

Building evidence for conservation globally

Journal of Threatened Taxa



Open Access

10.11609/jott.2022.14.3.20703-20810

www.threatenedtaxa.org

26 March 2022 (Online & Print)

14(3): 20703-20810

ISSN 0974-7907 (Online)

ISSN 0974-7893 (Print)



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

No. 12, Thiruvannamalai Nagar, Saravanampatti - Kalapatti Road, Saravanampatti,
Coimbatore, Tamil Nadu 641035, India

Ph: +91 9385339863 | www.threatenedtaxa.org

Email: sanjay@threatenedtaxa.org

EDITORS

Founder & Chief Editor

Dr. Sanjay Molur

Wildlife Information Liaison Development (WILD) Society & Zoo Outreach Organization (ZOO),
12 Thiruvannamalai Nagar, Saravanampatti, Coimbatore, Tamil Nadu 641035, India

Deputy Chief Editor

Dr. Neelesh Dahanukar

Noida, Uttar Pradesh, India

Managing Editor

Mr. B. Ravichandran, WILD/ZOO, Coimbatore, India

Associate Editors

Dr. Mandar Paingankar, Government Science College Gadchiroli, Maharashtra 442605, India

Dr. Ulrike Streicher, Wildlife Veterinarian, Eugene, Oregon, USA

Ms. Priyanka Iyer, ZOO/WILD, Coimbatore, Tamil Nadu 641035, India

Dr. B.A. Daniel, ZOO/WILD, Coimbatore, Tamil Nadu 641035, India

Editorial Board

Dr. Russel Mittermeier

Executive Vice Chair, Conservation International, Arlington, Virginia 22202, USA

Prof. Mewa Singh Ph.D., FASC, FNA, FNASC, FNAPsy

Ramanna Fellow and Life-Long Distinguished Professor, Biopsychology Laboratory, and
Institute of Excellence, University of Mysore, Mysuru, Karnataka 570006, India; Honorary
Professor, Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore; and Adjunct
Professor, National Institute of Advanced Studies, Bangalore

Stephen D. Nash

Scientific Illustration, Conservation International, Dept. of Anatomical Sciences, Health Sciences
Center, T-8, Room 045, Stony Brook University, Stony Brook, NY 11794-8081, USA

Dr. Fred Pluthero

Toronto, Canada

Dr. Priya Davidar

Sigur Nature Trust, Chadapatti, Mavinhalla PO, Nilgiris, Tamil Nadu 643223, India

Dr. Martin Fisher

Senior Associate Professor, Battcock Centre for Experimental Astrophysics, Cavendish
Laboratory, JJ Thomson Avenue, Cambridge CB3 0HE, UK

Dr. John Fellowes

Honorary Assistant Professor, The Kadoorie Institute, 8/F, T.T. Tsui Building, The University of
Hong Kong, Pokfulam Road, Hong Kong

Prof. Dr. Mirco Solé

Universidade Estadual de Santa Cruz, Departamento de Ciências Biológicas, Vice-coordenador
do Programa de Pós-Graduação em Zoologia, Rodovia Ilhéus/Itabuna, Km 16 (45662-000)
Salobrinho, Ilhéus - Bahia - Brasil

Dr. Rajeev Raghavan

Professor of Taxonomy, Kerala University of Fisheries & Ocean Studies, Kochi, Kerala, India

English Editors

Mrs. Mira Bhojwani, Pune, India

Dr. Fred Pluthero, Toronto, Canada

Mr. P. Ilangoan, Chennai, India

Web Development

Mrs. Latha G. Ravikumar, ZOO/WILD, Coimbatore, India

Typesetting

Mr. Arul Jagadish, ZOO, Coimbatore, India

Mrs. Radhika, ZOO, Coimbatore, India

Mrs. Geetha, ZOO, Coimbatore India

Fundraising/Communications

Mrs. Payal B. Molur, Coimbatore, India

Subject Editors 2019–2021

Fungi

Dr. B. Shivaraju, Bengaluru, Karnataka, India

Dr. R.K. Verma, Tropical Forest Research Institute, Jabalpur, India

Dr. Vatsavaya S. Raju, Kakatiya University, Warangal, Andhra Pradesh, India

Dr. M. Krishnappa, Jnana Sahyadri, Kuvempu University, Shimoga, Karnataka, India

Dr. K.R. Sridhar, Mangalore University, Mangalagangothri, Mangalore, Karnataka, India

Dr. Gunjan Biswas, Vidyasagar University, Midnapore, West Bengal, India

Plants

Dr. G.P. Sinha, Botanical Survey of India, Allahabad, India

Dr. N.P. Balakrishnan, Ret. Joint Director, BSI, Coimbatore, India

Dr. Shonil Bhagwat, Open University and University of Oxford, UK

Prof. D.J. Bhat, Retd. Professor, Goa University, Goa, India

Dr. Ferdinando Boero, Università del Salento, Lecce, Italy

Dr. Dale R. Calder, Royal Ontario Museum, Toronto, Ontario, Canada

Dr. Cleofas Cervancia, Univ. of Philippines Los Baños College Laguna, Philippines

Dr. F.B. Vincent Florens, University of Mauritius, Mauritius

Dr. Merlin Franco, Curtin University, Malaysia

Dr. V. Irudayaraj, St. Xavier's College, Palayamkottai, Tamil Nadu, India

Dr. B.S. Kholia, Botanical Survey of India, Gangtok, Sikkim, India

Dr. Pankaj Kumar, Kadoorie Farm and Botanic Garden Corporation, Hong Kong S.A.R., China

Dr. V. Sampath Kumar, Botanical Survey of India, Howrah, West Bengal, India

Dr. A.J. Solomon Raju, Andhra University, Visakhapatnam, India

Dr. Vijayasankar Raman, University of Mississippi, USA

Dr. B. Ravi Prasad Rao, Sri Krishnadevaraya University, Anantpur, India

Dr. K. Ravikumar, FRLHT, Bengaluru, Karnataka, India

Dr. Aparna Watve, Pune, Maharashtra, India

Dr. Qiang Liu, Xishuangbanna Tropical Botanical Garden, Yunnan, China

Dr. Noor Azhar Mohamed Shazili, Universiti Malaysia Terengganu, Kuala Terengganu, Malaysia

Dr. M.K. Vasudeva Rao, Shiv Ranjani Housing Society, Pune, Maharashtra, India

Prof. A.J. Solomon Raju, Andhra University, Visakhapatnam, India

Dr. Mandar Datar, Agharkar Research Institute, Pune, Maharashtra, India

Dr. M.K. Janarthanam, Goa University, Goa, India

Dr. K. Karthigeeyan, Botanical Survey of India, India

Dr. Errol Vela, University of Montpellier, Montpellier, France

Dr. P. Lakshminarasimhan, Botanical Survey of India, Howrah, India

Dr. Larry R. Noblick, Montgomery Botanical Center, Miami, USA

Dr. K. Haridasan, Pallavur, Palakkad District, Kerala, India

Dr. Analinda Manila-Fajard, University of the Philippines Los Banos, Laguna, Philippines

Dr. P.A. Sinu, Central University of Kerala, Kasaragod, Kerala, India

Dr. Afroz Alam, Banasthali Vidyapith (accredited A grade by NAAC), Rajasthan, India

Dr. K.P. Rajesh, Zamorin's Guruvayurappan College, GA College PO, Kozhikode, Kerala, India

Dr. David E. Boufford, Harvard University Herbaria, Cambridge, MA 02138-2020, USA

Dr. Ritesh Kumar Choudhary, Agharkar Research Institute, Pune, Maharashtra, India

Dr. Navendu Page, Wildlife Institute of India, Chandrabani, Dehradun, Uttarakhand, India

Invertebrates

Dr. R.K. Avasthi, Rohtak University, Haryana, India

Dr. D.B. Bastawade, Maharashtra, India

Dr. Partha Pratim Bhattacharjee, Tripura University, Suryamaninagar, India

Dr. Kailash Chandra, Zoological Survey of India, Jabalpur, Madhya Pradesh, India

Dr. Ansie Dippenaar-Schoeman, University of Pretoria, Queenswood, South Africa

Dr. Rory Dow, National Museum of natural History Naturalis, The Netherlands

Dr. Brian Fisher, California Academy of Sciences, USA

Dr. Richard Gallon, Llandudno, North Wales, LL30 1UP

Dr. Hemant V. Ghate, Modern College, Pune, India

Dr. M. Monwar Hossain, Jahangirnagar University, Dhaka, Bangladesh

Mr. Jatishwor Singh Irungbam, Biology Centre CAS, Branišovská, Czech Republic.

Dr. Ian J. Kitching, Natural History Museum, Cromwell Road, UK

Dr. George Mathew, Kerala Forest Research Institute, Peechi, India

For Focus, Scope, Aims, and Policies, visit https://threatenedtaxa.org/index.php/JoTT/aims_scope

For Article Submission Guidelines, visit <https://threatenedtaxa.org/index.php/JoTT/about/submissions>

For Policies against Scientific Misconduct, visit https://threatenedtaxa.org/index.php/JoTT/policies_various

continued on the back inside cover

Cover: Rufous-headed Hornbill *Rhabdotorrhinus waldeni* © Philip Godfrey C. Jakosalem.



Dragonflies and damselflies (Insecta: Odonata) of Jabalpur, Madhya Pradesh, India

Ashish Tiple¹ , Vivek Sharma² & Sonali V. Padwad³

¹P.G. Department of Zoology, Vidyabharti College, Seloo, Wardha, Maharashtra 442104, India.

²Departments of Zoology, Govt. Model Science College, Jabalpur, Madhya Pradesh 482003, India.

³B1/8 Savitri Vihar, Somalwada, Wardha Road Nagpur, Maharashtra 440025, India.

¹ashishdtiple@gmail.com (corresponding author), ²vks1007@gmail.com, ³sonalipadwad@yahoo.co.in

Abstract: The present study was carried out to reveal the odonate diversity in Jabalpur city and its surrounding area in Madhya Pradesh, central India. During the study period of 2008–2019 a total of 75 species of odonates belonging to two suborders and nine families were recorded. Twenty-one new species were recorded for Jabalpur district and four for Madhya Pradesh; 37% (28) species were abundant or very common, 19% (14) were common, 16% (12) were frequent, 24% (18) rare, and 4% (3) very rare. The maximum number of odonates were found in family Libellulidae (n= 32), followed by Coenagrionidae (n= 17), Gomphidae (n= 09), Platycnemididae (n= 06), Aeshnidae (n= 05), Lestidae (n= 03), Macromiidae (n= 02), and Chlorocyphidae (n= 01). Of 75 species recorded from Jabalpur city, 72 come under the IUCN Red List. Among them, *Indothemis carnatica* come under Near Threatened (NT) category, 65 species come under Least Concern (LC) Category, six species under Data Deficient (DD), and three species remain not assessed. The study supports the value of the city area in providing habitat for Odonata.

Keywords: Central India, checklist, conservation, distributional gaps, diversity, habitat, IUCN Red List, new records, Odonata.

वर्तमान अध्ययन मध्य भारत के मध्य प्रदेश में जबलपुर शहर और इसके आसपास के क्षेत्र में ओडोनेट विविधता को प्रकट करने के लिए किया गया था। 2008-2019 की अध्ययन अवधि के दौरान दो उपसमूहों और नौ परिवारों से संबंधित ओडोनेट्स की कुल 75 प्रजातियों को दर्ज किया गया था। जबलपुर जिले के लिए इक्कीस और मध्य प्रदेश के लिए चार नई प्रजातियां दर्ज की गईं; 37% (28) प्रजातियां प्रचुर या बहुत आम थीं, 19% (14) आम थीं, 16% (12) अक्सर दिखाई देने वाली, 24% (18) दुर्लभ और 4% (3) अति दुर्लभ थीं। लिबेलुलिडे (संख्या=32) परिवार में ओडोनेट्स की अधिकतम संख्या पाई गई, उसके बाद अन्य परिवार जिनमें प्रजातियां दर्ज की गईं वे संख्या के क्रम में इस प्रकार हैं- कोएनाग्रियोनिडे (संख्या=17), गोम्फिडे (संख्या=09), प्लैटिसीनेमिडिडे (संख्या=06), एशनिडे (संख्या=05), लेस्टिडे (संख्या=03), मैक्रोमिडि (संख्या=02), और क्लोरोसाइफिडे (संख्या=01)। जबलपुर शहर से दर्ज 75 प्रजातियों में से 72 आईयूसीएन रेड लिस्ट में आती हैं। उनमें से, इंडोथेमिस कार्नाटिका नियर थेटेंड (एनटी) श्रेणी के अंतर्गत आती है, 65 प्रजातियां लीस्ट कंसेर्न (एलसी) श्रेणी के अंतर्गत आती हैं, छह प्रजातियां डेटा डेफिसिएंट (डीडी) के अंतर्गत आती हैं, और तीन प्रजातियों का मूल्यांकन नहीं किया जाता है। प्रस्तुत अध्ययन ओडोनाटा के लिए आवास प्रदान करने में शहर के क्षेत्र के महत्व का समर्थन करता है।

Editor: K.A. Subramanian, Zoological Survey of India, Chennai, India.

Date of publication: 26 March 2022 (online & print)

Citation: Tiple, A., V. Sharma & S.V. Padwad (2022). Dragonflies and damselflies (Insecta: Odonata) of Jabalpur, Madhya Pradesh, India. *Journal of Threatened Taxa* 14(2): 20740–20746. <https://doi.org/10.11609/jott.7306.14.3.20740-20746>

Copyright: © Tiple et al. 2022. Creative Commons Attribution 4.0 International License. JoTT allows unrestricted use, reproduction, and distribution of this article in any medium by providing adequate credit to the author(s) and the source of publication.

Funding: None.

Competing interests: The authors declare no competing interests.

Author details: DR. ASHISH D. TIPLE is a wildlife biologist with field experience in Central India. He has more than 18 years of research experience. His prime research focuses on Butterfly biodiversity; taxonomy; behavior; population dynamics; molecular ecology and insect tissue culture; In addition, he is also a keen Odonatologist, interested in dragonfly diversity and behavior. He also maintains an active interest in Conservation at the grassroots level with respect to bureaucracy, community involvement and related activities. He has 70 International/ National papers, 09 books and 1 ebook in his credit on an extensive range of ecological, behavioral and biogeographically research of central Indian fauna. VIVEK SHARMA is actively working on snakes of India and has been part of 20 publications on snakes. His aim is to innovate and build bridges to facilitate citizen-science projects on wildlife and environment. Presently he is working as a freelance biologist to provide solutions on the education of snakes and snakebites and occasionally shows his interest in wild mammals and the Odonate diversity of central India. SONALI V. PADWAD is involved in extensive research in the field of Biotechnology and insect ecology. She has 14+ years of research and teaching experience and published 12 research papers in reputed journals. In addition, she is also interested in dragonfly and Butterfly diversity and behavior.

Author contributions: ADT and SVP designed the study, carried out the fieldwork, analyzed the data and prepared a draft; VS carried out the fieldwork and revised the final draft. ADT, SVP and VS helped with the preparation of the manuscript and revised the draft.

Acknowledgements: Thanks to Dr. K.C. Joshi and Dr. Nitin Kulkarni, senior scientists, Tropical Forest Research Institute, Jabalpur for valuable suggestions and providing facilities.



INTRODUCTION

Odonates (damselflies and dragonflies) are an ancient insect order with origins in the Carboniferous era about 250 million years ago. They probably mark the first time that evolution experimented with the ability to hover in the air over an object of interest (Andrew et al. 2008). They are beautifully coloured, primarily aquatic in their pre-adult stages, and closely tied to freshwater ecosystems such as rivers, streams, lakes, marshes, and rice fields. Species are usually highly specific to habitats, but some have adapted to using man-made water bodies (Tiple & Chandra 2013). Odonates are important for water-rich habitats such as wetlands, lakes and rainforests, and they are also significant for habitats where water is scarce. Thus the Odonata are regarded as vital to the survival of life (Dijkstra 2007). Odonates are economically significant and act as useful biocontrol agents, since adults prey on mosquitoes, flies, moths, aphids, termites, and small beetles, while larvae feed on mosquito larvae and other soft-bodied aquatic invertebrates. Odonata are reliable indicators of overall ecosystem health, since they are highly sensitive to environmental changes (Dijkstra & Lewington 2006; Andrew et al. 2008).

Globally, 6,356 species in 693 genera of odonates have been reported (Schorr & Paulson 2022), of which 498 species and 27 Subspecies in 154 genera and 18 families are known from India (Subramanian & Babu 2020; Joshi & Sawant 2020; Bedjanič et al. 2020; Payra et al. 2020, 2021; Dawn 2021). Fraser (1933–1936) published three volumes on Odonata in the 'Fauna of British India' and included 536 species and subspecies of Odonata from India, including Bangladesh, Bhutan, Myanmar, Nepal, Pakistan, and Sri Lanka and included many species from Madhya Pradesh. After Fraser's work, some additions were made by Bhasin (1953), Prasad & Ghosh (1988), Mitra (1988, 1995), Srivastava & SuriBabu (1997), Prasad & Varshney (1995), and Mishra (2007). Many additions have been made to the fauna of Madhya Pradesh by Tiple et al. (2011, 2012) with the latest updated checklist being Tiple & Chandra (2013) revealing 106 species under 53 genera and 12 families with 14 new records from Madhya Pradesh and Chhattisgarh. Recently Tiple & Payra (2020) reported *Epophthalmia frontalis* as a new record for Madhya Pradesh. Though the diversity of Odonata had been well documented from Madhya Pradesh, no consolidated checklist of Odonata of Jabalpur city and its surrounding areas is available and hence the present one with an objective of exploring the diversity and abundance.

MATERIALS AND METHODS

Opportunistic sampling and photo documentation were conducted in selected areas of Jabalpur city and its surrounding areas. Surveys were carried out from 2008 to 2019. Most of the samplings were done between 1000 h and 1400 h, when odonates control their body temperature in sunlight (Subramanian 2009; Koli et al. 2014; Payra & Tiple 2019). Identification of odonates was primarily made directly in the field from specimens collected with handheld aerial sweep nets and subsequently released without harm. Photographs of specimens taken from various angles aided their identification using field guides (Andrew et al. 2008; Subramanian 2009; Nair 2011). Specimens that were difficult to identify in the field were collected and preserved in 70% alcohol or acetone, and carried to the laboratory for further identification with the help of taxonomic keys (Fraser 1933, 1934, 1936; Mitra 2002). All scientific names follow Kalkman et al. (2020). The species were categorized on the basis of number of sightings in the Jabalpur city as: VC very common (>100 sightings), C common (50–100 sightings), FC frequently common (15–50 sightings), R rare (2–15 sightings), VR very rare (<2 sightings) (Tiple et al. 2008).

Study area

Jabalpur is one of the largest and the most crowded cities in Madhya Pradesh, located in the north-center region of India at 23.16°10'7.57"N & 79.93°55'54.64"E. It is situated on the Deccan Plateau at an altitude of 411 m and is surrounded on all sides by ancient basalt rocks and forests. Jabalpur consists of a long, narrow plain running from south-west to north-east flanked by the Bhanrer and Kaimur ranges of the Vindhyan system on the west and the various hills of the Mahadeo range and Maikal range on the east. The Bhitrigarh range and a few subsidiary hills intrude upon in the middle of the district and practically join the Vindhyan and the Satpura systems, which together form the great central watershed of India. It lies in the catchment of the longest river of central India, the Narmada, along with its tributaries, Hiran, Gour, Ken, and Sone. Jabalpur city is surrounded by low, rocky, and barren hillocks, which include Kariapathar hillock to the north-east, SitaPahad and Kandhari hills to the east and Madan Mahal hills to the south-west (Chandra 2008; Flora et al. 2020).

Jabalpur city has a humid subtropical climate, having three main seasons: June/July wet monsoon and its aftermath from June till October, the cool dry winter from October/November to February/March and the

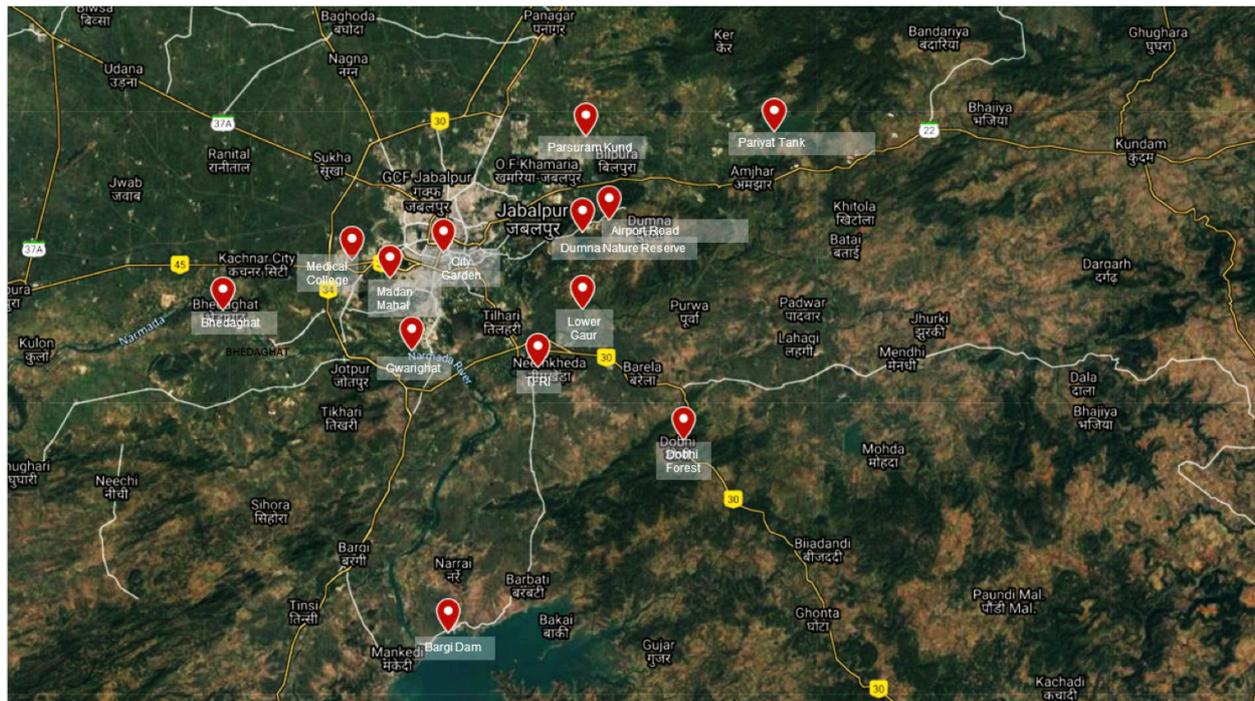


Figure 1. Map of the surveyed localities of Jabalpur City. Source: Google Earth

hot dry season from April till the onset of rains. The temperature of the city ranges from minimum of 10–25 °C to maximum 30–45 °C with a relative humidity 10–15 % to 60–95 %. Annual precipitation is 1,386 mm.

Survey sites

All the study sites were within and around Jabalpur city within a radius of 20 km. Odonates were surveyed in Dumna Nature Reserve (includes Kakartala), Dhobi Reserve Forest, Lower Gaur Reserve Forest, City Gardens, Tropical Forest Research Institute (TFRI), Airport Road, Vijaynagar, Garha, Adhartal, Medical College Campus, Bhedaghat, Pariyat Tank, Narrai forest, Parashuram Kund, Madan Mahal Hills (includes Thakurtal, Pisanhaari Temple and SangramSagar), areas adjacent to River Narmada, Bargi dam, temporary and permanent flowing or still water bodies, and rivers (Figure 1).

RESULTS AND DISCUSSION

Seventy-five species of Odonata belonging to nine families were recorded. The present study adds 21 new species recorded for Jabalpur district, and four species for Madhya Pradesh. Of the total, 37% (28) species were abundant or very common, 19% (14) were common, 16% (12) were frequently common, 24% (18) rare and 4% (03) very rare (i.e., *Aethriamanta brevipennis*, *Agricocnemis*

peris, *Caconeura ramburi*). The observed and identified species, their status in and around of Jabalpur city are listed in Table 1.

The highest number of odonates belonged to the family Libellulidae (32 species) with 10 new records (i.e., *Aethriamanta brevipennis*, *Diplacodes lefebvrii*, *Diplacodes nebulosa*, *Indothemis carnatica*, *Neurothemis fulvia*, *Orthetrum chrysis*, *Rhodothemis rufa*, *Tamea limbata*, *Rhyothemis triangularis*, *Urothemis signata*), followed by Coenagrionidae (17 species) with one new record (*Pseudagrion hypermelas*), Gomphidae (09 species) with five new records (i.e., *Cyclogomphus ypsilon*, *Cyclogomphus wilkinsi*, *Ictinogomphus distinctus*, *Ictinogomphus angulosus*, *Microgomphus torquatus*), Platycnemididae (06 species) with three new records (i.e., *Caconeura ramburi*, *Elattonaura nigerrima*, *Onychargia atrocyana*), Aeshnidae (05 species) with one new record (*Anax indicus*), Lestidae (03 species), Macromiidae (02 species) with one new record (*Macromia cingulata*) and Chlorocyphidae (1 species) (see Figure 2). *Ictinogomphus distinctus*, *Rhyothemis triangularis*, *Onychargia atrocyana*, and *Anax indicus* are recorded for the first time in Madhya Pradesh. *I. distinctus* has been reported from Santragachi, Howrah, West Bengal (Image 1). *R. triangularis* is a widely distributed species; it was recorded only from Assam, Karnataka, Kerala, Tamil Nadu states (Dow & Sharma 2010) (Image 4). *O. atrocyana* is a widely distributed

Table 1. Checklist of Odonata of Jabalpur city: OS—Occurrence status | TS—Threat status as assigned from IUCN (2014). NA—Not available | LC—Least concern | DD—Data deficient | VU—Vulnerable | NT—Near Threatened. The species recorded for the first time from the Jabalpur are asterisked by (*), and those which were previously unrecorded in the Madhya Pradesh state are marked by #.

	Scientific name	OS	TS
Suborder: Anisoptera (Dragonflies)			
Family: Aeshnidae (05)			
1	<i>Anax guttatus</i> (Burmeister, 1839)	VC	LC
2	<i>Anax immaculifrons</i> (Rambur, 1842)	C	LC
3	<i>Anax indicus</i> Lieftinck, 1942*#	R	LC
4	<i>Anax ephippiger</i> (Burmeister, 1839)	FC	LC
5	<i>Gynacantha bayadera</i> Selys, 1891	C	LC
Family: Gomphidae (09)			
6	<i>Burmagomphus pyramidalis</i> Laidlaw, 1922	R	NA
7	<i>Cyclogomphus ypsilon</i> Selys, 1854*	R	NA
8	<i>Cyclogomphus wilkinsi</i> Fraser, 1926*	R	DD
9	<i>Ictinogomphus distinctus</i> Ram, 1985*#	R	DD
10	<i>Ictinogomphus angulosus</i> (Selys, 1854)*	R	LC
11	<i>Ictinogomphus rapax</i> (Rambur, 1842)	VC	LC
12	<i>Macrogomphus annulatus</i> (Selys, 1854)	FC	DD
13	<i>Microgomphus torquatus</i> Selys, 1854*	R	DD
14	<i>Paragomphus lineatus</i> (Selys, 1850)	C	LC
Family: Libellulidae (32)			
15	<i>Acisoma panorpoides</i> Rambur, 1842	C	LC
16	<i>Aethriamant abrevipennis</i> (Rambur, 1842)*	VR	LC
17	<i>Brachydiplax sobrina</i> (Rambur, 1842)	FC	LC
18	<i>Brachythemis contaminata</i> (Fabricius, 1793)	VC	LC
19	<i>Bradinyopyga geminate</i> (Rambur, 1842)	VC	LC
20	<i>Crocothemis servilia</i> (Drury, 1770)	VC	LC
21	<i>Diplacodes lefebvrei</i> (Rambur, 1842)*	R	LC
22	<i>Diplacodes nebulosa</i> (Fabricius, 1793)*	R	LC
23	<i>Diplacodes trivialis</i> (Rambur, 1842)	VC	LC
24	<i>Indothemis carnatica</i> (Fabricius, 1798)*	R	NT
25	<i>Neurothemis fulvia</i> (Drury, 1773)*	C	LC
26	<i>Neurothemis intermedia</i> (Rambur, 1842)	VC	LC
27	<i>Neurothemis tullia</i> (Drury, 1773)	C	LC
28	<i>Orthetrum Sabina</i> (Drury, 1773)	VC	LC
29	<i>Orthetrum chrysis</i> (Selys, 1891) *	FC	LC
30	<i>Orthetrum glaucum</i> (Brauer, 1865)	VC	LC
31	<i>Orthetrum luzonicum</i> (Brauer, 1868)	VC	LC
32	<i>Orthetrum pruinosum</i> (Burmeister, 1839)	VC	LC
33	<i>Orthetrum taeniolatum</i> (Schneider, 1845)	VC	LC
34	<i>Pantalaflavescens</i> (Fabricius, 1798)	VC	LC
35	<i>Potamarcha congener</i> (Rambur, 1842)	VC	LC
36	<i>Rhodothemis rufa</i> (Rambur, 1842) *	R	LC
37	<i>Rhyothemis variegata</i> (Linnaeus, 1763)	VC	LC
38	<i>Rhyothemis triangularis</i> Kirby, 1889*#	R	LC
39	<i>Tholymis tillarga</i> (Fabricius, 1798)	C	LC

	Scientific name	OS	TS
40	<i>Tramea basilaris</i> (Palisot de Beauvois, 1807)	C	LC
41	<i>Tramea limbata</i> (Desjardins, 1832) *	C	LC
42	<i>Trithemis aurora</i> (Burmeister, 1839)	VC	LC
43	<i>Trithemis festiva</i> (Rambur, 1842)	VC	LC
44	<i>Trithemis kirbyi</i> Selys, 1891	FC	LC
45	<i>Trithemis pallidinervis</i> (Kirby, 1889)	VC	LC
46	<i>Urothemis signata</i> Rambur, 1842*	FC	LC
Family: Macromiidae (02)			
47	<i>Epophthalmia vittata</i> Burmeister, 1839	C	LC
48	<i>Macromia cingulata</i> Rambur, 1842*	C	LC
Suborder: Zygoptera (Damselflies)			
Family: Chlorocyphidae (01)			
49	<i>Libellago lineate</i> (Burmeister, 1839)	C	LC
Family: Coenagrionidae (17)			
50	<i>Aciagrion pallidum</i> (Selys, 1891)	FC	LC
51	<i>Aciagrion occidentale</i> Laidlaw, 1919	C	LC
52	<i>Agriocnemis splendidissima</i> Laidlaw	FC	NA
53	<i>Agriocnemis femina</i> (Brauer, 1868)	R	LC
54	<i>Agriocnemis pygmaea</i> (Rambur, 1842)	VC	LC
55	<i>Agriocnemis pieris</i> Laidlaw, 1919	VR	LC
56	<i>Paracercion calamorum</i> (Ris, 1916)	R	LC
57	<i>Ceriagrion coromandelianum</i> (Fabricius, 1798)	VC	LC
58	<i>Amphialagma parvum</i> (Selys, 1876)	R	LC
59	<i>Ischnura aurora</i> (Brauer, 1865)	VC	LC
60	<i>Ischnura senegalensis</i> (Rambur, 1842)	VC	LC
61	<i>Pseudagrion spencei</i> Fraser, 1922	FC	LC
62	<i>Pseudagrion decorum</i> (Rambur, 1842)	VC	LC
63	<i>Pseudagrion hypermelas</i> (Selys, 1876)*	R	LC
64	<i>Pseudagrion microcephalum</i> (Rambur, 1842)	C	LC
65	<i>Pseudagrion rubriceps</i> (Selys, 1876b)	VC	LC
66	<i>Ischnura nursei</i> (Morton, 1907)	FC	LC
Family: Lestidae (03)			
67	<i>Lestes elatus</i> Hagen in Selys, 1862	FC	LC
68	<i>Lestes concinnus</i> Hagen in Selys, 1862	VC	LC
69	<i>Lestes viridulus</i> Rambur, 1842	VC	LC
Family: Platycnemididae (06)			
70	<i>Copera marginipes</i> (Rambur, 1842)	VC	LC
71	<i>Caconeura ramburi</i> (Fraser, 1922) *	VR	DD
72	<i>Disparoneura quadrimaculata</i> (Rambur, 1842)	VC	LC
73	<i>Prodasineura verticalis</i> (Selys, 1860)	FC	LC
74	<i>Elattoneura nigerrima</i> (Laidlaw, 1917)*	R	DD
75	<i>Onychargia atrociana</i> (Selys, 1865)*#	R	LC

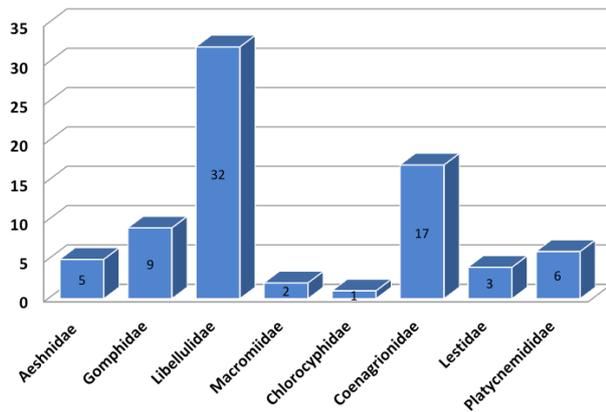


Figure 2. The number of odonate species encountered in different families in the Jabalpur city.

species; it was recorded only from forested areas of Western Ghats, Bengal, and northeastern states (Image 3). These species are recorded for the first time in central India. *A. indicus* is a widely distributed species in India. There are gaps in its known distribution but these are likely to be due to under sampling and misidentification as the closely related *A. guttatus*, with which it has been frequently confused (Image 2).

Among the 75 odonates recorded from Jabalpur city, 72 species are listed in the IUCN Red List of Threatened Species. Among them *Indothemis carnatica* is 'Near Threatened', 65 species are 'Least Concern', the six species are 'Data Deficient' (*Cyclogomphus wilkinsi*, *Ictinogomphus distinctus*, *Macrogomphus annulatus*, *Microgomphus torquatus*, *Caconeura ramburi*, and *Elattonaura nigerrima*), and three not listed. The family Gomphidae is also represented by the highest number of Data Deficient species (Table 1). The members of this family are fast moving insects and may have crepuscular habits. These insects are difficult to observe or collect. Many gomphids are already rare. Therefore, there are high chances of not detecting them during surveys (Tiple & Koparde 2015).

During monsoon and post-monsoon seasons, *Pantala flavescens* is very abundant, as a result of mass emergence and migration. However, species like *Aethriamanta brevipennis*, *Agriocnemis pieris*, *Caconeura ramburi*, *Onychargia atrocyana*, *Elattonaura nigerrima*, *Ictinogomphus angulosus*, and *Rhyothemis triangularis* were rarely encountered. Abundance of *Brachythemis contaminata*, *Orthetrum Sabina*, and *Diplacodes trivialis* was high in contaminated water bodies. Species of Gomphidae, Macromiidae, Chlorocyphidae, and Platycnemididae were not found in contaminated water but found to occur in unpolluted



Image 1. *Ictinogomphus distinctus*



Image 2. *Onychargia atrocyana*



Image 3. *Anax indicus*



Image 4. *Rhyothemis triangularis*

wetlands.

Odonates are an indicator group and conservation activities must be acknowledged, especially for tropical odonates (Samways & Steytler 1996; Suhling et al. 2004). Zones in and around urban regions which consist of rivers, lakes, dams, rainwater puddles, marshes, urban parks, and gardens are excellent and rich sites of Odonata, and thus should be conserved and kept pollution free. Emerging urbanization affects odonate populations because of destruction and contamination of their natural habitats. Regions like the Narmada River and Bargi dam, which are home to large numbers of migratory birds, should be monitored and kept pollution free. Thorough analyses of their population in these habitats may act as role model for the evaluation of environmental health and quality. Observations from the present investigation may end up being significant as a reference for biodiversity managers in assessing changes in environmental conditions in the study area.

To conserve the suitable habitats of these ecologically important insects, public awareness is required. Anthropogenic activities (cutting logs, expansion of agricultural fields in lake surroundings), siltation, and eutrophication are among the major causes for increasing deterioration rate of the suitable habitats of odonates. However, presence of forest streams, waterfalls, rivers, lakes, and temporary & permanent flowing or still water bodies with dense shrubs & tree vegetations are most likely the major attractions for the Odonata. The observations recorded in the present study may prove valuable as a reference for assessing the changes due to the environmental conditions in the locality in the future.

The suborder Anisoptera was abundant in comparison to Zygoptera, and found in all the water bodies that were sampled. This corroborates the findings of earlier reports (Williams 1997; Lawler 2001; Suhling et al. 2004). Our findings agree with Keize & Kalkman (2009), who concluded that Coenagrionidae and Libellulidae are the dominant Odonata fauna in standing water worldwide. Tiple (2008) studied the Odonata fauna of Nagpur city and observed that the Libellulidae dominated with 30 species followed by Coenagrionidae (16 species). In central India too, odonate fauna is mostly dominated by the Libellulidae and Coenagrionidae (Tiple & Chandra 2013). Andrew (2013) observed similar findings with the Odonata of Chatri Lake in Amravati and Zilpi Lake in Nagpur, respectively. Tiple et al. (2013) gave a detailed compilation of odonates of Vidarbha region of Maharashtra with 82 species under 47 genera and nine families, and revealed that the Libellulidae is

the dominant one (38 species). The present study also corroborates this as Libellulidae (32 species), the most dominant, followed by Coenagrionidae.

Tiple & Chandra (2013) reported 106 species of Odonata from Madhya Pradesh and Chhattisgarh States. The present study on the Odonata of Jabalpur city revealed the presence of 75 species which account 71% of total species reported in Madhya Pradesh and Chhattisgarh States. The Jabalpur city and surrounding area seems to be having rich Odonate diversity of 75 varieties of species in small city area. Probably due to the presence of rivers (Narmada, Hiran, Gour, Ken, and Sone), lakes, and temporary & permanent flowing or still water bodies with dense shrub & tree vegetation a major attraction to the odonate species. The observations recorded in the present study supports the value of the Jabalpur city area in providing valuable resources for Odonata and it may prove as a reference for assessing the changes due to the environmental conditions in the locality in the future.

REFERENCES

- Andrew, R.J. (2013). Odonates of Zilpi Lake of Nagpur (India) with a note on the emergence of the Libellulidae dragonfly, *Trithemis pallidenervis*. *Journal of New Biological Report* 2: 177–187.
- Andrew, R.J., K.A. Subramaniam, & A.D. Tiple (2008). *A Handbook on Common Odonates of Central India*. South Asian Council of Odonatology, 65 pp.
- Bedjanić, M., V. Kalkman & K.A. Subramaniam (2020) A new species of Orthetrum Newman, 1833 (Odonata: Libellulidae) from the Andaman Islands, India. *Zootaxa* 4779(1): 91–100.
- Bhasin, G.D. (1953). A systematic catalogue of main identified collection at Forest Research Institute, Dehra Dun. Pt. 12. Order Odonata. *Indian Forest Leaflet* 121(3): 63–78.
- Chandra, K. (2008). *Faunal Diversity of Jabalpur District, Madhya Pradesh*. Zoological Survey of India, Kolkata, 417 pp.
- Dawn, P. (2021). A new species of *Cephalaeschna* Selys, 1883 (Odonata: Anisoptera: Aeshnidae) from Neora Valley National Park, West Bengal, India, with notes on *C. acanthifrons* Joshi & Kunte, 2017 and *C. viridifrons* (Fraser, 1922). *Zootaxa* 4949(2): 371–380.
- Dijkstra, K.D.B. (2007). Gone with the wind: westward dispersal across the Indian Ocean and island speciation in *Hemicordulia* dragonflies (Odonata: Corduliidae). *Zootaxa* 1438: 27–48.
- Dijkstra, K.D.B. & R. Lewington (2006). *Field Guide to the Dragonflies of Britain and Europe*. British Wildlife Publishing, 320 pp.
- Dow, R.A. & G. Sharma (2010). *Rhyothemis triangularis*. The IUCN Red List of Threatened Species 2010: e.T169123A6570098. <https://doi.org/10.2305/IUCN.UK.2010-4.RLTS.T169123A6570098.en>
- Flora, J.S., A.D. Tiple, A. Sengupta & S.V. Padwad (2020). Butterfly (Lepidoptera: Rhopalocera) fauna of Jabalpur City, Madhya Pradesh, India. *Journal of Threatened Taxa* 12(11): 16607–16613. <https://doi.org/10.11609/jott.4168.12.11.16607-16613>
- Fraser, F.C. (1933). *Fauna of British India Odonata* 1. Taylor and Francis Ltd. London, 423 pp.
- Fraser, F.C. (1934). *Fauna of British India Odonata* 2. Taylor and Francis Ltd. London, 398 pp.
- Fraser, F.C. (1936). *Fauna of British India Odonata* 3. Taylor and Francis Ltd. London, 461 pp.
- Joshi, S. & D. Sawant (2020). Description of *Bradinopyga konkanensis*

- sp. nov. (Odonata: Anisoptera: Libellulidae) from the coastal region of Maharashtra, India. *Zootaxa* 4779(1): 65–78.
- Kalkman, V.J., R. Babu, M. Bedjanić, K. Conniff, T. Gyeltshen, M.K. Khan, K.A. Subramanian, A. Zia & A.G. Orr (2020).** Checklist of the dragonflies and damselflies (Insecta: Odonata) of Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka. *Zootaxa* 4849(1): 1–84.
- Keize, J. and V. Kalkman (2009).** Records of dragonflies from Kabupaten Merauke, Papua, Indonesia collected in 2007 and 2008 (Odonata). *Suara Serangga Papua* 4(2): 40–45.
- Koli, V.K., C. Bhatnagar & D.S. Shekhawat (2014).** Diversity and species composition of odonates in southern Rajasthan, India. *Proceedings of the Zoological Society* 68: 202–211.
- Lawler, S.P. (2001).** Rice fields as temporary wetlands: a review. *Israel Journal of Zoology* 47: 513–528.
- Mishra, S.K. (2007).** Fauna of Madhyapardesh (Odonata: Insecta). State Fauna Series, Zoological Survey of India, Kolkata 15(1): 245–272.
- Mitra, T.R. (1988).** Note on the odonata fauna of Central India. *Records of the Zoological Survey of India* 83: 69–81.
- Mitra, T.R. (1995).** Insecta: Odonata including a new species from Central India, pp. 31–34. In: *Fauna of Indravati Tiger Reserve*. Fauna of Conservation Areas, Zoological Survey of India, 117 pp.
- Mitra, T.R. (2002).** Geographical distribution of Odonata (Insecta) of Eastern India. *Memoirs of the Zoological Survey of India* 19(1): 1–208.
- Nair, M.V. (2011).** *Dragonflies & Damselflies of Orissa and Eastern India*. Wildlife Organization, Forest & Environment Department, Government of Orissa, 252 pp.
- Payra, A. & A.D. Tiple (2019).** Odonata fauna in adjoining coastal areas of Purba Medinipur District, West Bengal, India. *Munis Entomology & Zoology* 14(2): 358–367.
- Payra, A., K.A. Subramanian, K. Chandra & B. Tripathy (2020).** A first record of *Camacinia harterti* Karsch, 1890 (Odonata: Libellulidae) from Arunachal Pradesh, India. *Journal of Threatened Taxa* 12(8): 15922–15926. <https://doi.org/10.11609/jott.4653.12.8.15922-15926>
- Payra, A., P. Dawn, K. A. Subramanian, C. K Deepak, K. Chandra & B. Tripathy (2021).** New record of *Megalestes gyalsey* Gyeltshen, Kalkman & Orr, 2017 (Zygoptera: Synlestidae) from India, with first description of female and larva. *Zootaxa* 4938(2): 233–242.
- Prasad, M. & S.K. Ghosh (1988).** A contribution on the Eastuarine Odonata of East India. *Record of Zoological Survey of India* 85(2): 197–216.
- Prasad, M. & A. Singh (1995).** Fauna of conservation areas series 5. Rajaji National Park: Odonata. *Records of the Zoological Survey of India* 195–215.
- Samways, M.J. & N.S. Steytler (1996).** Dragonfly (Odonata) distribution patterns in urban and forest landscapes, and recommendations for riparian management. *Biological Conservation* 78: 279–288.
- Schorr, M. & D. Paulson (2021)** World Odonata List. <https://www.pugetsound.edu/academics/academic-resources/slater-museum/>. Accessed 12 January 2022.
- Srivastava, V.K. & B. SuriBabu (1997).** Annotations on the Damselfly collection from Sagar, Central India. *Fraseria* 4: 13–15.
- Subramanian, K.A. (2009).** *Dragonflies and Damselflies of Peninsular India - A Field Guide*. VigyanPrasar, Noida, India, 168 pp.
- Subramanian, K.A. & R. Babu (2020).** *Dragonflies and damselflies (Insecta: Odonata) of India*, pp. 29–45. In: Ramani, S., M. Prashanth & H.M. Yeshwanath (eds.). *Indian Insects Diversity and Science*. CRC Press, Taylor & Francis.
- Suhling, F., K. Schenk, T. Padeffke & A. Martens (2004).** A field study of larval development in a dragonfly assemblage in African desert ponds (Odonata). *Hydrobiologia* 528: 75–85
- Tiple A.D. & A. Payra (2020)** First Record of *Epopthalmia frontalis* from Central India (Insecta: Odonata: Macromiidae). *Travaux du Muséum National d'Histoire Naturelle "Grigore Antipa"* 63(2): 127–130. <https://doi.org/10.3897/travaux.63.e52897>
- Tiple, A.D. & P. Koparde (2015).** Odonata of Maharashtra, India with Notes on Species Distribution. *Journal of Insect Science* 15(1): 1–10. <https://doi.org/10.1093/jisesa/iev028>
- Tiple, A.D. & K. Chandra (2013)** Dragonflies and Damselflies (Insecta, Odonata) of Madhya Pradesh and Chhattisgarh States, India. *Care 4Nature* 1(1): 2–11.
- Tiple, A.D., N. Kulkarni & K.C. Joshi (2011).** Diversity of Odonata in Kanha National Park, Madhya Pradesh, India. *Indian Journal of Forestry* 34(3): 329–332.
- Tiple, A.D., R.J. Andrew, K.A. Subramanian & S.S. Talmale (2013).** Odonata of Vidarbha region, Maharashtra state, central India. *Odonatologica* 42: 237–245.
- Tiple, A.D., S. Paunekar & S.S. Talmale (2012).** Dragonflies and Damselflies (Odonata: Insecta) of Tropical Forest Research Institute, Jabalpur, Madhya Pradesh, central India. *Journal of Threatened Taxa* 4(4): 2529–2533. <https://doi.org/10.11609/joTT.o2657.2529-33>
- Tiple, A.D., A.M. Khurad & R.J. Andrew (2008).** Species Diversity of Odonata in and Around Nagpur City, Central India. *Fraseria* 7: 41–45.
- Williams, D.D. (1997).** Temporary ponds and their invertebrate communities. *Aquatic Conservation: Marine and Freshwater Ecosystems* 7: 105–117.

Dr. John Noyes, Natural History Museum, London, UK
Dr. Albert G. Orr, Griffith University, Nathan, Australia
Dr. Sameer Padhye, Katholieke Universiteit Leuven, Belgium
Dr. Nancy van der Poorten, Toronto, Canada
Dr. Kareen Schnabel, NIWA, Wellington, New Zealand
Dr. R.M. Sharma, (Retd.) Scientist, Zoological Survey of India, Pune, India
Dr. Manju Siliwal, WILD, Coimbatore, Tamil Nadu, India
Dr. G.P. Sinha, Botanical Survey of India, Allahabad, India
Dr. K.A. Subramanian, Zoological Survey of India, New Alipore, Kolkata, India
Dr. P.M. Sureshan, Zoological Survey of India, Kozhikode, Kerala, India
Dr. R. Varatharajan, Manipur University, Imphal, Manipur, India
Dr. Eduard Vives, Museu de Ciències Naturals de Barcelona, Terrassa, Spain
Dr. James Young, Hong Kong Lepidopterists' Society, Hong Kong
Dr. R. Sundararaj, Institute of Wood Science & Technology, Bengaluru, India
Dr. M. Nithyanandan, Environmental Department, La Ala Al Kuwait Real Estate. Co. K.S.C., Kuwait
Dr. Himender Bharti, Punjabi University, Punjab, India
Mr. Purnendu Roy, London, UK
Dr. Saito Motoki, The Butterfly Society of Japan, Tokyo, Japan
Dr. Sanjay Sondhi, TITLI TRUST, Kalpavriksh, Dehradun, India
Dr. Nguyen Thi Phuong Lien, Vietnam Academy of Science and Technology, Hanoi, Vietnam
Dr. Nitin Kulkarni, Tropical Research Institute, Jabalpur, India
Dr. Robin Wen Jiang Ngiam, National Parks Board, Singapore
Dr. Lionel Monod, Natural History Museum of Geneva, Genève, Switzerland.
Dr. Asheesh Shivam, Nehru Gram Bharti University, Allahabad, India
Dr. Rosana Moreira da Rocha, Universidade Federal do Paraná, Curitiba, Brasil
Dr. Kurt R. Arnold, North Dakota State University, Saxony, Germany
Dr. James M. Carpenter, American Museum of Natural History, New York, USA
Dr. David M. Claborn, Missouri State University, Springfield, USA
Dr. Kareen Schnabel, Marine Biologist, Wellington, New Zealand
Dr. Amazonas Chagas Júnior, Universidade Federal de Mato Grosso, Cuiabá, Brasil
Mr. Monsoon Jyoti Gogoi, Assam University, Silchar, Assam, India
Dr. Heo Chong Chin, Universiti Teknologi MARA (UiTM), Selangor, Malaysia
Dr. R.J. Shiel, University of Adelaide, SA 5005, Australia
Dr. Siddharth Kulkarni, The George Washington University, Washington, USA
Dr. Priyadarsanan Dharma Rajan, ATREE, Bengaluru, India
Dr. Phil Alderslade, CSIRO Marine And Atmospheric Research, Hobart, Australia
Dr. John E.N. Veron, Coral Reef Research, Townsville, Australia
Dr. Daniel Whitmore, State Museum of Natural History Stuttgart, Rosenstein, Germany.
Dr. Yu-Feng Hsu, National Taiwan Normal University, Taipei City, Taiwan
Dr. Keith V. Wolfe, Antioch, California, USA
Dr. Siddharth Kulkarni, The Hormiga Lab, The George Washington University, Washington, D.C., USA
Dr. Tomas Ditrich, Faculty of Education, University of South Bohemia in Ceske Budejovice, Czech Republic
Dr. Mihaly Foldvari, Natural History Museum, University of Oslo, Norway
Dr. V.P. Uniyal, Wildlife Institute of India, Dehradun, Uttarakhand 248001, India
Dr. John T.D. Caleb, Zoological Survey of India, Kolkata, West Bengal, India
Dr. Priyadarsanan Dharma Rajan, Ashoka Trust for Research in Ecology and the Environment (ATREE), Royal Enclave, Bangalore, Karnataka, India

Fishes

Dr. Neelesh Dahanukar, IISER, Pune, Maharashtra, India
Dr. Topiltzin Contreras MacBeath, Universidad Autónoma del estado de Morelos, México
Dr. Heok Hee Ng, National University of Singapore, Science Drive, Singapore
Dr. Rajeev Raghavan, St. Albert's College, Kochi, Kerala, India
Dr. Robert D. Sluka, Chiltern Gateway Project, A Rocha UK, Southall, Middlesex, UK
Dr. E. Vivekanandan, Central Marine Fisheries Research Institute, Chennai, India
Dr. Davor Zanella, University of Zagreb, Zagreb, Croatia
Dr. A. Biju Kumar, University of Kerala, Thiruvananthapuram, Kerala, India
Dr. Akhilesh K.V., ICAR-Central Marine Fisheries Research Institute, Mumbai Research Centre, Mumbai, Maharashtra, India
Dr. J.A. Johnson, Wildlife Institute of India, Dehradun, Uttarakhand, India

Amphibians

Dr. Sushil K. Dutta, Indian Institute of Science, Bengaluru, Karnataka, India
Dr. Annemarie Ohler, Muséum national d'Histoire naturelle, Paris, France

Reptiles

Dr. Gernot Vogel, Heidelberg, Germany
Dr. Raju Vyas, Vadodara, Gujarat, India
Dr. Pritpal S. Soorae, Environment Agency, Abu Dhabi, UAE.
Prof. Dr. Wayne J. Fuller, Near East University, Mersin, Turkey
Prof. Chandrashekhar U. Rivonker, Goa University, Taleigao Plateau, Goa, India
Dr. S.R. Ganesh, Chennai Snake Park, Chennai, Tamil Nadu, India
Dr. Himansu Sekhar Das, Terrestrial & Marine Biodiversity, Abu Dhabi, UAE

Birds

Dr. Hem Sagar Baral, Charles Sturt University, NSW Australia
Mr. H. Byju, Coimbatore, Tamil Nadu, India
Dr. Chris Bowden, Royal Society for the Protection of Birds, Sandy, UK
Dr. Priya Davidar, Pondicherry University, Kalapet, Puducherry, India
Dr. J.W. Duckworth, IUCN SSC, Bath, UK
Dr. Rajah Jayapal, SACON, Coimbatore, Tamil Nadu, India
Dr. Rajiv S. Kalsi, M.L.N. College, Yamuna Nagar, Haryana, India
Dr. V. Santharam, Rishi Valley Education Centre, Chittoor Dt., Andhra Pradesh, India
Dr. S. Balachandran, Bombay Natural History Society, Mumbai, India
Mr. J. Praveen, Bengaluru, India
Dr. C. Srinivasulu, Osmania University, Hyderabad, India
Dr. K.S. Gopi Sundar, International Crane Foundation, Baraboo, USA
Dr. Gombobaatar Sundev, Professor of Ornithology, Ulaanbaatar, Mongolia
Prof. Reuven Yosef, International Birding & Research Centre, Eilat, Israel
Dr. Taej Mundkur, Wetlands International, Wageningen, The Netherlands
Dr. Carol Inskipp, Bishop Auckland Co., Durham, UK
Dr. Tim Inskipp, Bishop Auckland Co., Durham, UK
Dr. V. Gokula, National College, Tiruchirappalli, Tamil Nadu, India
Dr. Arkady Lelej, Russian Academy of Sciences, Vladivostok, Russia
Dr. Simon Dowell, Science Director, Chester Zoo, UK
Dr. Mário Gabriel Santiago dos Santos, Universidade de Trás-os-Montes e Alto Douro, Quinta de Prados, Vila Real, Portugal
Dr. Grant Connette, Smithsonian Institution, Royal, VA, USA
Dr. M. Zafar-ul Islam, Prince Saud Al Faisal Wildlife Research Center, Taif, Saudi Arabia

Mammals

Dr. Giovanni Amori, CNR - Institute of Ecosystem Studies, Rome, Italy
Dr. Anwaruddin Chowdhury, Guwahati, India
Dr. David Mallon, Zoological Society of London, UK
Dr. Shomita Mukherjee, SACON, Coimbatore, Tamil Nadu, India
Dr. Angie Appel, Wild Cat Network, Germany
Dr. P.O. Nameer, Kerala Agricultural University, Thrissur, Kerala, India
Dr. Ian Redmond, UNEP Convention on Migratory Species, Lansdown, UK
Dr. Heidi S. Riddle, Riddle's Elephant and Wildlife Sanctuary, Arkansas, USA
Dr. Karin Schwartz, George Mason University, Fairfax, Virginia.
Dr. Lala A.K. Singh, Bhubaneswar, Orissa, India
Dr. Mewa Singh, Mysore University, Mysore, India
Dr. Paul Racey, University of Exeter, Devon, UK
Dr. Honnavalli N. Kumara, SACON, Anaikatty P.O., Coimbatore, Tamil Nadu, India
Dr. Nishith Dharaiya, HNG University, Patan, Gujarat, India
Dr. Spartaco Gippoliti, Socio Onorario Società Italiana per la Storia della Fauna "Giuseppe Altobello", Rome, Italy
Dr. Justus Joshua, Green Future Foundation, Tiruchirappalli, Tamil Nadu, India
Dr. H. Raghuram, The American College, Madurai, Tamil Nadu, India
Dr. Paul Bates, Harison Institute, Kent, UK
Dr. Jim Sanderson, Small Wild Cat Conservation Foundation, Hartford, USA
Dr. Dan Challenger, University of Kent, Canterbury, UK
Dr. David Mallon, Manchester Metropolitan University, Derbyshire, UK
Dr. Brian L. Cypher, California State University-Stanislaus, Bakersfield, CA
Dr. S.S. Talmale, Zoological Survey of India, Pune, Maharashtra, India
Prof. Karan Bahadur Shah, Budhanilakantha Municipality, Kathmandu, Nepal
Dr. Susan Cheyne, Borneo Nature Foundation International, Palangkaraja, Indonesia
Dr. Hemanta Kafley, Wildlife Sciences, Tarleton State University, Texas, USA

Other Disciplines

Dr. Aniruddha Belsare, Columbia MO 65203, USA (Veterinary)
Dr. Mandar S. Paingankar, University of Pune, Pune, Maharashtra, India (Molecular)
Dr. Jack Tordoff, Critical Ecosystem Partnership Fund, Arlington, USA (Communities)
Dr. Ulrike Streicher, University of Oregon, Eugene, USA (Veterinary)
Dr. Hari Balasubramanian, EcoAdvisors, Nova Scotia, Canada (Communities)
Dr. Rayanna Hellem Santos Bezerra, Universidade Federal de Sergipe, São Cristóvão, Brazil
Dr. Jamie R. Wood, Landcare Research, Canterbury, New Zealand
Dr. Wendy Collinson-Jonker, Endangered Wildlife Trust, Gauteng, South Africa
Dr. Rajeshkumar G. Jani, Anand Agricultural University, Anand, Gujarat, India
Dr. O.N. Tiwari, Senior Scientist, ICAR-Indian Agricultural Research Institute (IARI), New Delhi, India
Dr. L.D. Singla, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, India
Dr. Rupika S. Rajakaruna, University of Peradeniya, Peradeniya, Sri Lanka
Dr. Bahar Baviskar, Wild-CER, Nagpur, Maharashtra 440013, India

Reviewers 2019–2021

Due to pausivity of space, the list of reviewers for 2018–2020 is available online.

The opinions expressed by the authors do not reflect the views of the Journal of Threatened Taxa, Wildlife Information Liaison Development Society, Zoo Outreach Organization, or any of the partners. The journal, the publisher, the host, and the partners are not responsible for the accuracy of the political boundaries shown in the maps by the authors.

Journal of Threatened Taxa is indexed/abstracted in Bibliography of Systematic Mycology, Biological Abstracts, BIOSIS Previews, CAB Abstracts, EBSCO, Google Scholar, Index Copernicus, Index Fungorum, JournalSeek, National Academy of Agricultural Sciences, NewJour, OCLC WorldCat, SCOPUS, Stanford University Libraries, Virtual Library of Biology, Zoological Records.

NAAS rating (India) 5.64

Print copies of the Journal are available at cost. Write to:
The Managing Editor, JoTT,
c/o Wildlife Information Liaison Development Society,
No. 12, Thiruvannamalai Nagar, Saravanampatti - Kalapatti Road,
Saravanampatti, Coimbatore, Tamil Nadu 641035, India
ravi@threatenedtaxa.org



www.threatenedtaxa.org

OPEN ACCESS



The Journal of Threatened Taxa (JoTT) is dedicated to building evidence for conservation globally by publishing peer-reviewed articles online every month at a reasonably rapid rate at www.threatenedtaxa.org. All articles published in JoTT are registered under [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/) unless otherwise mentioned. JoTT allows unrestricted use, reproduction, and distribution of articles in any medium by providing adequate credit to the author(s) and the source of publication.

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

March 2022 | Vol. 14 | No. 3 | Pages: 20703–20810

Date of Publication: 26 March 2022 (Online & Print)

DOI: 10.11609/jott.2022.14.3.20703-20810

Article

Distribution and habitat-use of Dhole *Cuon alpinus* (Mammalia: Carnivora: Canidae) in Parsa National Park, Nepal

– Santa Bahadur Thing, Jhamak Bahadur Karki, Babu Ram Lamichhane, Shashi Shrestha, Uba Raj Regmi & Rishi Ranabhat, Pp. 20703–20712

Communications

Habitat preference and population density of threatened Visayan hornbills *Penelopides panini* and *Rhabdotornis waldeni* in the Philippines

– Andrew Ross T. Reintar, Lisa J. Paguntalan, Philip Godfrey C. Jakosalem, Al Christian D. Quidet, Dennis A. Warguez & Emelyn Peñaranda, Pp. 20713–20720

Nest colonies of Baya Weaver *Ploceus philippinus* (Linnaeus, 1766) on overhead power transmission cables in the agricultural landscape of Cuddalore and Villupuram districts (Tamil Nadu) and Puducherry, India

– M. Pandian, Pp. 20721–20732

Status and distribution of Mugger Crocodile *Crocodylus palustris* in the southern stretch of river Cauvery in Melagiris, India

– Rahul Gour, Nikhil Whitaker & Ajay Kartik, Pp. 20733–20739

Dragonflies and damselflies (Insecta: Odonata) of Jabalpur, Madhya Pradesh, India

– Ashish Tiple, Vivek Sharma & Sonali V. Padwad, Pp. 20740–20746

Spatial and temporal variation in the diversity of malacofauna from Aripal stream of Kashmir Himalaya, India

– Zahoor Ahmad Mir & Yahya Bakhtiyar, Pp. 20747–20757

A checklist of blue-green algae (Cyanobacteria) from Punjab, India

– Yadvinder Singh, Gurdarshan Singh, D.P. Singh & J.I.S. Khattar, Pp. 20758–20772

Short Communications

Breeding biology of Sri Lanka White-eye *Zosterops ceylonensis* (Aves: Passeriformes: Zosteropidae) in tropical montane cloud forests, Sri Lanka

– W.D.S.C. Dharmarathne, P.H.S.P. Chandrasiri & W.A.D. Mahaulpatha, Pp. 20773–20779

Two new species of army ants of the *Aenictus ceylonicus* group (Hymenoptera: Formicidae) from Kerala, India

– Anupa K. Antony & G. Prasad, Pp. 20780–20785

Addition of three new angiosperm taxa to the flora of Bangladesh

– M. Ashrafuzzaman, M. Khairul Alam & A.K.M. Golam Sarwar, Pp. 20786–20791

A new distribution record of *Memecylon clarkeanum* Cogn. (Melastomataceae) to Karnataka from Sharavathi river basin, central Western Ghats, India

– Malve Sathisha Savinaya, Jogattappa Narayana, Venkatarangaiah Krishna & KalamANJI Govindaiah Girish, Pp. 20792–20797

Notes

First record of Doherty's Dull Oakblue *Arhopala khamti* Doherty, 1891 from upper Assam, India

– Arun Pratap Singh, Pp. 20798–20800

A new species of *Pancratium* Dill. ex L. (Amaryllidaceae) from Eastern Ghats of India

– R. Prameela, J. Prakasa Rao, S.B. Padal & M. Sankara Rao, Pp. 20801–20804

Tribulus ochroleucus (Maire) Ozenda & Quezel (Zygophyllaceae) - a new addition to the flora of India

– K. Ravikumar, Umeshkumar Tiwari, Balachandran Natesan & N. Arun Kumar, Pp. 20805–20807

Abnormalities in the female spikelets of *Coix lacryma-jobi* L. (Poaceae) India

– Nilesh Appaso Madhav & Kumar Vinod Chhotupuri Gosavi, Pp. 20808–20810

Publisher & Host

