International Journal of Zoology Studies
www.zoologyjournals.com
ISSN: 2455-7269
Received: 27-11-2023, Accepted: 12-12-2023, Published: 28-12-2023
Volume 8, Issue 4, 2023, Page No. 71-78

Preliminary survey and species diversity of odonates of munia conservation reserve (MCR) of Nagpur district, central India: A checklist

Narendra G Chandewar[1], Sreelakshmi A[2]
[1] Department of Forest, Divisional Forest Officer, METDB, Nagpur, Government of Maharashtra, Maharashtra, India
[2] Department of Forest, Conservator of Forest (T), Nagpur Forest Circle, Government of Maharashtra, Maharashtra, India

Abstract
The present research focuses on conducting a preliminary survey to assess the biodiversity and preparation of checklist of Odonata (dragonflies and damselflies) in the Munia Conservation Reserve (MCR), Nagpur District of Maharashtra state. A checklist of 75 species, belonging to 43 genera and 10 families, was prepared to document the presence of these fascinating insects in the region. The survey identified 48 species of 30 genera of dragonflies and 27 species of 13 genera of damselflies. Ascending order of families of Anisoptera suborder - Libellulidae (30 species) fallowed by Gomphidae (8 species), Ashnidae (6 species), Macromiidae (3 species), and families of Zygoptera suborder- Coenagrionidae (18 species), followed by Protoneuridae (3 species), Lestidae (3 species), Platycnemididae (2 species), Chlorocyphidae (1 species). This paper discusses the methodology employed, checklist preparation, key findings, and implications for the conservation and management of Odonata species in MCR region.

Keywords: Odonata, dragonflies, damselflies, biodiversity, Nagpur District, MCR, conservation, habitat preservation, preliminary survey

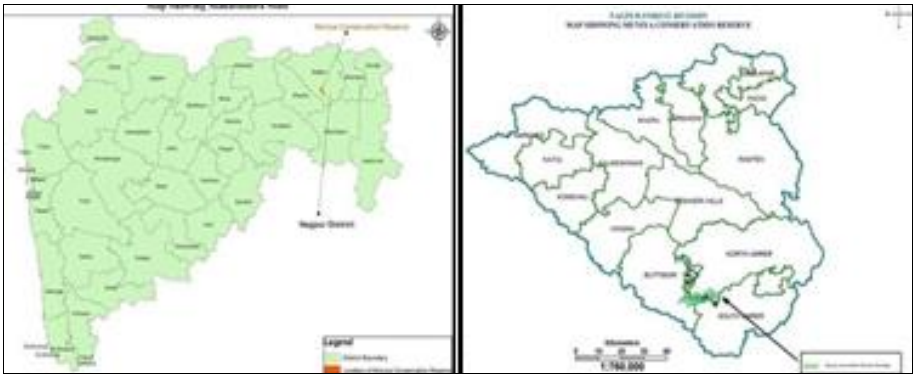
Introduction

Maharashtra State Government declared Munia Conservation Reserve (MCR) by notification dated 11 may 2021. (Notification no. WLP.0321/CR-67/F-1) Situation, limit and area of Munia Conservation Reserve (MCR) is in Butibori and North Umred ranges of Nagpur Forest Division of Nagpur Forest Circle having area is 9601.43 Ha. (96.01sq.km). The forests are widely spread and mainly situated on hilly slopes surrounded by cultivated plains. The majority of forest areas in the MCR are plain, undulating, and hilly area contain heterogeneous landscape like grassland, zudapi Jungle, dense forest, wetlands, undulating and hilly rocky forest having clear eco-tone. Very hot summer adversely affects vegetation growth more so because of highly radiating exposed quartzite and basalt in the tract. The rainy season generally starts from the second week of June and continuous up to the end of September every year. The forests of Nagpur Division belong to the Sub Group 5A -Southern Tropical Dry Deciduous Forests as per 'Revised classification of Champion and Seth'. (Working Plan of Nagpur Forest Division, Volume I, Period 2015-16 to 2024-25 by P. Kalyankumar and T.K. Choubey) (Chandewar *et al*., 2023) [6].

Dragonflies and damselflies are ecologically important insects known for their significance in water ecosystems. They play a crucial role in maintaining the balance of aquatic ecosystems by controlling insects, including mosquitoes, at their larval and adult stages.

Globally 6256 species in 686 genera of Odonates are known of this, 487 species, and 27subspecies in 152 genera and 18 families exist in India. The significant species of Odonata are found in India, high diversity and endemism is restricted to southern Western Ghats, Eastern Himalaya, Western Himalaya and Andaman and Nicobar Islands. Western Ghats and Eastern Himalaya have 191 and 256 species respectively. High diversity is found in hill streams, and forested riverine habitats and most of the endemic species are restricted to this habitat. Habitats like ponds, lakes, coastal marshes, irrigation canals and paddy fields have common and wide spread species (Mitra *et al.*, 2009 [19]; Subramanian, 2009; Subramanian *et al.*, 2011).

However, limited scientific research has been conducted on Odonata species in the Munia Conservation Reserve (MCR), Nagpur District. Therefore, this study aims to contribute to the existing knowledge on the diversity and distribution of Odonata in the region.



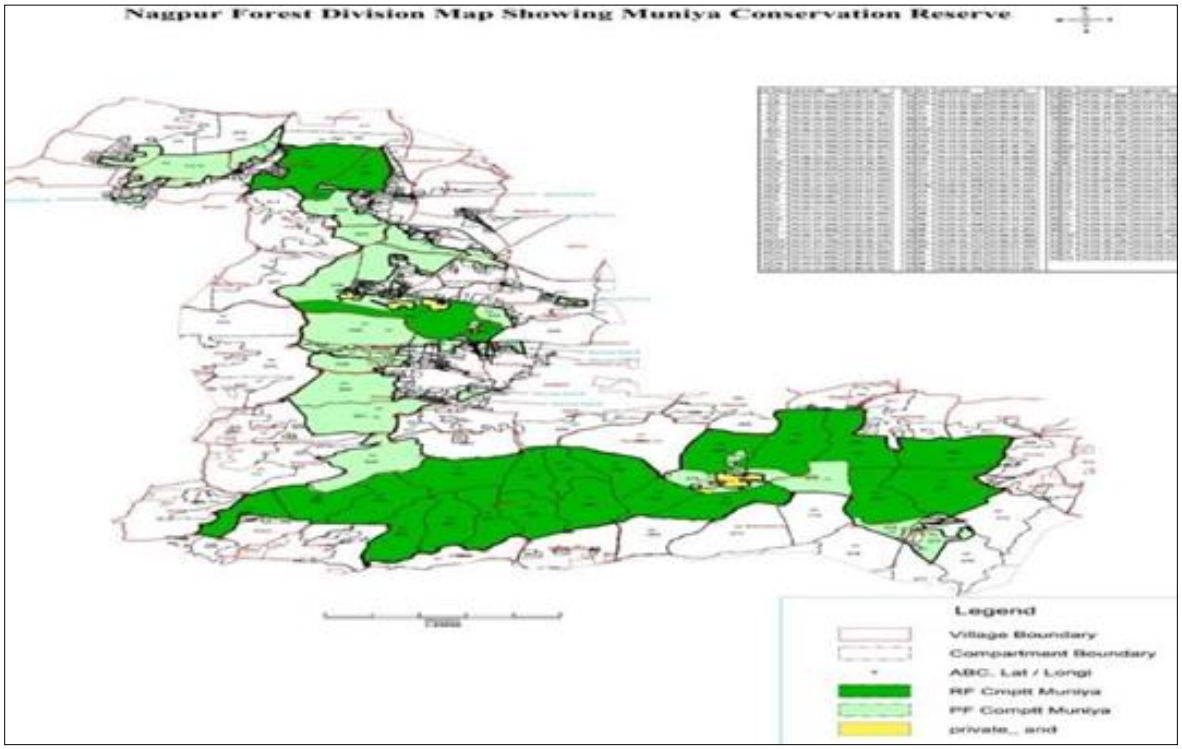


Fig 1: Map showing (MCR) study area

Materials and Methods

1. Study Area

The study was conducted in various habitats across Munia Conservation Reserve (MCR), Nagpur District, including grasslands, rivers, lakes, ponds, and wetlands. (Fig. No. 5). Situation and limits of "Munia Conservation Reserve" Located in Butibori and North Umred forest ranges of Nagpur Forest division of Nagpur district and lies between 79.00 East and 79.15 East longitudes and 20.40 North and 21.00 North latitude, covered with heterogeneous landscape and beautiful forest with some hilly area.

Table 1: Area showing of Munia Conservation Reserve (MCR)

Sr. No	Range	Compartment No.	ForestArea		Total Area (Ha.)
			RF	PF	
1	Butibori	23	3038.51	2317.47	5355.98
2	North Umred	15	3044.12	1201.33	4245.45
		38	6082.63	3518.80	9601.43

For study of Odonates covered all 38 compartment of reserve forest and protected forest covering all natural habitats having total area of MCR is 9601.43 Ha. i.e. 96.01 sq.km. (Chandewar *et al*., 2023) [6]

2. Survey, Sampling and Data collection

A combination of field observations, visual surveys, and photograph techniques was employed to collect images of Odonata species. Extensive sampling efforts were carried out across different habitats to ensure maximum coverage. Survey was carried out for four consecutive months, one day in a week from 1 July to 31 October 2023 and observation taken in selected time in the morning from 8.00 AM to 11.00 AM and in the evening from 4.00 PM to 5.30 PM with visual encounter method, when Odonates are more active. (Subramanian 2009; Payra and Tiple 2019). On the basis of the frequency of sighting, the species were assigned categories of species abundance as Rare (R) when encountered less than 10% of visits, Not Rare (NR) when encountered 10 to 25% of visits, Common (C) when encountered 25 to 50% of visits and the others were as Very Common (VC) when encountered above 50% of visits (Tiple A. D. *et al*, 2006 [39]; Tiple A. D. *et al*, 2007; Tiple A. D. *et al*, 2008) [35]

3. Taxonomic Identification

Photographs of dragonfly and damselfly was taken in their natural habitat for depository. (Fig. No.4). The collected specimens photograph was carefully examined and identified using standard taxonomic keys, specialized literature, and expert consultations. (Fraser 1933 [7], 1934, 1936; Mitra, 1986 [20]; Subramanian, 2005; Andrew R. J. *et al*., 2008 [2]; Nair, 2011 [21]; Subramanian and Babu, 2017; Joshi *et al*, 2019 [15]; Schorr and Paulson, 2020). Voucher photograph specimens were preserved and deposited in a designated repository for future reference. There were no live specimens collected during survey and study.

4. Checklist preparation and Literature Survey

For the Checklist, firstly the available literature on Odonates in protected areas of Vidarbha and specifically Nagpur districts was collected. These materials included standard reference, books, photo guide books and research papers as

well as materials searched and collected from online websites and archives. The standard material collected was arranged from the very beginning to July 2023. After a thorough review of the literature, an updated checklist of Odonates recorded in all the protected areas of Nagpur was prepared. (Table No.2).

Dragonfly and damselfly (Odonata) species diversity was studied in the Bor wildlife sanctuary and 72 species of Odonates belonging to 8 families were recorded. (Tiple, A.D., 2020) [37]. Twenty species of Odonates from 15 genera and 3 families were discovered, in the area around Nagpur's Koradi lake. (Sharma, P. *et al*, 2022) [27]. A total of 62 species belonging to 35 genera and 9 families recorded in and around Nagpur city, Central India. (Tiple, A. D. *et al*., 2008) [35]. The Odonate fauna of Nagpur consists of 99 species in 53 genera of 10 families. It includes 60 species of Dragonflies (Anisoptera) in 37 genera of 5 families and 39 species of Damselflies (Zygoptera) in 16 genera of 5 families. (Gajbe, P. U., 2020) [10]. Total 38 species of Odonates recorded from Mahurzari wetland near Nagpur city. (Patil *et al*, 2014). 28 species of Odonates recorded from Umred-Karhandla wildlife sanctuary of Nagpur District. (Gajbe P. U., 2015) [11]. And 25 species of Odonates recorded from Sonegaon lake of Nagpur city (Gajbe P. U., 2019) [12]. A total of 34 Odonate species belonging to 24 genera representing 5 families- Coenagrionidae (7), Lestidae (1), Aeshnidae (3), Gomphidae (1) and Libellulidae (22) was found breeding in Zilpi lake. (Andrew R.J., 2013) [3]. A total 35 Odonates (dragonflies=22; damselflies=13) recorded from Gondia district. (Bharathi D. and Koparde P., 2022) [4].

Results and Discussion

A comprehensive checklist of Odonata species was compiled, incorporating the findings from the survey. A checklist of 75 species, belonging to 43 genera and 10 families, was prepared to document the presence of these fascinating insects in the region. (Table No. 2). The survey identified 48 species of 30 genera of dragonflies and 27 species of 13 genera of damselflies. Ascending order of families of Anisoptera suborder - Libellulidae (30 species) Fallowed by Gomphidae (8 species), Ashnidae (6 species), Macromiidae(3 species), and families of Zygoptera suborder- Coenagrionidae (18 species), followed by Protoneuridae (3 species), Lestidae (3 species), Platycnemididae (2 species), Chlorocyphidae (1 species). (Table No. 3). Among the recorded species, 48 were dragonflies and 27 were damselflies, reflecting the relatively higher diversity of dragonflies in the region. Table No. 4 shows the status of Odonates of MCR of Nagpur, in which very common (VC) are 35 species with percentage of species is 46.67 %, and common (C), rare (R), and not rare (NR) are 21species (28.00%), 8 species (10.66%), 11 species (14.67%) respectively. This study provides a baseline for future studies and highlights the rich Odonata diversity in the Munia Conservation Reserve (MCR), Nagpur District.

The diversity of Odonata species documented during this preliminary survey indicates the presence of well-preserved aquatic habitats in the Munia Conservation Reserve (MCR), Nagpur District. The high number of recorded species suggests a healthy ecosystem capable of supporting diverse Odonata populations. However, further research should be conducted to assess the threats faced by these species and develop adequate conservation measures.

Table 3: Representation of Odonates as per, SubOrder, Family, Genus and Species.

Sub Order	Family	Genus	Species
Anisoptera	Aeshnidae	3	6
	Gomphidae	6	8
	Libellulidae	18	30
	Macromiidae	2	3
	Corduliidae	1	1
	Total	30	48
Zygoptera	Coenagrionidae	7	18
	Lestidae	1	3
	Chlorocyphidae	1	1
	Platycnemididae	1	2
	Protoneuridae	3	3
	Total	13	27
	All total	43	75

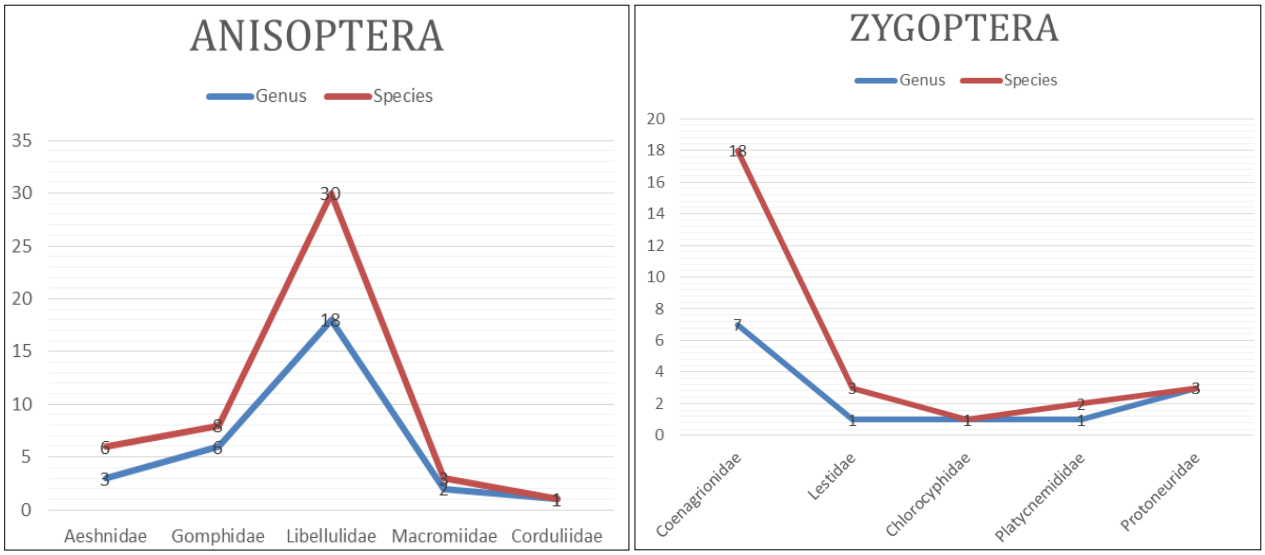


Fig 2: Representation of Sub-Order- Anisoptera and Zygoptera

Table 4: Status of Odonates of MCR of Nagpur, Central India

Sr. No.	Status	No. of Species	% of Species
1	Very Common (VC)	35	46.67
2	Common (C)	21	28.00
3	Rare (R)	8	10.66
4	Not Rare (NR)	11	14.67
	Total	75	100 %

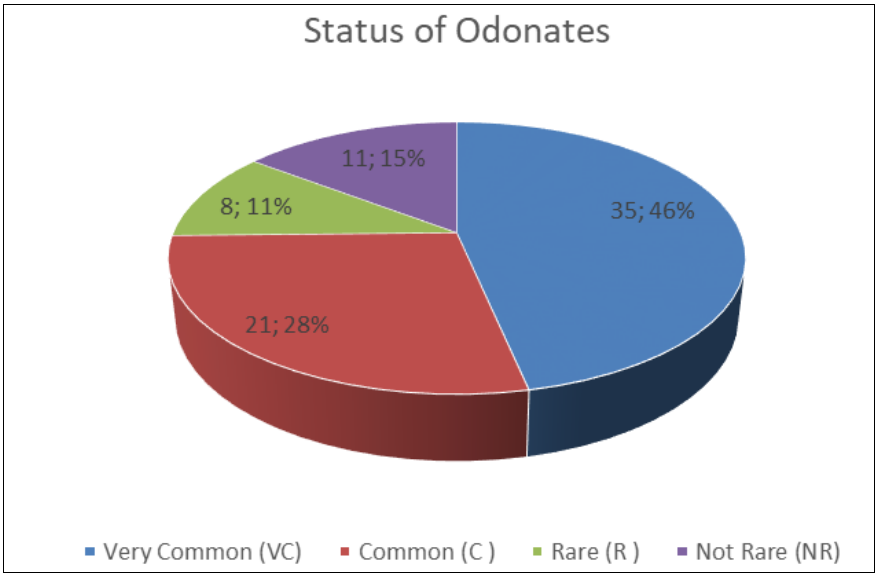


Fig 3: Status of Odonates of MCR of Nagpur, Central India.

Conservation Implications

Understanding the distribution, abundance, and environmental requirements of Odonata species is crucial for their conservation. The findings of this study provide valuable insights for implementing conservation strategies in the Munia Conservation Reserve (MCR), Nagpur District. Conservation efforts should focus on protecting and restoring key habitats, ensuring water quality, and minimizing human-induced disturbances that negatively impact Odonata populations.

Conclusion

This preliminary survey conducted in the Munia Conservation Reserve (MCR), Nagpur District, provides a significant contribution to the knowledge of Odonata Diversity in the region. The checklist of 75 species, including 48 dragonfly and 27 damselfly species, provides a foundation for future research and conservation initiatives. Continued efforts in monitoring, research, and conservation are essential to ensure the long-term survival of Odonata species and their ecosystems.

Acknowledgements

Authors are thankful to Government of Maharashtra, Forest Department for support and giving opportunity for this research work. Also thankful to the Professors, Informers, Biologists etc. who open heartedly shared their knowledge with us and also grateful to my staff for co-operating during entire study and field works and discussion.

Table 2: Checklist of Odonates of MCR, Nagpur.

Sr. No.	Zoological Name	Suborder	Family	Common Name	Status
1.	*Anax guttatus* (Burmeister,1839)	Anisoptera (Dragonflies)	Aeshnidae	Blue-tailed Green Darner	NR
2.	*Anax immaculifrons*(Rambur,1842)	Anisoptera (Dragonflies)	Aeshnidae	Blue Darner	C
3.	*Anax parthenope* (Selys,1839)	Anisoptera (Dragonflies)	Aeshnidae	The lesser Emperor	VC
4.	*Gynacantha bayadera* (Selys,1891)	Anisoptera (Dragonflies)	Aeshnidae	Parakeet Darter	R
5.	*Gynacantha dravida* (Lieftinck,1960)	Anisoptera (Dragonflies)	Aeshnidae	Brown Darner	C
6..	*Hemianax ephippiger* (Burmeister,1839)	Anisoptera (Dragonflies)	Aeshnidae	Ochre tailed Brown Darter	NR
7.	*Anormogomphus heteropterus* (Selys,1854)	Anisoptera (Dragonflies)	Gomphidae		R
8.	*Cyclogomphus wilkinsi* (Fraser,1926)	Anisoptera (Dragonflies)	Gomphidae		R
9.	*Gomphidia t-nigrum*(Selys,1854)	Anisoptera (Dragonflies)	Gomphidae	Other T-marked River Clubtail	VR
10.	*Ictinogomphus distinctus (*Ram,1985)	Anisoptera (Dragonflies)	Gomphidae	Common flange Tailed	R
11.	*Ictinogomphus rapax*(Rambur, 1842)	Anisoptera (Dragonflies)	Gomphidae	Common Clubtail	VC
12.	*Macrogomphus annulatus* (Selys,1854)	Anisoptera (Dragonflies)	Gomphidae	Keiser's forktail	C
13.	*Microgomphus torquatus* (Selys,1854)	Anisoptera (Dragonflies)	Gomphidae	Clubtail	R
14.	*Paragomphus lineatus* (Selys,1850)	Anisoptera (Dragonflies)	Gomphidae	Common Hooktail	VC
15.	*Acisoma panorpoides* (Rambur,1842)	Anisoptera (Dragonflies)	Libellulidae	Trumpet tail	C
16.	*Aethriamanta brevipennis* (Rambur,1842)	Anisoptera (Dragonflies)	Libellulidae	Scarlet marsh Hawk	C
17.	*Brachydiplax sobrina* (Rambur, 1842)	Anisoptera (Dragonflies)	Libellulidae	Blue-tailed Black Marsh Skimmer	NR

18.	*Brachythemis contaminate* (Fabricius,1793)	Anisoptera (Dragonflies)	Libellulidae	Ditch Jewel	VC
19.	*Bradinopyga geminate* (Rambur,1842)	Anisoptera (Dragonflies)	Libellulidae	Granite Ghost	VC
20.	*Crocothemis servilia* (Drury,1770)	Anisoptera (Dragonflies)	Libellulidae	Ruddy Marsh Skimmer	VC
21.	*Diplacodes lefebvrii* (Rambur,1842)	Anisoptera (Dragonflies)	Libellulidae	Black Ground Skimmer	NR
22.	*Diplacodes trivialis* (Rambur,1842)	Anisoptera (Dragonflies)	Libellulidae	Ground Skimmer	VC
23.	*Lathrecista asiatica* (Fabricius,1798)	Anisoptera (Dragonflies)	Libellulidae	Asiatic blood tail	C
24.	*Neurothemis fulvia* (Drury,1773)	Anisoptera (Dragonflies)	Libellulidae	Fulvous Forest Skimmer	VC
25.	*Neurothemis intermedia* (Rambur,1842)	Anisoptera (Dragonflies)	Libellulidae	Ruddy Meadow Skimmer	VC
26.	*Neurothemis tullia* (Drury,1773)	Anisoptera (Dragonflies)	Libellulidae	Paddy Skimmer	C
27.	*Orthetrum chrysis* (Selys,1891)	Anisoptera (Dragonflies)	Libellulidae	Brown Backed Red Marsh Hawk	NR
28.	*Orthetrum glaucum* (Brauer,1865)	Anisoptera (Dragonflies)	Libellulidae	Blue Marsh Hawk	C
29.	*Orthetrum luzonicum* (Brauer,1868)	Anisoptera (Dragonflies)	Libellulidae	Tricoloured Marsh Hawk	VC
30.	*Orthetrum pruinosum* (Burmeister,1839)	Anisoptera (Dragonflies)	Libellulidae	Crimson-tailed Marsh Hawk	VC
31.	*Orthetrum Sabina* (Drury,1773)	Anisoptera (Dragonflies)	Libellulidae	Green Marsh Hawk	VC
32.	*Orthetrum taeniolatum* (Schneider,1845)	Anisoptera (Dragonflies	Libellulidae	Taeniolate Marsh Hawk	C
33.	*Pantala flavescens* (Fabricius, 1798)	Anisoptera (Dragonflies	Libellulidae	Wandering Glider	VC
34.	*Potamarcha congener* (Rambur, 1842)	Anisoptera (Dragonflies	Libellulidae	Yellow Tailed Ashy Skimmer	VC
35.	*Rhodothemis rufa* (Rambur,1842)	Anisoptera (Dragonflies	Libellulidae	Rufous Marsh Glider	VR
36.	*Rhyothemis variegate* (Linnaeus, 1763)	Anisoptera (Dragonflies	Libellulidae	Common picture Wing Variegated flutter	VC
37.	*Tholymis tillarga* (Fabricius, 1798)	Anisoptera (Dragonflies	Libellulidae	Coral Tailed Cloud Wing	C
38.	*Tramea basilaris* (Kirby,1889)	Anisoptera (Dragonflies	Libellulidae	Red Marsh Trotter	C
39.	*Tramea limbata* (Desjardins,1858)	Anisoptera (Dragonflies	Libellulidae	Black marsh Trotter	C
40.	*Tramea virginia* (Rambur,1842)	Anisoptera (Dragonflies	Libellulidae	Saddlebag Glider	VC
41.	*Trithemis aurora* (Burmeister, 1839)	Anisoptera (Dragonflies	Libellulidae	Crimson Marsh Skimmer	VC
42.	*Trithemis festiva* (Rambur,1842)	Anisoptera (Dragonflies	Libellulidae	Black Stream Glider	VC
43.	*Trithemis pallidinervis* (Kirby, 1889)	Anisoptera (Dragonflies	Libellulidae	Long legged Marsh Skimmer	VC
44.	*Zyxomma petiolatum* (Rambur, 1842)	Anisoptera (Dragonflies	Libellulidae	Brown dusk Hawk	C
45.	*Epophthalmia vittata* (Burmeister,1839)	Anisoptera (Dragonflies	Macromiidae	Common Torrent Hawk	C
46.	*Macromia flavicincta* (Selys,1874)	Anisoptera (Dragonflies	Macromiidae	Emerald Green Eyes	VR
47.	*Macromia cingulata* (Rambur,1842)	Anisoptera (Dragonflies	Macromiidae	River Cruiser	C
48.	*Hemicordulia asiatica* (Selys,1878)	Anisoptera (Dragonflies	Corduliidae	Asian Emerald	R
49.	*Libellago indica* (Fraser,1928)	Zygoptera (Damselflies)	Chlorocyphidae	Southern helioder	VC
50.	*Aciagrion hisopa* (Selys,1876)	Zygoptera (Damselflies)	Coenagrionidae	Violet striped slender Darlet	R
51.	*Aciagrion occidentale* (Laidlaw,1919)	Zygoptera (Damselflies)	Coenagrionidae	Green striped Slender Darlet	VR
52.	*Aciagrion pallidum* (Selys,1891)	Zygoptera (Damselflies)	Coenagrionidae	Pale Slender Darlet	C
53.	*Agriocnemis femina* (Brauer,1868)	Zygoptera (Damselflies)	Coenagrionidae	Pruinose Darlet	VC
54.	*Agriocnemis pygmaea* (Rambur,1842)	Zygoptera (Damselflies)	Coenagrionidae	Pigmy Darlet	VC
55.	*Ceriagrion coromandelianum* (Fabricius,1798)	Zygoptera (Damselflies)	Coenagrionidae	Coromandel Marsh Dart	VC
56.	*Ceriagrion olivaceum* (Laidlaw,1914)	Zygoptera (Damselflies)	Coenagrionidae	Rusty Marsh Dart	VC
57.	*Ceriagrion rubiae* (Laidlaw,1916)	Zygoptera (Damselflies)	Coenagrionidae	Orange Marsh Dart	C
58.	*Enallagma parvum* (Selys,1876)	Zygoptera (Damselflies)	Coenagrionidae	Azure Darlet	VC
59.	*Ischnura aurora* (Brauer,1865)	Zygoptera (Damselflies)	Coenagrionidae	Golden Darlet	VC
60.	*Ischnura senegalensis* (Rambur,1842)	Zygoptera (Damselflies)	Coenagrionidae	Senegal Golden Darlet	VC
61.	*Ischnura rubilio* (Selys, 1876)	Zygoptera (Damselflies)	Coenagrionidae	Western Golden Darlet	C
62.	*Pseudagrion decorum* (Rambur,1842)	Zygoptera (Damselflies)	Coenagrionidae	Three Lined Dart	VC
63.	*Pseudagrion indicum* (Fraser,1924)	Zygoptera (Damselflies)	Coenagrionidae	Yellow Striped Blue Dart	VC
64.	*Pseudagrion malabaricum* (Fraser,1924)	Zygoptera (Damselflies)	Coenagrionidae	Malabar sprite Jungle Grass Dart	C
65.	*Pseudagrion microcephalum* (Rambur,1842)	Zygoptera (Damselflies)	Coenagrionidae	Blue Grass Dart	C
66.	*Pseudagrion rubriceps* (Selys, 1876)	Zygoptera (Damselflies)	Coenagrionidae	Saffron Faced Blue Dart	VC
67.	*Rhodischnura nursei* (Morton, 1907)	Zygoptera (Damselflies)	Coenagrionidae	Pixie Darlet	VC
68.	*Lestes elatus* (Selys,1862)	Zygoptera (Damselflies)	Lestidae	Emerald Spread Wing	VR
69.	*Lestes umbrinus* (Selys,1891)	Zygoptera (Damselflies)	Lestidae	Brown Spread wing	VC
70.	*Lestes viridulus (Rambur,1842)*	Zygoptera (Damselflies)	Lestidae	Emerald-Striped Spread wing	VC
71.	*Copera marginipes* (Rambur,1842)	Zygoptera (Damselflies)	Platycnemididae	Yellow Bush Dart	VC
72.	*Copera vittata* (Laidlaw,1917)	Zygoptera (Damselflies)	Platycnemididae	Blue Bush Dart	C
73.	*Caconeura ramburi* (Fraser,1922)	Zygoptera (Damselflies)	Protoneuridae	Indian Blue Bamboo Tail	R
74.	*Disparoneura quadrimaculata* (Rambur,1842)	Zygoptera (Damselflies)	Protoneuridae	Black winged Bamboo Tail	VC
75.	*Elattoneura nigerrima* (Laidlaw,1917)	Zygoptera (Damselflies)	Protoneuridae	Other Black and Yellow Bamboo Tail	NR

Fig 4: Odonates of Munia Conservation Reserve (MCR), of Nagpur District, Maharashtra.

Fig 5: Natural Habitats of Munia Conservation Reserve (MCR), of Nagpur District, Maharashtra.

References

1. Tiple A, Koparde P. Odonata of Maharashtra, India with notes on species distribution. Journal Insect Science,2015:15(1):47.
2. Andrew RJ, Subramaniam KA, Tiple AD. A Handbook on Common Odonates of Central India. Nagpur, India: South Asian Council of Odonatology, 2008. 54.
3. Andrew RJ. Odonates of Zilpi Lake of Nagpur (India) with a note on the emergence of the libellulidae dragonfly, Trithemis pallidinervis. J New Biol Rep,2013:2(2):177-187.
4. Bharathi D, Koparde P. Records of Dragonflies & Damselflies (Insecta: Odonata) from Gondia district, Maharashtra, India. Journal of Insect Biodiversity and Systematics,2022:8(3):379-387.
5. Champion HG, Seth SK. A Revised Survey of the Forest Types of India. New Delhi, India: Gov. of India Press, 1968, 404.
6. Chandewar NG, Chandewar R. Exploration and documentation of wild edible plants of Muniya Conservation Reserve (MCR) of Nagpur district, Maharashtra State. International Journal of Innovative Research in Science, Engineering, and Technology,2023:12(4):4063-4072.
7. Fraser FC. The Fauna of British India including Ceylon and Burma. Odonata London: Taylor and Francis Ltd.,1933:1:423.
8. Fraser FC. The Fauna of British India including Ceylon and Burma. Odonata Vol. II. London: Taylor and Francis Ltd, 1993, 398.
9. Fraser FC. The Fauna of British India including Ceylon and Burma. Odonata Vol. III. London: Taylor and Francis Ltd, 1936, 461.
10. Gajbe PU. Checklist of Odonate Fauna (Insecta: Odonata) of Nagpur, Maharashtra, India. J New Biol Rep,2020:9(1):53-59.
11. Gajbe PU. Odonate fauna of Karhandla region of Umred-Karhandla Wildlife Sanctuary, Maharashtra, India. J New Biol Rep,2015:4(3):233-237.
12. Gajbe PU. Diversity of odonates (Insecta: Odonata) around Sonegaon Lake, Nagpur, Maharashtra, India. J New Biol Rep,2019:8(3):167-171.
13. IUCN. International Union of Conservation Network red-list of threatened species. Available at http://www.iucnredlist.org/.
14. Joshi S, Sawant D. Description of Bradinopyga konkanensis sp. nov. (Odonata: Anisoptera: Libellulidae) from the coastal region of Maharashtra, India. Zootaxa,2020:4779(1):65–78.
15. Joshi S, Dawn P, Roy P, Kunte K (eds.). Odonata of India, v.1.48. Indian Foundation for Butterflies. Available at: https://www.indianodonata.org/. Accession Date: 02/06/2019.
16. Subramanian KA. Damselflies and dragonflies of peninsular India- A Field guide, 2005.
17. Kalyankumar P, Choubey TK. Working plan of Nagpur Forest Division, I, Period 2015-16 to 2024-25. 2015.
18. Kalkman VJ, Clausnitzer V, Dijkstra KDB, Orr AG, Paulson DR, Tol JV. Global diversity of dragonflies (Odonata) in freshwater. In: Freshwater animal diversity assessment. Dordrecht: Springer, 2007, 351-363.
19. Mitra A, Mitra B. Pictorial handbook of common dragon and damsel flies (Odonata: Insecta) of mangroves of Sundarbans, India. Zoological Survey of India, 2009, 175.
20. Mitra TR. Note on the Odonata fauna of Central India. Zoological Survey of India,1986:83:69–81.
21. Nair MV. Dragonflies & Damselflies of Orissa and Eastern India. Wildlife Organization, Forest & Environment Department, Government of Orissa, 2011. 252.
22. Smith J, Samways MJ, Taylor S. Assessing riparian quality using two complementary sets of bioindicators. Biodiversity and Conservation,2007:16:2695–2713.
23. Subramanian KA. A checklist of Odonata (Insecta) of India. Zoological survey of India, Kolkata, WB, 2014.
24. Schorr M, Paulson D. World Odonata List. Available at: http://www.pugetsound.edu/academics/academic-resources/slater-museum/, 2014.
25. Shende VA, Patil KG. Diversity of dragonflies in Gorewada International Biopark, Nagpur, Central India. Arthropods,2013:2(4):200-207.
26. Schorr M, Paulson D. World Odonata List. Available at: https://www.pugetsound.edu/academics/academic-resources/slater-museum/ (accessed 1 June 2020).
27. Sharma P, Kangale M, Agase DM. Study of Odonates Diversity near Koradi lake, Koradi, Nagpur, Maharashtra. Journal of Entomology and Zoology Studies,2022:11(1):126-130.
28. Subramanian KA, Babu R. Checklist of Odonata (Insecta) of India, Version 3.0. www.zsi.gov.in. 54 pp.
29. Subramanian KA, Babu R. Dragonflies and damselflies (Insecta: Odonata) of India. In: Indian Insects Diversity and Science. Editors: Ramani S, Prrashanth M, Yeshwanath HM. CRC Press, Taylor & Francis: 2020. Pp. 29–45.
30. Subramanian KA. Dragonflies and Damselflies of Peninsular India - A Field Guide. Noida, India: Vigyan Prasar, 2009, 168.
31. Subramanian KA, Kakkassery F, Nair MV. Chapter 5. The status and distribution of dragonflies and damselflies (Odonata) of the Western Ghats. In: Molur *et al*. (Compilers). The status and distribution of freshwater biodiversity in the Western Ghats, India. IUCN, 2011, 63-71.
32. Subramanian KA, Kakkassery F, Nair MV. Chapter 5. The status and distribution of dragonflies and damselflies (Odonata) of the Western Ghats. In: Molur *et al*. (Compilers). The status and distribution of freshwater biodiversity in the Western Ghats, India. Cambridge, UK and Gland, Switzerland: IUCN: 2011. Pp. 63-71.
33. Tijare RV, Patil KG. Diversity of Odonets in and around Gorewada National Park, Nagpur, M.S. (India). Bionano Frontier Special,2012:9:182-183.
34. Talmale SS, Tiple AD. New records of damselfly Lestes thoracicus Laidlaw, 1920 (Odonata: Zygoptera: Lestidae) from Maharashtra and Madhya Pradesh states, central India. Journal of Threatened Taxa,2013:5(1):3552–3555.
35. Tiple AD, Khurad AM, Andrew RJ. Species diversity of Odonata in and around Nagpur City, Central India. Fraseria,2008:7:41–45.

36. Tiple AD. New Record of Damselfly LestesnodalisSelys (Odonata: Lestidae) from Central India. ENVIS (SACON) Newsletter,2015:11(1):6–7.
37. Tiple AD. Dragonflies and Damselflies (Odonata: Insecta) of the Bor Wildlife Sanctuary, Wardha, Maharashtra, Central India. Travaux du Muséum National d'Histoire Naturelle "Grigore Antipa,2020:63(2):131–140.
38. Tiple AD, Deshmukh VP, Dennis RLH. Nota Lepidopteralogica,2006:28:213.
39. Tiple AD, Khurad AM, Dennis RLH. Nota Lepidopteralogica,2006:30:179.