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Journal of Threatened Taxa

10.11609/jott.2023.15.8.23631-23826
www.threatenedtaxa.org

26 August 2023 (Online & Print)
15(8): 23631-23826
ISSN 0974-7907 (Online)
ISSN 0974-7893 (Print)

Open Access

ISSN 0974-7907 (Online); ISSN 0974-7893 (Print)

Publisher
Wildlife Information Liaison Development Society
www.wild.zooreach.org

Host
Zoo Outreach Organization
www.zooreach.org

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Cover: Coromandal Sacred Langur *Semnopithecus priam* - made with acrylic paint. © P. Kritika.

Journal of Threatened Taxa | www.threatenedtaxa.org | 26 August 2023 | 15(8): 23778–23785
ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)
https://doi.org/10.11609/jott.8540.15.8.23778-23785
#8540 | Received 20 May 2023 | Final received 15 July 2023 | Finally accepted 26 July 2023
COMMUNICATION

Odonata diversity in the Egra and its adjoining blocks of Purba Medinipur District, West Bengal, India

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Abstract: The research was carried out over a three-year period, spanning from March 2020 to March 2023, with the aim of examining the status and diversity of Odonata fauna across a range of natural and anthropogenic habitats situated in Egra, Purba Medinipur District, located in the state of West Bengal. In total, 42 odonata species from 31 genera and seven families were identified throughout the study period from the study region. There were 28 (67%) species in the suborder Anisoptera, belonging to four distinct families. On the other hand, 14 (33%) species in the Suborder Zygoptera, divided into three different families. The four families of suborder Anisoptera were Aeshnidae (10%), Gomphidae (2%), Libellulidae (53%), and Macromiidae (2%). In the suborder Zygoptera, three families were identified, namely Coenagrionidae (24%), Lestidae (2%), and Platycnemididae (7%). %). According to the relative estimate of abundance, 38% of the species were classified as not rare (NR), 31% very common (VC), 14% common (C), 14% rare (R), and 3% as very rare (R). In addition, the IUCN red data list indicates that 41 species have been classified as Least Concern (LC), while a solitary species has been categorised as Data Deficient (DD). The identification of Odonata is a critical factor in determining the ecological well-being of an ecosystem.

Keywords: Anisoptera, checklist, damselflies, dragonflies, habitat, taxonomy, Zygoptera.

Editor: Ashish D. Tiple, Dr. R.G. Bhoyar Arts, Commerce and Science College, Wardha, India. **Date of publication:** 26 August 2023 (online & print)

Citation: Samanta, T., A. Giri, L. Chatterjee & A.B. Roy (2023). Odonata diversity in the Egra and its adjoining blocks of Purba Medinipur District, West Bengal, India. *Journal of Threatened Taxa* 15(8): 23778–23785. https://doi.org/10.11609/jott.8540.15.8.23778-23785

Funding: Nature Mates-Nature Club

Competing interests: The authors declare no competing interests.

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Author contributions: TS—data collection, research designing, data analysis and manuscript writing. AG—field work, data collection, photographic documentation & manuscript writing. LC—project planning, overall supervision. ABR—project planning, manuscript writing, interpretation & overall supervision.

Acknowledgements: We are extremely appreciative of the financial assistance from Nature Mates-Nature Club. We would like to extend our appreciation to Prasenjit Dawn, Swarochi Tathagath, Amila P Sumanapala, and Arajush Payra for their invaluable contributions in species identification. We express our gratitude to all the members of the Nature-Mates Nature Club for their consistent support and assistance. We also express our gratitude to the editor and to all of the reviewers for their valuable input

INTRODUCTION

Odonates (dragonflies and damselflies) are frequently used as global indicators of wetland health (Chovanec & Waringer 2001). They first made their appearance during the Carboniferous era, about 250 million years ago (Nair 2011). Odonata, a common group of insects found in freshwater habitats, have a life cycle that includes an extended larval stage in aquatic environments followed by a comparatively brief adult stage on land (Tiple et al. 2012). According to Clausnitzer et al. (2009), the larvae exhibit sensitivity towards the quality of water and the morphology of aquatic habitats, including the structure of bottom substrate and aquatic vegetation. Odonata was found to be effective biological control agents for agricultural pests, blood-sucking flies, and vector-borne diseases such as mosquitoes. Furthermore, they are useful indicators of environmental changes and the overall health of ecosystems (Nair 2011; Tiple & Koparde 2015; Mangaoang & Mohagan 2016). The worldwide population of odonates comprises 6,356 species across 693 genera. Throughout the Indian Subcontinent (Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka), a total of 588 species of odonates were recorded (Kalkman et al. 2020); similarly, 498 species consisting 154 genera and 18 families were recorded from India (Subramanian & Babu 2020). To date, Dawn (2021) has reported the existence of 239 species from 114 genera and 17 families in West Bengal. The current state of knowledge regarding the Odonata of southern West Bengal has been documented by various researchers, including Selys (1891), Fraser (1933, 1934, 1936), Ram et al. (1982), Srivastava & Das (1987), Prasad & Ghosh (1988), Mitra (1983, 2002), Srivastava & Sinha (1993), Gupta et al. (1995), Ghosh (2022), and Samanta et al. (2022). Studies on the diversity of Odonata in Purba Medinipur district have been conducted by various researchers including Prasad & Ghosh (1988), Jana et al. (2014) and Pahari et al. (2019). The extant literature on the diversity of odonata in Purba Medinipur district is limited. Prasad & Ghosh (1988) conducted the initial study in the estuarine regions of East India, specifically in West Bengal and Orissa. The survey locations included Balisai, Contai, Digha, Fatehpur (Nandakumar), Junput, Mahishadal, Nimalakhya, Nandakumar, and New Digha within the district. The survey documented a total of 22 species of odonates, classified into 19 genera and six families. Later Jana et al. (2014), reported 13 species of odonates belonging 12 genera and three families from eight contrasting coastal areas of the district. The extent of research conducted on the diversity of Odonata in Egra, located in Purba Medinipur, is currently limited. The current study was carried out within this geographical region with the goal of cataloguing the variety and proportional prevalence of odonates. The resulting inventory will be used to educate local people about the ecological importance of these organisms in this area.

MATERIALS AND METHODS

Study Area

The Egra subdivision encompasses the Egra municipality and five community development blocks, namely Bhagawanpur I, Egra I, Egra II, Pataspur I, and

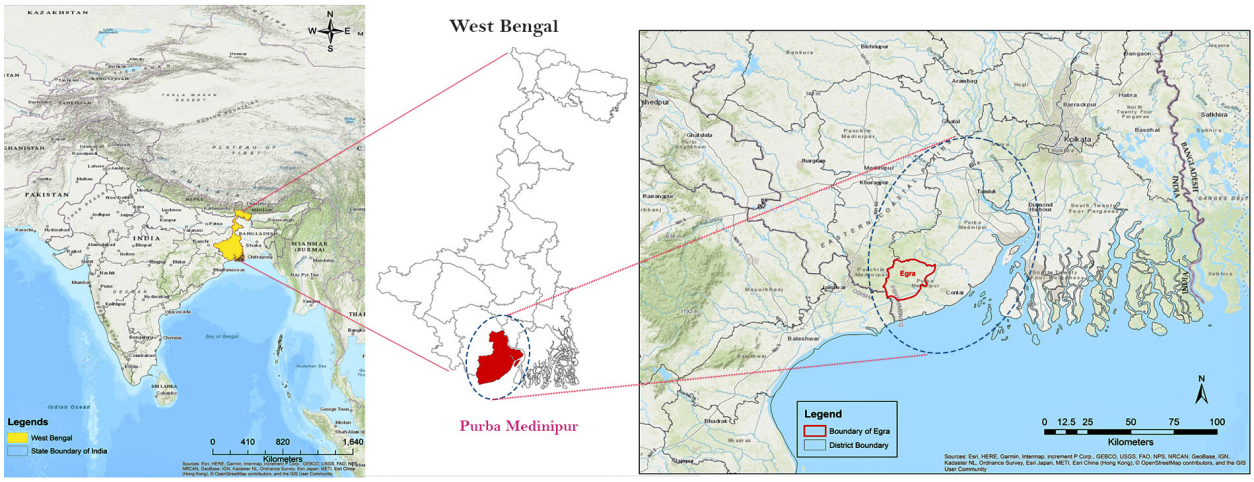

Figure 1. The map presented depicts the study area, with the yellow hue demarcating the boundary of West Bengal state , and the red hue indicating the boundary of Purba Medinipur District on the left. The eastern boundary of Egra within the district of Purba Medinipur is demarcated by a red border.

Pataspur II. But the focus was Egra municipality and Egra I and Egra II blocks. The aggregate land area of the three locations is 431.5 km^2, as depicted in Figure 1. These locations are located in the southern and south-western regions of West Bengal's Purba Medinipur District. Egra is located at 21.9°N, 87.53°E. The study areas primarily consist of extensive agricultural fields with limited clusters of trees and shrubs, as well as a few small forested regions, private gardens, village woodlands, and bamboo thickets, in addition to roadsides, ponds, and water channels (Samanta et al. 2022). The summer season (March–June) in this area experiences a temperature range of 30°C–38°C, while the winter season (November–February) has a temperature range of 15°C–25°C. The average annual rainfall in this district is around 1,700 mm (Payra et al. 2017).

Data Collection

The investigation was conducted over a period spanning from March 2020 to March 2023. The study employed the direct search technique as well as opportunistic sighting methods to gather data on the diversity and abundance of Odonata, as outlined by Sutherland (1996). The study involved biweekly site visits to various habitats (including ponds, canals, agricultural fields, gardens, and shaded areas within forest patches) to observe odonates. The photographs were taken using Nikon Coolpix P600, Nikon Coolpix B700 (Resolution: 20MP, Zoom: 60x) and a smartphone camera. Here, we have followed the systematic arrangement of the odonates proposed by Kalkman et al. (2020). The species were identified with the help of few guide books (Andrew et al. 2008; Nair 2011; Dawn & Roy 2016) and the unidentified species were identified with the help of expert guidance and the Citizen Science forum (iNaturalist, Odonata of India). Tiple et al. (2013) classified the odonates into five distinct groups based on their observed frequency in the area. These groups were denoted by the following abbreviations: VC—Very Common (> 100 sightings), C—Common (50-100 sightings), NR—Not Rare (15-50 sightings), R—Rare (2-15 sightings), VR—Very Rare (< 2 sightings).

RESULTS

The study area yielded a total of 42 species of Odonata, which were classified into 31 genera and seven families, as represented in Table 1. The data reveals that out of the total number of species observed, 67% (28 species) belonged to the sub-order Anisoptera, commonly known as dragonflies, while the remaining 33% (14 species) were classified under the sub-order Zygoptera, commonly known as damselflies (Figure 3). The sub-order Anisoptera encompassed four families, namely Aeshnidae (10%), Gomphidae (2%), Libellulidae (53%), and Macromiidae (2%). Meanwhile, the sub-order Zygoptera, encompassed three families, namely Coenagrionidae (24%), Lestidae (2%), and Platycnemididae (7%). The study area revealed that the Libellulidae family, which belongs to the sub-order Anisoptera, constituted the highest percentage (53%) of the species present. Following closely behind, the Coenagrionidae family of the sub-order Zygoptera accounted for 24% of the species present, as depicted in Figure 2.

According to our documentation (Figure 4, Image 1–42), among the 42 observed species, 38% were categorized under Not Rare (NR), 31% Very Common

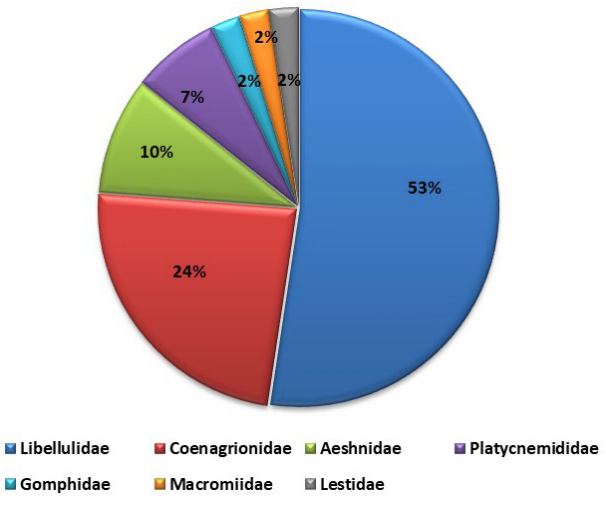

Figure 2. Abundance of different families

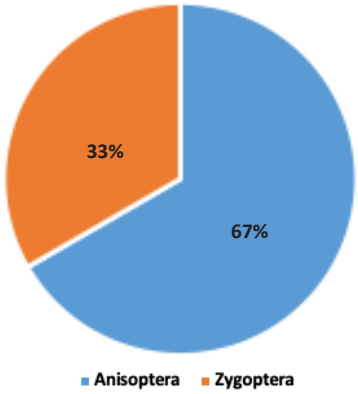

Figure 3. Relative abundance of Suborder Anisoptera and Zygoptera

Table 1. Checklist of Odonates recorded from the study area.

	Scientific name	Authority	Status	IUCN status
	Order: Odonata	Fabricius, 1793		
	Suborder: Zygoptera	(Selys, 1854)		
	Superfamily: Lestoidea	Calvert, 1901		
	Family- Lestidae	(Calvert, 1901)		
	Lestes	Leach, 1815		
1	*Lestes viridulus*	Rambur, 1842	**VR**	**LC**
	Superfamily: Coenagrionidea	Kirby, 1890		
	Family- Platycnemididae	(Yakobson & Bainchi, 1905)		
	Pseudocopera	Fraser, 1922		
2	*Pseudocopera ciliata*	(Selys, 1863)	**C**	**LC**
	Copera	Kirby, 1890		
3	*Copera marginipes*	(Rambur, 1842)	**C**	**LC**
	Onychargia	Selys, 1865		
4	*Onychargia atrocyana*	(Selys, 1865)	**NR**	**LC**
	Family- Coenagrionidae	(Kirby, 1890)		
	Agriocnemis	Selys, 1877		
5	*Agriocnemis kalinga*	(Nair & Subramanian 2014)	**R**	**LC**
6	*Agriocnemis lacteola*	Selys, 1877	**NR**	**LC**
7	*Agriocnemis pygmaea*	(Rambur, 1842)	**VC**	**LC**
	Ceriagrion	Selys, 1876		
8	*Ceriagrion cerinorubellum*	(Brauer, 1865)	**VC**	**LC**
9	*Ceriagrion coromandelianum*	(Fabricius, 1798)	**VC**	**LC**
	Ischnura	Charpentier, 1840		
10	*Ischnura rubilio*	(Selys, 1876)	**NR**	**LC**
11	*Ischnura senegalensis*	(Rambur, 1842)	**NR**	**LC**
	Mortonagrion	Fraser, 1920		
12	*Mortonagrion aborense*	(Laidlaw, 1914)	**NR**	**LC**
	Pseudagrion	Selys, 1876		
13	*Pseudagrion microcephalum*	(Rambur, 1842)	**NR**	**LC**
14	*Pseudagrion rubriceps*	(Selys, 1876)	**NR**	**LC**
	Suborder: Anisoptera	(Selys, 1854)		
	Superfamily: Aeshnoidea	Leach, 1815		
	Family- Aeshnidae	(Leach, 1815)		
	Anaciaeschna	Selys, 1878		
15	*Anaciaeschna jaspidea*	(Burmeister, 1839)	**R**	**LC**
	Anax	Leach, 1815		
16	*Anax guttatus*	(Burmeister, 1839)	**NR**	**LC**
17	*Anax indicus*	Lieftinck, 1942	**R**	**LC**
	Gynacantha	Rambur, 1842		
18	*Gynacantha dravida*	Lieftinck, 1960	**NR**	**DD**
	Superfamily: Gomphoidea	Rambur, 1842		
	Family- Gomphidae	(Rambur, 1842)		
	Ictinogomphus	Cowley, 1934		
19	*Ictinogomphus rapax*	(Rambur, 1842)	**C**	**LC**

	Scientific name	Authority	Status	IUCN status
	Superfamily: Libelluloidea	Leach, 1815		
	Family-Macromiidae	(Needham, 1903)		
	Epophthalmia	Burmeister, 1839		
20	*Epophthalmia vittata*	Burmeister, 1839	**R**	**LC**
	Family- Libellulidae	(Leach, 1815)		
	Acisoma	Rambur, 1842		
21	*Acisoma panorpoides*	(Rambur, 1842)	**NR**	**LC**
	Aethriamanta	Kirby, 1889		
22	*Aethriamanta brevipennis*	(Rambur, 1842)	**NR**	**LC**
	Brachydiplax	Brauer, 1868		
23	*Brachydiplax chalybea*	(Brauer, 1868)	**NR**	**LC**
24	*Brachydiplax farinosa*	(Krüger, 1902)	**VC**	**LC**
25	*Brachydiplax sobrina*	(Rambur, 1842)	**VC**	**LC**
	Brachythemis	Brauer, 1868		
26	*Brachythemis contaminata*	(Fabricius,1793)	**VC**	**LC**
	Crocothemis	Brauer, 1868		
27	*Crocothemis servilia*	(Drury, 1770)	**VC**	**LC**
	Diplacodes	Kirby, 1889		
28	*Diplacodes trivialis*	(Rambur, 1842)	**VC**	**LC**
	Neurothemis	Brauer, 1867		
29	*Neurothemis fulvia*	(Drury, 1773)	**NR**	**LC**
30	*Neurothemis tullia*	(Drury, 1773)	**C**	**LC**
	Orthetrum	Newman, 1833		
31	*Orthetrum pruinosum*	(Burmeister, 1839)	**R**	**LC**
32	*Orthetrum sabina*	(Drury, 1773)		**LC**
	Pantala	Hagen, 1861	**VC**	
33	*Pantala flavescens*	(Fabricius, 1798)	**VC**	**LC**
	Potamarcha	Karsch, 1890		
34	*Potamarcha congener*	(Rambur, 1842)	**VC**	**LC**
	Rhodothemis	Ris, 1909		
35	*Rhodothemis rufa*	(Rambur, 1842)	**VC**	**LC**
	Rhyothemis	Hagen, 1867		
36	*Rhyothemis variegata*	(Linnaeus, 1763)	**VC**	**LC**
	Tholymis	Hagen, 1867		
37	*Tholymis tillarga*	(Fabricius, 1798)	**C**	**LC**
	Tramea	Hagen, 1861		
38	*Tramea basilaris*	(Palisot de Beauvois, 1805)	**R**	**LC**
39	*Tramea limbata*	(Desjardins, 1832)	**NR**	**LC**
	Trithemis	Brauer, 1868		
40	*Trithemis pallidinervis*	(Kirby, 1889)	**NR**	**LC**
	Urothemis	Brauer, 1868		
41	*Urothemis signata*	(Rambur, 1842)	**C**	**LC**
	Zyxomma	Rambur, 1842		
42	*Zyxomma petiolatum*	Rambur, 1842	**NR**	**LC**

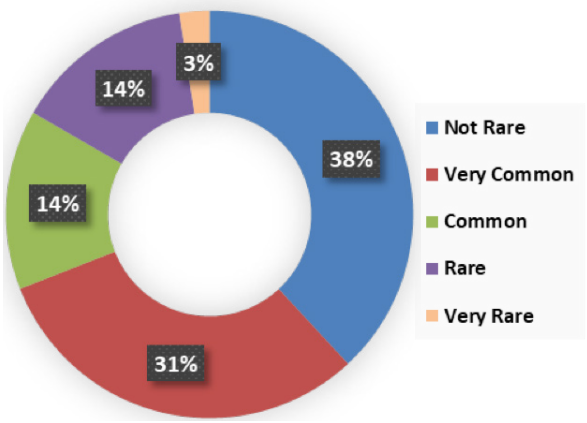

Figure 4. Local status of Odonata

(VC), 14% Common (C), 14% Rare (R), and 3% as Very Rare (R) (Tiple et al. 2013). As per the IUCN Red List, a total of 41 species have been classified as Least Concern (LC), while only a solitary species has been categorised as Data Deficient (DD).

DISCUSSION

The present investigation documented a total of 42 species in the Egra region, including 28 species of dragonflies and 14 species of damselflies, encompassing the two contiguous blocks of Purba Medinipur District (Image 43–46). By simply comparing the species count of previously studied checklist data on odonates from the different parts of Purba Medinipur by Prasad & Ghosh (1988), Jana et al. (2014), and Pahari et al. (2019), Libellulidae and Coenagrionidae family diversity was found higher among other families from all the study areas of Purba Medinipur district till date, which also stated in previous studies. Our study also shows that Libellulidae family was dominant and encompasses 22 species, like *Brachythemis contaminata* Fabricius, 1793, *Crocothemis servilia* Drury, 1770, *Diplacodes trivialis* Rambur, 1842, *Orthetrum sabina* Drury, 1773, *Pantala flavescens* Fabricius, 1798, *Rhyothemis variegata* Linnaeus, 1763, and *Tholymis tillarga* Fabricius, 1798. These species are commonly found in various habitats. According to our data, certain species within the family were found to be scarce in the study area, including *Macrodiplax cora* Brauer, 1867 and *Tramea basilaris* Palisot de Beauvois, 1805. *Gynacantha dravida* Lieftinck, 1960 and *Anaciaeschna jaspidea* Burmeister, 1839 belonging to the Aeshnidae family exhibit crepuscular behaviour and demonstrate active flight during the period of dusk. They tend to seek refuge in areas with abundant vegetation during daylight hours. Few dragonflies, like *Anax guttatus* Burmeister, 1839, *Anaciaeschna jaspidea* Burmeister, 1839, *Gynacantha dravida* Lieftinck, 1960, and *Ictinogomphus rapax* Rambur, 1842 are relatively larger in size. They are commonly observed in flight above waterbodies or perched on branches in the vicinity of such water sources. The *Epophthalmia vittata* Burmeister, 1839, of the Macromiidae family was only seen twice flying fast over the pond throughout the study period although it is generally considered to be abundant and common. The Coenagrionidae family exhibited the highest recorded species count among the damselflies. The observed species were categorized here as either 'very common' 'not rare' or 'rare' were present in various waterbodies, agricultural fields, and grasslands within the designated study areas. *Lestes viridulus* Rambur, 1842, a member of the Lestidae family, was observed only once during the study and was was categorized a very rare species within the family. The Platycnemididae family's species are predominantly observed in ponds with dense weed growth and surrounded by shaded vegetation and forests.

According to our research findings, the region has a thriving ecosystem characterised by a diverse range of Odonata species totalling 42 in number. However, excessive pesticide and herbicide use, the disappearance of small ponds and waterbodies, and the eradication of aquatic vegetation may have an impact on their population. Furthermore, people must recognize the importance of these aesthetically pleasing flying organisms in our ecological system.

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Image 1–28. Anisopteran species of the study area: 1—*Anax guttatus* | 2—*Anax indicus* | 3—*Gynacantha dravida* | 4—*Anaciaeschna jaspidea* | 5—*Ictinogomphus rapax* | 6—*Acisoma panorpoides* | 7—*Aethriamanta brevipennis* | 8—*Brachydiplax chalybea* | 9—*Brachydiplax sobrina* | 10—*Brachydiplax farinosa* | 11—*Brachythemis contaminata* | 12—*Crocothemis servilia* | 13—*Diplacodes trivialis* | 14—*Neurothemis fulvia* | 15—*Neurothemis tullia* | 16—*Orthetrum pruinosum* | 17—*Orthetrum sabina* | 18—*Pantala flavescens* | 19—*Zyxomma petiolatum* | 20—*Potamarcha congener* | 21—*Rhyothemis variegata* | 22—*Rhodothemis rufa* | 23—*Tholymis tillarga* | 24—*Tramea basilaris* | 25—*Tramea limbata* | 26—*Trithemis pallidinervis*| 27—*Urothemis signata* | 28—*Epophthalmia vittata*. © Asim Giri & Tarak Samanta.

Image 29–42. Zygopteran species of the study area: 29—*Agriocnemis pygmaea* | 30—*Agriocnemis kalinga* | 31—*Agriocnemis lacteola* | 32—*Ceriagrion cerinorubellum* | 33—*Ceriagrion coromandelianum*| 34—*Ischnura rubilio* | 35—*Ischnura senegalensis* | 36—*Pseudagrionr ubriceps* | 37—*Pseudagrion microcephalum* | 38—*Mortonagrion aborense* | 39—*Lestes viridulus* | 40—*Pseudocopera ciliata* | 41—*Copera marginipes* | 42—*Onychargia atrocyana*. © Asim Giri & Tarak Samanta.

Image 43–46. Different habitats of the study area: 1— Stagnant waterbody | 2— Roadside vegetation | 3—Agricultural fields | 4— Forest patch. © Asim Giri & Tarak Samanta.

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NAAS rating (India) 5.64

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Journal of Threatened Taxa

www.threatenedtaxa.org

ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

August 2023 | Vol. 15 | No. 8 | Pages: 23631–23826
Date of Publication: 26 August 2023 (Online & Print)
DOI: 10.11609/jott.2023.15.8.23631-23836

Publisher & Host

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