33.76% of total species of odonates found in Kerala (Adarsh *et al.*, 2014).

In the present study, Anisoptera (Dragonfly) were abundant than the Zygoptera (Damselfly).

Table 2. Odonate species along with scientific name, common name, and local name, and IUCN status.

Sl no	Common name	Scientific name	Malayalam name	Abundance	IUCN Status
1	Pied Paddy Skimmer	<i>Neurothemis tullia</i> (Drury, 1773)	Swamithumbi	Very common	LC
2	Common Picture Wing	<i>Rhyothemis variegata</i> (Linnaeus, 1763)	Shalabhathumbi	Very common	LC
3	Green Marsh Hawk	<i>Orthetrum Sabina</i> (Drury, 1770)	Pachavyali	Very common	LC
4	Fulvous Forest Skimmer	<i>Neurothemis fulvia</i> (Drury, 1773)	Thavidan thurumban	Locally common	LC
5	Blue Ground Skimmer	<i>Diplacodes trivialis</i> (Rambur, 1842)	Naattunilathan	Very common	LC
6	Brown-backed Red Marsh Hawk	<i>Orthetrum chrysis</i> (Selys, 1891)	Chendhavidan vyali	Locally common	LC
7	Tricoloured Marsh Hawk	<i>Orthetrum luzonicum</i> (Brauer, 1868)	Thrivarnan vyali	Locally common	LC
8	River Heliodor	<i>Libellago indica</i> (Fraser, 1928)	Thavalakkannan	Locally common	LC
9	Saffron-faced Blue Dart	<i>Pseudagrion rubriceps</i> (Selys, 1876)	Chem mukha poothaali	Common	LC
10	Orange -tailed Marsh Dart	<i>Ceriagrion cerinorubellum</i> (Brauer, 1865)	Kanalvalan chathuppan	Locally common	LC
11	Coromandel Marsh Dart	<i>Ceriagrion coromandelianum</i> (Fabricus, 1798)	Naattuchathuppan	Very common	LC
12	Western Golden Darlet	<i>Ischnura rubilio</i> (Selys, 1876)	Manjappulmanikyan	Locally common	LC
13	Ruddy Meadow Skimmer	<i>Neurothemis intermedia</i> (Rambur, 1842)	Pulthurumban	Locally common	LC
14	Black Tipped Forest Glory	<i>Vestalis apicalis</i> (Selys, 1873)	Chuttichirakan thanalthumbi	Locally common	LC
15	Clear-winged Forest Glory	<i>Vestalis gracilis</i> (Rambur, 1842)	Cheriyathalthumbi	Locally common	LC
16	White Darlet	<i>Agriocnemis pieris</i> (Laidlaw, 1916)	Vellappul chinnan	Common	LC
17	Wandering Glider	<i>Pantala flavescens</i> (Fabricus, 1798)	Thulathumbi	Very common	LC
18	Yellow bush dart	<i>Copera marginipes</i> (Rambur, 1842)	Manjakaali paalthumbi	Common	LC
19	Lined hooktail	<i>Paragomphus lineatus</i> (Selys, 1850)	Choondavalan kaduva	Common	LC
20	Blue riverdamsel	<i>Pseudagrion microcephalum</i> (Rambur, 1842)	Naattupoothali	Common	LC
21	Pigmy Skimmer	<i>Tetrathemis platypera</i> (Selys, 1878)	Kullanthumbi	Locally common	LC
22	Blue Bush Dart	<i>Copera vittata</i> (Selys, 1863)	Chenkaali paalthumbi	Common	LC
23	Green striped slender darlet	<i>Aciagrion occidentale</i> (Laidlaw, 1919)	Neelachutti	Common	LC
24	Pygmy Darlet	<i>Agriocnemis pygmaea</i> (Rambur, 1842)	Naattupul chinnan	Very common	LC
25	Red-striped black bamboo tail	<i>Prodasineura verticalis</i> (Selys, 1860)	Karichemban mulavaalan	Common	LC

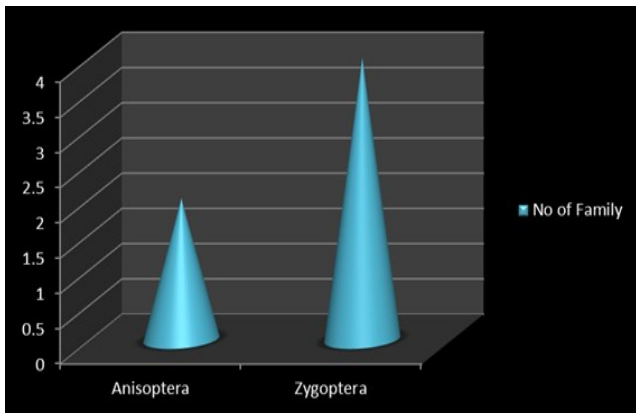


Figure 1. Suborder wise Distribution of Odonates

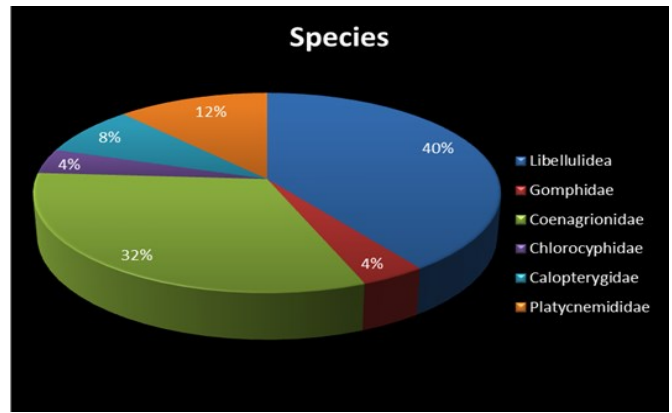


Figure 2. Percentage of Family wise distribution of Odonates

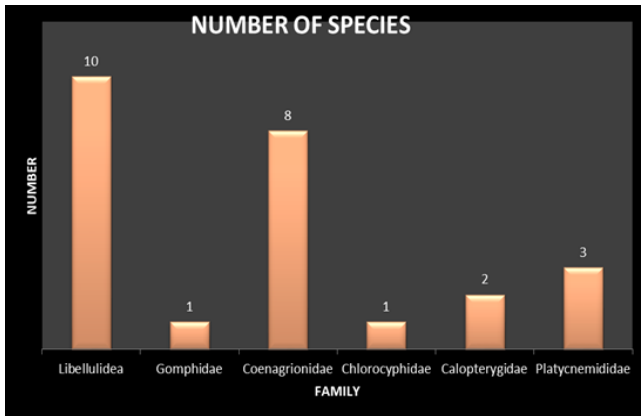


Figure 3. Species wise distribution in each family of Odonates

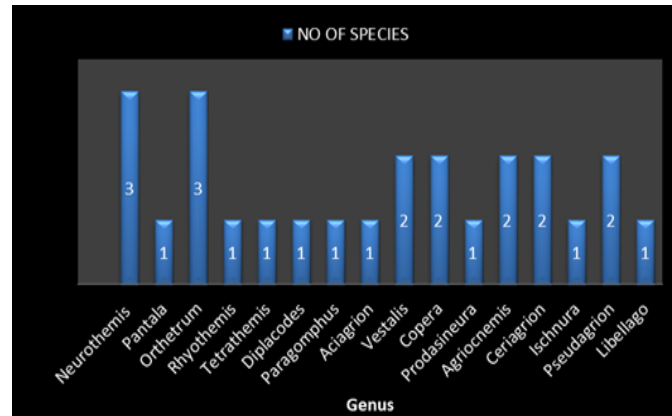


Figure 4. Species wise distribution in each genus of Odonates

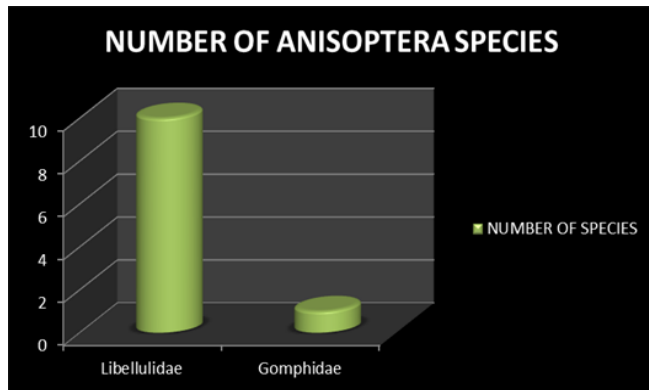


Figure 5. Family wise distributions of Anisoptera species

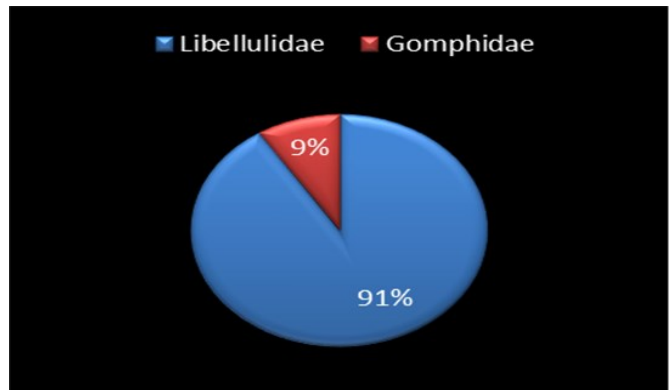


Figure 6. Family percentages of Anisoptera species

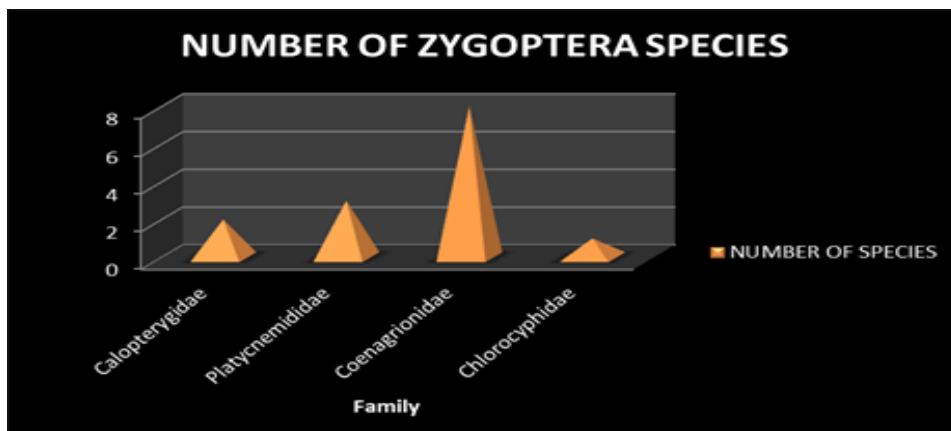


Figure 7. Family wise distribution of Zygoptera

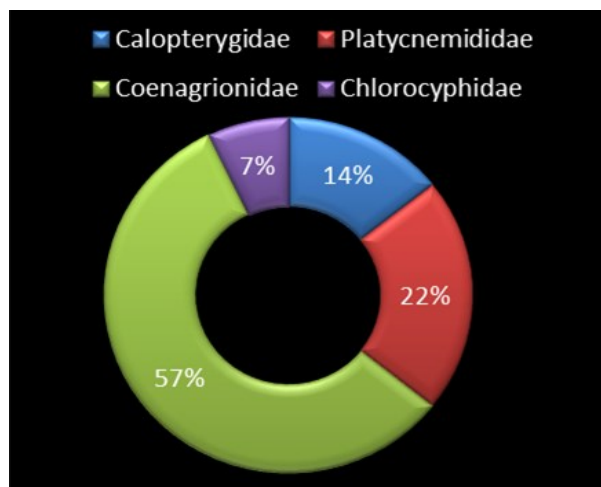


Figure 8. Family percentage of Zygoptera

Anisoptera are abundant in most of the water bodies due to their dispersal ability (Kadoya *et al.*, 2004) and their adaptability to wide range of habitats (Hodgkin and Watson, 1958). Fraser (1936) and Subramanian (2005) stated that shade and aquatic vegetation could favour Zygoptera more than Anisoptera. Damselflies were less abundant owing to their limited dispersal ability as opined by Wankhade *et al.* (2012). It might be also due to unstable environment in the temporary water bodies and absence of shade over (Clark and Samways (1996).

The two dominant families of odonates in the present study were Libellulidae, accounting for 10 species and Coenagrionidae with 7 species. Many earlier works reported the dominance of family Libellulidae in the Indian subcontinent (Emiliyamma and Radhakrishnan 2000, 2002; Emiliyamma 2005; Emiliyamma *et al.*, 2005). The abundance of Libellulidae (Anisoptera) and Coenagrionidae (Zygoptera) in the present study could be due to their shorter lifecycle and widespread distribution and their tolerance to wide range of habitats (Samways, 1989). Aghade *et al.*, 2022 also reported that the Libellulidae and Coenagrionidae were the most frequently sighted groups during their study.

The present study observed that the common species had more individuals than rare species; this was in accordance with the results of Shelton and Edward (1983) who stated the same and had the ability to survive in existing environmental conditions. Hurd *et al.*, (1971) stated that the abundance of one group of insects is to have little effect on the other species a stable ecosystem. There are numerous studies from the world, which have documented that Odonates respond to anthropogenic activity and thus may serve as useful indicators of habitat quality in terms of species occurrence and distribution (Kadaya *et al.*; 2004 Flenner and Sahlen 2008). The present study also support this fact as observations made in the three different sites, the area of Mukhathala and Kallambalam shows high diversity as compared to Sree Narayana College Campus, due to presence of water bodies in the area as well as least disturbance to the environment. Odonates are considered as an important component of freshwater ecosystems as well as good indicators of ecosystem health (Corbet 1993; Clark and Samways 1996). Presence of large perennial water bodies and good aquatic vegetation can contribute to the abundance and species richness of

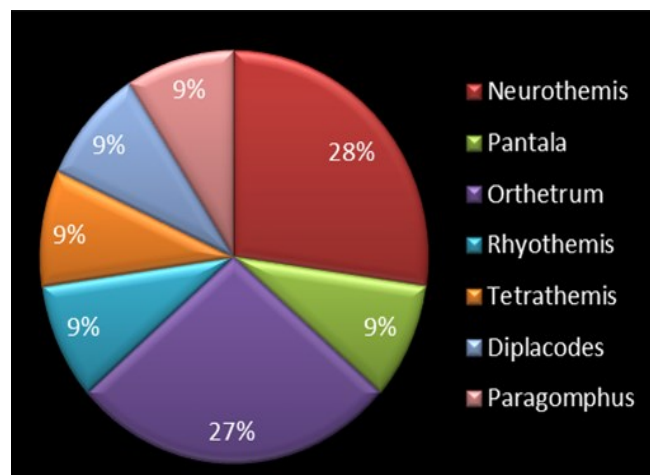


Figure 9. Percentage of Genus wise distribution of Anisoptera specie

Odonates (Saha and Gaikward, 2014). Odonate diversity greatly depends upon habitat type (Das *et al.*, 2012) which was evident from the results of present study. The present study demonstrates that Odonata diversity and distribution vary across different sites under the study. The variation is probably determined by the interaction between intrinsic habitat and extrinsic environmental parameters.

Libellulidae gathers most of the odonata species with wider distribution and richness. This follows a general trend which is also widely represented in surveys locally and globally (Salmah and Afzan, 2004), which coincide with the present study. The larger body size of the species in this family may be the cause of greater dispersion and distribution (Dalzochio *et al.*, 2011), and all the Libellulidae species were comparatively larger than species belonging to other families in the present study also.

A total of 45 species of Odonata including 29 species under 3 families of Anisoptera and 16 species under 3 families of Zygoptera were recorded in 4 different types of habitats in Barpeta district of Assam (Baruah and Sai 2015). 38 species were recorded from habitats near ponds and rivers, 39 from near beels and 41 species from open tracts of land. 7 species were recorded from three different types of habitats, 3 species were recorded from two types and 4 species were recorded from two habitat type. 32 species were recorded in all four habitat types. The most abundant Anisopteran species in ponds was *Diplacodes trivialis* (Rambur 1842) which was one of the abundant species in the present study also; in beels and rivers it was *Rhyothemis variegata* (Linnaeus, 1763), and *Pantala flavescens* (Fabricius, 1798) was most abundant in open tracts. Among the Zygopteran, the most abundant was *Ceriagrion coromandelianum* (Fabricius, 1798) in all the habitats. Madayipara and Mananthavady in Kannur and Wayanad seems to be an important source of support for insects like Odonates with this investigation which records 16 species belongs to 12 genera. The abundance and species richness tend to increase with increase in the presence of and perennial water sources, good aquatic vegetation etc (Athira & Dhivya 2021). In the present study *Ceriagrion coromandelianum* (Fabricius, 1798) was common in both Kallambalam and Mukhathala.

CONCLUSION

Biodiversity is important in human managed as well as natural ecosystems. Odonates are the flagship insect communities which are bioindicators of terrestrial as well as aquatic ecosystems and form an inevitable part of ecosystem and thus the present study is relevant in today's world of urbanization and exploitation of natural resources. Understanding the Odonate-habitat association provides essential information for characterizing the response of Odonates to changes in the habitat.

The results of the current study reveal that the Mukhathala and Kallambalam region supports a rich diversity of Odonates. The rich floral and faunal biodiversity of both the regions favours the diversity and distribution of Odonates to a greater extent. 25 species of odonates were recorded in the entire study. More damselfly individuals were recorded during the study period than the dragonfly individuals, but the more dominant species belongs to the family Libellulidae, which are dragonflies followed by the Coenagrionidae family which are damselflies. High species diversity of dragonfly in this area can be attributed to the high diversity of plants and increased water quality.

Allegedly natural habitat factors, variations in plant vegetation, time, weather, biotic factors, will determine the physical and chemical growth; and copulation of the Odonates. They are rapacious in nature and also serve as good source of energy for birds, other insects and spiders. As they play the crucial ecological roles of predator and prey, their diminution in number could have an adverse effect on both terrestrial and aquatic foodwebs. The study demonstrates the role of dragonflies and damselflies as bioindicators and predators. Eventhough any rare or endangered species were not recorded in the present study, the selected study sites have a rich Odonate diversity and abundance. Documentation of the biodiversity in every region is an urgent need of the hour Multifunctioning of Odonata largely determines in the stability of our ecosystem. Let's keep their existence and conserve them.

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