

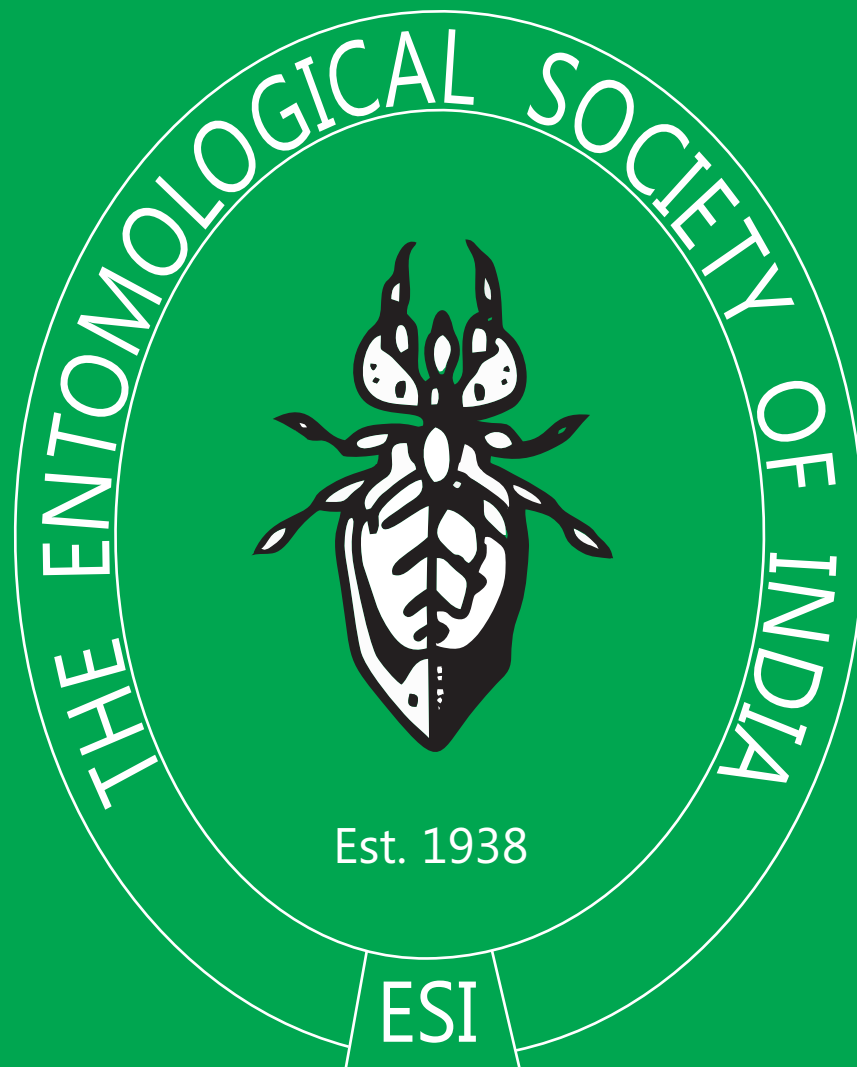
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# Indian Journal of Entomology

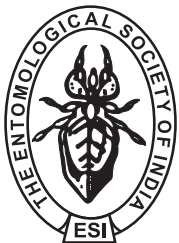
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## ODONATA DIVERSITY OF JALGAON CITY AND AROUND (MAHARASHTRA)

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### ABSTRACT

A total of 46 species of Odonata belonging to 26 genera under 7 families in two suborders were collected from Jalgaon city and its surrounding area during a study conducted in monsoon and post-monsoon seasons, 2012-2014. The post-monsoon abundance was comparatively high. It was observed that the suborder Anisoptera was dominant with 28 species under 3 families. Suborder Zygoptera revealed 18 species under 4 families. Libellulidae was the species rich family (24 species), followed by the Coenagrionidae (12 species), Platynemididae (3), Lestidae (2), Aeshnidae (2), Gomphidae (2), and Chlorocyphidae (1). Of the 46 species, 13 were very common, 22 were common, 10 rare and one very rare.

**Key words:** Diversity, abundance, Odonata, suborder, family, species, checklist, species richness, IUCN status, commonness, rarity, migration, urbanisation

The Odonata consists of a very primitive group of insects inhabiting the world for nearly 220 million years ago during the Carboniferous and Permian periods. These are among the most attractive and conspicuous insects mostly found around the vicinity of fresh water habitats like streams, marshes, rivers, lakes, temporary rain water puddles and even in rice fields. Odonates are economically important and act as an effective biocontrol agent since adult preys on mosquitoes, flies, moths, aphids, termites, small beetles etc, and larvae feed on the mosquito larvae/ other soft bodied aquatic invertebrates. It plays an important role in wetland and terrestrial food chain. Their sensitivity to environmental conditions make them an excellent biological indicator of environmental changes (Clark and Samways. 1996; Clausnitzer, 2004; Samways, 2008).

According to an updated list, Odonata has a worldwide distribution with 5,952 species in 652 genera (Kalkaman *et al.*, 2008; Schorr and Paulson, 2015; Subramanian, 2014; Dijkstra *et al.*, 2013) of which 474 species in 142 genera and 18 families under 3 suborders exist in India (Subramanian, 2014). Around 174 species are known from the Western Ghats of India, comprising of 56 endemic ones (Subramanian *et al.*, 2011). After Fraser's (1924, 1933, 1934, 1936) work on odonates of India with many species from Maharashtra, many additions had been made for the fauna of Maharashtra recently by Prasad (1996); Babu *et al.* (2009); Kulkarni *et al.* (2012); Kulkarni and Subramanian (2013) with the latest updated checklist

being Tiple and Koparde (2015) revealing 134 species under 70 genera and 11 families. Though diversity of Odonata had been well documented from Maharashtra, no consolidated checklist of the fauna of Jalgaon city and its surrounding areas is available and hence the present one, with an objective of exploring the diversity and abundance.

### MATERIALS AND METHODS

Jalgaon city (20.997884 E, 7566711N) is in the northern part of Deccan plateau in Jalgaon district, Maharashtra (Fig. 1). It is at 209 m msl, with Girna River flowing in the west with a very hot and dry weather during summer (maximum temperature being 49°C during May- June and annual rainfall of about 700 mm. Odonates were collected from habitats like dams, river banks, parks and gardens, small temporary pools, rain water puddles, lakes etc. of the city and its vicinity (Table 2). Monthly surveys were conducted during monsoon/ post-monsoon seasons, 2012-2014, and observed with binoculars and pictures taken. Only those specimens that were difficult to identify in the field were caught. Identification was facilitated with key provided by Fraser (1933-1936), Subramanian (2008) and Nair (2011); stereozoom microscope observations smaller specimens and details like genitalia etc.; and simple hand lens for the larger ones. Available online sources, and reference books related to faunistics were also consulted. Geographical coordinates along with environmental and ecological attributes were



Fig. 1. Map showing study area

documented. Photographs are given in Plate I-IV. Categorization on the basis of abundance- VC: very common (> 100 sightings); C: common (30–100 sightings); R: rare (2–10 sightings); VR: very rare (< 2 sightings) (Tiple *et al.*, 2008) was done.

## RESULTS AND DISCUSSION

### A. Systematic List

**Order - Odonata** Fabricius, 1793

**Suborder- Zygoptera** Selys, 1854

**Superfamily- Lestoidea** Calvert, 1901

**I. Family: Lestidae** Calvert, 1907

1. Genus: *Lestes* Leach, 1815

1. *Lestes umbrinus* Selys, 1891

2. *Lestes viridulus* Rambur, 1842

**Superfamily Calopterygoidea** Selys, 1850

**II. Family: Chlorocyphidae** Cowley, 1937

2. Genus: *Libellago* Selys, 1840

3. *Libellago lineata* (Burmeister, 1839)

**Superfamily Coenagrionidea** Kirby, 1890

**III. Family: Platycnemididae** Jakobson & Bainchi, 1905

3. Genus: *Copera* Kirby, 1890

4. *Copera marginipes* (Rambur, 1842)

5. *Copera vittata deccanensis* Laidlaw, 1917

4. Genus: *Disparoneura* Selys, 1860

6. *Disparoneura quadrimaculata* (Rambur, 1842)

**IV. Family: Coenagrionidae** Kirby, 1890

5. Genus: *Agriocnemis* Selys, 1877

7. *Agriocnemis femina* (Brauer, 1868)

8. *Agriocnemis pygmaea* (Rambur, 1842)

6. Genus: *Ceriagrion* Selys, 1876

9. *Ceriagrion coromandelianum* (Fabricius, 1798)

10. *Ceriagrion rubiae* Laidlaw, 1916

7. Genus: *Enallagma* Charpentier, 1840

11. *Enallagma parvum* Selys, 1876

8. Genus: *Ischnura* Charpentier, 1840

12. *Ischnura aurora* (Brauer, 1865)

13. *Ischnura senegalensis* (Rambur, 1842)

14. *Ischnura nursei* (Morton, 1907)

9. Genus: *Pseudagrion* Selys, 1876

15. *Pseudagrion decorum* (Rambur, 1842)

16. *Pseudagrion hypermelas* Selys, 1876

17. *Pseudagrion microcephalum* (Rambur, 1842)

18. *Pseudagrion rubriceps rubriceps* Selys, 1876

**Suborder Anisoptera** Selys, 1854

**Superfamily Aeshnoidea** Leach, 1815

**V. Family: Aeshnidae** Leach, 1815

10. Genus: *Anax* Leach, 1815

19. *Anax guttatus* (Burmeister, 1839)

20. *Anax immaculifrons* Rambur, 184

**Superfamily Gomphoidea** Rambur, 1842

**VI. Family: Gomphidae** Rambur, 1842

11. Genus: *Ictinogomphus* Cowley, 1934
21. *Ictinogomphus rapax* (Rambur, 1842)
12. Genus: *Paragomphus* Cowley, 1934
22. *Paragomphus lineatus* (Selys, 1850)
- Superfamily Libelluloidea Leach, 1815
- VII. Family: Libellulidae Leach, 1815
13. Genus: *Acisoma* Rambur, 1842
23. *Acisoma panorpoides* Rambur, 1842
14. Genus: *Brachythemis* Brauer, 1868
24. *Brachythemis contaminata* (Fabricius, 1793)
15. Genus: *Bradinopyga* Kirby, 1893
25. *Bradinopyga geminata* (Rambur, 1842)
16. Genus: *Crocothemis* Brauer, 1868
26. *Crocothemis servilia* (Drury, 1770)
17. Genus: *Diplacodes* Kirby, 1889
27. *Diplacodes trivialis* (Rambur, 1842)
18. Genus: *Lathrecista* Kirby, 1889
28. *Lathrecista asiatica* (Fabricius, 1798)
19. Genus: *Neurothemis* Brauer, 1867
29. *Neurothemis fulvia* (Drury, 1773)
30. *Neurothemis intermedia* (Rambur, 1842)
31. *Neurothemis tullia* (Drury, 1773)
20. Genus: *Orthetrum* Newman, 1833
32. *Orthetrum glaucum* (Brauer, 1865)
33. *Orthetrum luzonicum* (Brauer, 1868)
34. *Orthetrum pruinosum neglectum* (Rambur, 1842)
35. *Orthetrum sabina* (Drury, 1770)

36. *Orthetrum taeniolatum* (Schneider, 1845)
21. Genus: *Pantala* Hagen, 1861
37. *Pantala flavescens* (Fabricius, 1798)
22. Genus: *Potamarcha* Karsch, 1890
38. *Potamarcha congener* (Rambur, 1842)
23. Genus: *Rhyothemis* Hagen, 1867
39. *Rhyothemis variegata* (Linnaeus, 1763)
24. Genus: *Tholymis* Hagen, 1867
40. *Tholymis tillarga* (Fabricius, 1798)
25. Genus: *Tramea* Hagen, 1861
41. *Tramea basilaris* (Palisot de Beauvois, 1805)
42. *Tramea limbata* (Desjardins, 1832)
26. Genus: *Trithemis* Brauer, 1868
43. *Trithemis aurora* (Burmeister, 1839)
44. *Trithemis festiva* (Rambur, 1842)
45. *Trithemis kirbyi* Selys, 1891
46. *Trithemis pallidinervis* (Kirby, 1889)

A total of 46 species under 26 genera and 7 families in two suborders was documented (Table 1; Plate I- IV). Suborder Anisoptera was dominant with 28 species in 17 genera under 3 families (Fig. 2); Zygoptera revealed 18 species in 9 genera and under 4 families. The Libellulidae (Skimmers) was the dominant family with 24 species under 13 genera; it was followed by Coenagrionidae (12), Platycnemididae (3), Lestidae, Aeshnidae and Gomphidae (2 each), and Chlorocyphidae (1) (Fig. 3).

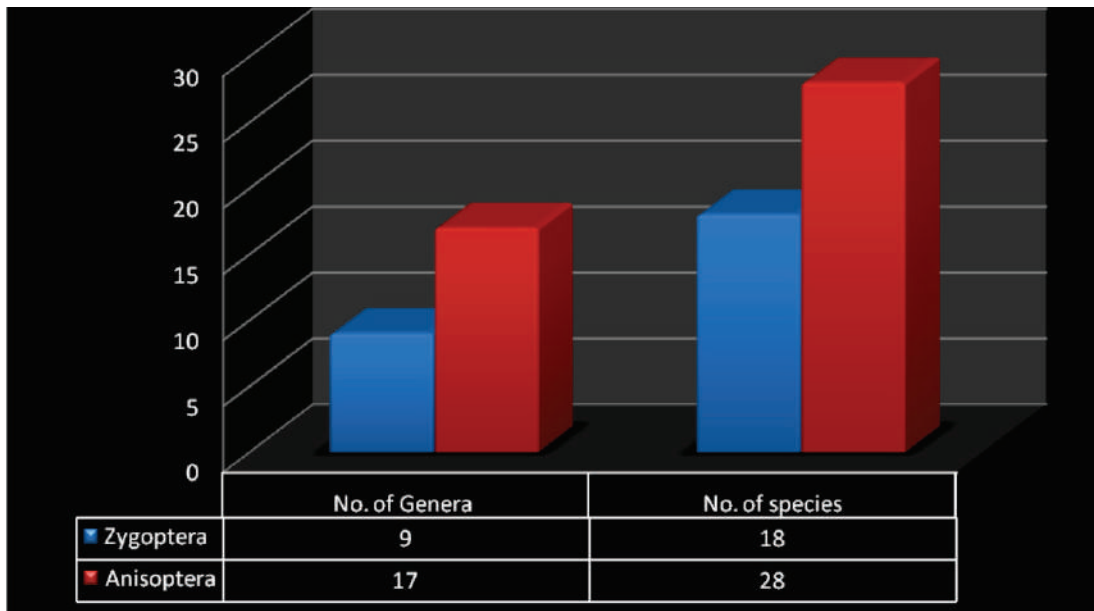


Fig. 2. Species Richness of Odonates in the study area

Table 1. Odonata of Jalgaon city and around

S. No	Species	Common name	Status	IUCN Status
Suborder: Zygoptera (Damselflies)				
I. Family: Lestidae Calvert, 1907 (Spreadwings)				
1	<i>Lestes umbrinus</i> Selys, 1891	Brown Spreadwing	R	DD
2	<i>Lestes viridulus</i> Rambur, 1842	Emerald – stripped spreadwing	C	LC
II. Family: Chlorocyphidae Cowley, 1937 (Stream Jewels)				
3	<i>Libellago lineata</i> (Burmeister, 1839)	River Heliodor	R	LC
III. Family: Platycnemididae Yakobson & Bainchi, 1905 (Bush Darts)				
4	<i>Copera marginipes</i> (Rambur, 1842)	Yellow Bush Dart	VC	LC
5	<i>C. vittata deccanensis</i> Laidlaw, 1917	Blue Bush Dart	C	LC
6	<i>Disparoneura quadrimaculata</i> (Rambur, 1842)	Black-winged Bamboo tail	C	LC
IV. Family: Coenagrionidae Kirby, 1890 (Marsh Darts)				
7	<i>Agriocnemis femina</i> (Brauer, 1868)	Blue-backed Dartlet	C	LC
8	<i>Agriocnemis pygmaea</i> (Rambur, 1842)	Pigmy Dartlet	VC	LC
9	<i>Ceriagrion coromandelianum</i> (Fabricius, 1798)	Coromandel Dartlet	VC	LC
10	<i>Ceriagrion rubiae</i> Laidlaw, 1916	Orange Marsh Dart	VR	NA
11	<i>Enallagma parvum</i> Selys, 1876	Pigmy Marsh Dart	C	LC
12	<i>Ischnura aurora</i> (Brauer, 1865)	Goldrn Dartlet	VC	LC
13	<i>Ischnura senegalensis</i> (Rambur, 1842)	Senegal Golden Dartlet	VC	LC
14	<i>Ischnura nursei</i> (Morton, 1907)	Pixie Dartlet	C	LC
15	<i>Pseudagrion decorum</i> (Rambur, 1842)	Blue Dart	C	LC
16	<i>Pseudagrion hypermelas</i> Selys, 1876	Black-faced Dart	R	LC
17	<i>Pseudagrion microcephalum</i> (Rambur, 1842)	Blue Grass Dartlet	R	LC
18	<i>Pseudagrion rubriceps</i> Selys, 1876	Safron-faced Blue Dartlet	C	LC
Suborder: Anisoptera (Dragonflies)				
V. Family: Aeshnidae Leach, 1815 (Darners)				
19	<i>Anax guttatus</i> (Burmeister, 1839)	Blue-tailed green Darner	R	LC
20	<i>Anax immaculifrons</i> Rambur, 1842	Blue Darner	C	LC
VI. Family: Gomphidae Rambur, 1842 (Clubtails)				
21	<i>Ictinogomphus rapax</i> (Rambur, 1842)	Common Clubtail	R	LC
22	<i>Paragomphus lineatus</i> (Selys, 1850)	Common oartail	R	LC
VII. Family: Libellulidae Leach, 1815 (Skimmrs)				
23	<i>Acisoma panorpoides</i> Rambur, 1842	Trumpet Tail	C	LC
24	<i>Brachythemis contaminata</i> (Fabricius, 1793)	Ditch Jewel	VC	LC
25	<i>Bradinopyga geminata</i> (Rambur, 1842)	Granite Ghost	C	LC
26	<i>Crocothemis servilia</i> (Drury, 1770)	Ruddy Marsh Skimmer	VC	LC
27	<i>Diplacodes trivialis</i> (Rambur, 1842)	Ground Skimmer	VC	LC
28	<i>Lathrecista asiatica</i> (Fabricius, 1798)	Asiatic Blood Tail	C	LC
29	<i>Neurothemis fulvia</i> (Drury, 1773)	Fulvous Forest Skimmer	R	LC
30	<i>Neurothemis intermedia</i> (Rambur, 1842)	Amber-winged Marsh Skimmer	C	LC
31	<i>Neurothemis tullia</i> (Drury, 1773)	Pied Paddy Skimmer	C	LC
32	<i>Orthetrum glaucum</i> (Brauer, 1865)	Blue Marsh Hawk	C	LC
33	<i>Orthetrum luzonicum</i> (Brauer, 1868)	Tricolored Marsh Hawk	C	LC
34	<i>Orthetrum pruinosum neglectum</i> (Rambur, 1842)	Crimson-tailed Marsh Haek	VC	LC
35	<i>Orthetrum sabina</i> (Drury, 1770)	Green Marsh Hawk	VC	LC
36	<i>Orthetrum taeniolatum</i> (Schneider, 1845)	Small skimmer	C	LC
37	<i>Pantala flavescens</i> (Fabricius, 1798)	Wandering Glider	VC	LC
38	<i>Potamarcha congener</i> (Rambur, 1842)	Blue- tailed Yellow Skimmer	R	LC
39	<i>Rhyothemis variegata</i> (Linnaeus, 1763)	Common Picture Wing	C	LC
40	<i>Tholymis tillarga</i> (Fabricius, 1798)	Dusky Cloud Wing	R	LC
41	<i>Tramea basilaris</i> (Palisot de Beauvois, 1805)	Red Marsh Trotter	C	LC
42	<i>Tramea limbata</i> (Desjardins, 1832)	Black Marsh Totter	C	LC
43	<i>Trithemis aurora</i> (Burmeister, 1839)	Crimson Marsh Skimmer	VC	LC
44	<i>Trithemis festiva</i> (Rambur, 1842)	Black Stream Skimmer	VC	LC
45	<i>Trithemis kirbyi</i> Selys, 1891	Scarlet Rock Glider	C	LC

LC- Least concerned; DD- Data Deficient; NA- Not Assessed; VC- Very Common; C- Common; R- Rare



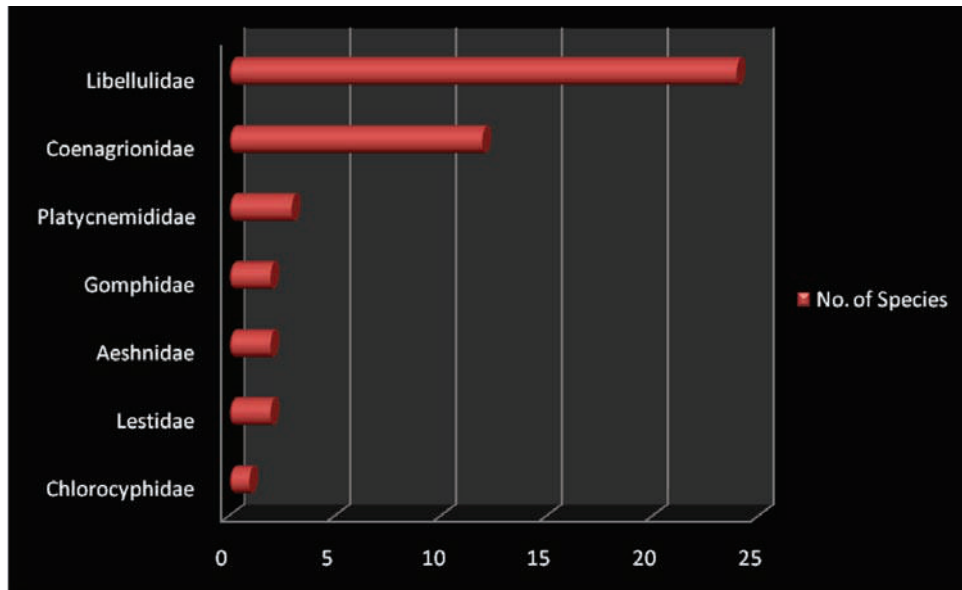


Fig. 3. Family dominance in the study area

The relative abundance analysis revealed that of the 46 species, 13 were very common, 22 common, 10 rare and one very rare in occurrence (Table 1). *Lestes umbrinus* was observed as the data deficient (DD) under IUCN Red list of threatened species category. Data was not evaluated and therefore not available for *Ceriagrion rubiae*. Rest of the species were grouped under least concern category. Among the Anisoptera, *Brachythemis contaminata*, *Orthetrum sabina* and *Crocothemis servilia* were the most common. Among Zygoptera, *Ceriagrion coromandelianum* and *Copera marginipes* were common.

The mass emergence and migration of *Pantala flavescens* during monsoon and post-monsoon seasons resulted in their soaring abundance. Whereas species like *Ceriagrion rubiae*, *Pseudagrion hypermelas*, *Paragomphus lineatus*, *Ictinogomphus rapax* and *Tholymis tillarga* were rarely encountered. Abundance of *Brachythemis contaminata* was high in polluted water bodies. *Libellago lineata*, *Pseudagrion microcephalum*, *Neurothemis fulvia*, and *Lathrecista asiatica* were not found in contaminated water but found to occur near unpolluted streams.

The study area, though being an industrialized city, revealed a good Odonata diversity with 46 species under 26 genera belonging to 7 families. The suborder Anisoptera was abundant in comparison to Zygoptera, and found in all the water bodies that were sampled. This corroborates with the findings of almost all the earlier workers, which might be due to their adaptability

to wide range of habitats and high dispersal ability (Williams, 1997; Lawler, 2001; Suhling et al., 2004). Family Libellulidae (Skimmers) is the dominant family, represented by 88 species under 39 genera in the Indian fauna (Subramanian, 2014). The present study also corroborates this as Libellulidae (24 sp.), the most dominant, followed by Coenagrionidae (12).

The findings thus agree with Keize and Kalkman (2009) who concluded that Coenagrionidae and Libellulidae are the two worldwide largest families dominating the Odonata fauna of standing water. Tiple (2008) studied the Odonata fauna of Nagpur city and observed that the Libellulidae dominated with 30 species followed by Coenagrionidae (16 species). Tiple et al. (2012) also got analogous results when describing Odonata diversity of Tropical Forest Research Institute of Jabalpur in Madhya Pradesh. In central India too, Odonata fauna is mostly dominated by the Libellulidae and Coenagrionidae (Tiple and Chandra, 2013b). Manwar et al. (2012) and Andrew (2013) observed similar findings with the Odonata of Chatri Lake in Amravati and Zilpi Lake in Nagpur, respectively. Tiple et al. (2013 a) gave a detailed compilation of odonates of Vidarbha region of Maharashtra with 82 species under 47 genera and 9 families, and revealed that the Libellulidae is the dominant one (38 species).

The most species rich site was Jain dam area, mostly comprising of virgin forest cover coupled with water body with good aquatic vegetation. Again, though being a crowded park in the heart of the city, J.K. Park showed a good abundance. The probable cause

Table 2. Details of collection localities

Sl. No.	Place Name	Latitude	Longitude	Elevation
1	J. K. Park	20.98620	75.56870	229 m
2	Meharun Lake	20.97566	75.89703	236 m
3	Jain Lake	20.92781	75.55450	240 m
4	Water Body (Shirsoli)	20.95324	75.55903	249 m
5	Hanuman Khora	21.00002	75.48056	232 m
6	N M U campus	21.00805	75.49342	201 m
7	Manyarkheda Lake	20.99978	75.86456	241 m
8	Waghur Dam and backwater	20.92491	75.70187	227m

of this richness was due to the abundance of aquatic vegetations which odonates uses as perching and oviposition sites, presence of shade cover, and shoreline structure (Saha and Gaikwad, 2014). Dragonflies occurred mostly in sunny biotopes and damselflies found in shaded areas. Good abundance was also observed in the Mehrun Lake area which is very famous for winter-visiting migratory birds like Brahminy duck, Spoon-billed duck, Asian Openbill stork, and Flamingo (Table 2). Odonata larvae, a major part of food of the migratory birds should be conserved. Seasonality, a very common phenomenon in most of the insect population, was also exhibited by the Odonata. Abundance and species richness increases as soon as precipitation stops after monsoon. The population further decreases during winter till the onset of summer.

Since Odonates provide an excellent easy-to-use indicator group (Samways and Steytler, 1996; Suhling *et al.*, 2004), conservation actions need to be realized especially for tropical odonates. Urban habitats which comprise all the human inhabited area like lakes, dams, rainwater puddles, marshes, urban parks and gardens etc. are good Odonata-rich sites and therefore should be conserved and kept pollution free. Urbanization has a deleterious effect on their population due to destruction of their natural habitats and over pollution. Areas like Mehrun Lake, which are home to a large number of migratory birds should be conserved and kept pollution free. Monitoring their population in these areas might prove beneficial for evaluation of environmental health and quality, apart from providing food to these birds. Observations of the present study might prove to be valuable as reference to biodiversity managers for assessing changes in environmental condition in the study area.

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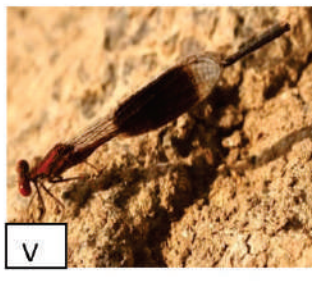
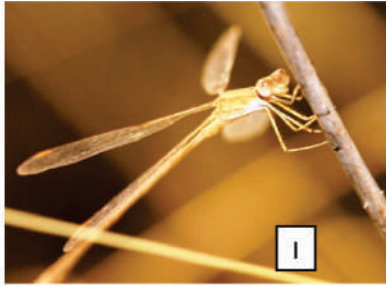
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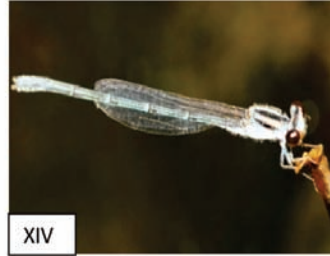
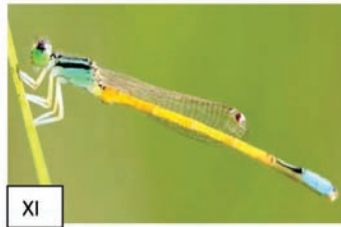
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PLATE 1



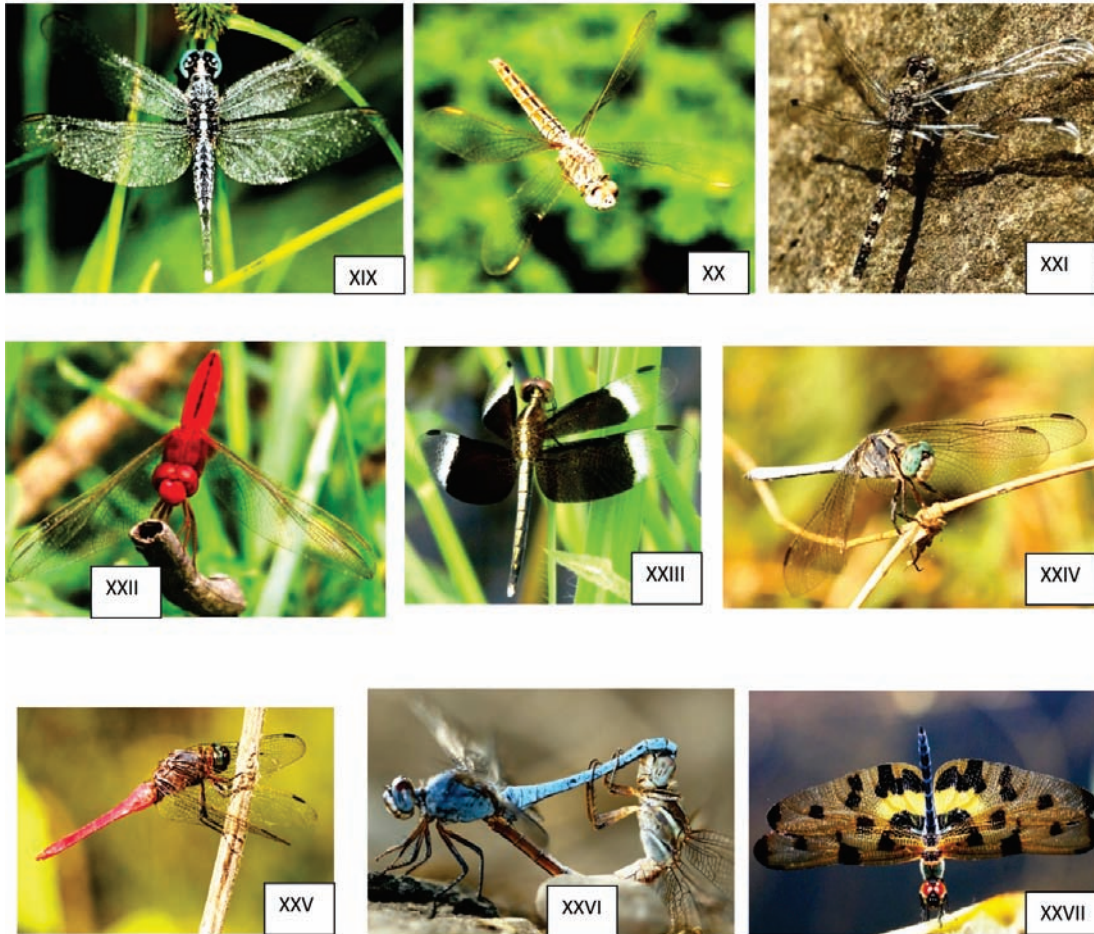
I: *Lestes umbrinus* Selys; II: *Libellago lineata* (Burmeister, 1839); III: *Copera marginipes* (Rambur, 1842); IV: *C. vittata deccanensis* Laidlaw, 1917; V: *Disparoneura quadrimaculata* (Rambur, 1842); VI: *Agriocnemis femina* (Brauer, 1868); VII *Agriocnemis pygmaea* (Rambur, 1842); VIII: *Ceriagrion coromandelianum* (Fabricius, 1798); IX: *Ceriagrion rubiae* Laidlaw, 1916;

PLATE II



X: *Enallagma parvum* Selys, 1876; XI: *Ischnura aurora* (Brauer, 1865); XII: *Ischnura senegalensis* (Rambur, 1842); XIII: *Ischnura nursei* (Morton, 1907); XIV: *Pseudagrion hypermelas* Selys, 1876; XV: *Pseudagrion rubriceps* Selys, 1876; XVI: *Anax immaculifrons* Rambur, 1842; XVII: *Ictinogomphus rapax* (Rambur, 1842); XVIII: *Paragomphus lineatus* (Selys, 1850).

PLATE III



XIX: *Acisoma panorpoides* Rambur, 1842; XX: *Brachythemis contaminata* (Fabricius, 1793); XXI: *Bradinopyga geminata* (Rambur, 1842); XXII: *Crocothemis servilia* (Drury, 1770); XXIII: *Neurothemis tullia* (Drury, 1773); XXIV: *Orthetrum luzonicum* (Brauer, 1868); XXV: *Orthetrum pruinatum neglectum* (Rambur, 1842); XXVI: *Orthetrum taeniolatum* (Schneider, 1845); XXVII: *Rhyothemis variegata* (Linnaeus, 1763).

PLATE IV



XXVIII: *Tramea limbata* (Desjardins, 1832); XXIX: *Trithemis aurora* (Burmeister, 1839); XXX: *Trithemis festiva* (Rambur, 1842). Localities: A: : J.K.Park; B: Mehrun Lake; C: Jain dam area;

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