



CHECKLIST OF ODONATA IN THE RICE FIELDS OF INDIA

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ABSTRACT

Odonata is one of the most important natural enemy in the rice ecosystems and their occurrence in rice fields from different parts India was inventoried. Odonata diversity in the rice fields from different regions of India comprised 127 species under 71 genera of 13 families. Anisoptera (Dragonflies) were dominant with 81 species and 52 genera under six families over Zygoptera (Damsel flies) (46 species, 19 genera under 7 families). Libellulidae (Anisoptera) was the most speciose family with 53 species and 32 genera followed by Coenagrionidae (Zygoptera) with 27 species and 7 genera. *Orthetrum sabina* (Drury, 1770) (Libellulidae) was observed to occur in all the rice fields studied across the country. Analysis of Odonata from rice fields in different bio geographical regions of India revealed that the order of dominance of species was Gangetic Plain Zone (76 species) > Western Ghat Zone (57 species) > Deccan Plateau Zone (54 species) > Semi Arid Zone (39 species) > Northeast Zone (14 species) > Coastal Zone (10 species) > Himalayan Zone (1 species). Among the different biogeographical zones, Odonata in rice fields of the Western Ghat Zone and Deccan Plateau Zone were found to have a maximum of 50.48 % similarity.

Key words: Odonata, Anisoptera, Zygoptera, rice, wetlands, distribution, references, checklist, geographic zones, Libellulidae, Coenagrionidae

Wetlands are important and crucial ecosystems that perform innumerable ecosystem functions for the welfare of the human society. Irrigated rice fields are man-made wetlands harnessing a myriad of flora and fauna in complex food webs (Schoenly et al., 1998) which need to be documented and conserved. Transition from traditional rice cultivation systems to modern cultivation systems alter the ecology of the rice fields leading to subtle changes in the existing community structures (Settle et al., 1996). Major pesticide application in India is observed in rice and cotton with per hectare consumption accounting to 0.6 kg (Anon, 2018). Odonata are important components of the food webs in the rice ecosystems either as prey or predators (Schoenly et al., 1996) and are most likely to be affected by agrochemical application (Hashimoto et al., 2019).

Globally, 6,256 species under 686 genera and 39 families of Odonata have been documented (Schorr and Paulson, 2017). Pioneering unrivalled work on Indian Odonata are those of Fraser (1933, 1934 and 1936). Checklisting of Indian Odonata accounted to 487 species, 152 genera under 18 families (Subramaniam and Babu, 2017). Elsewhere in rice, Odonata fauna consisted of 14 species, 10 genera under two families have been recorded (Barrion and Litsinger, 1994).

Though, few fragmented studies on the diversity Odonata in the rice fields in India are available, a comprehensive checklisting of Odonata in the rice fields in India remains to be compiled. Inventory of Odonata in the rice fields would facilitate to know the status of the previously recorded species for the present research on the Odonata diversity and conservation. Further, the impact of agrochemicals on Odonata, if any, would also be reflected. This checklisting would help to form the baseline database of Odonata fauna in rice agro ecosystems. Literature on Odonata diversity recorded from the rice fields of different regions from India were collected and compiled. The rice fields Odonata were further grouped under different biogeographic regions of India (Rodger et al., 2000). Similarity of Odonata fauna from different biogeographical regions were compared as per Bray Curtis Similarity Index (Bray and Curtis, 1957) with Biodiversity Professional Version 2 (Mc Alece et al., 1997).

CHECKLIST

Odonata in rice fields of India comprised 127 species under 71 genera of 13 families (Table 1). Comparatively, Anisoptera were dominant (81 species, 52 genera under 6 families) than Zygoptera (46 species,

Table 1. Checklist of Odonata in rice fields of India

S.No.	Suborder/ Family/ Scientific Name	Distribution	Reference
A	ANISOPTERA		
I	Aeshnidae		
1	<i>Anaciaeschna jaspaedia</i> (Burmeister, 1839)	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
2	<i>Anax ephippiger</i> (Burmeister, 1839)	Pattukottai (Tamil Nadu) Chakdaha and Cooch Behar (West Bengal)	Arulprakash et al. (2017) Satpathi (2017)
3	<i>Anax guttatus</i> (Burmeister, 1839)	Madurai Tiruvallur (Tamil Nadu) Anand (Gujarat) Chakdaha and Cooch Behar (West Bengal)	Kandibane et al.(2003) Anbalagan et al.(2008) Rohmare et al.(2016) Satpathi (2017)
4	<i>Anax immaculifrons</i> Rambur, 1842	Tiruvallur (Tamil Nadu) Kohlapur (Maharashtra) Anand (Gujarat)	Anbalagan et al.(2008) Sathe and Sindhe (2014) Rohmare et al.(2016)
5	<i>Gynacantha bainbriggei</i> Fraser, 1922	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
6	<i>Gynacantha basiguttata</i> Selys, 1882	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
7	<i>Gynacantha bayadera</i> Selys, 1891	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
8	<i>Gynacantha dravida</i> Lieftinck, 1960	Palakkad (Kerala) Chakdaha and Cooch Behar (West Bengal)	Sherif (2016) Satpathi (2017)
II	Gomphidae		
9	<i>Burmagomphus laidlawi</i> Fraser, 1924*	Kohlapur (Maharashtra)	Sathe and Sindhe (2014)
10	<i>Cyclogomphus ypsilon</i> Selys, 1854	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
11	<i>Gomphidia williamsoni</i> Fraser, 1923	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
12	<i>Ictinogomphus distinctus</i> (Ram, 1985)	Tiruvallur (Tamil Nadu)	Anbalagan et al.(2008)
13	<i>Ictinogomphus rapax</i> (Rambur, 1843)	Tiruvallur (Tamil Nadu) Anand (Gujarat) Palakkad (Kerala) Chakdaha and Cooch Behar (West Bengal)	Anbalagan et al.(2008) Rohmare et al.(2016) Sherif (2016) Satpathi (2017)
14	<i>Macrogomphus annulatus</i> (Selys, 1854)	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
15	<i>Macrogomphus montanus</i> Selys, 1869	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
16	<i>Macrogomphus wynaadicus</i> Fraser, 1924*	Kohlapur (Maharashtra)	Sathe and Sindhe (2014)
17	<i>Megalogomphus</i> sp.	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
18	<i>Merogomphus longistigma</i> (Fraser, 1922)*	Kohlapur (Maharashtra)	Sathe and Sindhe (2014)
19	<i>Onychogomphus striatus</i> Fraser	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
20	<i>Paragomphus lineatus</i> (Selys, 1850)	Palakkad (Kerala) Chakdaha and Cooch Behar (West Bengal)	Sherif (2016) Satpathi (2017)
21	<i>Phaenandrogomphus aureus</i> (Laidlaw, 1922)	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)

22	<i>Heliogomphus selysi</i> Fraser, 1925	Tiruvallur (Tamil Nadu)	Anbalagan et al.(2008)
III Cordulegasteridae			
23	<i>Anotogaster nipalensis</i> (Selys, 1854)	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
IV Chlorogomphidae			
24	<i>Chlorogomphus preciosus</i> Fraser, 1925	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
25	<i>Watanabeopetalia atkinsoni</i> (Selys, 1878)	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
V Macromiidae			
26	<i>Macromia indica</i> Fraser, 1924*	Kohlapur (Maharashtra)	Sathe and Sindhe (2014)
27	<i>Macromia moorei</i> Selys, 1874	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
28	<i>Epophthalmia vittata</i> Burmeister, 1839	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
VI Libellulidae			
29	<i>Acisoma panorpoides</i> Rambur, 1842	Tiruvallur Pattukottai (Tamil Nadu) Anand (Gujarat) Chakdaha and Cooch Behar (West Bengal)	Anbalagan et al.(2008) Arulprakash et al.(2017) Rohmare et al.(2016) Satpathi (2017)
30	<i>Aethriamanta brevipennis</i> (Rambur, 1842)	Palakkad (Kerala) Chakdaha and Cooch Behar (West Bengal)	Sherif (2016) Satpathi (2017)
31	<i>Brachydiplax chalybea</i> Brauer, 1868	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
32	<i>Brachydiplax farinose</i> Kruger, 1902	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
33	<i>Brachydiplax sobirna</i> (Rambur, 1842)	Anand (Gujarat) Chakdaha and Cooch Behar (West Bengal)	Rohmare et al. (2016) Satpathi (2017)
34	<i>Brachythemis contaminata</i> (Fabricius, 1793)	Coimbatore Tiruvallur Pattukottai (Tamil Nadu) Palakkad (Kerala) Anand (Gujarat) Titibar (Assam) Chakdaha and Cooch Behar (West Bengal)	Gunathilagaraj et al.(1999) Anbalagan et al.(2008) Arulprakash et al. (2017) Palot et al.(2005) ; Sherif (2016) Rohmare et al. (2016) Saikia et al.(2016) Satpathi (2017)
35	<i>Bradinopyga geminata</i> (Rambur, 1842)	Palakkad (Kerala) Chakdaha and Cooch Behar (West Bengal)	Sherif (2016) Satpathi (2017)
36	<i>Camacinia gigantean</i> (Brauer, 1867)	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
37	<i>Cratilla lineata</i> (Brauer, 1878)	Palakkad, Kerala Chakdaha and Cooch Behar (West Bengal)	Sherif (2016) Satpathi (2017)

- 38 *Crocothemis servilia* (Drury, 1770) Coimbatore Gunathilagaraj et al.(1999)
Madurai Kandibane et al.(2003 & 2005)
Tiruvallur Anbalagan et al.(2008)
Pattukottai (Tamil Nadu) Arulprakash et al.(2017)
Jorhat Bhattacharya et al.(2006)
Titibar (Assam) Saikia et al.(2016)
Kohlapur (Maharashtra) Sathe and Sindhe (2014)
Anand (Gujarat) Rohmare et al.(2016)
Palakkad (Kerala) Sherif (2016)
Chakdaha and Cooch Behar Satpathi (2017)
(West Bengal)
- 39 *Diplacodes lefebrrii* (Rambur, 1842) Anand (Gujarat) Rohmare et al. (2016)
Chakdaha and Cooch Behar Satpathi (2017)
(West Bengal)
- 40 *Diplacodes nebulosa* (Fabricius, 1793) Titibar (Assam) Saikia et al.(2016)
Palakkad (Kerala) Sherif (2016)
Chakdaha and Cooch Behar Satpathi (2017)
(West Bengal)
- 41 *Diplacodes trivialis* (Rambur, 1842) Coimbatore Gunathilagaraj et al.(1999)
Chidambaram Asaithambi and Manickavasagam, (2002)
Madurai Kandibane et al.(2003 & 2005)
Pattukottai (Tamil Nadu) Arulprakash et al.(2017)
Karaikal (Union Territory of Soniyagandhi and Kumar
Pondicherry) (2004)
Palakkad (Kerala) Palot et al.(2005) ; Sherif
(2016)
Kohlapur (Maharashtra) Sathe and Sindhe, (2014)
Anand (Gujarat) Rohmare et al.(2016)
Titibar (Assam) Saikia et al.(2016)
Chakdaha and Cooch Behar Satpathi (2017)
(West Bengal)
- 42 *Hydrobasileus croceus* (Brauer, 1867) Palakkad (Kerala) Sherif (2016)
- 43 *Indothemis carnatica* (Fabricius, 1798) Palakkad (Kerala) Sherif (2016)
Chakdaha and Cooch Behar Satpathi (2017)
(West Bengal)
- 44 *Lathrecista asiatica* (Fabricius, 1798) Palakkad (Kerala) Sherif (2016)
Chakdaha and Cooch Behar Satpathi (2017)
(West Bengal)
- 45 *Macrodiplax eora* (Brauer, 1867) Chakdaha and Cooch Behar Satpathi (2017)
(West Bengal)
- 46 *Nannophya pygmaea* Rambur, 1842 Chakdaha and Cooch Behar Satpathi (2017)
(West Bengal)
- 47 *Neurothemis fluctuans*(Fabricius, 1793) Chakdaha and Cooch Behar Satpathi (2017)
(West Bengal)
- 48 *Neurothemis fulvia* (Drury, 1773) Titibar (Assam) Saikia et al.(2016)
Palakkad (Kerala) Sherif (2016)
Chakdaha and Cooch Behar Satpathi (2017)
(West Bengal)
- 49 *Neurothemis intermedia* (Rambur, 1842) Bhandara (Maharashtra) Talmale and Kulkarni (2003)
Palakkad (Kerala) Palot et al.(2005) ;
Sherif (2016)
Chakdaha and Cooch Behar Satpathi (2017)
(West Bengal)

50	<i>Neurothemis tullia</i> (Drury, 1773)	Coimbatore Madurai (Tamil Nadu) Palakkad (Kerala) Kohlapur (Maharashtra) Anand (Gujarat) Chakdaha and Cooch Behar (West Bengal)	Gunathilagaraj et al.(1999) Kandibane et al.(2005) Palot et al.(2005) ; Sherif (2016) Sathe and Sindhe (2014) Rohmare et al.(2016) Satpathi (2017)
52	<i>Onychothemis testacea</i> Laidlaw, 1902	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
52	<i>Orthetrum cancellatum</i> (Linnaeus, 1758)	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
53	<i>Orthetrum chrysis</i> (Selys, 1891)	Coimbatore (Tamil Nadu) Palakkad (Kerala) Chakdaha and Cooch Behar (West Bengal)	Gunathilagaraj et al.(1999) Sherif (2016) Satpathi (2017)
54	<i>Orthetrum glaucum</i> (Brauer, 1865)	Tiruvallur (Tamil Nadu) Palakkad (Kerala) Chakdaha and Cooch Behar (West Bengal)	Anbalagan et al.(2008) Sherif (2016) Satpathi (2017)
55	<i>Orthetrum internum</i> Mac Lachlan, 1894	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
56	<i>Orthetrum luzonicum</i> (Brauer, 1868)	Anand (Gujarat) Palakkad (Kerala) Chakdaha and Cooch Behar (West Bengal)	Rohmare et al.(2016) Sherif (2016) Satpathi (2017)
57	<i>Orthetrum neglectum</i> (Burmeister, 1839)	Anand (Gujarat) Chakdaha and Cooch Behar (West Bengal)	Rohmare et al.(2016) Satpathi (2017)
58	<i>Orthetrum sabina</i> (Drury, 1770)	Doon Valley (Uttarakhand) Coimbatore Madurai Tiruvallur Pattukottai (Tamil Nadu) Karaikal (Union Territory of Pondicherry) Palakkad (Kerala)	Singh and Prasad (1976) Gunathilagaraj et al.(1999) Kandibane et al.(2003 & 2005) Anbalagan et al.(2008) Arulprakash et al.(2017) Soniyyagandhi and Kumar (2004) Palot et al.(2005) ; Sherif (2016) Bhattacharya et al.(2006) Saikia et al.(2016) Rohmare et al.(2016) Satpathi (2017)
59	<i>Orthetrum taeniolum</i> (Schneider, 1845)	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
60	<i>Orthetrum triangulare</i> (Selys, 1878)	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
61	<i>Palpopleura sexmaculata</i> (Fabricius, 1787)	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)

62	<i>Pantala flavescens</i> (Fabricius, 1798)	Coimbatore Madurai Tiruvallur Pattukottai (Tamil Nadu) Karaikal (Union Territory of Pondicherry) Palakkad (Kerala) Jorhat Titibar (Assam) Anand (Gujarat) Chakdaha and Cooch Behar (West Bengal)	Gunathilagaraj et al.(1999) Kandibane et al.(2003 & 2005) Anbalagan et al.(2008) Arulprakash et al.(2017) Soniya Gandhi and Kumar (2004) Palot et al.(2005) ; Sherif (2016) Bhattacharya et al.(2006) Saikia et al.(2016) Rohmare et al.(2016) Satpathi (2017)
63	<i>Potamarcha congener</i> (Rambur, 1842)	Palakkad (Kerala) Pattukottai (Tamil Nadu) Chakdaha and Cooch Behar (West Bengal)	Palot et al. (2005) ; Sherif (2016) Arulprakash et al.(2017) Satpathi (2017)
64	<i>Rhodothemis rufa</i> (Rambur, 1842)	Palakkad (Kerala) Chakdaha and Cooch Behar (West Bengal)	Sherif (2016) Satpathi (2017)
65	<i>Rhyothemis variegata variegata</i> (Linneaus, 1763)	Madurai Tiruvallur Pattukottai (Tamil Nadu) Karaikal (Union Territory of Pondicherry) Palakkad (Kerala) Anand (Gujarat) Chakdaha and Cooch Behar (West Bengal)	Kandibane et al.(2003 & 2005) Anbalagan et al.(2008) Arulprakash et al.(2017) Soniya Gandhi and Kumar (2004) Palot et al.(2005) ; Sherif (2016) Rohmare et al.(2016) Satpathi (2017)
66	<i>Sympetrum hypomelas</i> (Selys, 1884)	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
67	<i>Tetrathemis platyptera</i> (Selys, 1878)	Palakkad (Kerala) Chakdaha and Cooch Behar (West Bengal)	Sherif (2016) Satpathi (2017)
68	<i>Tholymis tillarga</i> (Fabricius, 1798)	Chidambaram (Tamil Nadu)	Asaithambi and Manickavasagam, (2002) Sherif (2016)
69	<i>Tramea basilaris</i> (Palisot de Beauvois, 1805)	Palakkad (Kerala) Anand (Gujarat) Pattukottai (Tamil Nadu) Palakkad (Kerala) Chakdaha and Cooch Behar (West Bengal)	Rohmare et al.(2016) Arulprakash et al.(2017) Sherif (2016) Satpathi (2017)
70	<i>Tramea limbata</i> (Desjardins, 1832)	Palakkad (Kerala) Tiruvallur Pattukottai (Tamil Nadu) Anand (Gujarat) Chakdaha and Cooch Behar (West Bengal)	Palot et al.(2005) Anbalagan et al.(2008) Arulprakash et al.(2017) Rohmare et al.(2016) Satpathi (2017)
71	<i>Tramea virginia</i> (Rambur, 1842)	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
72	<i>Trapezostigma basilaris burmeisteri</i> Kirby	Coimbatore (Tamil Nadu)	Gunathilagaraj et al.(1999)
73	<i>Trapezostigma limbata</i> (Desjardins)	Madurai (Tamil Nadu)	Kandibane et al.(2003)

74	<i>Trithemis aurora</i> (Burmeister, 1839)	Coimbatore Tiruvallur Pattukottai (Tamil Nadu) Palakkad (Kerala)	Gunathilagaraj et al.(1999) Anbalagan et al.(2008) Arulprakash et al.(2017) Palot et al.(2005) ; Sherif (2016) Rohmare et al.(2016) Satpathi (2017)
75	<i>Trithemis festiva</i> (Rambur, 1842)	Anand (Gujarat) Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
76	<i>Trithemis pallidinervis</i> (Kirby, 1889)	Chidambaram	Asaithambi and Manickavasagam, (2002)
77	<i>Trithemis kirbyi</i> Selys, 1891	Tiruvallur Pattukottai (Tamil Nadu) Palakkad (Kerala)	Anbalagan et al.(2008) Arulprakash et al.(2017) Palot et al.(2005)
78	<i>Trithemis</i> sp.	Anand (Gujarat) Chakdaha and Cooch Behar (West Bengal)	Rohmare et al.(2016) Satpathi (2017)
79	<i>Urothemis signata</i> (Rambur, 18420)	Kohlapur (Maharashtra) Madurai (Tamil Nadu)	Sathe and Sindhe (2014) Kandibane et al.(2005)
80	<i>Zygonyx iris</i> (Selys, 1869)	Anand (Gujarat) Palakkad (Kerala) Chakdaha and Cooch Behar (West Bengal)	Rohmare et al.(2016) Sherif (2016) Satpathi (2017)
81	<i>Zyxomma petiolatum</i> Rambur, 1842	Chakdaha and Cooch Behar (West Bengal)	Satpathi (2017)
82	<i>Vestalis apicalis</i> Selys, 1873	Anand (Gujarat) Chakdaha and Cooch Behar (West Bengal)	Rohmare et al.(2016) Satpathi (2017)
83	<i>Vestalis gracilis</i> (Rambur, 1842)	Palakkad (Kerala) Kohlapur (Maharashtra)	Sherif (2016) Palot et al.(2005) Sathe and Sindhe (2014)
B Zygoptera			
I Calopterygidae			
II Chlorocyphidae			
84	<i>Libellago lineate</i> (Burmeister, 1839)	Palakkad (Kerala)	Sherif (2016)
III Coenagrionidae			
85	<i>Aciagrion occidentale</i> Laidlaw, 1919	Palakkad (Kerala) Kohlapur (Maharashtra)	Palot et al.(2005) ; Sherif(2016) Sathe and Sindhe (2014)
86	<i>Aciagrion hisopa</i> (Selys, 1876)	Bangalore (Karnataka) Titibar (Assam)	Fraser (1933) Saikia et al.(2016)
87	<i>Agriocnemis femina</i> (Brauer, 1868)	Madurai Tiruvallur (Tamil Nadu) Jorhat, Assam Chakdaha, Cooch Behar and Kalimpong (West Bengal)	Kandibane et al.(2003 & 2005) Anbalagan et al.(2008) Bhattacharya et al.(2006) Satpathi and Mondal (2016)

- 88 *Agriocnemis pygmaea* (Rambur, 1842) Coimbatore Gunathilagaraj et al.(1999)
Chidambaram Asaithambi and Manickavasagam, (2002)
Madurai Kandibane et al.(2003)
Tiruvallur Anbalagan et al.(2008)
Pattukottai (Tamil Nadu) Arulprakash et al.(2017)
Karaikal (Union Territory of Pondicherry) Soniyagandhi and Kumar (2004)
Palakkad (Kerala) Palot et al.(2005) ; Sherif(2016)
Jorhat Bhattacharya et al.(2006)
Titibar (Assam) Saikia et al.(2016)
Nellore, Andhra Pradesh Kamakshi et al.(2015)
Chakdaha, Cooch Behar and Kalimpong (West Bengal) Satpathi and Mondal (2016)
- 89 *Agriocnemis pieris* Laidlaw, 1919 Kohlapur (Maharashtra) Sathe and Sindhe (2014)
Titibar (Assam) Saikia et al.(2016)
Palakkad (Kerala) Sherif (2016)
- 90 *Agriocnemis rubescens* Selys, 1877 Coimbatore Gunathilagaraj et al.(1999)
Chidambaram (Tamil Nadu) Asaithambi and Manickavasagam, (2002)
Sherif (2016)
- 91 *Agriocnemis splendidissima* Laidlaw, 1919 Palakkad (Kerala) Sherif (2016)
- 92 *Ceriagrion azureum* (Selys, 1891) Chakdaha, Cooch Behar and Kalimpong (West Bengal) Satpathi and Mondal (2016)
- 93 *Ceriagrion coromandelianum* (Fabricius, 1798) Coimbatore Gunathilagaraj et al.(1999)
Chidambaram Asaithambi and Manickavasagam, (2002)
Tiruvallur Anbalagan et al.(2008)
Pattukottai (Tamil Nadu) Arulprakash et al.(2017)
Karaikal (Union Territory of Pondicherry) Soniyagandhi and Kumar (2004)
Palakkad (Kerala) Palot et al.(2005) ; Sherif(2016)
Jorhat Bhattacharya et al.(2006)
Titibar (Assam) Saikia et al.(2016)
Chakdaha, Cooch Behar and Kalimpong (West Bengal) Satpathi and Mondal (2016)
- 94 *Ceriagrion calamineum* Lieftinck, 1951 Titibar (Assam) Saikia et al.(2016)
- 95 *Ceriagrion olivaceum* Laidlaw, 1914 Titibar (Assam) Saikia et al.(2016)
Chakdaha, Cooch Behar and Kalimpong (West Bengal) Satpathi and Mondal (2016)
- 96 *Ceriagrion cerinorubellum* (Brauer, 1865) Coimbatore (Tamil Nadu) Gunathilagaraj et al.(1999)
Palakkad (Kerala) Sherif (2016)
- 97 *Ceriagrion rubiae* Laidlaw, 1916 Kohlapur (Maharashtra) Sathe and Sindhe (2014)
Palakkad (Kerala) Sherif (2016)
- 98 *Ceriagrion tenellum* (Brun) Chakdaha, Cooch Behar and Kalimpong (West Bengal) Satpathi and Mondal (2016)
- 99 *Enallagma cyathigerum* (Charpentier, 1840) Anand (Gujarat) Rohmare et al.(2016)
- 100 *Ischnura aurora* (Brauer, 1865) Chidambaram Asaithambi and Manickavasagam, (2002)
Tiruvallur Anbalagan et al.(2008)
Pattukottai (Tamil Nadu) Arulprakash et al.(2017)
Bhandara (Maharashtra) Talmale and Kulkarni (2003)
Karaikal (Union Territory of Pondicherry) Soniyagandhi and Kumar (2004)
Palakkad (Kerala) Palot et al.(2005) ; Sherif(2016)
Titibar (Assam) Saikia et al.(2016)
Chakdaha, Cooch Behar and Kalimpong (West Bengal) Satpathi and Mondal (2016)

101	<i>Ischnura elegans</i> (Vander Linden, 1823)	Anand (Gujarat)	Rohmare et al.(2016)
102	<i>Ischnura forcipata</i> Morton, 1907	Kohlapur (Maharashtra)	Sathe and Sindhe (2014)
103	<i>Ischnura nursei</i> (Mortan, 1907)	Anand (Gujarat)	Rohmare et al.(2016)
104	<i>Ischnura senegalensis</i> (Rambur, 1842)	Coimbatore Chidambaram Pattukottai (Tamil Nadu) Kohlapur (Maharashtra) Anand (Gujarat) Chakdaha, Cooch Behar and Kalimpong (West Bengal)	Gunathilagaraj et al.(1999) Asaithambi and Manickavasagam, (2002) Arulprakash et al.(2017) Sathe and Sindhe (2014) Rohmare et al.(2016) Satpathi and Mondal (2016)
105	<i>Ischnura sp.</i>	Madurai (Tamil Nadu)	Kandibane et al.(2005)
106	<i>Ischnura delicate</i> Hagen	Coimbatore Chidambaram Madurai Tiruvallur (Tamil Nadu)	Gunathilagaraj et al.(1999) Asaithambi and Manickavasagam, (2002) Kandibane et al.(2003) Anbalagan et al.(2008)
107	<i>Paracercion malayanum</i> (Selys, 1876)	Anand (Gujarat)	Rohmare et al.(2016)
108	<i>Pseudagrion decorum</i> (Rambur, 1842)	Anand (Gujarat) Pattukottai (Tamil Nadu)	Rohmare et al.(2016) Arulprakash et al.(2017)
109	<i>Pseudagrion hypermelas</i> Selys, 1876	Anand (Gujarat)	Rohmare et al.(2016)
110	<i>Pseudagrion microcephalum</i> (Rambur, 1842)	Palakkad (Kerala) Kohlapur (Maharashtra) Anand (Gujarat) Chakdaha, Cooch Behar and Kalimpong (West Bengal)	Palot et al.(2005) ; Sherif (2016) Sathe and Sindhe (2014) Rohmare et al.(2016) Satpathi and Mondal (2016)
111	<i>Pseudagrion rubriceps</i> Selys, 1876	Palakkad (Kerala) Anand (Gujarat)	Palot et al.(2005) ; Sherif (2016) Rohmare et al.(2016)
IV	Euphaeidae		
112	<i>Euphaea cardinalis</i> (Fraser, 1924)*	Kohlapur (Maharashtra)	Sathe and Sindhe (2014)
V	Lestidae		
113	<i>Lestes viridulus</i> Rambur, 1842	Coimbatore Thiruvallur (Tamil Nadu) Anand (Gujarat)	Gunathilagaraj et al.(1999) Anbalagan et al.(2008) Rohmare et al.(2016)
114	<i>Lestes elatus</i> Hagen in Selys, 1862	Bangalore (Karnataka) Karaikal (Union Territory of Pondicherry) Palakkad (Kerala) Kohlapur (Maharashtra) Pattukottai (Tamil Nadu)	Fraser (1933) Soniya Gandhi and Kumar (2004) Palot et al.(2005) Sathe and Sindhe (2014) Arulprakash et al.(2017)
115	<i>Lestes malabaricus</i> Fraser, 1929	Cochin Palakkad (Kerala)	Fraser (1933) Palot et al.(2005)
116	<i>Lestes thoracicus</i> Laidlaw, 1930	Anand (Gujarat)	Rohmare et al.(2016)
117	<i>Lestes umbrinus</i> Selys, 1891	Kohlapur (Maharashtra) Anand (Gujarat)	Sathe and Sindhe (2014) Rohmare et al.(2016)
118	<i>Lestes nodalis</i> Selys, 1891	Palakkad (Kerala)	Sherif (2016)
VI	Platycnemididae		
119	<i>Elatoneura nigerrima</i> (Laidlaw, 1917)	Anand (Gujarat)	Rohmare et al.(2016)
120	<i>Copera marginipes</i> (Rambur, 1842)	Palakkad (Kerala) Anand (Gujarat)	Palot et al.(2005) ; Sherif (2016) Rohmare et al.(2016)
121	<i>Copera vittata</i> Selys, 1863	Kohlapur (Maharashtra)	Sathe and Sindhe (2014)
122	<i>Caconeura ramburi</i> (Fraser, 1922)	Kohlapur (Maharashtra)	Sathe and Sindhe (2014)

123	<i>Disparoneura quadrimaculata</i> (Rambur, 1842)	Kohlapur (Maharashtra)	Sathe and Sindhe (2014)
124	<i>Esmecyaneo vittata</i> Fraser, 1922	Kohlapur (Maharashtra)	Sathe and Sindhe (2014)
125	<i>Phylloneura westermanni</i> (Hagen in Selys, 1860)*	Kohlapur (Maharashtra)	Sathe and Sindhe (2014)
126	<i>Prodasineura verticalis</i> (Selys, 1860)	Kohlapur (Maharashtra)	Sathe and Sindhe (2014)
VII	Platystictidae		
127	<i>Protosticta antelopoides</i> Fraser, 1931*	Kohlapur (Maharashtra)	Sathe and Sindhe (2014)

* Endemic to Western Ghats

19 genera under 7 families). The most speciose family was Libellulidae with 54 species and 32 genera followed by Coenagrionidae (27 species and 7 genera). The least representation was that of Euphaeidae (1 species). *Orthetrum sabina* (Libellulidae) was observed to occur in all the rice fields studied under different geographic regions. The dominance of Libellulidae may be due to higher tolerance levels to modern agricultural practices including the agrochemicals applied in rice fields. Subramaniam et al. (2008) has opined that the species richness of Libellulidae may be due to preference for colonization in lentic habitats. Rice fields in general may be the ideal habitat suited for Libellulidae wherein water will be available even during the fallow periods in the irrigation channels nearby. This may help in the continuous breeding of Libellulids.

Analysis of Odonata from rice fields in different biogeographical regions of India revealed that the order of dominance of species was Gangetic Plain Zone (76 species) > Western Ghat Zone (57 species) > Deccan Plateau Zone (54 species) > Semi Arid Zone (39 species) > Northeast Zone (14 species) > Coastal Zone (10 species) > Himalayan Zone (1 species) (Table 2).

Six clusters were formed as per Bray-Curtis analysis. Western Ghat Zone and Deccan Plateau Zone were found to be more similar (50.48%) while Western Ghat Zone and Gangetic Zone showed 49.6% similarity. Subramaniam et al. (2018) have listed 74 species of Odonata endemic to Western Ghat Zone. Of these, seven species viz., (*Burmagomphus laidlawi* Fraser, 1924, *Macrogomphus wynaadicus* Fraser, 1924, *Merogomphus longistigma* (Fraser, 1922), *Macromia indica* Fraser, 1924, *Euphaea cardinalis* (Fraser, 1924), *Phylloneura westermanni* (Hagen in Selys, 1860) and *Protosticta antelopoides* Fraser, 1931) have been reported from rice fields of Kohlapur, Maharashtra (Sathe and Sindhe, 2014). As per *International Union for Conservation of Nature* (IUCN) Red list Assessment (2016) *Phylloneura westermanni* (Platycnemididae) is categorized as Near Threatened Species. This elicits

the urgent need to assess the Odonata diversity in agro ecosystems, in particular, rice fields which harbour more Odonata. Rice fields most of the time act as temporal habitats for Odonata survival in the escalating phase of land degradation, urbanization and other anthropogenic activities.

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Table 2. Family wise distribution of Odonata

Suborder/ Family	Gangetic zone		Western Ghat Zone		Deccan Plateau Zone		Semi-Arid Zone		North Eastern Zone		Coastal Zone		Himalayan Zone		Total	
	Genus	Species	Genus	Species	Genus	Species	Genus	Species	Genus	Species	Genus	Species	Genus	Species	Genus	Species
ANISOPTERA																
Aeshnidae	3	7	1	1	1	3	1	1	-	-	-	-	-	-	6	12
Gomphidae	7	8	3	3	4	5	1	1	-	-	-	-	-	-	15	17
Cordulegasteridae	1	1	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Chlorogomphidae	2	2	-	-	-	-	-	-	-	-	-	-	-	-	2	2
Macromiidae	2	2	-	-	1	1	-	-	-	-	-	-	-	-	3	3
Libellulidae	33	47	19	35	14	19	14	20	5	6	6	6	1	1	92	134
ZYGOPTERA																
Calopterygidae	-	-	1	2	1	1	-	-	-	-	-	-	-	-	2	3
Chlorocyphidae	-	-	1	1	-	-	-	-	-	-	-	-	-	-	1	1
Coenagrionidae	4	9	5	11	5	14	5	11	3	8	3	3	-	-	25	56
Euphaeidae	-	-	-	-	1	1	-	-	-	-	-	-	-	-	1	1
Lestidae	-	-	1	3	1	3	1	4	-	-	1	1	-	-	3	10
Platycnemididae	-	-	1	1	6	6	2	2	-	-	-	-	-	-	9	9
Platystictidae	-	-	-	-	1	1	-	-	-	-	-	-	-	-	1	1
Total	52	76	32	57	35	54	24	39	8	14	10	10	1	1	161	250

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