Article

Diversity of dragonflies (Anisoptera) in Gorewada International Bio-Park, Nagpur, Central India

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Abstract

Gorewada International Bio-Park provides a good habitat for biodiversity of Odonates. Its geographical location is $21^0$11'N $79^0$2'E. Dragonfly watching and recording has been done in each line transect during a week. Total 34 species of dragonflies are recorded belonging to 24 genera and 4 families. Out of total dragonfly species examined, 26 (76.47%) are common and 8 (23.53%) are occasional. Libellulidae family is consisting of maximum number of genera and species followed by Aeshnidae, Gomphidae and Macromiidae. The present study encourages the conservation of a wide range of dragonfly species in this area.

Keywords dragonfly; Anisoptera; Odonata; Insecta; International Bio-Park; Gorewada.

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1 Introduction

Damselflies and dragonflies can be traced back to the Carboniferous and Permian periods of the Paleozoic Era (500-200 million years ago). However, modern families of these insects date from the upper Jurassic and Cretaceous periods (150-60 million years ago) (Westfall and May, 1996).

Dragonflies and damselflies are among the most attractive creatures on earth belonging to the most popular insect order- Odonata. These are observed near the ponds, lakes, rivers, ditches and all over the marshy places. Dragonflies (suborder- Anisoptera) have broad head with confluent separated eyes. Wings are dissimilar; hind-wings are broadly dilated at base and differ in venation from fore-limbs.

Silsby (2001) described about 6000 species of dragonflies in all over the world. The number of odonata species known from UAE (Giles, 1998) and islands of the Sicilian Channel (Corso et al., 2012) (20) till date are very little in respect to Bhutan (31) (Mitra, 2006); Srilanka (117) of which 53 are endemic (De Fonseka, 2000); Bangladesh (114) and Nepal (172) (Prasad and Varshney, 1995) and North America (462) (Paulson and Dunkle, 2012). In India, 470 species of Odonates are recorded belonging to 139 genera and 19 families; while in Maharashtra state 267 species of 87 genera and 8 families are reported (Subramanian, 2009).

Gorewada is a good habitat for biodiversity of dragonflies. It is developing International Bio-Park situated at North-West of Nagpur city and its geographical location is 21°11′N 79°2′E. Gorewada Reservoir is bordered by thick forest on three sides. Reservoirs catchment area is approx. 11 sq. mile (17,702.74 sq. mt.).

In spite of its global significance, studies of dragonfly diversity of Gorewada International Park have been least undertaken. Since, the main objective of this study has been conduct preliminary observation of dragonflies and carried out the checklist, occurrence and richness inhibiting the Gorewada International Bio-Park.

2 Material and Methods

Dragonfly watching and recording has been done for a period of two year from March 2011 to February 2013. The study has been carried out during Sunday and holidays in such a way that there should be least one visit in each line transect during a week. Observations are made through walking transects of 0.6 km to 1 km length with 2 m to 5 m on either side with the aid of binocular and digital cameras. The present study is based on 5 line transects to study the dragonfly population. The sites are visited in morning, noon and evening hours to note maximum possible species of dragonflies and record its activities. The recorded species of Gorewada International Bio-Park (Fig. 1) are identified with the help of photographs by using reference books and publications.

Fig. 1 Line transects along the Gorewada International Bio-Park (Courtesy- Google Map).

3 Results

In the present report, 34 species of dragonflies belonging to 24 genera and 4 families (Gomphidae, Aeshnidae, Libellulidae and Macromiidae) have been recorded (Table 1; Plate 1 and 2).

Gomphids or Clubtails are identified by conspicuous black and yellow coloration with well separated eyes. These are medium to large-sized dragonflies with transparent wings. The last abdominal segment appears bulbous to club shape. They inhabits in flowing water like rivers and streams. In the present observation, 2 genera and species (*Ictinogomphus rapax* and *Paragomphus lineatus*) belonging to family- Gomphidae (Fig. 2 & Table 3).

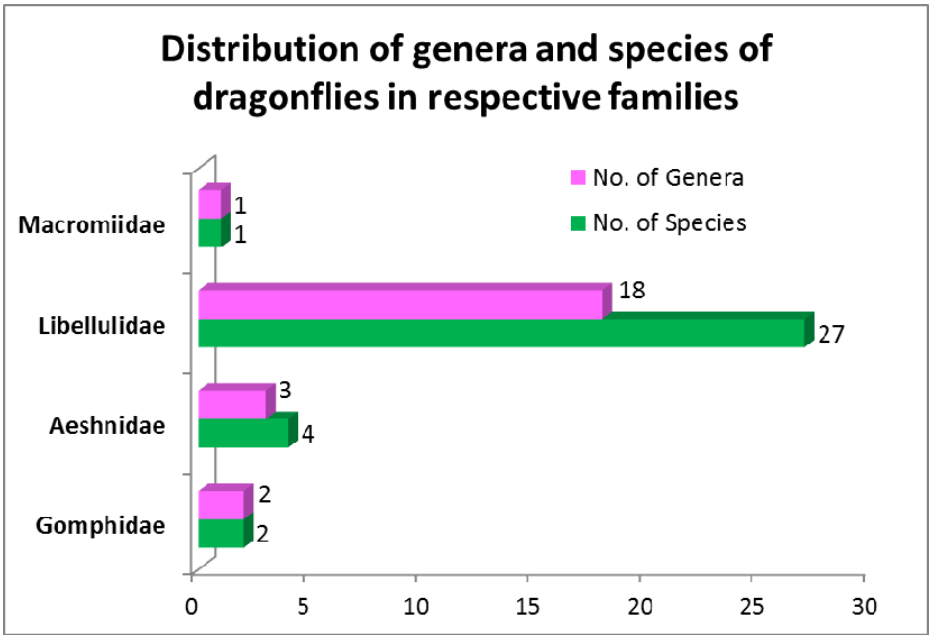


Fig. 2 Distribution of genera and species of dragonflies in respective families.

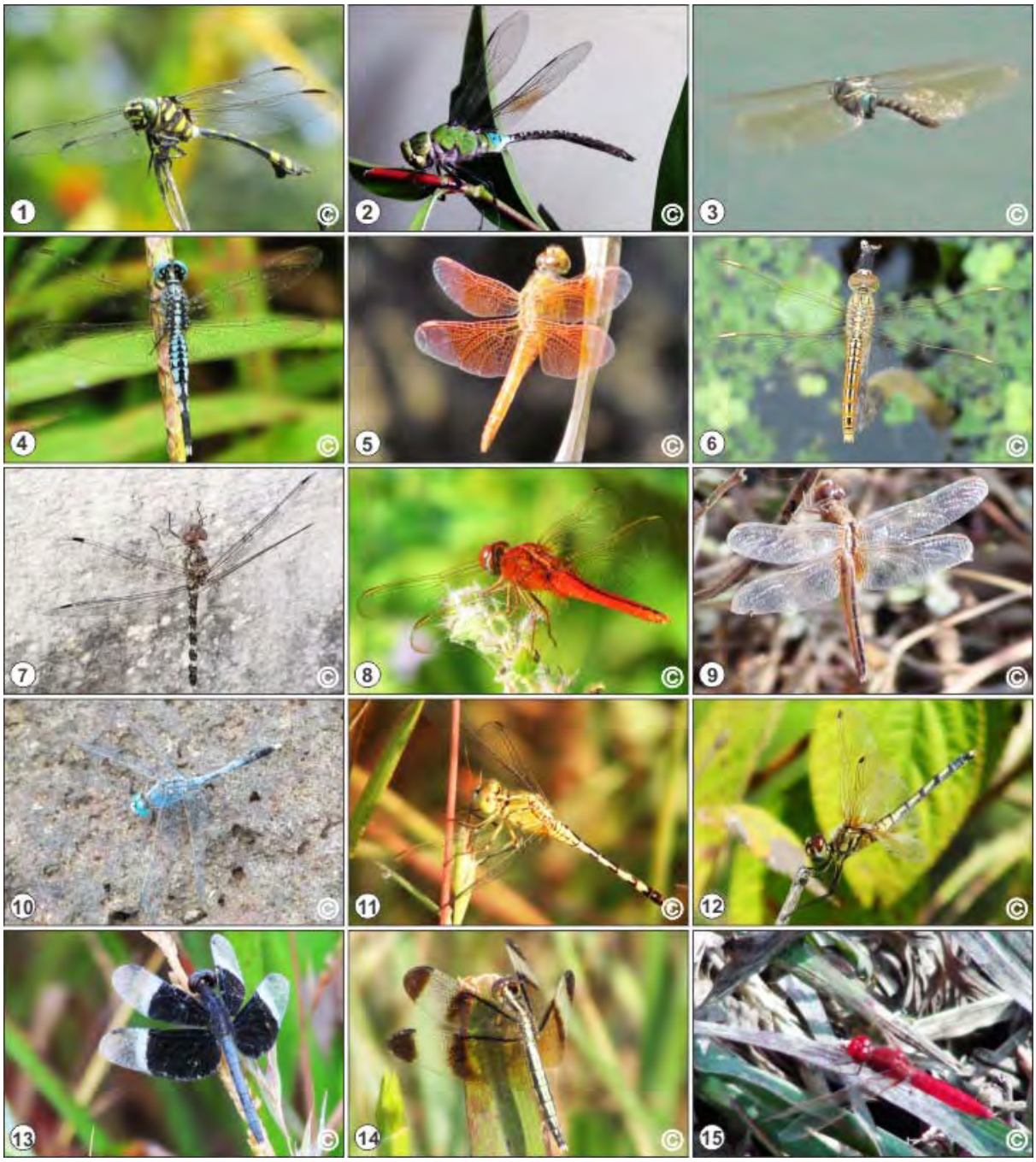
The body colors of Aeshnids or Darners are nonmetallic green, brown or blue. These are medium to large sized dragonflies with fuse eyes along their dorsal margins. It has long anal appendages and abdomen is longer than the wings. These are found near stagnant water with very less flow. 3 genera and 4 species (*Anax guttatus, Anax immaculifrons, Gynacantha bayadera* and *Hemianax ephippiger*) are reported from family- Aeshnidae (Fig. 2 & Table 3).

Libellulids or Skimmers are the most diverse group of dragonflies. They are small, medium to large sized with nonmetallic colors. The wings are varying in size, shape, and width; eyes are broadly confluent and joined on top. These are observed near standing and slow flowing waters. The maximum 27 species (*Acisoma panorpoides, Aethriamanta brevipennis, Brachydiplax sobrina, Brachythemis contaminate, Bradinopyga geminate, Crocothemis servilia, Diplacodes trivialis, Neurothemis intermedia, Neurothemis tullia, Orthetrum chrysis, Orthetrum glaucum, Orthetrum luzonicum, Orthetrum pruinosum, Orthetrum Sabina, Orthetrum taeniolatum, Pantala flavescens, Potamarcha congener, Rhodothemis rufa, Rhyothemis variegate, Tetrathemis platyptera, Tholymis tillarga, Tramea basilaris, Tramea limbata, Trithemis aurora, Trithemis festiva, Trithemis pallidinervis* and *Zyxomma petiolatum*) belongs to 18 genera are monitored from the family- Libellulidae (Fig. 2 & Table 3).

Single species *Epophthalmia vittata* is observed from family- Macromiidae. These are brown colored large dragonflies with yellowish stripes on abdomen. In male wings are transparent having infumed edges but in female wings having amber tint along costal and cubital sides. This species is observed in the plains and lakeside.

In this study, out of 34 dragonfly species examined, 26 (76.47%) are common and 8 (23.53%) are occasional (Table 2).

Plate 1



Figures show diversity of dragonflies- 1. *Ictinogomphus rapax* (Common Clubtail) Male; 2. *Anax guttatus* (Blue-Tailed Green Darner) Male; 3. Anax immaculifrons (Blue Darner) Male; 4. *Acisoma panorpoides* (Trumpet Tail) Male; 5. *Brachythemis contaminata* (Ditch Jewel) Male; 6. *Brachythemis contaminata* (Ditch Jewel) Female; 7. *Bradinopyga geminata* (Granite Ghost) Male; 8. *Crocothemis servilia* (Ruddy Marsh Skimmer) Male; 9. *Crocothemis servilia* (Ruddy Marsh Skimmer) Female; 10. *Diplacodes trivialis* (Ground Skimmer) Male; 11. *Diplacodes trivialis* (Ground Skimmer) Female; 12. *Neurothemis intermedia* (Ruddy Meadow Skimmer) Female; 13. *Neurothemis tullia* (Pied Paddy Skimmer) Male; 14. *Neurothemis tullia* (Pied Paddy Skimmer) Female and 15. *Orthetrum chrysis* (Brown-Backed Red Marsh Hawk) Male.

Plate 2

Figures show diversity of dragonflies- 16. *Orthetrum glaucum* (Blue Marsh Hawk) Male; 17. *Orthetrum pruinosum* (Crimson Tailed Marsh Hawk) Male; 18. *Orthetrum Sabina* (Green Marsh Hawk) Male; 19. *Orthetrum taeniolatum* (Taeniolate Marsh Hawk) Female; 20. *Potamarcha congener* (Yellow Tailed Ashy Skimmer) Female; 21. *Rhyothemis variegata* (Common Picture Wing) Female; 22. *Tholymis tillarga* (Coral Tailed Cloud Wing) Male; 23. *Tholymis tillarga* (Coral Tailed Cloud Wing) Female; 24. *Tramea basilaris* (Red Marsh Trotter) Male; 25. *Tramea basilaris* (Red Marsh Trotter) Female; 26.*Trithemis aurora* (Crimson Marsh Skimmer) Male; 27. *Trithemis aurora* (Crimson Marsh Skimmer) Female; 28. *Trithemis pallidinervis* (Long-Legged Marsh Skimmer) Male and 29. *Trithemis pallidinervis* (Long-Legged Marsh Skimmer) Female.

Table 1 Anisoptera (Odonates) species of Gorewada National Park, Nagpur.

S.N.	Species	Common Name	Status
	Family: Gomphidae (Species- 02)		
1	*Ictinogomphus rapax* (Rambur, 1842)	Common Clubtail	C
2	*Paragomphus lineatus* (Selys, 1850)	Common Hooktail	C
	Family: Aeshnidae (Genera- 03, Species-4)		
3	*Anax guttatus* (Selys, 1839)	Blue-Tailed Green Darner	C
4	*Anax immaculifrons* (Rambur, 1842)	Blue Darner	C
5	*Gynacantha bayadera* (Selys, 1891)	Parakeet Darter	C
6	*Hemianax ephippiger* (Burmeister, 1839)	Ochre tailed Brown Darter	C
	Family: Libellulidae (Genera- 18, Species-27)		
7	*Acisoma panorpoides* (Rambur, 1842)	Trumpet Tail	C
8	*Aethriamanta brevipennis* (Rambur, 1842)	Scarlet Marsh Hawk	O
9	*Brachydiplax sobrina* (Rambur, 1842)	Blue Tailed Black Marsh Skimmer	C
10	*Brachythemis contaminata* (Fabricius, 1793)	Ditch Jewel	C
11	*Bradinopyga geminata* (Rambur, 1842)	Granite Ghost	C
12	*Crocothemis servilia* (Drury, 1770)	Ruddy Marsh Skimmer	C
13	*Diplacodes trivialis* (Rambur, 1842)	Ground Skimmer	C
14	*Neurothemis intermedia* (Rambur, 1842)	Ruddy Meadow Skimmer	O
15	*Neurothemis tullia* (Drury, 1773)	Pied Paddy Skimmer	C
16	*Orthetrum chrysis* (Selys, 1892)	Brown-Backed Red Marsh Hawk	C
17	*Orthetrum glaucum* (Brauer, 1865)	Blue Marsh Hawk	C
18	*Orthetrum luzonicum* (Brauer, 1868)	Tri-coloured Marsh Hawk	O
19	*Orthetrum pruinosum* (Rambur, 1842)	Crimson Tailed Marsh Hawk	C
20	*Orthetrum Sabina* (Drury, 1770)	Green Marsh Hawk	C
21	*Orthetrum taeniolatum* (Schneider, 1845)	Taeniolate Marsh Hawk	O
22	*Pantala flavescens* (Fabricius, 1798)	Wandering Glider	C
23	*Potamarcha congener* (Rambur, 1842)	Yellow Tailed Ashy Skimmer	C
24	*Rhodothemis rufa* (Rambur, 1842)	Rufous Marsh Glider	O
25	*Rhyothemis variegata* (Linnaeus, 1763)	Common Picture Wing	C
26	*Tetrathemis platyptera* (Selys, 1878)	Pigmy Skimmer	O
27	*Tholymis tillarga* (Fabricius, 1798)	Coral Tailed Cloud Wing	C
28	*Tramea basilaris* (Kirby, 1889)	Red Marsh Trotter	C
29	*Tramea limbata* (Desjardins, 1842)	Black Marsh Trotter	O
30	*Trithemis aurora* (Burmeister, 1839)	Crimson Marsh Skimmer	C
31	*Trithemis festiva* (Rambur, 1842)	Black Stream Glider	C
32	*Trithemis pallidinervis* (Kirby, 1889)	Long-Legged Marsh Skimmer	C
33	*Zyxomma petiolatum* (Rambur, 1842)	Brown Dusk Hawk	O
	Family: Macromiidae (Species-1)		
34	*Epophthalmia vittata* (Burmeister, 1839)	Common Torrent Hawk	C
	Families-04; Genera-24; Species- 34		

Abbreviations- C- Common; O- Occasional

Table 2 Status of dragonflies of Gorewada International Bio-Park.

S.N.	**Status**	**No. of species**	**% of species**
1.	Common	26	76.47
2.	Occasional	08	23.53
		34	100.00

Table 3 Distribution of genera and species in respective families.

S.N.	Family	No. of Genera	No. of Species
1.	Gomphidae	02	02
2.	Aeshnidae	03	04
3.	Libellulidae	18	27
4.	Macromiidae	01	01
	4	**24**	**34**

4 Dissusion

Total 34 species of dragonflies belonging to 24 genera and 4 families (Gomphidae, Aeshnidae, Libellulidae and Macromiidae) have been reported in the present study. The family Libellulidae is consisting of maximum number of genera and species followed by Aeshnidae, Gomphidae and Macromiidae.

Dragonflies are a predaceous, hemi-metabolous and amphibiotic insect, which inhabits all kinds of freshwater habitats either permanent or temporary (Silsby, 2001). Subramanian (2009) reported 11 dragonfliy families, of which Libellulidae (972) and Gomphidae (958) are major families containing maximum species throughout the world followed by Aeshnidae (436), Corduliidae (249) and Macromiidae (123). In India, out of 7 families, Libellulidae and Gomphidae are major families consisting of 85 species each. These are followed by Aeshnidae (45), Macromiidae (17), and Corduliidae (16). A very least number of species are reported in family- Chlorogomphidae (10) and Cordulegastridae (9). In Indian peninsula, major species are studied under family- Libellulidae (50) followed by Gomphidae (27) Macromiidae (17) and Aeshnidae (8).

Sharma et al., (2009) collected 147 species of dragonflies belongs to 5 families in Indian Agricultural Research Institute, New Delhi, India; of which 74, 36, 19, 16 and only 2 species are belongs to family- Libellulidae, Gomphidae, Aeshnidae, Corduliidae and Cordulegasteridae respectively. In Orissa and Eastern India, Nair (2011) recorded 45, 9, 8 and 3 species belongs to family- Libellulidae, Gomphidae, Aeshnidae and Cordulegasteridae. Manwar et al. (2012) in Chatri Lake Region, in Pohara–Malkhed Reserve Forest, Amravati, Maharashtra (India) recorded 22 species of dragonflies and damselflies of 4 families and 17 genera; of which 50% species are of family Libellulidae followed by Coenogrionidae (36%), Gomphidae (9%) and Platycenemididae (5%).

In Western Ghats, the Anisoptera has 53 genera, 107 species with 31 endemics. The families Libellulidae (49 species), Gomphidae (26 species) and Corduliidae (22 species) are the most species-rich, followed by Aeshnidae (8 species) Cordulegasteridae and (2 species) (Subramanian *et al.,* 2011). Tijare & Patil (2012) were observed 21 species of dragonflies in and around Gorewada National Park, Nagpur; of which 15 species belonging to Family- Libellulidae, 4 species from Aeshnidae and 2 species from Gomphidae. The above observations are similar to the present observations where family- Libellulidae is the largest family carrying maximum number of species and dragonflies are amphibiotic insects found all kind of freshwater bodies.

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