

A Preliminary Study of Odonate Diversity in Wayanad Wildlife Sanctuary

Muneer PK, Vivek Chandran A



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PREFACE

The earth is facing an Ecological Armageddon and already going through the sixth mass extinction, caused by human activities. Mitigating environmental degradation through research and action is the need of the hour. Odonata, which includes dragonflies and damselflies are easy to study insects and can serve as ecological indicators. Despite this, even preliminary studies on odonates are found wanting in many of our Protected Areas.

Ferns Nature Conservation Society, a non-profit conservation organization based in Wayanad has earlier joined hands with the Kerala Forests and Wildlife Department for studies on butterflies, including the study on migration of milkweed butterflies, mapping the spread of the invasive tree *Senna spectabilis* and ecological restoration activities in Wayanad Wildlife Sanctuary. With this study, the collaboration has been extended to the study of odonates, the little flying jewels whose study can help us understand nature better. Technical support offered by Society for Odonate Studies (SOS); an organization founded for the exclusive study of odonates in Kerala has greatly improved this study. Conservation of the natural world, and the survival of humankind in turn, would increasingly rely on such egoless collaborations in the future.

Vinayan P.A.
President, Ferns Nature Conservation Society

About Odonata



Dragonflies and damselflies which together form the insect Order Odonata are good indicators of ecological change because of their relatively large size, short life cycles, amphibious life history and moderate diversity. They are ubiquitous organisms of freshwater ecosystems. Their species assemblage and abundance have been found to reflect the water quality of the habitats in which they occur. They also play an important role in the food web as predators of smaller animals and prey for larger ones. Their contribution in controlling agricultural pests and mosquitoes is underappreciated. Numerous studies around the world have made use of odonates for assessing the health of forest ecosystems, but even a preliminary checklist of odonates found in the region are missing for many of India's forest areas. This glaring gap needs to be filled because odonates can act as good measures of biodiversity of a region and they have entered the biodiversity crisis debate already.

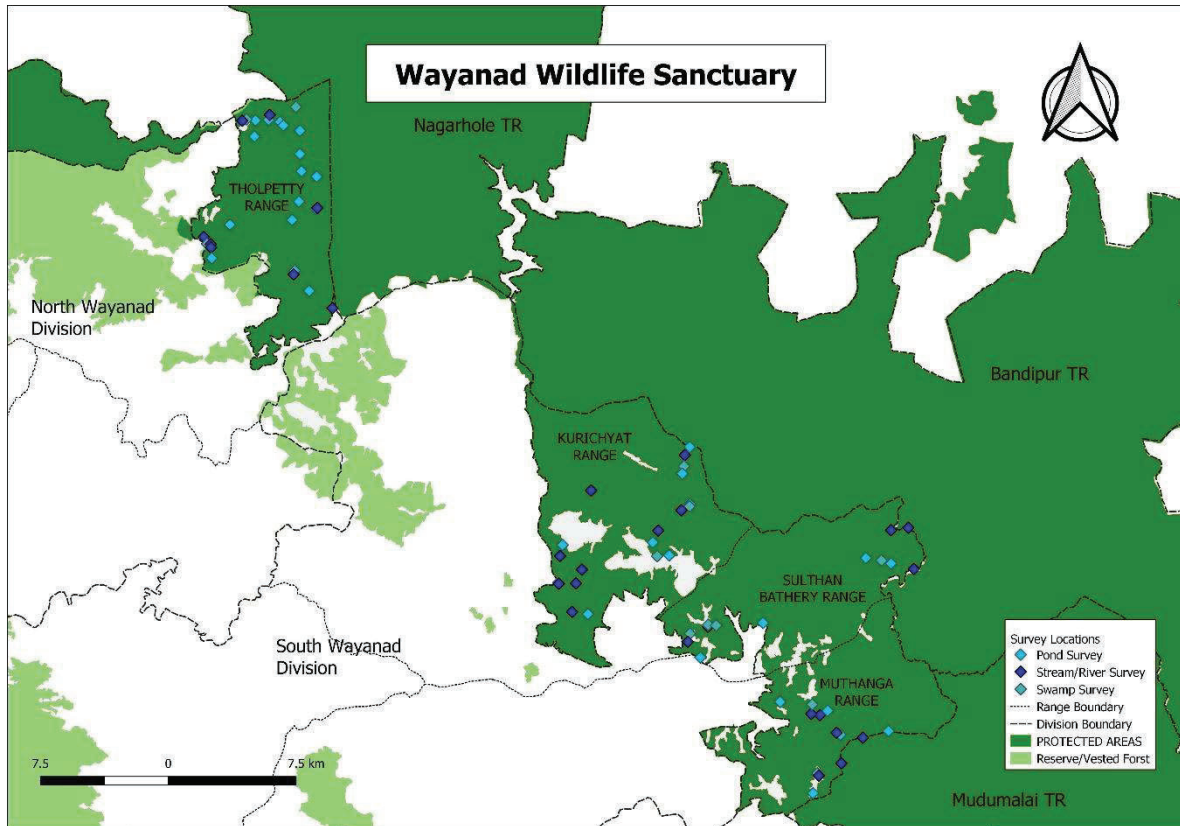
Wayanad Wildlife Sanctuary



Wayanad district is set high on the Western Ghats with altitudes ranging from 300 to 2200 meters. In terms of percentage of forest cover with total geographical area, Wayanad district has the highest forest cover of 41.59% in Kerala. Wayanad Wildlife Sanctuary is a part of the Nilgiri Biosphere Reserve and with an extent of 344.44 Km² across four ranges supports a variety of flora and fauna. The sanctuary is famed for supporting good populations of megafauna including the Asian Elephant and the Royal Bengal Tiger.

In India, the Eastern Himalayas and the Western Ghats are richest in terms of odonate diversity. Dr. F.C. Fraser, the British military officer who gave the first detailed account of odonates of India recognised that the Coorg-Wayanad belt was exceptionally rich in odonate fauna. In a study titled 'Systematic studies on Odonata (Insecta) of Southern Western Ghats' by Dr. K.G. Emiliyamma, Zoological Survey of India, multiple specimens were collected from Wayanad including those of some rare species like *Chlorogomphus campioni* and *Idionyx saffronata*. Three-day surveys with the help of volunteers were held in 2014 and 2016 in Wayanad Wildlife Sanctuary. In these two surveys coordinated by Malabar Natural History Society (MNHS) and Kerala Forests and Wildlife Department, 68 and 75 species of odonates were identified respectively. In an independent study published in 2020 by two researchers, Susanth C and Anooj S.S, 59 species of odonates were reported from various locations of Wayanad district. Having many rivulets and ponds, and being located in a hotspot of biodiversity, the Wayanad Wildlife Sanctuary is expected to host a rich variety of odonate fauna that can only be revealed with dedicated, systematic studies. This study is a pioneering attempt in this direction.

Methodology



Since odonates require freshwater to complete their life cycles, the main odonate habitats in the Sanctuary are streams, swamps and ponds. The study was carried out during the period August-November 2020. This period of the year was chosen because the water bodies are full and odonates are engaged in reproductive activities like territorial defence, patrolling and courtship, increasing their detectability. Also, camps become accessible in these months after the heavy Monsoon showers of June-July. In each of the four forest ranges, streams, swamps and ponds for sampling were pre-determined considering their accessibility. An observer accompanied by a forest watcher visited these water bodies between 9 AM to 3 PM in fine weather. Visual Encounter Survey (VES) was done to record the diversity of odonates in each habitat. For this, the observer walked along the edge of the freshwater habitat for 20 minutes and recorded the species encountered and their numbers. Belt transects conventionally used to document odonate diversity were not suitable as access to most habitats were limited. Time of the survey was fixed as 20 minutes after arriving at a species-accumulation curve (Figure 1). Spending more than 20 minutes in a habitat did not yield in the detection of any additional species. All the species were photographed in the field and identified with the help of field guides (Kiran & Raju 2014; SOS 2020) and taxonomic monographs (Fraser 1933, 1934 & 1936). Additionally, species encountered opportunistically in the Sanctuary were added to the checklist.

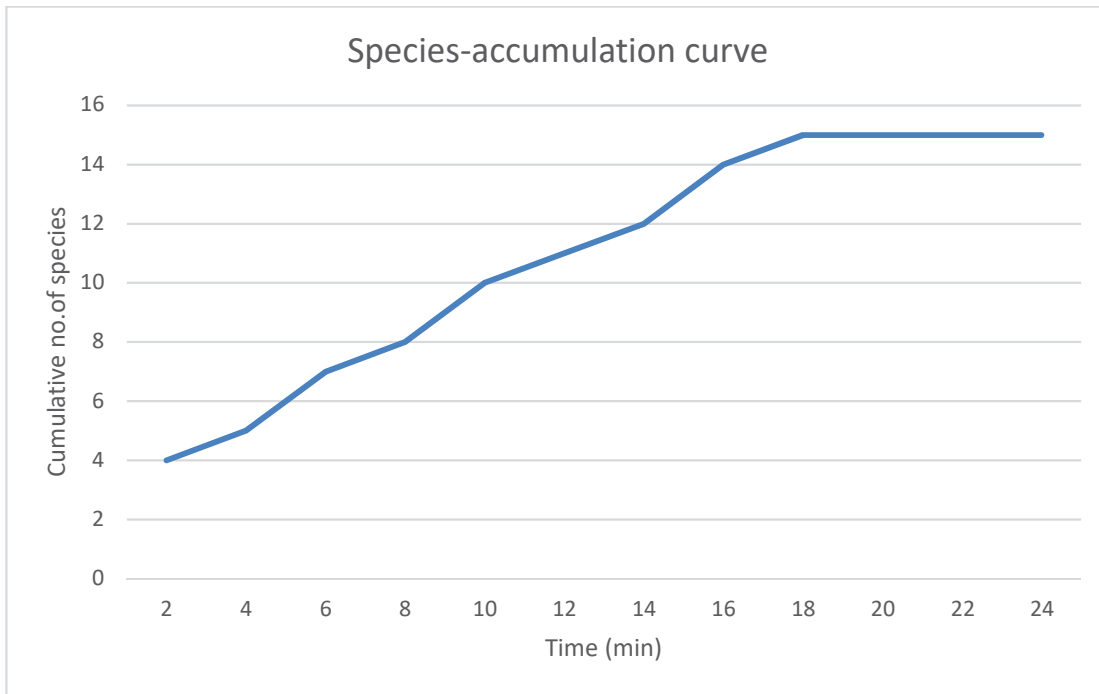


Figure 1: Species-accumulation curve drawn for a pond sampled



Picture- showing an observer doing fieldwork

Results

1. Tholpetty Range



No. of streams sampled= 9

No. of swamps sampled= 4

No. of ponds sampled= 16

A total of 79 species of odonates (34 damselflies and 45 dragonflies) were recorded out of which 13 are endemic to the Western Ghats.

2. Kurichiyat Range



No. of streams sampled= 9

No. of swamps sampled= 4

No. of ponds sampled= 8

A total of 66 species of odonates (26 damselflies and 40 dragonflies) were recorded out of which 6 are endemic to the Western Ghats.

3. Sulthan Bathery Range



No. of streams sampled= 5

No. of swamps sampled= 4

No. of ponds sampled= 5

A total of 68 species of odonates (28 damselflies and 40 dragonflies) were recorded out of which 5 are endemic to the Western Ghats.

4. Muthanga Range



No. of streams sampled= 6

No. of swamps sampled= 3

No. of ponds sampled= 4

A total of 64 species of odonates (28 damselflies and 36 dragonflies) were recorded out of which 5 are endemic to the Western Ghats.

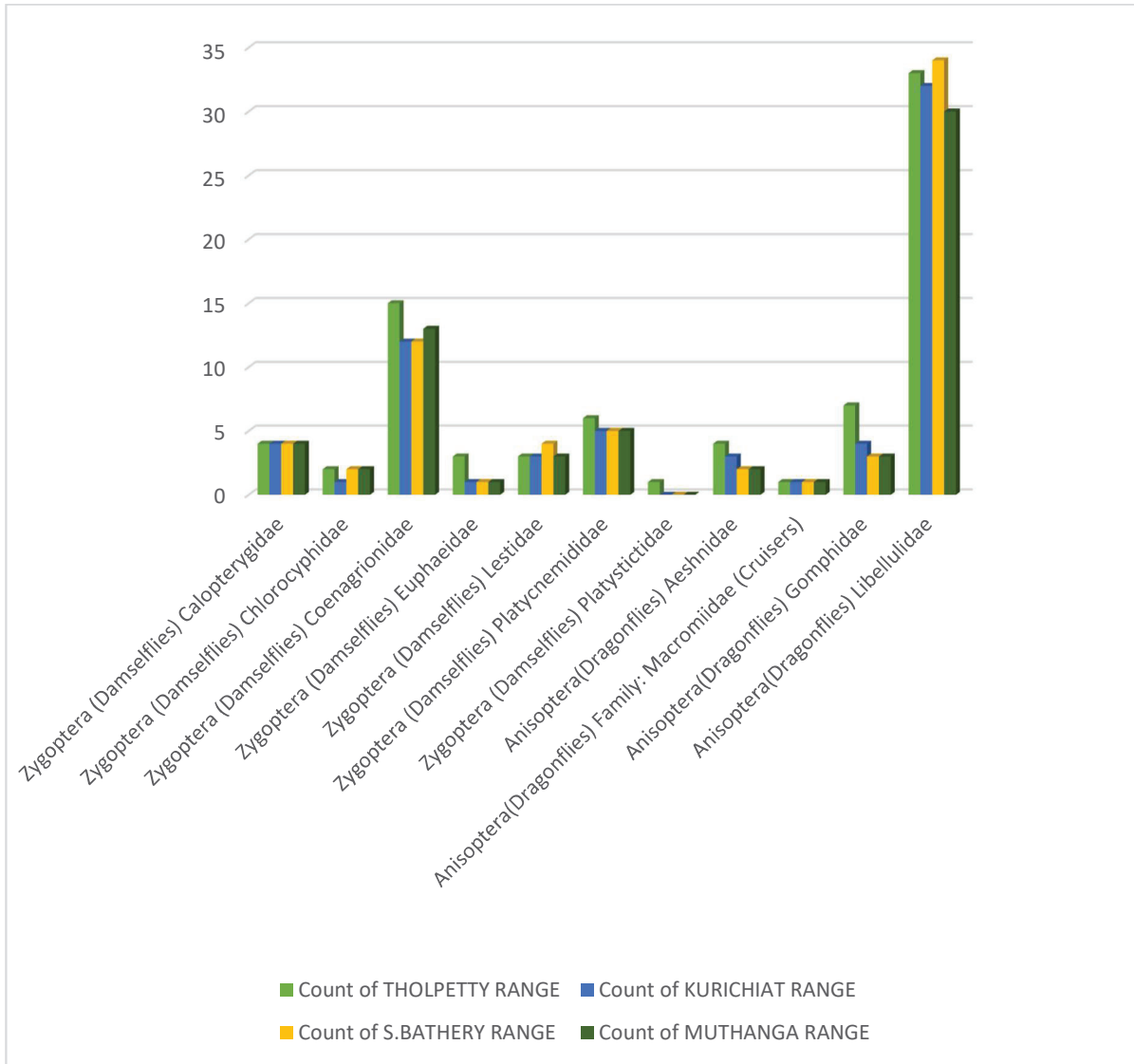


Figure 2: Number of species from each odonate family recorded in the four forest ranges

From the entire sanctuary area, a total of 84 species of odonates (35 damselflies and 47 dragonflies) were recorded out of which 15 are endemic to the Western Ghats. Species richness was highest in ponds (56), followed by streams (46) and swamps (33). However, the number of endemic species was highest in streams (8), followed by swamps (3) and ponds (2). The ‘ponds’ in the sanctuary are in most cases waterholes dug for larger wild animals. It is clear from the study that odonates have largely benefitted from the presence of these man-made ecosystems. Nonetheless, it must be noted that the number of endemic species supported by this habitat type is proportionally very less. The proportion of Libellulids, which are mostly sun-loving generalist species is remarkably higher in ponds.

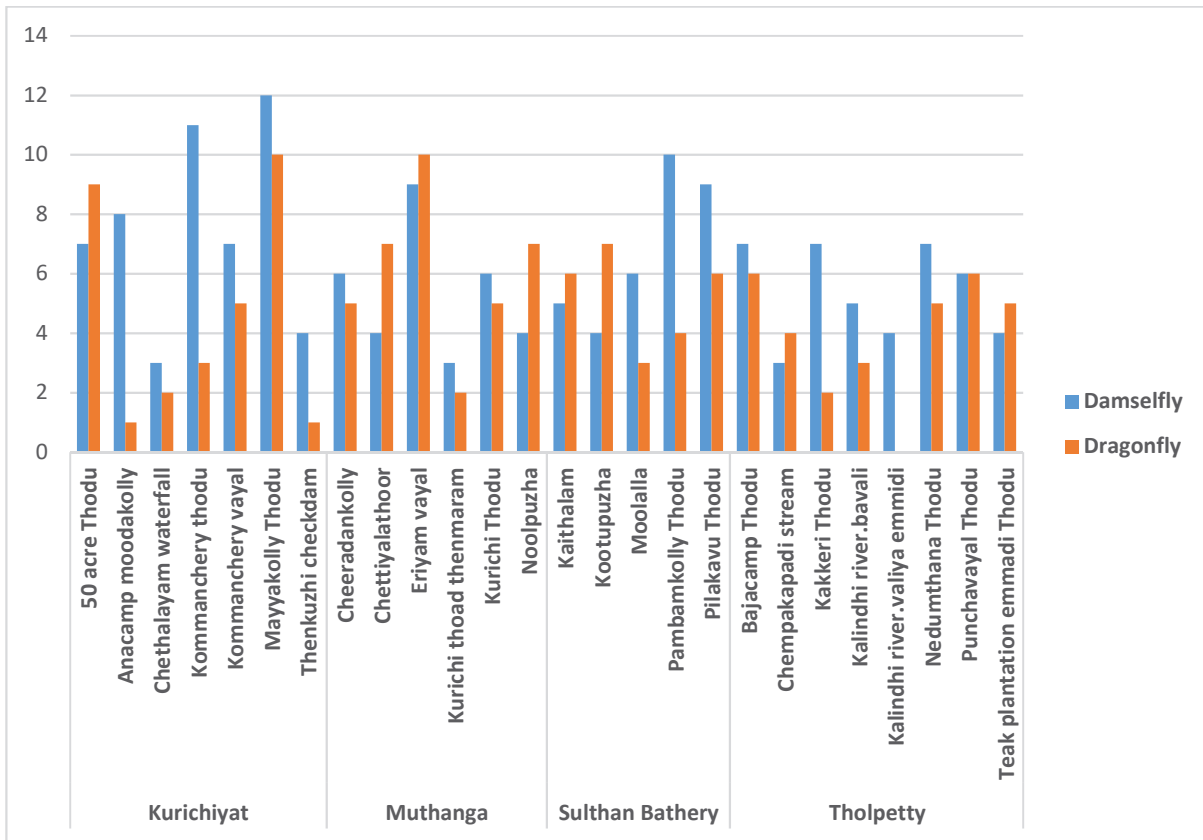


Figure 3: Number of damselfly and dragonfly species recorded from the streams in WWS

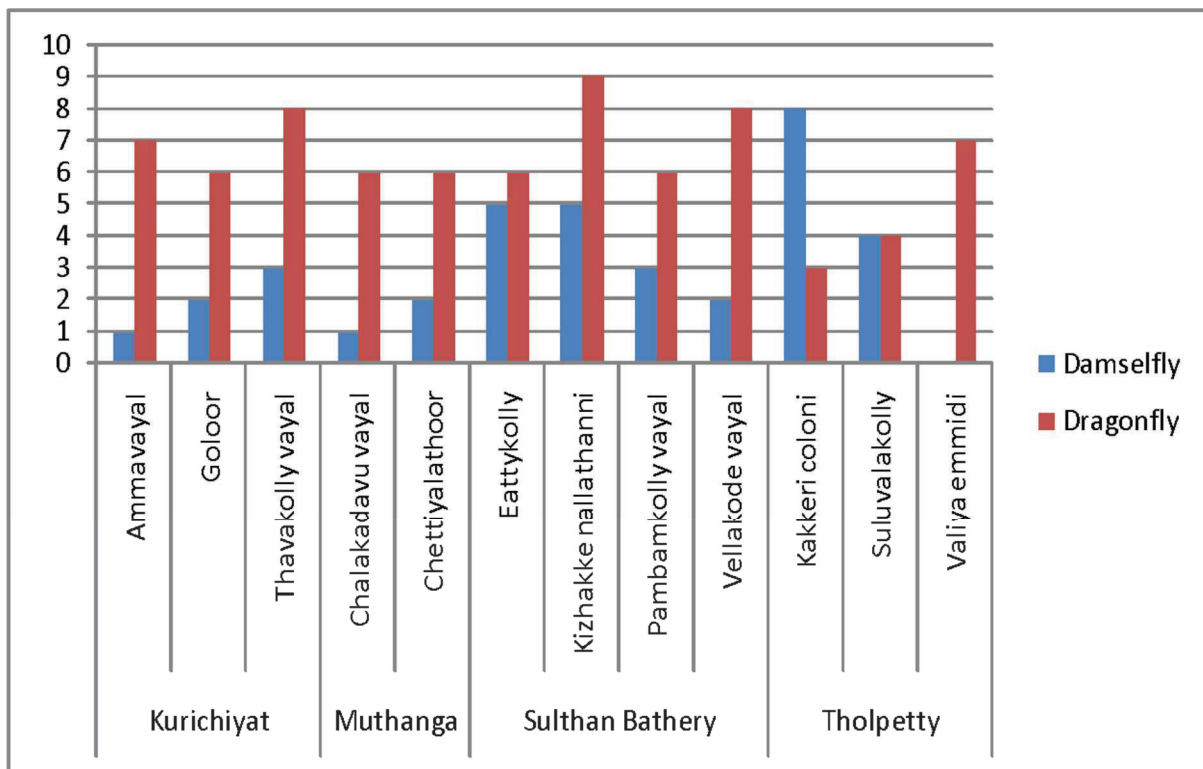


Figure 4: Number of damselfly and dragonfly species recorded from the swamps in WWS

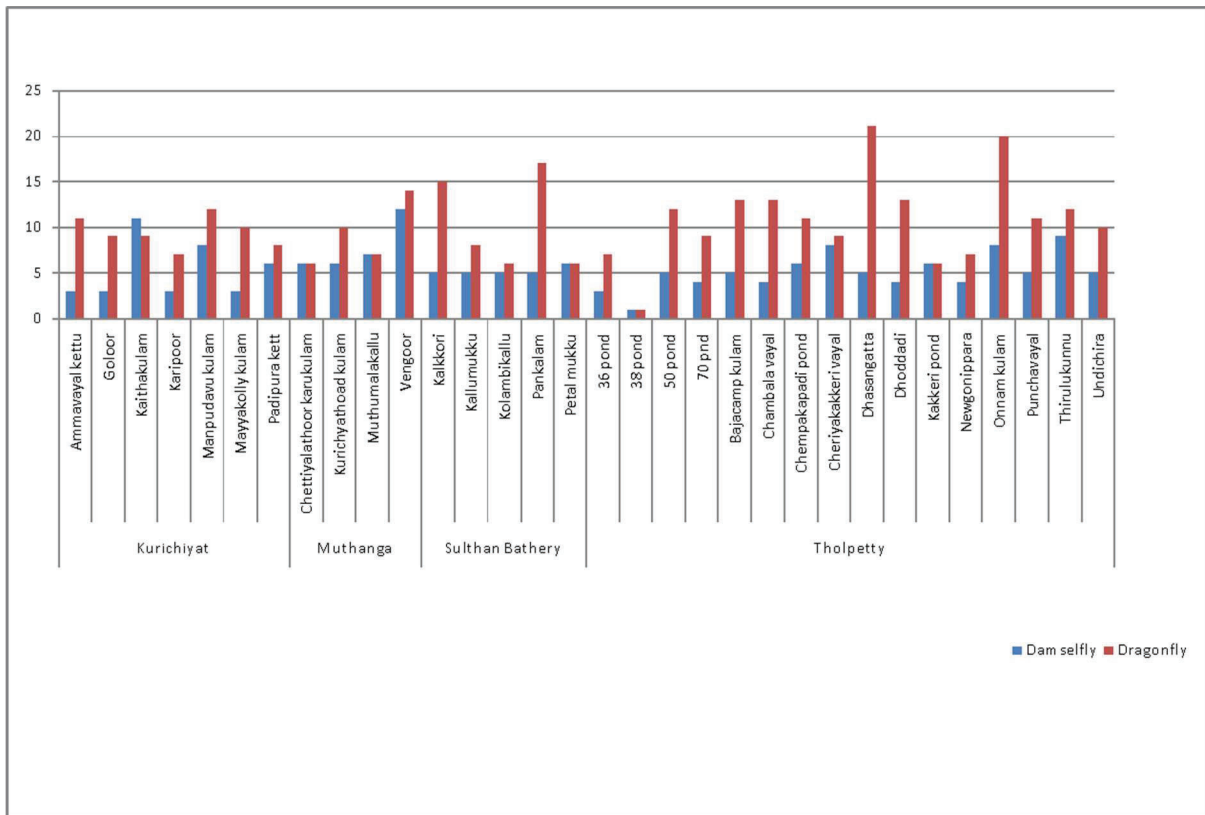


Figure 5: Number of damselfly and dragonfly species recorded from the ponds in WWS

Significant finds:

- i) ***Indolestes pulcherrimus* (Fraser, 1924)** – Commonly called Coorg False Spreadwing, this rare and endemic damselfly was earlier recorded only from Coorg in Karnataka. The discovery of this species from Wayanad Wildlife Sanctuary has increased the tally of odonate species recorded from Kerala to 175. Large colonies of this species were seen in Sulthan Bathery range. Many teneral (adults just emerged from larvae) were also seen, highlighting the importance of the sanctuary as their breeding area.



- ii) ***Amphiallagma parvum* (Selys, 1876)** – Although widely distributed in many South Asian countries, this small damselfly with the common name Azure Dartlet is very rare in Kerala and was formerly recorded only from a few locations in Kannur district. It was seen in Vengoor pond of Muthanga range.



- iii) ***Indothemis limbata* (Selys, 1891)** – A rare dragonfly inhabiting weedy ponds in the western parts of India, the Restless Demon was recorded from all four ranges of the sanctuary. In Kerala, it was earlier reported only from Kasaragod.



Recommendations

1. A year-long study should be conducted in the sanctuary to document its odonate diversity completely. Many species, especially Gomphids are highly seasonal and can only be seen on the wing for a brief period of the year. It is likely that the present study has missed many such species.
2. Field staff should be trained in identifying odonates. Even though they are insects, most odonates can be readily identified in the field thanks to their relatively large size and distinct colouration. Online resources for identification are available for free and since the field staff spend maximum time in the field, they can detect rare species and do continuous monitoring of odonates in the sanctuary. This will also be a valuable addition to the skillset of the staff and enhance their self-esteem.
3. The integrity of water bodies in the sanctuary should be maintained. As this study shows, streams running through the sanctuary support eight species of odonates endemic to the Western Ghats. Activities that interfere with the free flow of water in these streams should be avoided at all costs.

Acknowledgements

We thank the Wildlife Warden, Wayanad Wildlife Sanctuary and all the staff of Kerala Forests and Wildlife Department who facilitated this study. We are grateful to Vinayan P.A, President, Ferns Nature Conservation Society for his help in the execution of fieldwork. We are thankful to Arun Lal and Yadumon for their help in the field. We are indebted to Society for Odonate Studies (SOS) for the technical support rendered throughout the study.

Sl No	Speices	THOLPE TTY RANGE	KURICHI AT RANGE	S.BATHE RY RANGE	MUTHAN GA RANGE	Endemis m
	Zygoptera (Damselflies)	34	26	28	28	8
	Lestidae	3	3	4	3	1
1	<i>Indolestes pulcherrimus</i>			x	x	x
2	<i>Lestes dorothea</i>	x	x	x		
3	<i>Lestes elatus</i>	x	x	x	x	
4	<i>Lestes praemorsus</i>	x	x	x	x	
	Platystictidae	1				1
5	<i>Protosticta gravelyi</i>	x				x
	Calopterygidae	4	4	4	4	1
6	<i>Neurobasis chinensis</i>	x	x	x	x	
7	<i>Vestalis apicalis</i>	x	x	x	x	
8	<i>Vestalis gracilis</i>	x	x	x	x	
9	<i>Vestalis submontana</i>	x	x	x	x	x
	Chlorocyphidae	2	1	2	2	
10	<i>Libellago indica</i>	x		x	x	
11	<i>Heliocypha bisignata</i>	x	x	x	x	
	Euphaeidae	3	1	1	1	2
12	<i>Dysphaea ethela</i>	x		x	x	
13	<i>Euphaea dispar</i>	x				x
14	<i>Euphaea fraseri</i>	x	x			x
	Platycnemididae	6	5	5	5	2
15	<i>Caconeura ramburi</i>	x	x	x	x	x
16	<i>Copera marginipes</i>	x	x	x	x	
17	<i>Copera vittata</i>	x	x	x	x	
18	<i>Melanoneura bilineata</i>	x				x
19	<i>Onychargia atrocyana</i>	x	x	x	x	
20	<i>Prodasineura verticalis</i>	x	x	x	x	
	Coenagrionidae	15	12	12	13	1
21	<i>Aciagrion approximans krishna</i>	x	x	x	x	
22	<i>Aciagrion occidentale</i>	x	x	x	x	
23	<i>Agriocnemis pieris</i>	x	x	x	x	
24	<i>Agriocnemis pygmaea</i>	x	x	x	x	
25	<i>Agriocnemis splendidissima</i>	x	x	x	x	
26	<i>Amphiallagma parvum</i>	x			x	
27	<i>Ceriagrion coromandelianum</i>	x	x	x	x	
28	<i>Ceriagrion olivaceum aurantiacum</i>	x				
29	<i>Ceriagrion rubiae</i>	x	x	x	x	
30	<i>Ischnura rubilio</i>	x	x	x	x	
31	<i>Ischnura senegalensis</i>	x	x	x	x	

32	<i>Pseudagrion decorum</i>	x				
33	<i>Pseudagrion indicum</i>	x	x	x	x	x
34	<i>Pseudagrion malabaricum</i>	x	x	x	x	
35	<i>Pseudagrion rubriceps</i>	x	x	x	x	
	Anisoptera(Dragonflies)	45	40	40	36	7
	Aeshnidae	4	3	2	2	
36	<i>Anax immaculifrons</i>	x	x	x	x	
37	<i>Anax indicus</i>	x	x	x	x	
38	<i>Gynacantha dravida</i>	x	x			
39	<i>Gynacantha millardi</i>	x				
	Gomphidae	7	4	3	3	6
40	<i>Burmagomphus laidlawi</i>	x				x
41	<i>Gomphidia kodaguensis</i>	x				x
42	<i>Ictinogomphus rapax</i>	x	x	x	x	
43	<i>Lamelligomphus nilgiriensis</i>		x			x
44	<i>Melligomphus acinaces</i>	x				x
45	<i>Merogomphus longistigma</i>	x	x	x	x	x
46	<i>Microgomphus souteri</i>	x				x
47	<i>Paragomphus lineatus</i>	x	x	x	x	
	Macromiidae	1	1	1	1	
48	<i>Epophthalmia vittata</i>	x	x	x	x	
	Libellulidae	33	32	34	30	1
49	<i>Acisoma panorpoides</i>	x	x	x	x	
50	<i>Aethriamanta brevipennis</i>			x		
51	<i>Brachydiplax sobrina</i>	x	x	x	x	
52	<i>Brachythemis contaminata</i>	x	x	x	x	
53	<i>Bradinyopyga geminata</i>	x	x	x	x	
54	<i>Cratilla lineata</i>	x	x	x	x	
55	<i>Crocothemis servilia</i>	x	x	x	x	
56	<i>Diplacodes trivialis</i>	x	x	x	x	
57	<i>Epithemis mariae</i>	x				x
58	<i>Hydrobasileus croceus</i>	x	x	x	x	
59	<i>Hylaeothemis apicalis</i>	x	x	x	x	
60	<i>Indothemis carnatica</i>	x	x	x	x	
61	<i>Indothemis limbata</i>	x	x	x	x	
62	<i>Lathrecista asiatica</i>	x	x	x	x	
63	<i>Neurothemis fulvia</i>	x	x	x	x	
64	<i>Neurothemis tullia</i>	x	x	x	x	
65	<i>Onychothemis testacea</i>	x	x	x	x	
66	<i>Orthetrum chrysis</i>	x	x	x	x	
67	<i>Orthetrum glaucum</i>	x	x	x	x	
68	<i>Orthetrum luzonicum</i>	x	x	x	x	
69	<i>Orthetrum prunosum</i>	x	x	x	x	
70	<i>Orthetrum sabina</i>	x	x	x	x	
71	<i>Palpopleura sexmaculata</i>	x	x	x	x	

72	<i>Pantala flavescens</i>	x	x	x	x	
73	<i>Potamarcha congener</i>	x	x	x	x	
74	<i>Rhodothemis rufa</i>	x	x	x	x	
75	<i>Rhyothemis triangularis</i>	x	x	x		
76	<i>Rhyothemis variegata</i>	x				
77	<i>Tetrathemis platyptera</i>	x	x	x	x	
78	<i>Tholymis tillarga</i>	x	x	x		
79	<i>Tramea limbata</i>	x	x	x	x	
80	<i>Trithemis aurora</i>	x	x	x	x	
81	<i>Trithemis festiva</i>	x	x	x	x	
82	<i>Urothemis signata</i>	x	x	x	x	
83	<i>Zygonyx iris</i>		x	x	x	
84	<i>Zyxomma petiolatum</i>			x		
	Grand Total	79	66	68	64	15
	Total Endemic Sp.	13	6	5	5	15

Table 1: Checklist of Odonata recorded from Wayanad Wildlife Sanctuary

	Kurichiyat				Muthanga			Sulthan Bathery					Tholpetty				Swamp Survey Total
	Ammavayal	Goloor	Thavakolly vayal	Kurichiyat Total	Chalacadavu vayal	Chettiyalathoor	Muthanga Total	Eattykolly	Kizhakke nallathanni	Pambamkolly vayal	Vellakode vayal	Sulthan Bathery Total	Kakkeri coloni	Suluvalakolly	Valiya emmidi	Tholpetty Total	
Damselfly																	
Lestidae													X			X	X
<i>Lestes praemorsus</i>													X			X	X
Calopterygidae																	
<i>Vestalis apicalis</i>								X				X	X			X	X
<i>Vestalis gracilis</i>								X				X					X
Chlorocyphidae																	
<i>Heliocypha bisignata</i>								X				X					X
Euphaeidae																	
<i>Euphaea fraseri</i>								X				X					X
Platycnemididae																	
<i>Caconeura ramburi</i>														X		X	X
<i>Copera vittata</i>		X		X				X				X	X	X		X	X
<i>Melanoneura bilineata</i>												X	X			X	X
<i>Onychargia atrocyana</i>			X	X					X			X	X	X		X	X
Coenagrionidae																	
<i>Aciagrion approximans krishna</i>									X			X	X			X	X
Chlorocyphidae	X	X	X	X	X	X	X		X	X	X	X	X			X	X
<i>Agriocnemis pygmaea</i>						X	X		X	X		X	X			X	X
<i>Ceriagrion coromandelianum</i>			X	X					X			X					X
<i>Ischnura rubilio</i>										X	X	X					X
<i>Ischnura senegalensis</i>																	
Dragonfly																	
Aeshnidae																	
<i>Gynacantha dravida</i>														X		X	X
Libellulidae																	
<i>Acisoma panorpoides</i>	X	X	X	X		X	X		X			X					X
<i>Cratilla lineata</i>					X		X					X	X				X
<i>Crocothemis servilia</i>	X			X													X
<i>Diplacodes trivialis</i>			X	X		X	X					X	X			X	X
<i>Hydrobasileus croceus</i>																	
<i>Hylaeothemis apicalis</i>								X				X		X		X	X
<i>Neurothemis fulvia</i>															X	X	X
<i>Neurothemis tullia</i>			X	X	X		X		X	X	X	X					X
<i>Orthetrum chrysis</i>								X	X			X		X		X	X
<i>Orthetrum glaucum</i>		X		X	X		X	X	X			X					X
<i>Orthetrum luzonicum</i>	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
<i>Orthetrum pruinosum</i>	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
<i>Orthetrum sabina</i>	X		X	X		X	X			X	X	X			X	X	X

	Kurichiyat				Muthanga			Sulthan Bathery					Tholpetty				Swamp Survey Total	
	Ammavayal	Goloor	Thavakolly vayal	Kurichiyat Total	Chaladakavu vayal	Chettiyalathoor	Muthanga Total	Eattykolly	Kizhakke nallathanni	Pambamkolly vayal	Vellakode vayal	Sulthan Bathery Total	Kakkeri coloni	Suluvalakolly	Valiya emmidi	Tholpetty Total		
<i>Palpopleura sexmaculata</i>	x	x	x	x				x		x	x	x			x	x	x	
<i>Pantala flavescens</i>	x	x	x	x		x	x			x	x	x					x	
<i>Potamarcha congener</i>					x		x		x			x			x	x	x	
<i>Rhodothemis rufa</i>									x			x					x	
<i>Tetrathemis platyptera</i>													x	x		x	x	
<i>Trithemis aurora</i>									x			x					x	
Grand Total	8	8	1	4	7	8	2	1	1	4	9	0	2	1	8	7	2	3

Table 3: Odonata recorded from the swamps of Wayanad Wildlife Sanctuary



Indolestes pulcherrimus



Lestes dorothea



Lestes elatus



Lestes praemorsus



Protosticta gravelyi



Neurobasis chinensis



Vestalis apicalis



Vestalis gracilis



Vestalis submontana



Heliocypha bisignata



Libellago indica



Dysphaea ethela



Euphaea dispar



Euphaea fraseri



Caconeura ramburi



Copera marginipes



Copera vittata



Melanoneura bilineata



Onychargia atrocyana



Prodasineura verticalis



Aciagrion approximans krishna



Aciagrion occidentale



Agriocnemis pieris



Agriocnemis pygmaea



Agriocnemis splendidissima



Amphiallagma parvum



Ceriagrion coromandelianum



Ceriagrion olivaceum aurantiacum



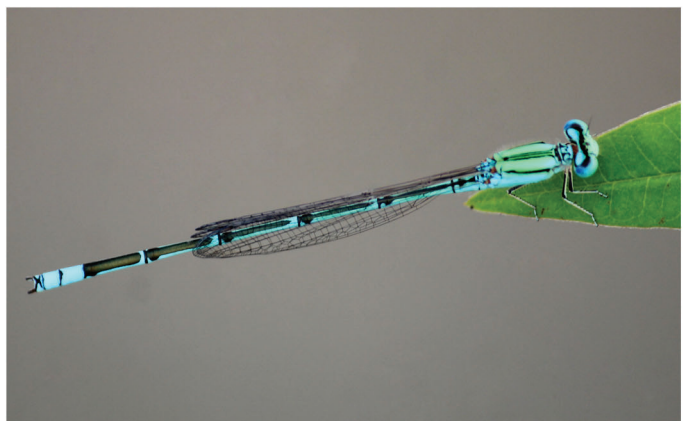
Ceriagrion rubiae



Ischnura rubilio



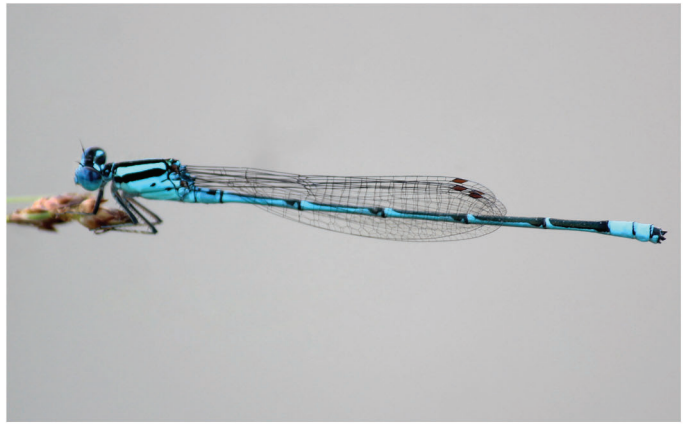
Ischnura senegalensis



Pseudagrion decorum



Pseudagrion indicum



Pseudagrion malabaricum



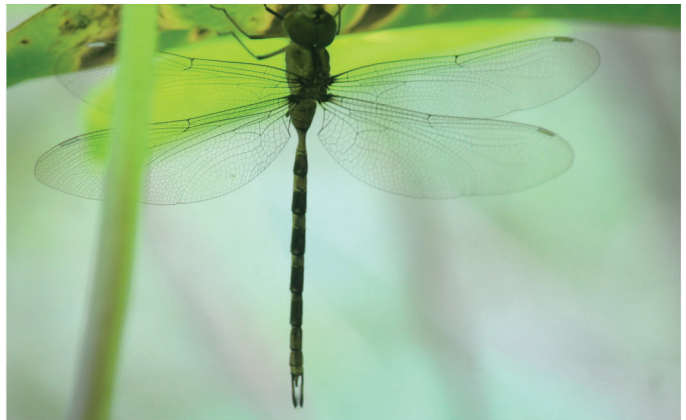
Pseudagrion rubriceps



Anax immaculifrons



Anax indicus



Gynacantha dravida



Gynacantha millardi



Burmagomphus laidlawi



Gomphidia kodaguensis



Ictinogomphus rapax



Lamelligomphus nilgiriensis



Melligomphus acinaces



Merogomphus longistigma



Microgomphus souteri



Paragomphus lineatus



Epophthalmia vittata



Acisoma panorpoides



Aethriamanta brevipennis



Brachydiplax sobrina



Brachythemis contaminata



Bradinopyga geminata



Cratilla lineata



Crocothemis servilia



Diplacodes trivialis



Epithemis mariae



Hydrobasileus croceus



Hylaeothemis apicalis



Indothemis carnatica



Indothemis limbata



Lathrecista asiatica



Neurothemis fulvia



Neurothemis tullia



Onychothemis testacea



Orthetrum chrysis



Orthetrum glaucum



Orthetrum luzonicum



Orthetrum pruinatum



Orthetrum sabina



Palpopleura sexmaculata



Pantala flavescens



Potamarcha congener



Rhodothemis rufa



Rhyothemis triangularis



Rhyothemis variegata



Tetrathemis platyptera



Tholymis tillarga



Tramea limbata



Trithemis aurora



Trithemis festiva



Urothemis signata



Zygonyx iris



Zyxomma petiolatum