

Dragonflies and damselflies (Odonata) of Silent Valley National Park, Kerala, India and its environs

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ABSTRACT: The odonate diversity of the Silent Valley National Park (SVNP) in the Western Ghats (WG) of Kerala state, in southern India, is discussed. A total of 111 species of odonates (41 Zygoptera and 70 Anisoptera) including 29 endemics were recorded for the SVNP region, out of the 181 species (14 families, 87 genera with 68 WG endemics). SVNP harbours 53.37 per cent of WG and 61.34 per cent of the odonate diversity of Kerala. In addition, this includes 42.64 percent endemic odonates of Kerala and 35.80 percent of WG. With respect to IUCN Red List status, there were two vulnerable, three near threatened, 84 least concerned, 17 data deficient, and five species whose status was not assessed. Family Libellulidae (40 species) dominated the diversity, followed by Coenagrionidae and Gomphidae (16 species each). None of the species listed from SVNP is protected under the Indian Wildlife (Protection) Amendment Act, 2022.

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Silent Valley National Park (SVNP) is located on the southwestern slopes of the Nilgiri Landscape of the Western Ghats, north of the Palghat Gap. The area lies within the latitudes 11° 2' N to 11° 13' N and longitudes 76° 24' E to 76° 32' E. Administratively the Silent Valley Forest division comprises the Silent Valley Range (143.52 km²) and the buffer zone of Bhavani Range (94 km²), making a total area of 237.52 km². The terrain is

undulating with steep valleys, escarpments, and hillocks. The elevation ranges from 900m to the highest point at 2,383m (Anginda peak). Both the southwest monsoon and the northeast monsoon causes rains in this area (Anonymous, 2012). The major share, however, comes from the southwest monsoon, which sets in during the first week of June. The heaviest rainfall is during the months of June, July, and August. The rainfall varies from

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7500mm per year on the northern side to 2800mm in the drier Attapady Valley. The main drainage basin is Kunthipuzha (Bharatapuzha) (Nair, 1991). The average minimum temperature ranges from 8 to 14 °C and the average maximum temperature varies from 23 to 29 °C. The major forest types known from the region based on Champion and Seth classification (1968) are Southern Hill Top Tropical Evergreen Forest, West-Coast Tropical Evergreen Forests, Cane Brakes, Wet Bamboo Brakes, West-Coast Semi-Evergreen Forests, West-Coast Secondary Evergreen Dipterocarp Forests, Southern Sub-tropical Hill Forests, Reed Brakes, South Indian Sub-tropical Hill Savannah, Southern Montane Wet Temperate Forests, Southern Montane Wet Scrub, and Southern Montane Wet Grasslands (Nair, 1991; Anonymous, 2012). The region has excellent biodiversity as exemplified by 2000 species of plants, 41 species of mammals, 97 species of birds, 42 reptiles, and 46 amphibians recorded as per Manoharan *et al.* (1999). There are no published records on the odonate fauna of this protected tract except that of a preliminary study conducted by Rao and Lahiri (1982), in which they reported 23 species from SVNP and the adjoining New Amarambalam Reserve Forest. There had not been any scientifically structured surveys for odonates in the SVNP, and the first one was done by the Travancore Nature History Society (TNHS) in association with Kerala Forest Department, SVNP in September 2016 with records of 35 species over a span of three days (Sadasivan and Jayakumar, 2016). In this paper, 111 species of odonates from SVNP, based on the fieldwork in the region since the year 2000, are reported.

Field data predominantly from the authors over the last two decades and the published peer-reviewed literature available on odonates of the region (Rao and Lahiri, 1982; Subramanian, 2007; Emiliyamma *et al.*, 2007) were collected. The data logged in the Management Plan of SVNP, by the Kerala Forest Department (Anonymous, 2012), as well as the report on the first comprehensive invertebrate survey of SVNP done by TNHS in 2016, submitted to the Kerala Forest Department (Sadasivan and Jayakumar, 2016) were also referred. During the

fieldwork, the odonates were observed and photographed as far as possible, with special consideration to the prothorax and anal appendages. The basic taxonomy of the group follows Fraser (1933, 1934, 1936), and is updated as per the latest arrangements by Kalkman *et al.* (2020). The current Odonata checklist and distribution for the Western Ghats as well as Kerala state were critically reviewed and updated by Nair *et al.* (2021), which will be followed here. The global checklist follows Paulson *et al.* (2021) and conservation status data was derived from the IUCN site <http://www.iucnredlist.org> (IUCN, 2022).

Abbreviations: ASL—Above Sea Level, TORG—TNHS Odonata Research Group; SVNP—Silent Valley National Park; TNHS—Travancore Nature History Society; TIES—Tropical Institute of Ecological Sciences; IUCN—The International Union for Conservation of Nature; WG—Western Ghats, WPA— Indian Wildlife (Protection) Amendment Act, 2022

According to Nair *et al.* (2021) the current checklist of odonates of the Western Ghats stands at 207 species with 80 endemics. A total of 181 species belonging to 87 genera and 14 families have been compiled for Kerala state, and this includes 68 WG endemics. In SVNP 111 species of odonates including 29 endemics were recorded (Table 1). Forty-one damselflies (Zygoptera) and 70 dragonflies (Anisoptera) were recorded for the sanctuary. Family Libellulidae dominated the odonate list with 40 species, followed by Coenagrionidae and Gomphidae (with 16 species each). Fifty-four species were identified from the SVNP core zone and 103 species from the Bhavani buffer zone, and 47 were seen in both core and buffer zones of the National Park. Two races of *Ceriagrion olivaceum* viz., *C. o. aurantiacum* Fraser, 1924 (Rao and Lahiri, 1982) and *C. o. olivaceum* Laidlaw, 1914 (Emiliyamma *et al.*, 2007), and *Davidiodes martini* Fraser, 1924 (Subramanian, 2007) are the historical records included here, with no recent sightings other than those mentioned in parenthesis.

Table 1 Checklist of Odonates of Silent Valley National Park

No.	Scientific name	End*	IUCN	Core zone	Buffer zone
Suborder Zygoptera: Damselflies Family Calopterygidae					
1	<i>Neurobasis chinensis</i> (Linnaeus, 1758)		LC	✓	✓
2	<i>Vestalis gracilis</i> (Rambur, 1842)		LC	✓	✓
3	<i>V. apicalis</i> Selys, 1873		LC	✓	✓
4	<i>V. submontana</i> Fraser, 1934		NA	✓	✓
Family Chlorocyphidae					
5	<i>Heliocypha bisignata</i> (Hagen in Selys, 1853)		LC	✓	✓
6	<i>Libellago indica</i> (Fraser, 1928)		LC	–	✓
Family Coenagrionidae					
7	<i>Aciagrion approximans krishna</i> Fraser, 1921	WG	LC	✓	✓
8	<i>Ac. occidentale</i> Laidlaw, 1919		LC	–	✓
9	<i>Agriocnemis pieris</i> Laidlaw, 1919		LC	–	✓
10	<i>Ag. pygmaea</i> (Rambur, 1842)		LC	–	✓
11	<i>Ag. splendidissima</i> Laidlaw, 1919		LC	–	✓
12	<i>Archibasis oscillans</i> (Selys, 1877)		LC	–	✓
13	a) <i>Ceriagrion olivaceum aurantiacum</i> Fraser, 1924		LC	–	✓
	b) <i>C. olivaceum olivaceum</i> Laidlaw, 1914		LC	–	–
14	<i>C. cerinorubellum</i> (Brauer, 1865)		LC	–	✓
15	<i>C. coromandelianum</i> (Fabricius, 1798)		LC	–	✓
16	<i>C. rubiae</i> Laidlaw, 1916		NA	–	✓
17	<i>Ischnura rubilio</i> Selys, 1876		LC	✓	✓
18	<i>I. senegalensis</i> (Rambur, 1842)		LC	–	✓
19	<i>Pseudagrion indicum</i> Fraser, 1924	WG	LC	–	✓
20	<i>P. malabaricum</i> Fraser, 1924		LC	–	✓
21	<i>P. microcephalum</i> (Rambur, 1872)		LC	–	✓
22	<i>P. rubriceps</i> (Selys, 1876)		LC	✓	✓
Family Euphaeidae					
23	<i>Dysphaea ethela</i> Fraser, 1924		DD	✓	✓
24	<i>Euphaea dispar</i> (Rambur, 1842)	WG	LC	✓	✓
25	<i>E. fraseri</i> (Laidlaw, 1920)	WG	LC	✓	✓
Family Lestidae					
26	<i>Lestes dorothea</i> Fraser, 1924		LC	✓	✓
27	<i>L. elatus</i> Hagen in Selys, 1862		LC	–	✓
Family Platycnemididae					
29	<i>Caconeura ramburi</i> (Fraser, 1922)		DD	✓	✓
30	<i>Ca. risi</i> (Fraser, 1931)	WG	DD	✓	–

31	<i>Copera marginipes</i> (Rambur, 1842)		LC	✓	✓
32	<i>Co. vittata</i> (Selys, 1863)		LC	–	✓
33	<i>Esme longistyla</i> Fraser, 1931	WG	LC	✓	–
34	<i>E. mudiensis</i> Fraser, 1931	WG	DD	–	✓
35	<i>Onychargia atrocyana</i> (Selys, 1865)		LC	–	✓
36	<i>Phylloneura westermanni</i> (Hagen in Selys, 1860)	WG	NT	✓	✓
37	<i>Prodasineura verticalis annandalei</i> (Fraser, 1921)		LC	–	✓
Family Platystictidae					
38	<i>Indosticta deccanensis</i> Laidlaw, 1915	WG	VL	–	✓
39	<i>Protosticta graveleyi</i> Laidlaw, 1915	WG	LC	✓	✓
40	<i>P. hearseyi</i> Fraser, 1922	WG	DD	✓	–
41	<i>P. sanguinostigma</i> Fraser, 1922	WG	VL	–	✓
Suborder Anisoptera: Dragonflies Family Aeshnidae					
42	<i>Anax guttatus</i> (Burmeister, 1839)		LC	✓	✓
43	<i>A.indicus</i> Leiftnick, 1942		LC	✓	✓
44	<i>A. immaculifrons</i> (Rambur, 1842)		LC	✓	✓
45	<i>Gynacantha dravida</i> Liefinck, 1960		DD	–	✓
46	<i>G. millardi</i> Fraser, 1920		LC	✓	✓
Family Chlorogomphidae					
47	<i>Chlorogomphus campioni</i> (Fraser, 1924)	WG	LC	✓	–
Family Corduliidae					
48	<i>Hemicordulia asiatica</i> (Selys, 1878)		LC	–	✓
Family Gomphidae					
49	<i>Burmagomphus laidlawi</i> Fraser, 1924	WG	DD	✓	✓
50	<i>B. pyramidalis</i> Laidlaw, 1922		LC	✓	✓
51	<i>Cyclogomphus flavoannulatus</i> Rangnekar, Dharwadkar, Kalesh & Subramanian, 2019	WG	NA	–	✓
52	<i>Davidioides martini</i> Fraser, 1924	WG	DD	–	✓
53	<i>Gomphidia kodaguensis</i> Fraser, 1923	WG	DD	–	✓
54	<i>Heliogomphus kalarensis</i> Fraser, 1934	WG	DD	✓	–
55	<i>H. promelas</i> (Selys, 1873)		NT	✓	✓
56	<i>Ictinogomphus rapax</i> (Rambur, 1842)		LC	–	✓
57	<i>Macrogomphus wynaadicus</i> Fraser, 1924	WG	DD	–	✓
58	<i>Megalogomphus hanningtoni</i> (Fraser, 1923)		NT	–	✓
59	<i>Merogomphus longistigma</i> (Fraser, 1922)	WG	DD	✓	–
60	<i>Me. tamaracherriensis</i> Fraser, 1931	WG	NA	✓	✓
61	<i>Microgomphus souteri</i> Fraser, 1924	WG	LC	–	✓
62	<i>Melligomphus acinaces</i> (Laidlaw, 1922)	WG	DD	–	✓

63	<i>Lamelligomphus nilgiriensis</i> Fraser, 1922	WG	LC	–	✓
64	<i>Paragomphus lineatus</i> (Selys, 1850)		LC	–	✓
Family Libellulidae					
65	<i>Acisoma panorpoides</i> Rambur, 1842		LC	–	✓
66	<i>Brachydiplax chalybea</i> Brauer, 1868		LC	–	✓
67	<i>Brachythemis sobrina</i> (Rambur, 1842)		LC	–	✓
68	<i>Brachythemis contaminata</i> (Fabricius, 1793)		LC	–	✓
69	<i>Bradinyopyga geminata</i> (Rambur, 1842)		LC	–	✓
70	<i>Cratilla lineata calverti</i> (Forster, 1903)		LC	✓	✓
71	<i>Crocothemis servilia</i> (Drury, 1770)		LC	–	✓
72	<i>Diplacodes nebulosa</i> (Fabricius, 1793)		LC	–	✓
73	<i>Diplacodes trivialis</i> (Rambur, 1842)		LC	✓	✓
74	<i>Epithemis mariae</i> (Laidlaw, 1915)	WG	LC	–	✓
75	<i>Hydrobasileus croceus</i> (Brauer, 1867)		LC	–	✓
76	<i>Hylaeothemis apicalis</i> Fraser, 1924		DD	✓	✓
77	<i>Indothemis carnatica</i> (Fabricius, 1798)		LC	–	✓
78	<i>Lathrecista asiatica</i> (Fabricius, 1798)		LC	–	✓
79	<i>Lyrithemis tricolor</i> Ris, 1919		LC	–	✓
80	<i>Neurothemis fulvia</i> (Drury, 1773)		LC	–	✓
81	<i>Neurothemis intermedia intermedia</i> (Rambur, 1842)		LC	–	✓
82	<i>Neurothemis tullia</i> (Drury, 1773)		LC	–	✓
83	<i>Onychothemis testacea ceylanica</i> Ris, 1912		LC	–	✓
84	<i>Orthetrum chrysis</i> (Selys, 1891)		LC	✓	✓
85	<i>Orthetrum triangulare triangulare</i> (Selys, 1878)		LC	✓	✓
86	<i>Or. glaucum</i> (Brauer, 1865)		LC	✓	✓
87	<i>Or. luzonicum</i> (Brauer, 1868)		LC	✓	✓
88	<i>Or. pruinatum neglectum</i> (Rambur, 1842)		LC	✓	✓
89	<i>Or. sabina sabina</i> (Drury, 1770)		LC	✓	✓
90	<i>Paplopleura sexmaculata</i> (Fabricius, 1787)		NA	✓	✓
91	<i>Pantala flavescens</i> (Fabricius, 1798)		LC	✓	✓
92	<i>Potamarcha congener</i> (Rambur, 1842)		LC	✓	✓
93	<i>Rhodothemis rufa</i> (Rambur, 1842)		LC	–	✓
94	<i>Rhyothemis triangularis</i> Kirby, 1889		LC	–	✓
95	<i>Rh. variegata variegata</i> (Linnaeus, 1763)		LC	–	✓
96	<i>Tetrathemis platyptera</i> Selys, 1878		LC	–	✓
97	<i>Tholymis tillarga</i> (Fabricius, 1798)		LC	✓	✓
98	<i>Tramea basilaris</i> (Palisot de Beauvois, 1805)		LC	✓	✓
99	<i>Tramea limbata</i> (Desjardins, 1832)		LC	✓	✓

100	<i>Trithemis aurora</i> (Burmeister, 1839)		LC	✓	✓
101	<i>Tr. pallidinervis</i> (Kirby, 1889)		LC	–	✓
102	<i>Tr. festiva</i> (Rambur, 1842)		LC	✓	✓
103	<i>Zygonyx iris malabarica</i> Fraser, 1926		LC	✓	✓
104	<i>Zyxomma petiolatum</i> Rambur, 1842		LC	✓	✓
Family Macromiidae					
105	<i>Epophthalmia vittata vittata</i> Burmeister, 1839		LC	✓	✓
106	<i>Macromia cingulata</i> Rambur, 1842		LC	–	✓
107	<i>M. ellisoni</i> Fraser, 1924	WG	LC	✓	✓
108	<i>M. flavocolorata</i> Fraser, 1922		LC	–	✓
Genera incertae sedis					
109	<i>Idionyx corona</i> Fraser, 1921	WG	DD	✓	✓
110	<i>I. saffronata</i> Fraser, 1924	WG	DD	✓	–
111	<i>I. travancorensis</i> Fraser, 1931	WG	DD	✓	✓
	Total	29		54	103

(End*–Endemic, WG–Western Ghats, IUCN–Red List status, LC–Least Concern, NA–Not Assessed, DD–Data Deficient, VL–Vulnerable, NT–Near Threatened)

Suborder Zygoptera (Damselflies): All the seven damselfly families present in Kerala are represented in SVNP with 41 taxa. This includes 12 WG endemics. Family Calopterygidae includes four species distributed in two genera in the WG. All the four species of Calopterygidae present in Kerala are represented in SVNP. *Vestalis submontana* Fraser, 1934 was locally common in the higher reaches of SVNP from 1200m ASL. Family Chlorocyphidae with three genera with one species each in WG is represented by *Heliocypha bisignata* (Hagen in Selys, 1853) and *Libellago indica* (Fraser, 1928) in SVNP. Among the 24 species of Cenagrionidae in Kerala 16 species are present here. Both races of *C. olivaceum* are also found. Among the Coenagrionids present in SVNP two taxa are WG endemics namely *Pseudagrion indicum* Fraser, 1924, and the subspecies of *Aciagrion approximans* (*A. a. krishna* Fraser, 1921). Family Euphaeidae is represented by two genera with six species in WG. In SVNP three species are present among the four found in Kerala. *Euphaea dispar* (Rambur, 1842) and *Euphaea fraseri* (Laidlaw, 1920) are WG endemic species. Lestidae has only two species in SVNP as far as it is known, namely *Lestes elatus* Hagen in Selys,

1862 and *L. dorothea* Fraser, from among the 11 species occurring in Kerala. Platycnemididae is represented by 10 genera with 19 species in WG, while in SVNP nine species out of 16 are in the Kerala state. *Caconeura risi* (Fraser, 1931), *Esme longistyla* Fraser, 1931, *E. mudiensis* Fraser, 1931, and *Phylloneura westermanni* (Hagen in Selys, 1860) are WG endemics in SVNP. Platystictidae is represented by four species out of 12 in the state. They are *Indosticta deccanensis* Laidlaw, 1915, *Protosticta graveleyi* Laidlaw, 1915, *P. hearseyi* Fraser, 1922, and *P. sanguinostigma* Fraser, 1922, all the four are WG endemics.

Suborder Anisoptera (Dragonflies): All the seven dragonfly families seen in Kerala state are represented in SVNP with 70 species, out of 107 from Kerala. This includes 17 WG endemics. Family Aeshnidae is represented by three genera with ten species in the WG. In SVNP five species out of nine occurring in the state are reported. Chlorogomphidae has a sole representative *Chlorogomphus campioni* (Fraser, 1924), a WG endemic, and Corduliidae has a single species *Hemicordulia asiatica* (Selys, 1878). In SVNP 16 out of 22 species of Gomphidae reported

from the state were recorded. Of these 11 taxa are endemic to WG (Table 1). *Davidioides martini* Fraser, 1924, *Heliogomphus kalarensis* Fraser, 1934, *Megalogomphus hanningtoni* (Fraser, 1923), and *Lamelligomphus nilgiriensis* Fraser, 1922 are some of the interesting ones present here. Libellulidae is represented by 40 species out of the 52 species for Kerala and 55 in the WG. Some interesting ones include the phytotelmata breeding species –*Lyriothemis tricolor* Ris, 1919, and the freshwater swamp associate *Epithemis mariae* (Laidlaw, 1915), the latter a WG endemic. In SVNP three species of Macromiidae are found out of 11 in both Kerala state and the WG. Dragonflies belonging to the genera *Macromidia* and *Idionyx* have unclear family level affinities and hence they are treated as *incertae sedis*. Three species of *Idionyx* are found in SVNP out of nine species found in Kerala. *Idionyx nadganiensis* Fraser, 1924, a species described from Nadgani Ghat (Malappuram) in Nilgiri–Wayanad near SVNP in the same landscape has no recent record as in Nair *et al.* (2021), hence not included in the checklist.

Endemism: Twenty nine (24.54%) species of odonates from Silent Valley National Park were found strictly endemic to the Western Ghats (Table 1).

IUCN Red List Status: Regarding IUCN status, there were three Near Threatened species, two Vulnerable, eighty-four Least Concern, seventeen Data Deficient, and five species whose Red List status were not available (Table 1).

SVNP harbours a total of 111 species of odonates with 29 WG endemic species. This is the second-highest number of odonates reported from a protected area in Kerala. Mathavan and Miller (1989) reported 36 species of odonates from Periyar Tiger reserve, Emiliyamma and Radhakrishnan (2000, 2014) reported 39 species from Parambikulam Wildlife Sanctuary, Gnanakumar *et al.* (2012) recorded 55 species from Chimmony Sanctuary; Adarsh *et al.* (2014) got 48 species from Chinnar; Varghese *et al.* (2014) got 82 species from Thattaekkad (Thattekkad) bird sanctuary; and Palot and Kiran (2016) reported 93 species from Aaralam Sanctuary. Sadasivan *et al.* (2022)

reported 116 species of odonates from the Shendurney Sanctuary in Agasthyamalais. As per the findings SVNP and its buffer zone harbours 53.37 per cent of all odonates reported for WG and 61.34 per cent of the odonates from Kerala. In addition, this includes 35.80 per cent of endemic odonates of the WG and 42.64 per cent of endemics recorded from Kerala.

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REFERENCES

- Adarsh C.K., Arunraj R. and Nameer P.O. (2015) Odonata (Insecta) diversity of Chinnar Wildlife Sanctuary, The Southern Western Ghats, India. *Journal of Threatened Taxa* 7 (2): 6910–6919. doi.10.11609/JoTT.o3771.6010-19.
- Anonymous (2012) Management plan of Silent Valley National Park, 2012–2022. Kerala Forests and Wildlife Department, Government of Kerala.
- Emiliyamma K.G. and Radhakrishnan C. (2000) Odonata (Insecta) of Parambikulam Wildlife Sanctuary, Kerala, India. *Records of the Zoological Survey of India* 98 (1): 157–167.
- Emiliyamma K.G. and Radhakrishnan C. (2014) Additional records of Odonata (Insecta) from Parambikulam Wildlife Sanctuary, Kerala, India. *Records of the Zoological Survey of India* 114 (3): 365–369.
- Emiliyamma K.G., Radhakrishnan C. and Palot M.J. (2007) Odonata (Insecta) of Kerala. *Records of the Zoological Survey of India, Occ. Paper No: 269, Zoological Survey of India*. 195pp + 8 plates.
- Fraser F.C. (1933) *Fauna of British India, including Ceylon and Burma, Odonata, Vol I.* Taylor & Francis group, London. 436pp.

- Fraser F.C. (1934) Fauna of British India, including Ceylon and Burma, Odonata, Vol II. Taylor & Francis group, London. 442pp.
- Fraser F.C. (1936). Fauna of British India, including Ceylon and Burma, Odonata, Vol III. Taylor & Francis group, London. 461pp.
- Gnanakumar M., Ansil B.R., Nameer P.O. and Das S. (2012) Checklist of Odonates of Chimmony Wildlife Sanctuary. Malabar Trogon 10 (1 & 2): 5–8.
- IUCN (2022) The IUCN Red List of Threatened Species. Version 2021-1. <https://www.iucnredlist.org> Downloaded on 03 January 2022.
- Kalkman V.J., Babu R., Bedjanic M., Coniff K., Gyeltshen T., Khan M.K., Subramanian K.A., Zia A. and Orr A.G. (2020) Checklist of the dragonflies and damselflies (Insecta: Odonata) of Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka. *Zootaxa* 4849 (1): 1–84. doi:10.11646/zootaxa.4849.1.1.
- Manoharan T.M., Biju S.D., Nayar T.S. and Easa P.S. (1999) Silent Valley – Whispers of Reason, Kerala Forest Department. XXXI, 425pp.
- Mathavan S. and Miller P.L. (1989) A collection of dragonflies (Odonata) made in the Periyar National Park, Kerala, South India, in January 1988. International Odonatological Society, Bilthoven (Rapid communications, supplements), no.10. 10pp.
- Nair S.C. (1991) The Southern Western Ghats: a biodiversity conservation plan. Studies in Ecology and Sustainable Development–4. Published by Indian National Trust for Art and Cultural heritage, New Delhi 110002. 92pp.
- Nair V.P., Samuel K.A., Palot M.J. and Sadasivan K. (2021). The Dragonflies and damselflies (Odonata) of Kerala – Status, and distribution. *ENTOMON* 46 (3): 185–238. doi:10.33307/entomon.v46i3.609.
- Palot M.J. and Kiran C.G. (2016) Dragonfly survey of Aralam Wildlife Sanctuary, Kannur district, Kerala—a report. *Malabar Trogon* 14 (1-3): 44–46.
- Paulson D., Schorr M. and Deliry C. (2021) World Odonata List. <https://www.pugetsound.edu/academics/academicresources/slater-museum/biodiversity-resources/dragonflies/world-odonata-list2/> (accessed 2 June, 2021)
- Rao K.R. and Lahiri A.R. (1982) First records of Odonata (Arthropoda: Insecta) from Silent Valley and New Amarambalam reserve forests. *Journal of the Bombay Natural History Society* 79: 557–562.
- Sadasivan K. and Jayakumar K. (2016) Report on invertebrate survey of Silent Valley (Butterflies, Odonates and Ants), Travancore Nature History Society. 11pp.
- Sadasivan K., Nair V.P. and Samuel K.A. (2022) The Dragonflies and Damselflies (Insecta: Odonata) of Shendurney Wildlife Sanctuary, Southern Western Ghats, India. *Journal of Threatened Taxa* 14 (6): 21213–21226. doi:10.11609/jott.7885.4.6.21213-21226.
- Subramanian K.A. (2007) Endemic odonates of the Western Ghats; Habitat, distribution, and conservation. In: *Odonata–Biology of Dragonflies*, ed. B.K. Tyagi, Scientific publishers, Jodhpur, India. pp257–271.
- Varghese A.P., Nikesh P.R. and Mathew J. (2014) Odonata (Insecta) diversity of Salim Ali Bird Sanctuary and its adjacent areas in Thattekkad, Kerala, India. *Journal of Threatened Taxa* 6 (6): 5887–5893. doi:10.11609/JoTT.o3395.5887-93.