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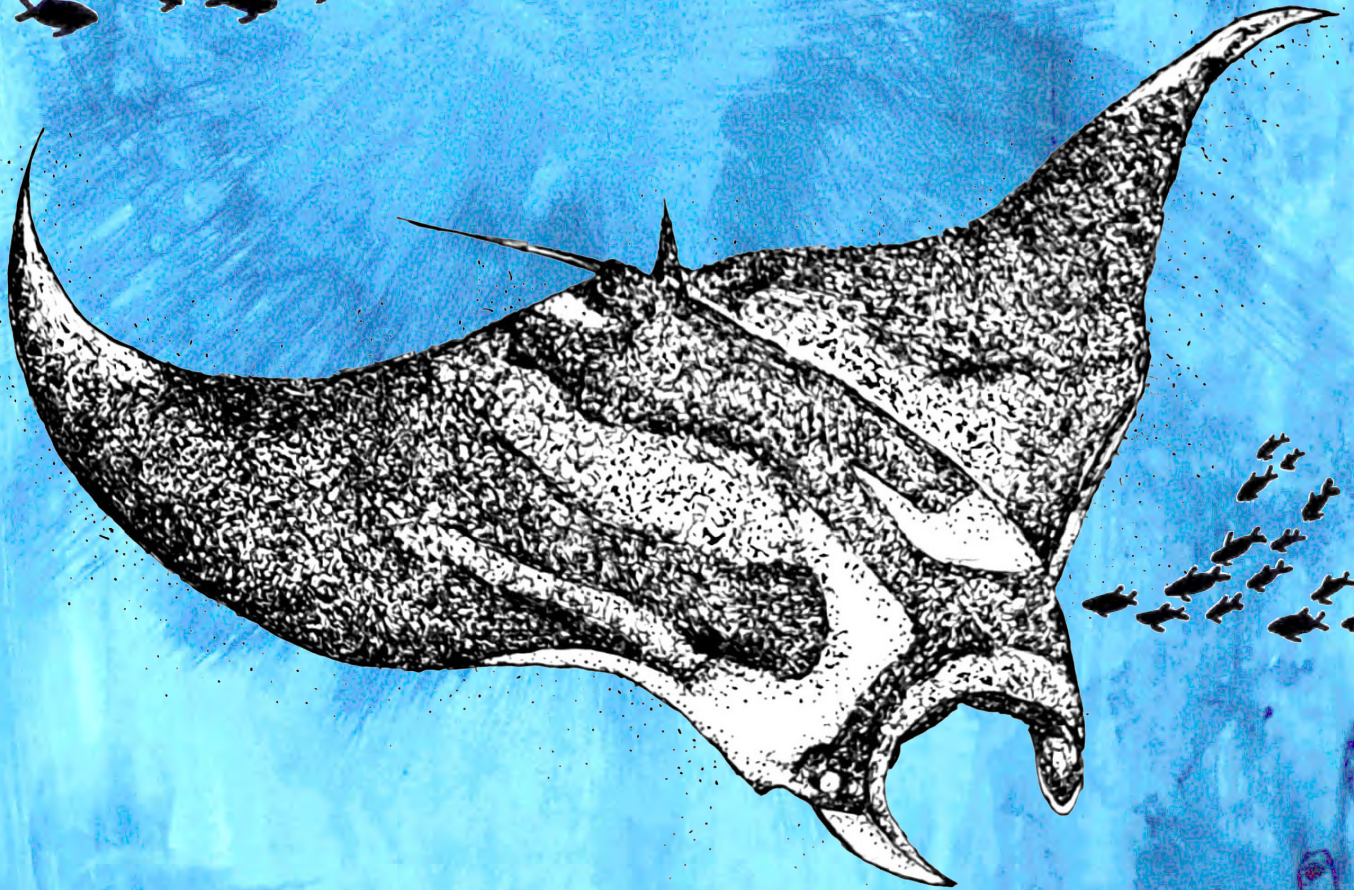
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Cover: Giant Oceanic Manta Ray *Mobula birostris* in ink on acrylic wash by Elakshi Mahika Molur adapted from scientific illustration by Roger Hall.



Three new records of odonates (Insecta: Odonata) from Sindhudurg District, Maharashtra, India

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Abstract: Genus *Indolestes* Fraser, 1922 and *Dysphaea* Selys, 1853 were previously known from Goa, Kerala, Karnataka, Tamil Nadu, parts of Gujarat, and eastern India. In this paper, we report the first confirmed records of *Indolestes gracilis davenporti* Fraser, 1930 and *Dysphaea ethela* Fraser, 1924 based on a specimen collected from Sindhudurg District, Maharashtra, India. We have also provided additional records of *Macrodiplax cora* (Brauer, 1867) from Maharashtra based on photographic evidence from Sindhudurg District.

Keywords: Damselfly, *Dysphaea*, Euphaeidae, *Indolestes*, Lestidae *Macrodiplax*, Western Ghats.

Marathi Abstract: *Indolestes*, Fraser, 1922 and *Dysphaea* Selys, 1853 या टाचणीच्या दोन जाती आधी गोवा, केरळ, कर्नाटक, तमीळनाडू, गुजरात राज्याचा काही भाग आणि ईशान्य भारत येथून ज्ञात होत्या. आम्ही या पेपरमध्ये महाराष्ट्र राज्यातून *Indolestes gracilis davenporti* Fraser, 1930 या उपप्रजातीची आणि *Dysphaea ethela* Fraser, 1924 या प्रजातीची सिंधुदुर्ग जिल्ह्यातून गोळ्या करण्यात आलेल्या नमुन्यांच्या आधारे निश्चित नोंद करत आहोत. तसेच *Macrodiplax cora* (Brauer, 1867) या प्रजातीच्या सिंधुदुर्ग जिल्ह्यातून घेतलेल्या छायाचित्रांच्या आधारावर महाराष्ट्रातील अतिरिक्त नोंदी देत आहोत.

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Author contributions: AD wrote the manuscript and collected data in the field by surveying odonates at three different locations. YK photographed *Macrodiplax cora* from one of the localities. RT assisted AD during the collection of *Dysphaea ethela* and helped in collecting the data during field work.

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INTRODUCTION

The Sindhudurg District of Maharashtra is well-known for numerous new discoveries of faunal species as a result of extensive surveys carried out by researchers across the country (Biju & Bossuyt 2009; Mirza et al. 2014; Padhye 2014; Gower et al. 2016; Pati et al. 2016; Sayyed et al. 2016; Joshi & Sawant 2019, 2020; Praveenraj & Thackeray 2020; Sulakhe et al. 2020; Sayyed & Sulakhe 2020; Bhosale et al. 2021; Joshi et al. 2022). The district harbours mixed types of vegetation including moist deciduous, dry deciduous, and semi-evergreen forests (Kulkarni 1988; Sawant et al. 2023). It also has a diverse range of habitats, including grassland, open lateritic plateaus, wetlands, mangroves, and freshwater swamps (Satoose et al. 2018; Sreedharan & Indulkar 2018). Recent documentation of Odonata diversity of the Sindhudurg District resulted in more than 90 species of odonates documented from Amboli & Chaukul village, recognised as one of the most biodiverse regions of Maharashtra State (Tiple & Koparde 2015; Sawant et al. 2022, 2023). Ten out of them resulted in the new records to the state of Maharashtra. Koli & Dalvi (2021), Koli et al. (2021), and Dalvi & Koli (2022) reported a total of five Odonata species from Sindhudurg District, all of which are first confirmatory records to the state of Maharashtra. In this paper, we report three new records of odonates from Maharashtra, India, and their distribution maps are provided.

MATERIAL AND METHODS

We surveyed Amboli-Chaukul and Dodamarg region of Sindhudurg District, Maharashtra from May 2022 to December 2022. One of the records is based on previous surveys conducted outside of this study area in the year 2020. The details including study localities are provided in Table 1. Specimens were photographed and collected from non-protected areas for identification purpose. All the specimens are deposited at the Zoological Survey of India (ZSI), Pune, Maharashtra, India (Table 1). All field photographs were taken with Canon 760D DSLR

camera 100 mm F/2.8 macro lens & Nikon D5300 70–300 mm f/4.5–6.3G. Specimens were Identified with the help of Fraser (1933, 1934, 1936) Kosterin (2015), and Subramanian et al. (2018).

Abbreviations used in the text: S1–S10 = abdominal segments 1–10.

Morphological terms are referring to Garrison et al. (2010). Distribution maps are based on the data given by Subramanian et al. (2018) and Anonymous (2023a,b,c). Maps are created using QGIS v3.10.2.

RESULTS AND DISCUSSION

1. *Indolestes gracilis davenporti* Fraser, 1930

Akshay Dalvi & Yogesh Koli first observed *I. gracilis davenporti* at Bordhangarwadi stream (15.86528N, 74.09833E) on 15th May 2022 (Table 1, Image 4b). One male specimen was found perching on a tree branch at about two feet above the ground. Despite multiple visits to the same locality, only one male specimen was observed at this site. It is a medium sized damselfly, brown in its immature form and turns pale blue later. Male can be identified with two triangular spots on posterior lobe of prothorax, pterothorax with brownish black antihumeral stripes, wavy in its lower side, S9 is black whereas S10 is completely blue (Image 1a, b). In dorsal view, cerci are slightly rounded in shape, directed inwards and meet at the apices with protruding end, twice as long as S10 with robust spines on its outer border (Image 1c). Paraprocts short, broader at the base with blunt apices. Genus *Indolestes* Fraser, 1922 globally includes 36 species (Paulson et al. 2022). *I. indicus* Fraser, 1922, *I. assamicus* Fraser, 1930, and *I. cyaneus* (Selys, 1862) are endemic to India, found in northern Eastern Ghats. *I. gracilis* (Hagen in Selys, 1862) consists of two subspecies, mainly *I. gracilis gracilis* (Hagen in Selys, 1862) which is endemic to Sri Lanka whereas *I. gracilis davenporti* along with *I. pulcherrimus* Fraser, 1924 are endemic to the Western Ghats (Subramanian et al. 2018; Kalkman et al. 2020; Anonymous 2023a). Previous records of *I. gracilis davenporti* are confined to Kerala, Karnataka, and Tamil Nadu states (Image 5b). Here we report first confirmed

Table 1. Details of survey locations and deposition codes.

	Species Name	Location	Latitude & Longitude	Specimen deposited at ZSI, Pune	Altitude (in meter)
01	<i>Indolestes gracilis davenporti</i> (male)	Kegad (Bordhangarwadi)	15.8652N & 74.0983E	ZSI, WRC, Ent. 4/2990	784
02	<i>Dyspha ethela</i> (male)	Bambarde	15.9191N & 74.1213E	ZSI, WRC, Ent. 4/2991	89

record of this species to Maharashtra, India (Image 5a,b).

2. *Dysphaea ethela* Fraser, 1924

Akshay Dalvi first observed and photographed this species at Bambarde (15.91917 N, 74.12139 E) on 22 May 2022 (Table 1, Image 2). Two male specimens were observed along the side of a hill stream perching on a small shrub *Homonium repens*, locally known as 'Sherni' (Image 4a). *Dysphaea ethela* is the only species of the genus found in the Western Ghats Biodiversity Hotspot, which can be easily identified by its entire black colouration, transparent wings, and yellow stripes on the body (Image 2a). Cerci are deeply concave inside, widely separated at base, apices flattened inside and meet to an end; paraprocts very short, not visible dorsally (Image 2b,c). The genus *Dysphaea* Selys, 1853, constitutes a total of nine species distributed in Asia. Out of these, *D. gloriosa* Fraser, 1938 and *D. walli* Fraser, 1927 are found in northeastern and eastern India respectively whereas *D.*

ethela is a widely spread species found in the Eastern and Western Ghats as well as in central India (Subramanian 2014; Subramanian & Babu 2017). However, Kalkman (2020) excluded *D. walli* from Indian Odonata checklist because current records are only based on photographic evidence and there are no voucher specimens available to confirm its validity. Within Western Ghats, *Dysphaea ethela* were earlier recorded from Goa, Kerala, Karnataka, Tamil Nadu, parts of Gujarat state (Anonymous 2023b) (Image 5c). Here we provide first confirmed record of this species to Maharashtra State, India (Image 5a,c).

3. *Macrodiplax cora* (Brauer, 1867)

Akshay Dalvi first observed and photographed female of this species on Chipi plateau (15.999533N, 73.526062E) on 5 January 2020 (Image 3b). Successively, Yogesh Koli observed and photographed male specimen perching on a wooden stick particularly in an obelisk position near Oros budruk dam (16.127627N, 73.72221E)

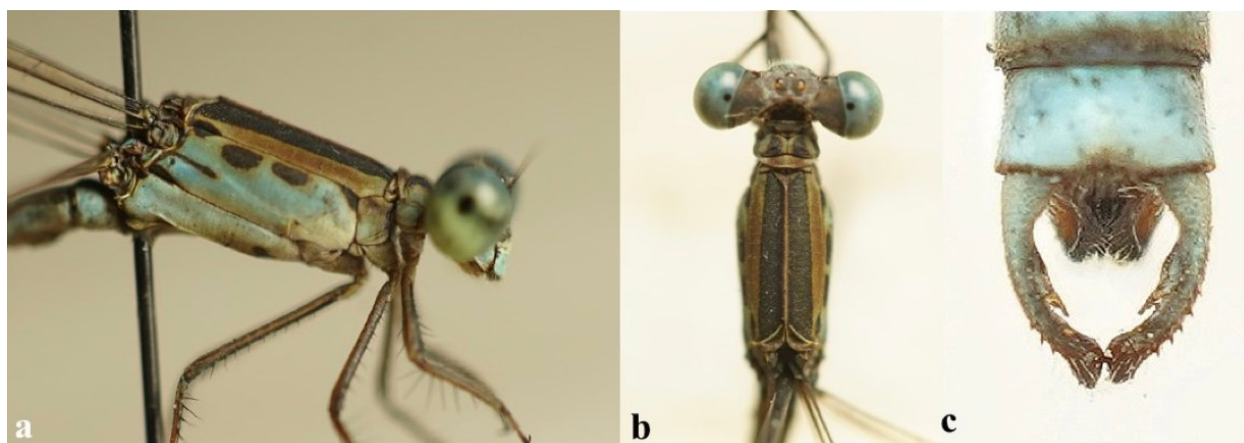


Image 1. *Indolestes gracilis davenporti* Fraser, 1930, male: a—thorax, lateral view | b—thorax, dorsal view | c—caudal appendages, dorsal view. © Yogesh Koli.

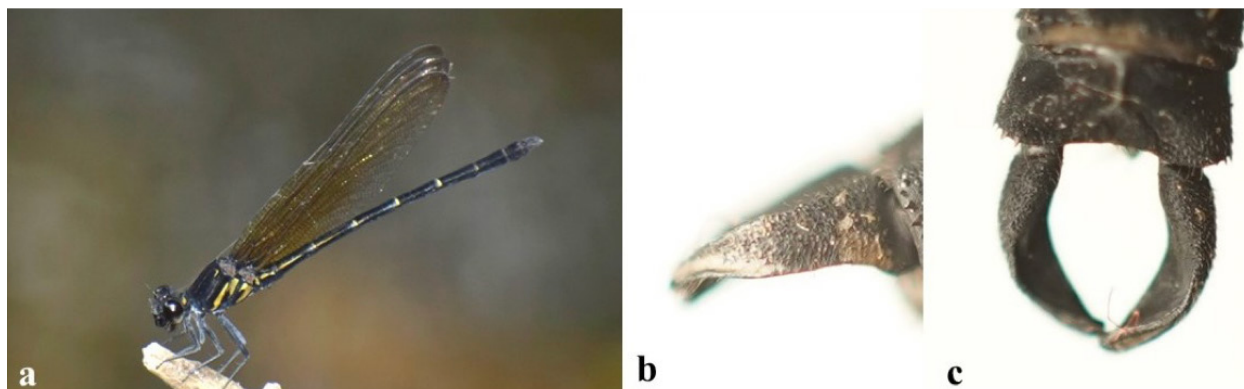


Image 2. *Dysphaea ethela* Fraser, 1924, male: a—habitus, lateral view | b—caudal appendages, lateral view | c—caudal appendages, dorsal view. © a—Akshay Dalvi | b, c— Yogesh Koli

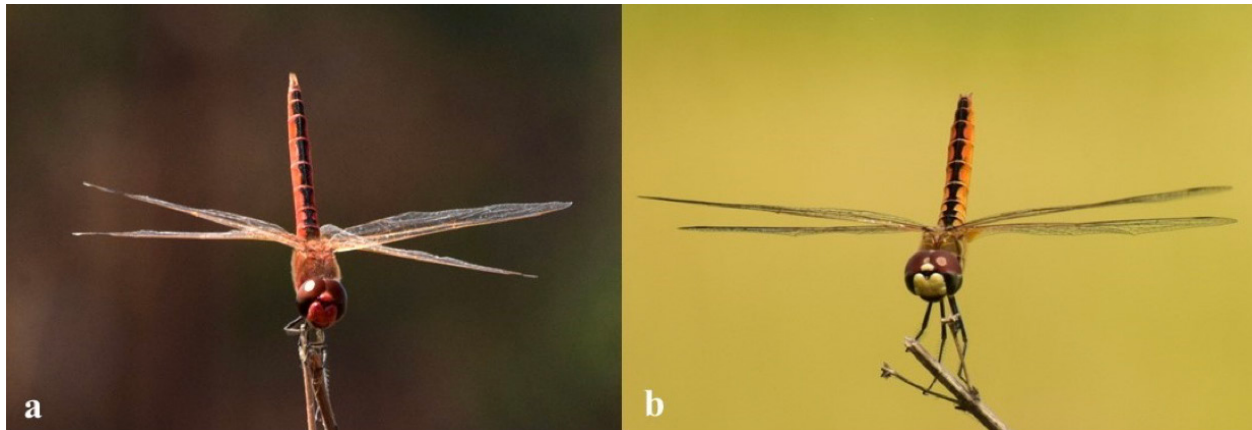


Image 3. *Macrodiplax cora* (Brauer, 1867), male: a—habitus | b—female, habitus. © a—Yogesh Koli | b—Akshay Dalvi.

on 30 February 2020 (Image 3a). It is a red coloured dragonfly (Golden yellow in its immature stage) and can be easily identified by dumbbell shaped markings on dorsal side of S1–S10. Genus *Macrodiplax* Brauer, 1868 constitutes only one species within Indian limits. Within India, this species has been reported from Kerala, Odisha, Tamil Nadu, and West Bengal (Subramanian et al. 2018) (Image 5d). Sawant et al. (2022) added *M. cora* into the checklist of Maharashtra based on photographic evidence available at 'Odonata of India' (Joshi et al. 2017). Here we provide some additional records of this species to the Maharashtra State based on photographic evidence from Oros dam and Chipi plateau, Sindhudurg District (Image 5a).

This paper fills the gap of the disjunct distribution of the genus *Dysphaea* into the northern and central Western Ghats. Sawant et al. (2022) provided an annotated checklist of 93 Odonata species from Amboli-Chaukul and Parpoli region with the addition of total six species to the state of Maharashtra. In that, apart from these six species, Dattaprasad Sawant has mentioned the record of *D. ethela* from Hadpid, Devgad Taluka based on his personal observations (Image 5a). Here we provide the first confirmed record of this species to the state of Maharashtra based on a specimen collected from Bambarde Village. Hence the updated Odonata checklist of Maharashtra has 153 species from 13 families.

Perennial mountain streams originating in the Chandigarh Taluka, Kolhapur District, flows through the Bambarde Village, Dodamarg Taluka, Sindhudurg District and meets Tilari River later. All these are potential breeding places for the *D. ethela*. Habitat of *I. gracilis davenporti* is a small seasonal mountain stream which almost dries up after the monsoon. Both of these areas are quite inaccessible to some extent but can be surveyed extensively in future to document the species

diversity in these regions. However, increasing pressure of human activities and habitat loss are already affecting the species diversity in Amboli-Dodamarg region. Hence, constant awareness among local people, and scientific studies are needed in order to formulate conservation plans in the near future.

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Image 4. Habitat: a—Bambarde hill stream, Dodamarg | b—Kegad hill stream, Sawantwadi | c—Chipi plateau, Vengurla | d—Oros budruk dam.
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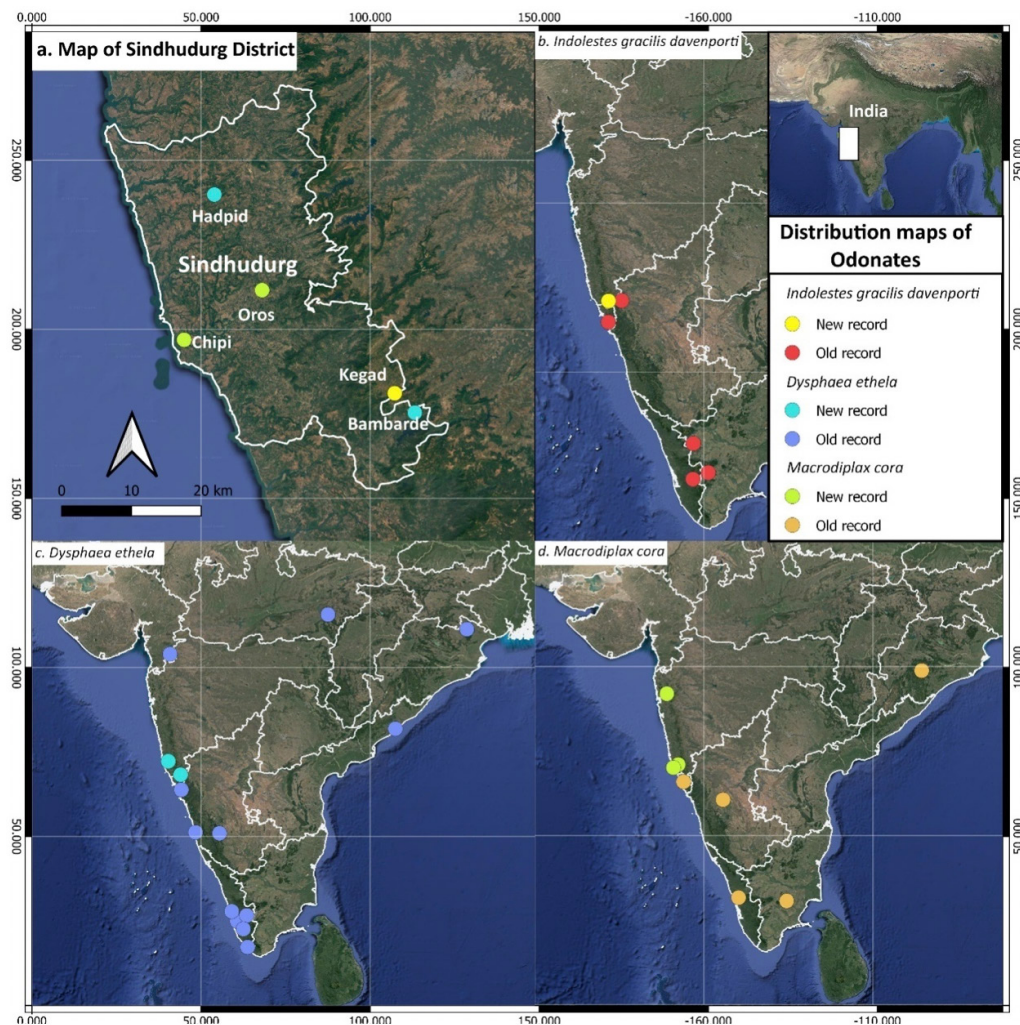


Image 5. Distribution maps: a—New records in Sindhudurg District | b—*Indolestes gracilis davenporti* | c—*Dysphaea ethela* | d—*Macrodiplax cora*. Maps are created using QGIS v3.10.2. ©Akshay Dalvi.

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