



ISSN 0974-7907 (Online)
ISSN 0974-7893 (Print)

Journal of Threatened Taxa | www.threatenedtaxa.org | 26 February 2015 | 7(2): 6910–6919

ODONATA (INSECTA) DIVERSITY OF CHINNAR WILDLIFE SANCTUARY, THE SOUTHERN WESTERN GHATS, INDIA

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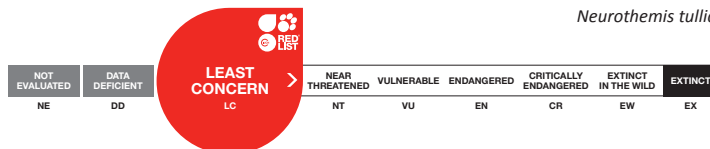
Abstract: A study was conducted at Chinnar Wildlife Sanctuary, Idukki District, Kerala, the southern Western Ghats, to assess the diversity of odonates. We report 48 species of odonates, which include 31 species of Anisoptera (dragonflies) and 17 species of Zygoptera (damselflies). Among the dragonflies, the family Libellulidae dominated with 25 species, while Coenagrionidae with seven species was the dominant family among the damselflies. The odonate diversity of Chinnar WS accounted for 31.16 % of the odonates in Kerala and 27.58% of the odonates of the Western Ghats. Chinnar also recorded two species of odonates that are endemic to the Western Ghats, which are, the Pied Reed Tail *Protosticta gravelyi* and the Travancore Bamboo Tail *Esme mudiensis*.

Keywords: Anisoptera, damselflies, dragonflies, Idukki District, Kerala, Zygoptera.

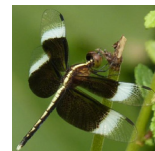
Odonata, which comprise dragonflies and damselflies being the top predators at larval and adult stages, play a significant role in freshwater ecosystems. Five-thousand-seven-hundred-and-forty (5740) species of odonates are known from the world, of which 474 species in 142 genera and 18 families exist in India

(Subramanian 2014). Around 174 species of odonates have been reported from the Western Ghats, including 56 species endemic to the region (Subramanian & Sivaramakrishnan 2002; Subramanian et al. 2011), while Kiran & Raju (2013) reported 154 species of odonates from Kerala.

Some of the published works on the odonates of the Western Ghats include: Fraser (1924 & 1931); Peters (1981) who reported 26 species of odonates from Thiruvananthapuram District of Kerala which was later expanded by 17 species that were added to the list (Emiliyamma & Radhakrishnan 2002); Rao & Lahiri (1982) recorded 29 species of odonates from Silent Valley and New Amarambalam Reserved Forests in Kerala while 25 species of odonates have been reported by Emiliyamma & Radhakrishnan (2000) from Parambikulam Wildlife Sanctuary, Kerala; Mathavan & Miller (1989) reported 36 species of odonates from Periyar Tiger Reserve, Kerala; Emiliyamma (2005) recorded 31 species of odonates



Neurothemis tullia



DOI: <http://dx.doi.org/10.11609/JoTT.o3771.6910-9> | **ZooBank:** urn:lsid:zoobank.org:pub:14027E3F-A5CB-484E-9D78-C8179FFD3DFB

Editor: K.A. Subramanian, Zoological Survey of India, Kolkata, India.

Date of publication: 26 February 2015 (online & print)

Manuscript details: Ms # o3771 | Received 15 September 2013 | Final received 14 December 2014 | Finally accepted 16 January 2015

Citation: Adarsh, C.K., R. Arunraj & P.O. Nameer (2015). Odonata (Insecta) diversity of Chinnar Wildlife Sanctuary, the southern Western Ghats, India. *Journal of Threatened Taxa* 7(2): 6910–6919; <http://dx.doi.org/10.11609/JoTT.o3771.6910-9>

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Funding: Kerala Agricultural University.

Competing Interest: The authors declare no competing interests.

Acknowledgements: We thank the Wildlife Warden, Munnar Wildlife Division and the Asst. Wildlife Warden Chinnar Wildlife Sanctuary for the logistical support, David. V. Raju and C.G. Kiran for helping us with the identification the odonates, C.R. Aneesh, R. Anand, Akhil Das, Bill Nelson Paul and Nithin Lal for the support in the field. We thank R. Sreehari for helping with the preparation of the map of the study area. We also thank the Dean, College of Forestry, Kerala Agricultural University for encouragement and support. We also thank the anonymous reviewers and the subject editor for their critical comments which greatly improved the manuscript.



from the Kottayam District of Kerala; Gunathilagaraj et al. (1999) recorded 16 species of odonates including nine dragonflies and seven damselflies from the rice fields of Coimbatore, Tamil Nadu; 12 species of odonates were recorded from the irrigated rice fields of Madurai, Tamil Nadu (Kandibane et al. 2005); Arulprakash & Gunathilagaraj (2010) reported 21 species of odonates from Coimbatore and Salem districts in Tamil Nadu; Rangnekar et al. (2010) documented a total of 66 species of odonates from the state of Goa; Subramanian et al. (2013) described *Idionyx gomantakensis*, a species new to science from Goa; Rangnekar & Naik (2014) reported 13 more species of odonates from Goa; and Adarsh et al. (2014) recorded 52 species of odonates from Kerala Agricultural University campus, Thrissur, Kerala. Here we summarise our findings from a study conducted on the odonates of Chinnar Wildlife Sanctuary from September to December, 2012.

Study area

The Chinnar Wildlife Sanctuary is located 18km north of Marayoor in the Marayoor and Kanthalloor panchayats of Devikulam Taluk in the Idukki District of Kerala State (Fig. 1). It is located between 10°15'–10°21'N & 77°5'–77°16'E and has a total area of 90.44km². The Munnar-Udumalpet Road, SH17 passes through the sanctuary for 16km and divides it into two nearly equal portions. It is contiguous with Eravikulam National Park to the south and Indira Gandhi Wildlife Sanctuary to the north. It forms an integral part of the 1,187km² block of protected forests in the Anamalai Hills, Western Ghats.

The terrain is undulating with hills and hillocks of varying heights. The altitude ranges from 400–2372 m. The sanctuary is situated in the rain shadow region and hence the area experiences a prolonged hot/dry season and fewer rainy days. The major rainfall season is during the north-east monsoon occurring during October–December. The rainy days in a year range from 30 to 40 days which account for about 300–500 mm rainfall in Chinnar; but the higher altitude areas like Olikkudy and Mangappara receive rain during both the north-east and south-west monsoons with comparatively much higher rainfall. The recorded lowest temperature is 12°C and the highest is 38°C.

The vegetation shows an entire spectrum ranging from temperate sholas to dry scrub of the arid plains. The vegetation of the sanctuary can be broadly classified into the following types according to Champion and Seth (1968). They are southern tropical thorn forest (scrub jungle), southern dry mixed deciduous forest (dry deciduous forest), southern moist mixed deciduous

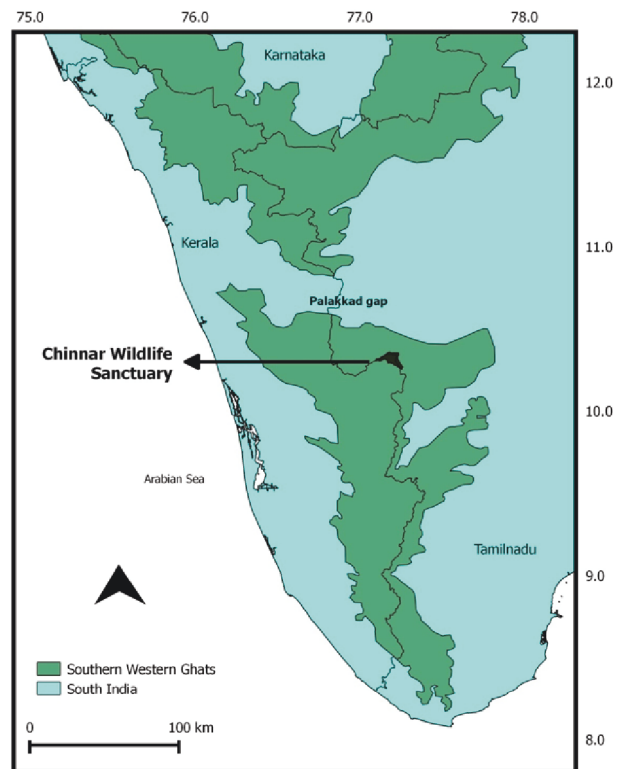


Figure 1. Chinnar Wildlife Sanctuary, southern Western Ghats

forest (moist deciduous forest), tropical riparian fringing forest (riparian forest), southern montane wet temperate forest (montane shola forest) and southern montane wet grassland (grasslands).

METHODS

The odonates of the Chinnar Wildlife Sanctuary were surveyed by an all out search method, from September to December 2012. The present study was conducted at five different sites within Chinnar Wildlife Sanctuary, viz.: Chambakkad (scrub jungle) (Image 1), Karimala (dry deciduous forest) (Image 2), Ichampetti (moist deciduous forest) (Image 3), Kootar (riparian forest) (Image 4) and Karuveppin Shola (montane shola forest) (Image 5). At each study site 5–10 days were spent searching for dragonflies and damselflies. Upon spotting them, the odonates were photographed and identification was confirmed using taxonomy monographs of Fraser (1933, 1934, 1936) and field guides (Subramanian 2005, 2009). The taxonomy and nomenclature that has been used is as per Subramanian (2014). The odonates observed were categorized into five groups based on their abundance during the period of study. Accordingly, those species observed 80–100 % of the survey days were categorized as very common (VC), 60–80 % as common (C), 40–60 %



Image 1. Chambakkad (scrub jungle)



Image 2. Karimala (dry deciduous forest)

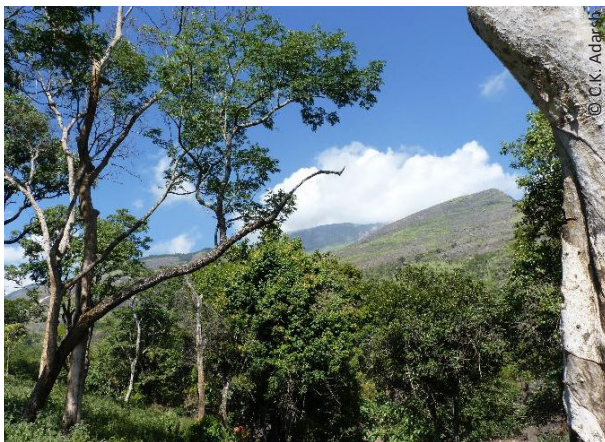


Image 3. Ichampetti (moist deciduous forest)

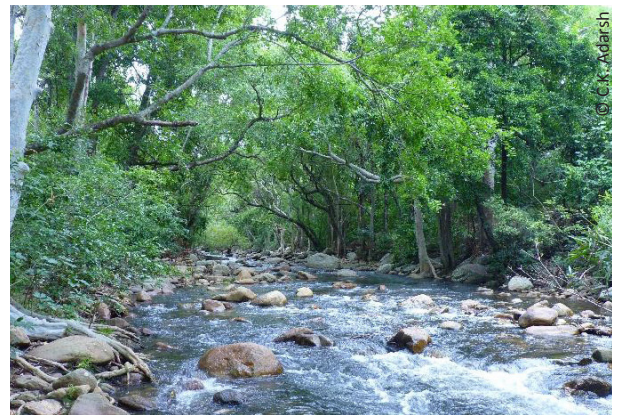


Image 4. Kootar (riparian forest)

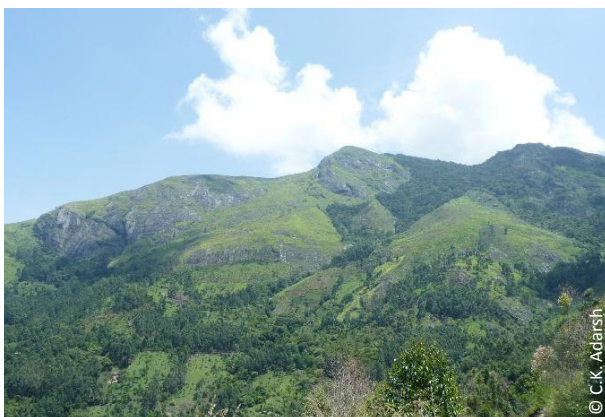


Image 5. Karuveppin Shola (montane shola forest)

as occasional (O), 20–40 % as rare (R) and below 20% as very rare (VR).

RESULTS AND DISCUSSION

A total of 48 species of odonates including 31 species of Anisoptera (dragonflies) and 17 species of Zygoptera (damselflies) were recorded from the Chinnar Wildlife Sanctuary (Table 1). The family Libellulidae dominated with 25 species among Anisoptera followed by Aeshnidae (4) and Gomphidae (2). Among Zygoptera, Coenagrionidae (7) was the dominant family followed by Calopterygidae (3) and Platycnemididae (3). The family-wise distribution of odonates (both Anisoptera and Zygoptera) is given in figures 2 and 3, respectively. The species richness of odonates in the five different study sites is given in Fig. 4. Kootar, the riverine forest habitat, accounted for maximum species richness with 45 species followed by Ichampetti (31), Chambakkad (30), Karimala (28) and Karuveppin Shola (24).

The five most common odonates at Chinnar WS during the survey period were the Wandering Glider *Pantala flavescens* (Fabricius, 1798), Green Marsh Hawk *Orthetrum sabina* (Drury, 1770), Ditch Jewel *Brachythemis contaminata* (Fabricius, 1793), Yellow

Table 1. Checklist of odonates recorded from the study sites of Chinnar Wildlife Sanctuary

Common name	Family / Scientific name	IUCN Red List status	Image no.	Study areas				
				Kootar	Karimala	Karuveppin Shola	Chambakkad	Ichampetti
ZYGOPTERA (Damselflies)								
Bush Dart	Platycenemididae							
1. Yellow Bush Dart	<i>Copera marginipes</i> (Rambur, 1842)	LC	6	✓	✓	✓	✓	✓
2. Black Bamboo Tail	<i>Prodasineura verticalis</i> (Selys, 1860)	LC	7	✓	✓	✓	✓	✓
3. Travancore Bamboo Tail*	<i>Esme mudiensis</i> Fraser, 1931	DD		A	A	✓	A	✓
Reed Tail	Platystictidae							
4. Pied Reed Tail*	<i>Protosticta gravelyi</i> Laidlaw, 1915	LC	8	✓	A	✓	A	✓
Marsh Dart	Coenagrionidae							
5. Violet Striped Slender Dartlet	<i>Aciagrion hisopa</i> (Selys, 1876)	LC	9	A	A	✓	A	A
6. Orange-tailed Marsh Dart	<i>Ceriagrion cerinorubellum</i> (Brauer, 1865)	LC	10	✓	✓	✓	✓	✓
7. Coromandel Marsh Dart	<i>Ceriagrion coromandelianum</i> (Fabricius, 1798)	LC	11	✓	✓	✓	✓	✓
8. Golden Dartlet	<i>Ischnura aurora</i> (Brauer, 1865)	LC	12	✓	A	✓	✓	✓
9. Pigmy Dartlet	<i>Agriocnemis pygmaea</i> (Rambur, 1842)	LC		✓	✓	✓	✓	✓
10. Saffron-faced Blue Dart	<i>Pseudagrion rubriceps</i> Selys, 1876	LC	13	✓	A	A	A	A
11. Blue Grass Dartlet	<i>Pseudagrion microcephalum</i> (Rambur, 1842)	LC	14	✓	✓	✓	✓	✓
Stream Jewel	Chlorocyphidae							
12. River Heliodor	<i>Libellago lineata</i> (Burmeister, 1839)	LC	15	✓	✓	A	A	A
13. Stream Ruby	<i>Heliocypha bisignata</i> Hagen in Selys, 1853	LC	16	✓	A	A	A	A
Glories	Calopterygidae							
14. Black-tipped Forest Glory	<i>Vestalis apicalis</i> Selys, 1873	LC	17	✓	✓	A	A	A
15. Clear-winged Forest Glory	<i>Vestalis glacialis</i> (Rambur, 1842)	NE	18	✓	✓	A	A	✓
16. Stream Glory	<i>Neurobasis chinensis</i> (Linnaeus, 1758)	LC	19	✓	A	A	A	A
Torrent Darts	Euphaeidae							
17. Black Torrent Dart	<i>Dysphaea ethela</i> Fraser, 1924	DD	20	✓	A	A	A	A
ANISOPTERA (Dragonflies)								
Darners	Aeshnidae							
18. Parakeet Darner	<i>Gynacantha bayadera</i> Selys, 1854	LC	21	✓	A	A	A	A
19. Brown Darner	<i>Gynacantha dravida</i> Lieftinck, 1960	DD	22	✓	✓	✓	✓	✓
20. Blue Darner	<i>Anax immaculifrons</i> Rambur, 1842	LC		✓	✓	A	A	✓
21. Blue-tailed Green Darner	<i>Anax guttatus</i> (Burmeister, 1839)	LC	23	✓	A	A	✓	✓
Clubtails	Gomphidae							
22. Common Clubtail	<i>Ictinogomphus rapax</i> (Rambur, 1842)	LC	24	✓	✓	✓	✓	A
23. Clubtail	<i>Gomphidia</i> sp.		25	✓	A	A	A	✓
Skimmers	Libellulidae							
24. Trumpet Tail	<i>Acisoma panorpoides</i> Rambur, 1842	LC	26	✓	A	A	✓	A
25. Scarlet Marsh Hawk	<i>Aethriamanta brevipennis</i> (Rambur, 1842)	LC		A	A	A	✓	A
26. Rufous-backed Marsh Hawk	<i>Brachydiplax chalybea</i> Brauer, 1868	LC		✓	✓	A	A	✓
27. Little Marsh Hawk	<i>Brachydiplax sobrina</i> (Rambur, 1842)	LC	27	✓	✓	A	✓	A
28. Ditch Jewel	<i>Brachythemis contaminata</i> (Fabricius, 1793)	LC	28, 20	✓	A	A	A	✓
29. Granite Ghost	<i>Bradynopyga geminata</i> (Rambur, 1842)	LC	30	✓	✓	✓	✓	✓
30. Black-tipped Ground Skimmer	<i>Diplacodes nebulosa</i> (Fabricius, 1793)	LC		✓	A	A	A	A

Common name	Family / Scientific name	IUCN Red List status	Image no.	Study areas				
				Kootar	Karimala	Karuveppin Shola	Chambakkad	Ichampetti
31. Ground Skimmer	<i>Diplacodes trivialis</i> (Rambur, 1842)	LC	31, 32	✓	✓	✓	✓	✓
32. Asiatic Blood Tail	<i>Lathrecista asiatica</i> (Fabricius, 1798)	LC	33	✓	✓	A	✓	✓
33. Fulvous Forest Skimmer	<i>Neurothemis fulvia</i> (Drury, 1773)	LC	34	✓	A	A	✓	✓
34. Pied Paddy Skimmer	<i>Neurothemis tullia</i> (Drury, 1773)	LC	35, 36	✓	✓	✓	✓	✓
35. Brown Backed Red Marsh Hawk	<i>Orthetrum chrysis</i> (Selys, 1891)	LC	37	✓	✓	✓	✓	✓
36. Blue Marsh Hawk	<i>Orthetrum glaucum</i> (Brauer, 1865)	LC	38	✓	✓	✓	✓	✓
37. Tricolored Marsh Hawk	<i>Orthetrum luzonicum</i> (Brauer, 1868)	LC	39	✓	✓	✓	✓	✓
38. Crimson Tailed Marsh Hawk	<i>Orthetrum pruinosum</i> (Burmeister,1839)	LC	40	✓	✓	✓	✓	✓
39. Green Marsh Hawk	<i>Orthetrum sabina</i> (Drury, 1770)	LC	41	✓	✓	✓	✓	✓
40. Wandering Glider	<i>Pantala flavescens</i> (Fabricius, 1798)	LC	42	✓	✓	✓	✓	✓
41. Rufous Marsh Glider	<i>Rhodothemis rufa</i> Rambur, 1842	LC	43, 44	✓	✓	✓	✓	✓
42. Common Picture Wing	<i>Rhyothemis variegata</i> (Linnaeus, 1763)	LC	45, 46	✓	A	A	✓	A
43. Black Marsh Trotter	<i>Tramea limbata</i> (Desjardins,1832)	LC	47	✓	✓	✓	✓	✓
44. Pigmy Skimmer	<i>Tetrathemis platyptera</i> (Selys, 1878)	LC	48	✓	A	A	A	A
45. Coral-Tailed Cloud Wing	<i>Tholymis tillarga</i> (Fabricius, 1798)	LC	49	✓	A	A	✓	A
46. Crimson Marsh Glider	<i>Trithemis aurora</i> (Burmeister, 1839)	LC	50, 51	✓	✓	✓	✓	✓
47. Long Legged Marsh Glider	<i>Trithemis pallidinervis</i> (Kirby, 1889)	LC	52	✓	✓	A	✓	A
48. Brown Dusk Hawk	<i>Zyxomma petiolatum</i> Rambur, 1842	LC	53	✓	A	A	A	✓

Legend: LC - Least concern; NT - Near Threatened; DD - Data Deficient; * - Endemic to Western Ghats; ✓ - presence; A - absence.

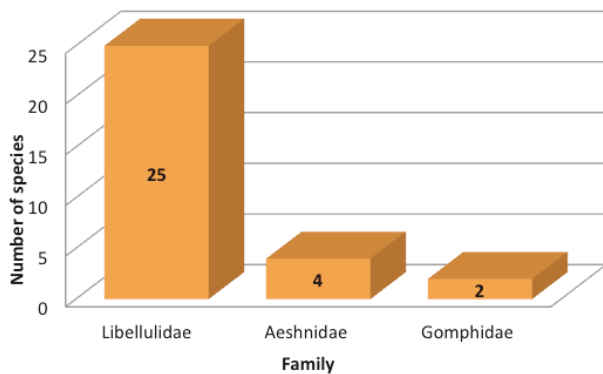


Figure 2. Family-wise distribution of dragonflies (Anisoptera) at Chinnar Wildlife Sanctuary

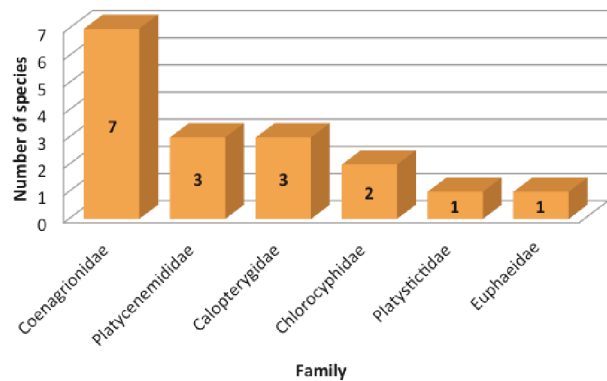


Figure 3. Family-wise distribution of damselflies (Zygoptera) at Chinnar Wildlife Sanctuary

Bush Dart *Copera marginipes* (Rambur, 1842) and Granite Ghost *Bradinopyga geminata* (Rambur, 1842). While five very rare species of odonates at Chinnar during the present survey were Blue Darner *Anax immaculifrons* Rambur, 1842, Parakeet Darner *Gynacantha bayadera* Selys, 1854, Brown Darner *Gynacantha dravida* Lieftinck, 1960, Pigmy Skimmer *Tetrathemis platyptera* Selys,

1878 and Travancore Bamboo Tail *Esme mudiensis* Fraser, 1931.

Chinnar also recorded two species of odonates that are endemic to the Western Ghats, the Pied Reed Tail *Protosticta gravelyi* Laidlaw, 1915 and Travancore Bamboo Tail *Esme mudiensis* Fraser, 1931.

According to IUCN Red List categorization three

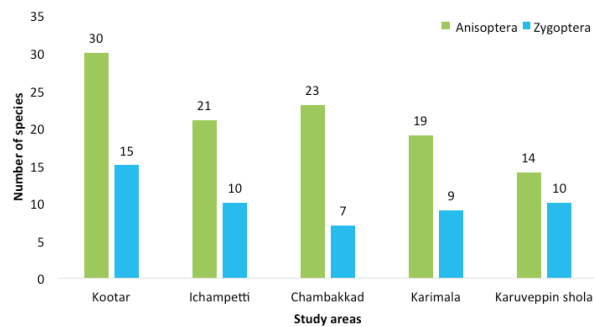


Figure 4. Species richness of odonates across the five study areas

species of the odonates of Chinnar fall under the Data Deficient category. They are the Brown Darner *Gynacantha dravida* Lieftinck, 1960, Travancore Bamboo Tail *Esme mudiensis* Fraser, 1931 and Black-torrent Dart *Dysphaea ethela* Fraser, 1924. Data Deficient species are the ones that must be accorded a high priority with respect to more studies, surveys and monitoring.

The odonate diversity of Chinnar WS accounted for 31.16% of the odonates in Kerala and 27.58% of the odonates of Western Ghats. This is a preliminary documentation of the odonate fauna of Chinnar Wildlife Sanctuary. We hence recommend more detailed studies on these lesser known taxa, which would be much rewarding in terms of understanding the odonate diversity of Chinnar.

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Image 6. *Copera marginipes*



Image 7. *Prodasineura verticalis*



Image 8. *Protosticta gravelyi*



Image 9. *Aciagrion hisopa*



Image 10. *Ceriagrion cerinorubellum*



Image 11. *Ceriagrion coromandelianum*



Image 12. *Ischnura aurora*



Image 13. *Pseudagrion rubriceps*



Image 14. *Pseudagrion microcephalum*



Image 15. *Libellago lineata*

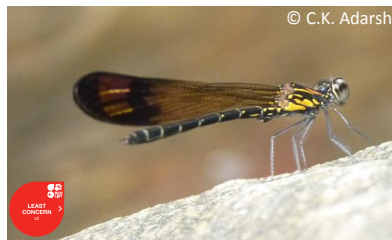


Image 16. *Heliocypha bisignata*



Image 17. *Vestalis apicalis*



Image 18. *Vestalis glacilis*



Image 19. *Neurobasis chinensis*



Image 20. *Dysphaea ethela*

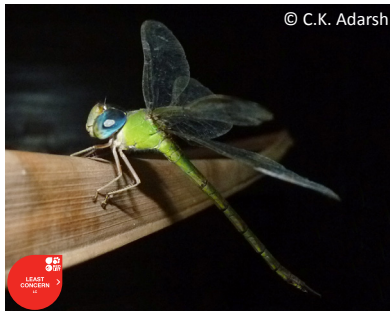


Image 21. *Gynacantha bayadera*



Image 22. *Gynacantha dravida*



Image 23. *Anax guttatus*



Image 24. *Ictinogomphus rapax*

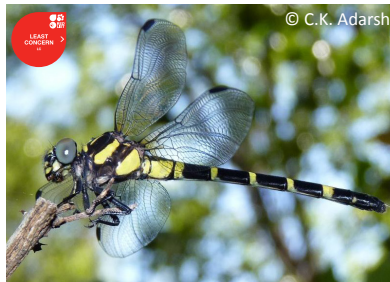


Image 25. *Gomphidia* sp.



Image 26. *Acisoma panorpoides*



Image 27. *Brachydiplax chalybea*



Image 28. *Brachythemis contaminata* (female)



Image 29. *Brachythemis contaminata* (male)



Image 30. *Bradinopyga geminata*

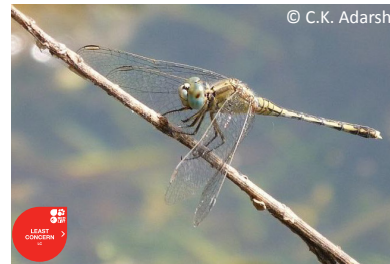


Image 31. *Diplacodes trivialis* (female)

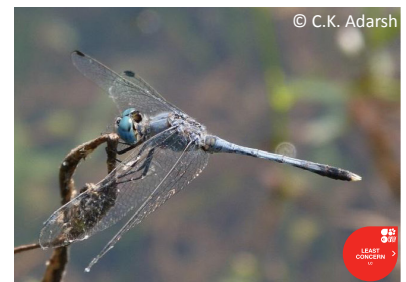


Image 32. *Diplacodes trivialis* (male)



Image 33. *Lathrecista asiatica*

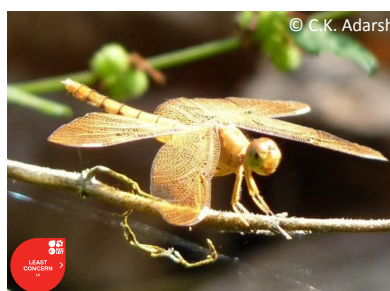


Image 34. *Neurothemis fulvia*



Image 35. *Neurothemis tullia* (female)



Image 36. *Neurothemis tullia* (male)



Image 37. *Orthetrum chrysis*



Image 38. *Orthetrum glaucum*



Image 39. *Orthetrum luzonicum*



Image 40. *Orthetrum pruinosum*



Image 41. *Orthetrum sabina*



Image 42. *Pantala flavescens*

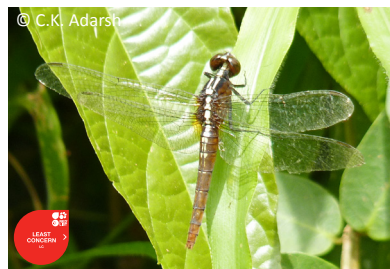


Image 43. *Rhodothemis rufa* (female)



Image 44. *Rhodothemis rufa* (male)

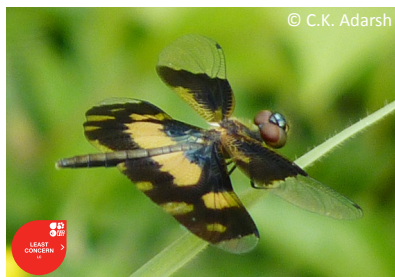


Image 45. *Rhyothemis variegata* (female)



Image 46. *Rhyothemis variegata* (male)



Image 47. *Tramea limbata*

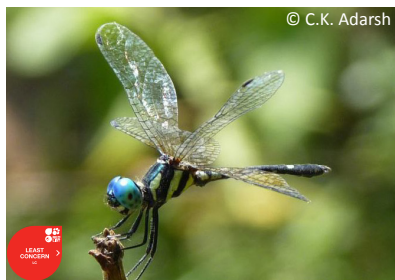


Image 48. *Tetrathemis platyptera*



Image 49. *Tholymis tillarga* (male)



Image 50. *Trithemis aurora* (female)



Image 51. *Trithemis aurora* (male)



Image 52. *Trithemis pallidinervis*



Image 53. *Zyxomma petiolatum*

