

Bugs & All

Invertebrate Conservation & Information Network of South-Asia (ICINSA)

Newsletter of the
Invertebrate Conservation & Information Network of South-Asia (ICINSA)

Odonates of Irinjalakuda ponds of central Kerala, India



One of the ponds sampled. Debris from the waste dumped can be seen floating (© Amitha Wilson).

Dragonflies and damselflies (Odonata) are good indicators of the freshwater ecosystem health because of their amphibious life history, relatively short generation time, high trophic position, and diversity (Corbet 1993). Ponds are home to a diverse community of specialized plants and animals and are hence of great conservation concern. Through land-use changes, ponds have been disappearing rapidly and the remaining ponds are often threatened by contamination and eutrophication, with negative consequences for pond-dependent taxa like Odonata (Janssen et al. 2018). Irinjalakuda is a municipal town in Thrissur

District, Kerala, India. Irinjalakuda has a number of public and private ponds like most parts of the state. Twenty man-made ponds with public access were selected randomly in and around Irinjalakuda for sampling odonates (Figure 1 & Table 1).

The fieldwork was done in the post-monsoon season (November 2019–February 2020). Each pond was visited between 09 AM and 11 AM in sunny weather. The observers walked along the banks of each pond at constant pace for 30 minutes and recorded the species and the number of individuals seen. All individual odonates observed



Table 1. GPS locations and odonate diversity of the ponds sampled.

Pond no.	Name of the pond	GPS location (Lat.–Long.)	Species richness	Shannon index (H)
1	Near Christ College basketball court	10.358870–76.214837	12	1.76
2	Kuttamkulam	10.346703–76.203406	11	2.19
3	Thamarakulam	10.346484–76.199814	6	1.67
4	Mannathikulam	10.350657–76.200152	4	0.7
5	Njourikulam	10.348087–76.213416	14	2.53
6	Oomenkulam	10.345397–76.19944	5	1.17
7	Brahmakulam	10.33725–76.190875	12	2.45
8	Thekkekulam	10.345381–76.200298	6	1.47
9	Kesavankulangara temple pond	10.357995–76.219401	10	2.27
10	Parakulam	10.357479–76.186495	6	1.74
11	Thrithanni ambalakulam	10.358049–76.190074	12	2.39
12	Padmanabhaswami kshethrakulam	10.360912–76.183011	11	2.25
13	Pond 13	10.347648–76.182623	11	2.39
14	Pond 14	10.363761–76.194351	14	1.97
15	Kizhuthani ambalakulam	10.366118–76.188235	17	2.32
16	Manthripulam kulam	10.344961–76.231876	8	1.87
17	Pond near Avittathur road	10.340845–76.238879	9	1.92
18	Thommana irrigation pond	10.331622–76.263026	9	2.11
19	Thazhekkad Sivashekthra kulam	10.334641–76.271885	6	1.73
20	Karakulam	10.324312–76.282514	11	2.16

were photographed using a Nikon Coolpix P-900 digital camera. Damselflies, especially *Pseudagrion* species which are difficult to identify were caught using a sweep net, detailed photographs taken, and released. Species were identified referring to field guides (Subramanian 2009; Kiran & Raju 2013) and taxonomic monographs (Fraser 1933, 1934, 1936). The odonate species were categorized into five relative frequency

classes, based on the number of ponds in which they occurred. The categories include very common (80%–100%), common (60%–80%), occasional (40%–60%), rare (20%–40%), and very rare (<20%). Area and perimeter of the ponds were estimated using QGIS 3.12. Vegetation along the fringes of the pond (Vf), vegetation in the water body (Vw) and algal cover (Va) were recorded for each pond based on a visual scoring from 0

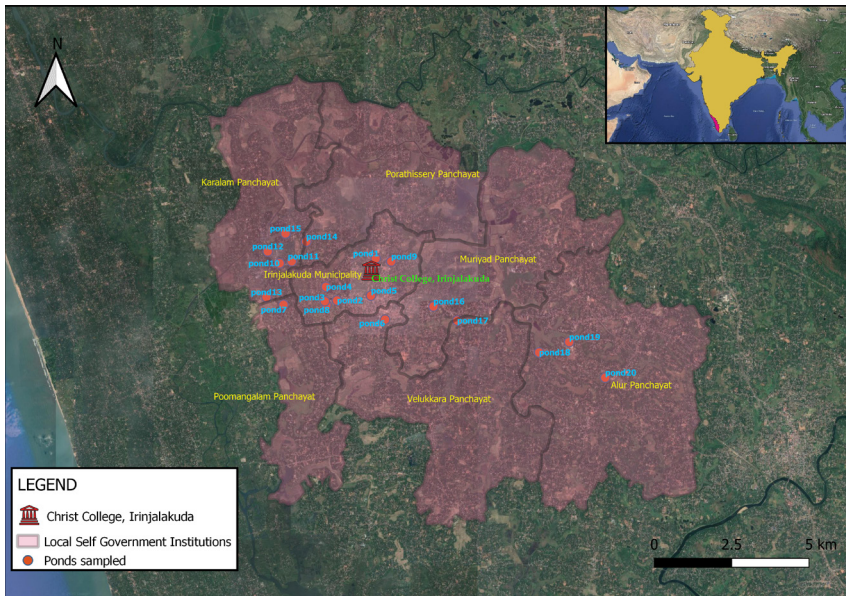


Figure 1. Locations of the ponds sampled in Irinjalakuda.

to 10, 0 indicating no cover and 10 meaning 100% cover. Eight water quality parameters of the pond waters were estimated by standard methods – alkalinity, conductivity, total dissolved solids (TDS), dissolved oxygen (DO), biochemical oxygen demand (BOD), acidity, temperature, and pH (Greenberg et al. 1992). Shannon index (H) calculated for each pond was tested for correlation with the 13 habitat parameters measured.

Thirty species from five families of the order Odonata were recorded in the study,

of which 19 were dragonflies (suborder Anisoptera) and 11 were damselflies (suborder Zygoptera) (Table 2). This forms 17.75% of the total

odonate species recorded from the state of Kerala till date (Society for Odonate Studies 2020). Of these, three species belonged to the Very Common (VC) relative frequency class, one species to Common (C), six species to Occasional (O), eight species to Rare (R), and 12 species to Very Rare (VR). All damselfly species were either Very Rare (VR) or Rare (R). Scarcity of shade in the sampled ponds and the limited dispersal ability of damselflies were probably responsible for their low abundance. The most common species was

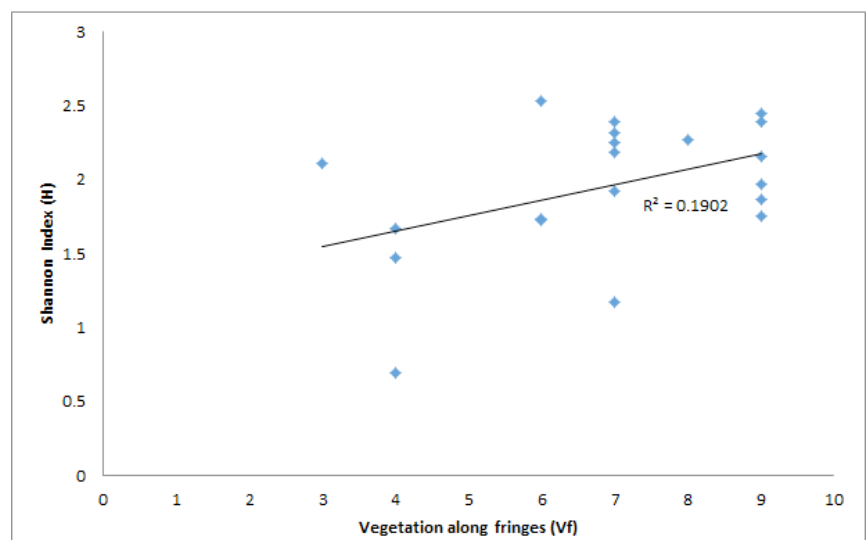


Figure 2. Scatterplot of the score for vegetation along the fringes and Shannon Index (H) of the ponds.

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Invertebrate Conservation & Information Network of South-Asia (ICINSA)

Newsletter of the

Table 2. Odonate species recorded in the study with their relative frequencies of occurrence. Relative frequency classes: VC- Very Common, C- Common, O- Occasional, R- Rare, VR- Very rare.

	Name of species	Common name	Relative frequency
	Class: Insecta		
	Order: Odonata		
	Suborder: Anisoptera		
	Family: Macromiidae		
1	<i>Epophthalmia vittata</i>	Common Torrent Hawk	R
	Family: Gomphidae		
2	<i>Ictinogomphus rapax</i>	Common Clubtail	O
	Family: Libellulidae		
3	<i>Acisoma panorpoides</i>	Trumpet Tail	O
4	<i>Aethriamanta brevipennis</i>	Scarlet Marsh Hawk	R
5	<i>Brachydiplax chalybea</i>	Rufous-backed Marsh Hawk	O
6	<i>Brachythemis contaminata</i>	Ditch Jewel	VC
7	<i>Bradinyopyga geminata</i>	Granite Ghost	VR
8	<i>Crocothemis servilia</i>	Ruddy Marsh Skimmer	O
9	<i>Diplacodes trivialis</i>	Ground Skimmer	R
10	<i>Hydrobasileus croceus</i>	Amber-winged Marsh Glider	R
11	<i>Neurothemis tullia</i>	Pied Paddy Skimmer	O
12	<i>Orthetrum chrysis</i>	Brown-backed Red Marsh Hawk	VR
13	<i>Orthetrum sabina</i>	Green Marsh Hawk	VC
14	<i>Pantala flavescens</i>	Wandering Glider	C
15	<i>Rhodothemis rufa</i>	Rufous Marsh Glider	O
16	<i>Rhyothemis variegata</i>	Common Picturewing	VC
17	<i>Tamea limbata</i>	Black Marsh Totter	VR
18	<i>Trithemis pallidinervis</i>	Long-legged Marsh Glider	VR
19	<i>Urothemis signata</i>	Greater Crimson Glider	R
	Suborder: Zygoptera		
	Family: Coenagrionidae		
20	<i>Agriocnemis keralensis</i>	Kerala Dartlet	VR
21	<i>Agriocnemis pygmaea</i>	Pygmy Dartlet	R
22	<i>Ceriagrion coromandelianum</i>	Coromandel Marsh Dart	VR
23	<i>Ceriagrion cerinorubellum</i>	Orange-tailed Marsh Dart	R
24	<i>Ischnura rubilio</i>	Western Golden Dartlet	VR
25	<i>Ischnura senegalensis</i>	Senegal Golden Dartlet	VR
26	<i>Paracercion calamorum</i>	Dusky Lilly-squatter	VR
27	<i>Pseudagrion australasiae</i>	Look-alike Sprite	VR
28	<i>Pseudagrion malabaricum</i>	Malabar Sprite	VR
29	<i>Pseudagrion microcephalum</i>	Blue Grass Dart	R
	Family: Platycnemididae		
30	<i>Copera marginipes</i>	Yellow Bush Dart	VR

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Odonata species recorded from the ponds in Irinjalakuda (© Vivek Chandran A).



Acisoma panorpoides



Aethriamanta brevipennis



Agriocnemis keralensis



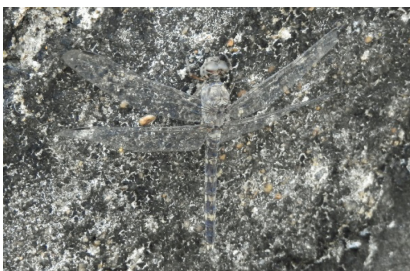
Agriocnemis pygmaea



Brachydiplax chalybea



Brachythemis contaminata



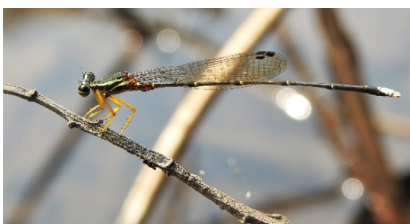
Bradinopyga geminata



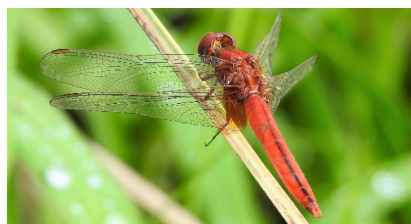
Ceriagrion cerinorubellum



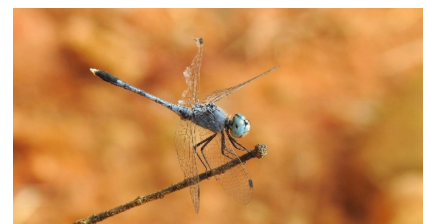
Ceriagrion coromandelianum



Copera marginipes



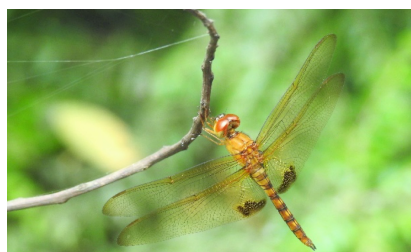
Crocothemis servilia



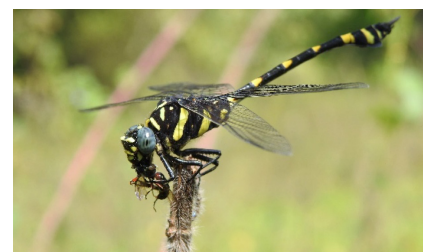
Diplacodes trivialis



Ephthalma vittata



Hydrobasileus croceus



Ictinogomphus rapax

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Newsletter of the Invertebrate Conservation & Information Network of South-Asia (ICINSA)



Ischnura rubilio



Ischnura senegalensis



Neurothemis tullia



Orthetrum chrysis



Orthetrum sabina



Pantala flavescens



Paracercion calamorum



Pseudagrion australasiae



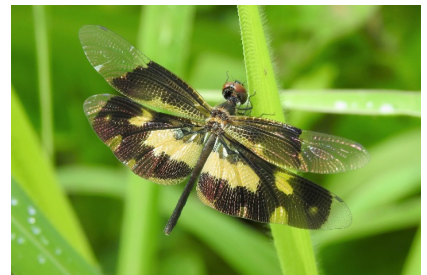
Pseudagrion malabaricum



Pseudagrion microcephalum



Rhodothemis rufa



Rhyothemis variegata



Tramea limbata



Trithemis pallidinervis



Urothemis signata



Table 3. Habitat parameters ranked according to their influence on odonate diversity.

Habitat parameter	Pearson correlation coefficient (r)	Coefficient of determination (r ²)
Vegetation along fringes (Vf)	+ 0.43611925	0.1902
Dissolved Oxygen (DO)	+ 0.316227766	0.1
Biochemical Oxygen Demand (BOD)	+ 0.273313007	0.0747
Vegetation in water body (Vw)	+ 0.265518361	0.0705
Temperature	+ 0.16583124	0.0275
Perimeter of the pond	+ 0.122065556	0.0149
Area of the pond	+ 0.116619038	0.0136
Alkalinity	- 0.414125585	0.1715
Conductivity	- 0.409878031	0.168
Total Dissolved Solids (TDS)	- 0.390256326	0.1523
Acidity	- 0.184119526	0.0339
Vegetation- algal cover (Va)	- 0.059160798	0.0035
pH	- 0.007745967	0.00006

Brachythemis contaminata, recorded from 19 of the 20 ponds sampled. It is a species of polluted waters (Subramanian 2005) and hence its abundance points to the poor water quality of the ponds studied. Dumping of waste was seen in all the ponds sampled (Image 1). This could be the reason behind the low DO (4.72 ± 3.82 , $n=20$) and high BOD (2.03 ± 2.83 , $n=20$) values obtained for the water collected from many of the ponds. The study recorded *Agriocnemis keralensis*, a species endemic to the Western Ghats (Subramanian 2009) from two of the ponds sampled. Of the 13 habitat parameters studied, none had a strong correlation with odonate diversity. However, vegetation along the fringes (Vf) of the ponds had a moderate positive relation ($r = +0.43$) (Figure 2), and alkalinity and conductivity of the pond water

had moderate negative relations ($r = -0.41$ and $r = -0.40$ respectively) with odonate diversity (Table 3). Vegetation along the pond fringes usually include grasses, herbs, shrubs and rarely trees which the odonates use for foraging, resting and thermoregulation. Only adult odonates were sampled in this study. It has been shown that urban water sources with poor water quality act as 'ecological traps' for odonates where they may deposit their eggs which never produce adults (Villalobos-Jiménez 2016). Hence, future studies should take into account the presence of larvae and exuviae.

Conclusion

There has been an increased tendency among the local self-governments in Kerala to 'clean' the man-made ponds and revive

Bugs R All

Newsletter of the Invertebrate Conservation & Information Network of South Asia (ICINSA)

their water storage role as there is scarcity of potable water during the summer months in many parts of the state. Although such revival of ponds can stop dumping of waste and increase the water quality, it often involves removal of aquatic vegetation and vegetation along the banks of the ponds also. It is proposed that such activities focus on increasing the water quality of the ponds and spare the vegetation along their banks to conserve the odonate diversity they sustain.

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