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SHORT COMMUNICATION

NEW RECORDS OF *AGRIOCNEMIS KERALENSIS* PETERS, 1981 AND *GYNACANTHA KHASIACA* MACLACHLAN, 1896 (INSECTA: ODONATA) FROM MAHARASHTRA, INDIA

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New records of *Agriocnemis keralensis* Peters, 1981 and *Gynacantha khasiaca* MacLachlan, 1896 (Insecta: Odonata) from Maharashtra, India

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Abstract: *Agriocnemis keralensis* Peters, 1981 is reported for the first time from Maharashtra, India. Previously it was known from Kerala and Goa states. In this paper we report *A. keralensis* from Thakurwadi and Bambuli wetlands and Chipi Plateau, Sindhudurg District. Also, the new record of *Gynacantha khasiaca* MacLachlan, 1896 is confirmed on the basis of specimens collected from Sindhudurg District. Hence, we report the range extension of both *A. keralensis* and *G. khasiaca* in northern Western Ghats. Apart from this, a combined checklist of Odonata fauna of Thakurwadi (51 species), Bambuli wetlands (44 species), and Chipi Plateau (51 species) is provided.

Keywords: *Agriocnemis*, Anisoptera, *Gynacantha*, range extension, Sindhudurg, Western Ghats, Zygoptera.

Marathi abstract: *Agriocnemis keralensis* Peters, 1981 ही टाचणी सिंधुदुर्ग जिल्हा, महाराष्ट्र राज्यात पहिल्यांदाच मिळाली आहे. याआधी ही टाचणी केरळ आणि गोवा राज्यातून ज्ञात होती. या पेपरमध्ये आम्ही *A. keralensis* च्या नोंदी ठाकूरवाडी आणि बांबुली पाणथळ जागा आणि चिपी पठार येथून करित आहोत. तसेच, सिंधुदुर्ग जिल्ह्यातून गोळा केलेल्या नमुन्यांच्या आधारे *Gynacantha khasiaca* MacLachlan, 1896 या चतुराच्या नोंदीची खातरजमा केली आहे. यावरून *A. keralensis* आणि *G. khasiaca* ची उत्तर पश्चिम घाटातील विस्तारित नोंद आम्ही करित आहोत. याव्यतिरिक्त ठाकूरवाडी आणि बांबुली पाणथळ जागा आणि चिपी पठार येथील चतुर आणि टाचण्यांची एकत्रित यादी देण्यात आली आहे.

India is one of the mega diverse countries of the world in terms of biodiversity. Maharashtra, one of the biggest states in India, has 134 species of Odonata (Tiple & Koparde 2015). Western Ghats as a whole

harbours 174 Odonata species including 56 endemics (Subramanian & Sivaramakrishnan 2002; Subramanian et al. 2011), which increases the importance of habitat conservation.

The narrow strip of land present between Arabian Sea and Western Ghats is known as the Konkan-Malabar region (Watve 2013). Sindhudurg District is one of the biodiverse places situated in this region (Image 8c). Recently, two new species of Odonata, namely, *Ceriagrion chromothorax*, Joshi & Sawant, 2019 and *Bradinopyga konkanensis*, Joshi & Sawant, 2020 have been described from Sindhudurg. The district is situated in southern Konkan region covers a total of 5,207km² of area and is bounded by the Arabian Sea on the west and the Western Ghats on the east. From the mountain streams of the Western Ghats, from perennial rivers to shallow wetlands on lateritic plateaus and large lakes in the district are ideal habitats for odonate species.

In this paper, we report the first record of *Agriocnemis keralensis* from Maharashtra, based on one male and one female specimen each, which is the northernmost record for the species and multiple field observations

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from nearby areas. Also, the presence of *Gynacantha khasiaca* in the Western Ghats is confirmed based on one male and one female specimen, which is the southernmost record for the species. These records are the range extensions for both the species. In addition to this, we provide a combined checklist of Thakurwadi and Bambuli wetlands and Chipi Plateau.

The present work was started in the year 2020 and carried out at three localities consisting of two wetlands and one plateau (see Table 1). AD & YK first observed *Agriocnemis keralensis* at Thakurwadi on 20 July 2020 and subsequently from Bambuli wetlands and Chipi Plateau. AD first observed *Gynacantha khasiaca* from Majgaon on 30 August 2020; 2 males and 1 female of *A. keralensis* were collected from Thakurwadi wetland and 1 male and 1 female of *G. khasiaca* were collected from Majgaon, Sawantwadi Taluka with the help of insect collecting nets. Based on these specimens we report new records of the above mentioned species. All specimens were preserved in 70% alcohol and three of them were deposited at Research Collections, National Centre for Biological Sciences (NCBS), Bengaluru, India and one specimen was deposited at Zoological Survey of India (ZSI), Western Regional Centre, Pune. Collected specimens were examined and photographed under the Lawrence and Mayo microscope, model LM-52-3621 at Shivaji University, Kolhapur. Field photographs of specimens were taken by Canon 760D with a 100mm macro lens and Nikon 7500D with Tamron 90mm lens. Identification of the species was done with the help of standard field guides and Fauna of British India (Fraser 1936). Random survey method was applied to document odonate diversity in all above habitats. Morphological terms refer to Garrison et al. (2006). All measurements are given in mm. Abbreviations in the text: FW= fore wing, HW= hind wing, Ax and Px= antenodal and postnodal nervures, Pt= pterostigma, S1–S10= abdominal segments 1–10. Maps used in Image 8 were created using QGIS v3.14.

***Agriocnemis keralensis* Peters, 1981 (Image 1, 2)**

Material examined: Male (NCBS-IBC-BO400): Thakurwadi wetland, Kudal Taluka, Sindhudurg District, Maharashtra, India (16.011°N, 73.648°E, 20m), 20.vii.2020, Yogesh Koli leg.

Female (ZSI, WRC, Ent.4/2828): Thakurwadi wetland, Kudal Taluka, Sindhudurg District, Maharashtra, India (16.011°N, 73.648°E, 20m), 20.vii.2020, Yogesh Koli leg.

Brief description of male (Image 1)

Head (Image 1b, d): Labium, labrum, anteclypeus,

Table 1. Localities where survey has been conducted in Sindhudurg District, Maharashtra, India.

	Locality	District	GPS coordinates (N, E)	Altitude (m)
01	Thakurwadi wetland, Kudal Taluka	Sindhudurg	16.01, 73.648	20
02	Bambuli wetland, Kudal Taluka	Sindhudurg	16.043, 73.683	16
03	Chipi Plateau, Vengurla Taluka	Sindhudurg	15.993, 73.522	32
04	Majgaon, Sawantwadi Taluka	Sindhudurg	15.886, 73.820	109

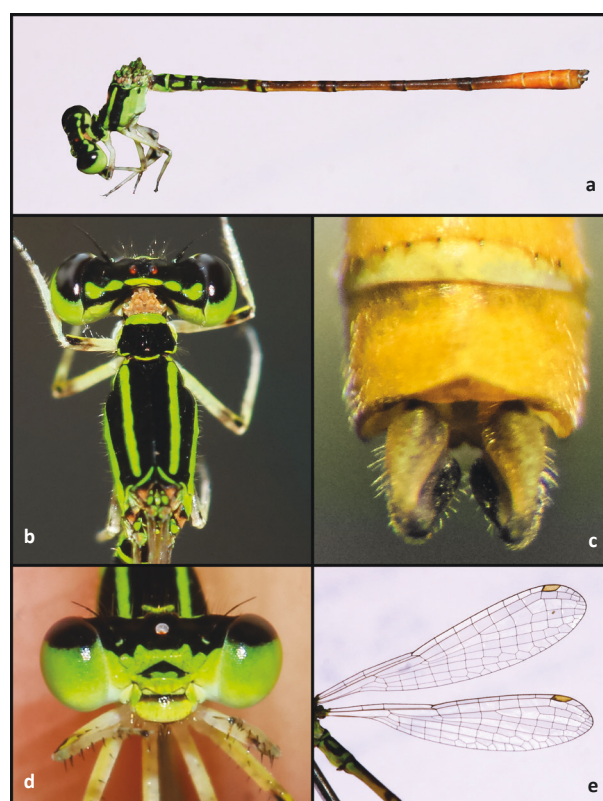


Image 1. *Agriocnemis keralensis* (Peters, 1981) male: a—habitus, lateral view | b—head and thorax, dorsal view | c—caudal appendages, dorsal view | d—face | e—left FW and HW. © a–e—Yogesh Koli.

postclypeus and base of mandible pale yellowish green; vertex and occiput brownish-black, posterior side of head with two yellowish-green post-ocular spots on either side; eyes black above, greenish below.

Thorax: Prothorax (Image 1b) black with horizontal green stripe on its anterior lobe; posterior margin of posterior lobe bordered with green. Synthorax (Image 1a,b) black on its dorsal side with green antehumeral stripe on each side of mid dorsal carina; metepisternum



Image 2. Field images of *Agriocnemis keralensis* (Peters, 1981): a—male | c—female | d—heteromorph female | *A. pygmaea* (Rambur 1842): b—male. © a—d—Yogesh Koli.

and metepimeron greenish-yellow; broad black stripe on postero-lateral suture. Legs: pale creamy white with black spines; black stripe on extensor surface of femora.

Wings (Image 1e): Hyaline, Ax: FW left and right= 2; HW left and right= 2. Px: FW left= 7, right= 6; HW left and right= 5. Pt twice as long as broad, yellow-ochraceous.

Abdomen (Image 1a): S1 having lateral side greenish yellow and tergum black on dorsum. S2 with black cobra's hood shaped mark on dorsum. S2–6 blackish-brown to brownish-orange on dorsum and pale brown on lateral. Narrow brown ochraceous annules on the posterior end of each segment, more prominent on dorsum; last 3 segments ochraceous orange.

Caudal appendages (Image 1c): Orange to pale brown; cerci conical and slightly curved inwards, longer than S10 and tip black; paraproacts pale brown, shorter than cerci. Measurements: Abdomen including caudal appendages= 15, FW= 8, HW= 9.

Brief description of female (Image 2c, d)

Adult female (Image. 2c): Head, prothorax, and pterothorax similar in colour pattern with male. Wings: hyaline, Pt dirty ochraceous yellow. Abdomen: S1–7

broad black stripe on dorsum which expands laterally at the posterior end, greenish-yellow from lateral and ventral side. S8–10 are black on dorsum, pale green ventro-laterally, oval green patch on antero-lateral of S8; caudal appendages pointed, pale green.

Form Heteromorph (Image 2d): Ground colour orange to pale brown. Head: Labium, labrum, anteclypeus, postclypeus pale yellowish-brown; vertex and occiput black; eyes brown above, pale yellowish-green below. Prothorax: Pale brownish-orange. Pterothorax: Two brownish-orange stripes at mid-dorsal carina and run parallel to each other, orange to pale brown on lateral side with pinkish hue in life. Wings: Hyaline, Pt dirty ochraceous yellow. Abdomen: S1–10 orange to pale brown on dorsal, mid dorsal and lateral side with apical narrow pale yellow annule. S8–10 faint black on dorsum fading towards the base. Caudal appendages: pointed, dirty yellow.

Diagnosis: *Agriocnemis* Seelys, 1869 genus has 11 species in India (Subramanian & Babu 2017). From those species, *Agriocnemis clauseni* (Fraser, 1933), *A. femina* (Brauer, 1868), *A. lacteola* (Selys, 1877), *A. kalinga* (Nair & Subramanian, 2014), *A. dabreui* (Fraser,

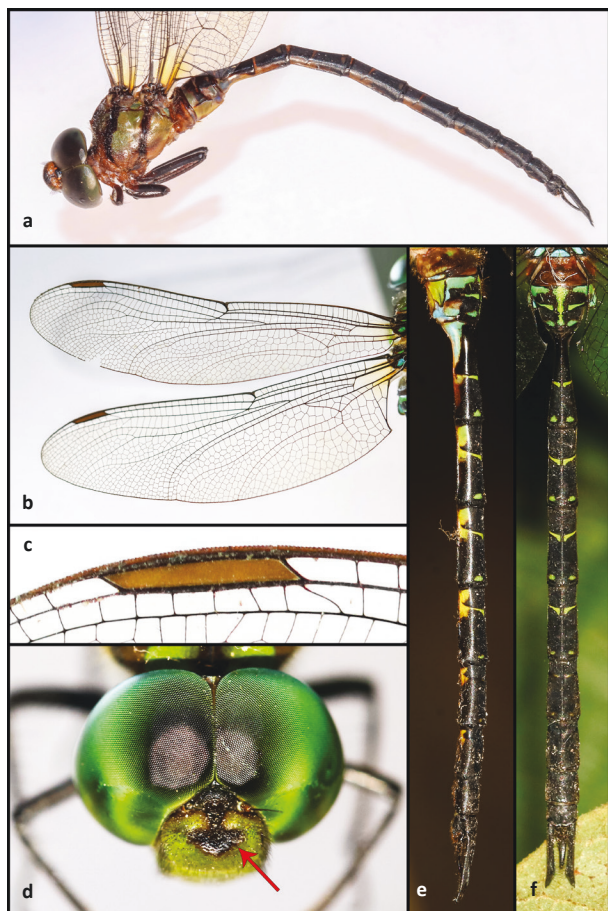


Image 3. *Gynacantha khasiaca* (MacLachlan, 1896) male: a—habitus, lateral view | b—right FW and HW | c—pterostigma, right FW | d—head, dorsal view (Red arrow showing 'T' mark) | e—abdomen, lateral view | f—abdomen, dorsal view. © a–f—Yogesh Koli.

1919) are reported from northeastern India (Nair & Subramanian 2014). In fact, *A. femina* is also reported from the Western Ghats region (Subramanian et al. 2018). *A. pygmaea* (Rambur, 1842) and *A. pieris* (Laidlaw, 1919), *A. splendidissima* (Laidlaw, 1919) are distributed throughout the Indian subcontinent (Kalkman, 2020). *A. keralensis* is endemic to the Western Ghats (Kalkman 2020). *A. keralensis* is identified by its small size, five post-ocular spots (one horizontal and two spots on either side), blackish-brown to brownish-orange abdomen with 'cobra hood' mark on S2. This species is very similar to *A. kalinga* (Subramanian & Nair, 2014) with respect to cobra shaped hood mark on S2, but differs significantly in case of abdominal colouration. *A. pygmaea* (Image 2b) which occurs with the same locality can be distinguished by the colour of the abdomen and absence of 'cobra hood' mark on S2.

Distribution (Image 8a,c): *Agriocnemis keralensis* was described by Peters in 1981 from Kerala and redescribed

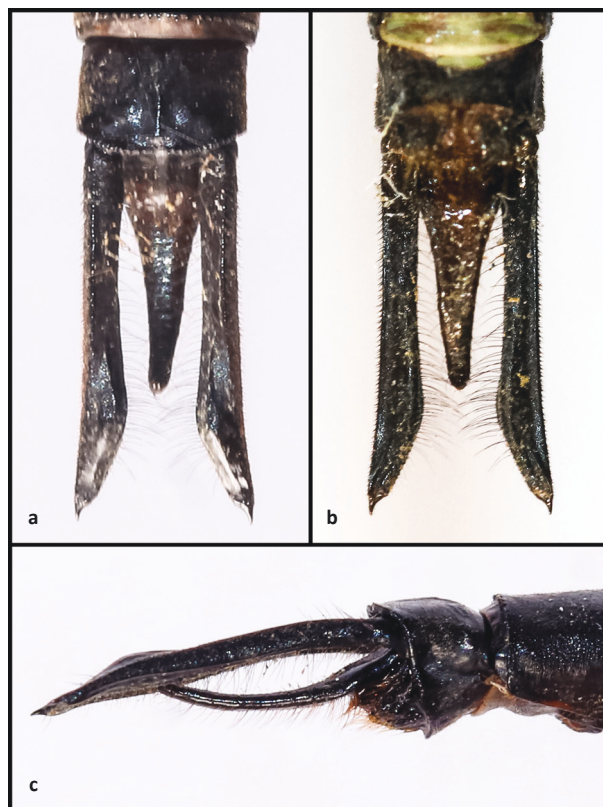


Image 4. Caudal appendages of *Gynacantha khasiaca* (MacLachlan, 1896) male: a—dorsal view | b—ventral view | c—left lateral view. © a–c—Yogesh Koli.

by Nair & Subramanian (2014). Recently, it was reported from Goa State (Rangnekar et al. 2010). In this paper, we report the northernmost record of *A. keralensis* from Thakurwadi, Bambuli, and Chipi, which is range extension for the species (Image 8c). A population of *A. keralensis* with good number of males and two females with one heteromorph were observed at Thakurwadi wetland. A total of four individuals were observed at Bambuli wetland. Chipi Plateau had scattered colonies in seasonal ponds with both males and females. No females were observed at Bambuli.

Habitat (Image 7a,b,c): Thakurwadi wetland is a perennial waterbody where many males and two females including heteromorph female of *Agriocnemis keralensis* were found. Individuals were observed in the aquatic grasses. Other species observed were *Agriocnemis pygmaea*, *Urothemis signata*, and *Ceriagrion* spp. Bambuli wetland, a perennial waterbody where four males of *A. keralensis* were found in aquatic grasses. Scattered population was found on lateritic plateau of Chipi in seasonal ponds.

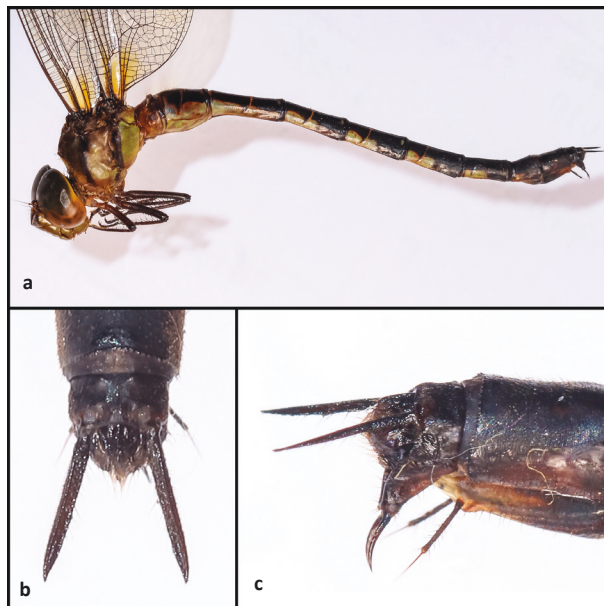


Image 5. *Gynacantha khasiaca* (MacLachlan, 1896) female: a—habitus, lateral view | b—caudal appendages, dorsal view | c—caudal appendages, left lateral view. © a–c—Yogesh Koli.

Gynacantha khasiaca MacLachlan, 1896 (Image 3–6)

Material examined: Male (NCBS-IBC-BO398): Majgaon, Sawantwadi Taluka, Sindhudurg District, Maharashtra, India (15.886°N, 73.820°E, 109m), 30.viii.2020, Akshay Dalvi leg.

Female (NCBS-IBC-BO399): Majgaon, Sawantwadi Taluka, Sindhudurg District, Maharashtra, India (15.886°N, 73.820°E, 109m), 10.ix.2020, Akshay Dalvi leg.

Brief description of male (Image 3,4)

Head (Image 3a,d): Labium, labrum bright olivaceous with ochre hue, antefrons and postfrons olivaceous, postfrons having black coloured ‘T’ mark with stem towards eyes. Eyes bluish-green above and olivaceous below in life, become dull olivaceous post-mortem. Vertex dull black, occiput dark olivaceous, antennae brownish-black.

Thorax. Prothorax yellow to olivaceous. Synthorax (Image 3a) olivaceous green on dorsum with mid dorsal carina brownish-black. Bright grass green on lateral with sharply defined dark brown stripes on humeral suture



Image 6. Field images of *Gynacantha khasiaca* (MacLachlan, 1896): a, b, d—male | c—female. © a, b, c—Yogesh Koli, © d—Dr Muralidhar G.



Image 7. Habitat photos of: a—Thakurwadi wetland | b—Bambuli wetland | c—Chipi Plateau | d—Majgaon, Sawantwadi. © a—Dattaprasad Sawant, © b–c—Yogesh Koli, © d—Akshay Dalvi.

and postero-lateral suture. A large turquoise blue spot on posterior end of metepimeron separated by a thin brown line from the rest. Ventral part pale brown. Legs: proximally brown, distally dark brownish-black, coxae pale brown

Wings (Image 3b,c): Hyaline, bases of both wings amber coloured, Ax: FW left= 25, right= 23; HW left= 17, right = 16. Px: FW left= 19, right= 20; HW left= 20, right= 21. FW triangle 5-celled, HW 4–5 celled. Anal triangle 3-celled, anal loop 11–13- celled. Pt dark ochraceous covering five cells in all wings.

Abdomen (Image 3e,f): Tumid at base, significantly constricted at S3, again narrow and cylindrical till the end. S1 brown on dorsum, grass green area on both lateral sides bearing a small yellow spot. S2 black, marked with grass green as follows: narrow irregularly bordered vertical band on dorsum, narrow ring which is incomplete on dorsum, two pairs of lunule shaped spots on each side of mid-dorsal line, ventrally yellow above and pale blue below, auricles pale brown, pale blue above auricles and grass green below auricles. S3–7 black on dorsum and marked with grass green as follows: jugal paired spots and paired apical annules, S3

blue on ventral, S4–7 yellow on antero-lateral. S8–10 black except S8 antero-lateral part having faint yellow markings.

Caudal Appendages (Image 4): Cerci black, almost three times longer than S10 with fine hairs on medial side, apices pointed. Paraprocts black, conical in shape, almost two-thirds the length of cerci, apex blunt.

Measurements: Abdomen including Caudal appendages= 53, FW= 42, HW= 41–42.

Brief description of female (Image 5)

Head, prothorax, pterothorax (Image 5a) similar to the male. Two sharply defined brown stripes on each side of pterothorax. Legs. Brown proximally, brownish-black distally. Wings. Similar to male with amber colour at base. Ax: FW left= 24, right= 22; HW left= 17, right= 16. Px: FW left= 19, right= 18; HW left= 19, right= 20. **Abdomen (Image 5a).** Tumid at base, less constricted at S3 than male, remaining narrow and cylindrical. S1 pale brown, S2 black and less marked with grass green on dorsum than male, ventro-laterally pale green changing to yellow on ventral. S3–10 similar to male. **Caudal Appendages (Image 5b,c).** Black, cerci pointed almost as

long as S9, ovipositor dark brown.

Measurements: Abdomen including caudal appendages= 55, FW= 44, HW= 45.

Diagnosis: *Gynacantha* Rambur, 1842 is a genus of large sized dragonflies with 99 species distributed throughout the world (Paulson & Schorr 2020). Among them 14 species are reported in India (Kalkman et al. 2020). *G. khasiaca* was previously recorded from Assam (Laidlaw 1923; Fraser 1936), Meghalaya (Fraser 1922; Kimmins, 1969; MacLachlan 1896) and West Bengal (Mitra 2002). In this paper, we report new locality of *G. khasiaca* in northern Western Ghats which is an extension in range for the species. Here we report first confirmatory record in Maharashtra State and entire Western Ghats. 'T' shape mark on postfrons, sharply defined brown stripes on each side of pterothorax, long and pointed cerci, paraprocts almost two-thirds length of cerci are helpful to distinguish it from other species of *Gynacantha* genus. *Gynacantha cattienensis* Kompier & Holden, 2017 is similar to *G. khasiaca*, but previous species is present in Vietnam and can be distinguished from later by the absence of thoracic stripes, different shape of auricle and cerci.

Distribution (Image 8b,c): *Gynacantha khasiaca* is previously known from India, Bangladesh, Bhutan, and Nepal. In India, it was recorded from northeastern states, i.e., Arunachal Pradesh, Assam, Meghalaya, West Bengal, and coastal areas of West Bengal. In October 2019, *Gynacantha* cf. *khasiaca* was reported from Thakurwadi wetland, Sindhudurg District, Maharashtra on the basis of photograph of a male (Mujumdar et al. 2020) (Image 6d). With this record, now *G. khasiaca* is reported from two localities from northern Western Ghats. This record is the southernmost range of the species in India.

Habitat (Image 7d): Two males and one female of *Gynacantha khasiaca* were observed at Majgaon Village, Sindhudurg District. All the individuals were attracted to light and came in house of AD in the night time. The place has human population surrounded by trees and seasonal natural streams at close proximity.

RESULT AND DISCUSSION

After multiple surveys in Thakurwadi and Bambuli wetlands and Chipi Plateau, we recorded a total of 65 species of odonates, consisting of five families of Zygoptera and four families of Anisoptera (Table 2). Family Coenagrionidae in Zygoptera and family Libellulidae in Anisoptera had the maximum number of species at all three locations (Table 2; Figure 1). Thakurwadi wetland was recorded with the maximum

Table 2. Family-wise distribution of Odonata of Thakurwadi & Bambuli wetlands and Chipi Plateau.

Family	No. of Species			Total
	Thakurwadi wetland	Bambuli wetland	Chipi Plateau	
Lestidae	2	0	3	3
Calopterygidae	2	1	1	2
Chlorocyphidae	2	0	2	2
Platycnemididae	2	1	2	2
Coenagrionidae	16	15	15	17
Aeshnidae	3	1	1	3
Gomphidae	1	1	2	2
Macromiidae	1	1	1	1
Libellulidae	28	24	24	33
Total	57	44	51	65

number of species (57 species) with a special mention of *Ceriagrion chromothorax*, *Pseudagrion malabaricum*, and *Indothemis limbata*, apart from *Agriocnemis keralensis* and *Gynacantha khasiaca* (Image 9). Chipi Plateau (51 species) and Bambuli wetland (44 species) also had a good number of diversity in terms of species. Out of 65 species, *Agriocnemis keralensis*, *Ceriagrion chromothorax*, and *Bradinopyga konkanensis* are endemic to the Western Ghats (Table 3). Out of 65 species, 57 are LC (Least Concern), three are DD (Data deficient), and five are NE (Not Evaluated) as per IUCN status.

We report *Agriocnemis keralensis* for the first time from Maharashtra and confirm record of *Gynacantha khasiaca* from Maharashtra. Three localities of *A. keralensis* in Sindhudurg are the northernmost record of the species which was previously known from Kerala and Goa (Image 8a). Out of the three localities, Thakurwadi and Bambuli are wetlands with moderate human interference. These two are major water sources to nearby human habitation in terms of farming. Third locality, Chipi plateau is a lateritic plateau near Arabian Sea and has many seasonal ponds. *G. khasiaca* was photographed in Sindhudurg District in October 2019 (Mujumdar et al. 2020) but further confirmation was not done due to lack of specimens. With this record from Majgaon, we confirm the presence of *G. khasiaca* in northern Western Ghats and report the range extension for the same (Image 8b). Majgaon is a village in Sawantwadi Taluka, surrounded by dense vegetation and some seasonal streams. With all these records, the rich biodiversity of Sindhudurg District is again highlighted. Yet there are many remote and inaccessible

Table 3. Combined checklist of Odonata of Thakurwadi & Bambuli wetlands and Chipi Plateau.

	Scientific name	Authority	IUCN status	Location		
				Thakur-wadi Wetland	Bambuli Wetland	Chipi Plateau
	Suborder Zygoptera Selys, 1854					
	Family Lestidae Calvert, 1901					
01	<i>Lestes elatus</i>	Hagen in Selys, 1862	LC	✓	—	✓
02	<i>Lestes praemorsus</i>	Hagen in Selys, 1862	LC	✓	—	✓
03	<i>Lestes viridulus</i>	Rambur, 1842	LC	—	—	✓
	Family Calopterygidae Selys, 1850					
04	<i>Vestalis apicalis</i>	Selys, 1873	LC	✓	✓	—
05	<i>Vestalis gracilis</i>	(Rambur, 1842)	LC	✓	—	✓
	Family Chlorocyphidae Cowley, 1937					
06	<i>Heliocypha bisignata</i>	(Hagen in Selys, 1853)	LC	✓	—	✓
07	<i>Libellago indica</i>	(Fraser, 1928)	NE	✓	—	✓
	Family Platycnemididae Yakobson & Bainchi, 1905					
08	<i>Copera marginipes</i>	(Rambur, 1842)	LC	✓	✓	✓
09	<i>Copera vittate</i>	Selys, 1863	LC	✓	—	✓
	Family Coenagrionidae Kirby, 1890					
10	<i>Aciagrion occidentale</i>	Laidlaw, 1919	LC	✓	✓	—
11	<i>Agriocnemis keralensis</i> ¹⁹	Peters, 1981	LC	✓	✓	✓
12	<i>Agriocnemis pieris</i>	Laidlaw, 1919	LC	✓	✓	✓
13	<i>Agriocnemis pygmaea</i>	(Rambur, 1842)	LC	✓	✓	✓
14	<i>Agriocnemis splendidissima</i>	Laidlaw, 1919	LC	✓	✓	✓
15	<i>Ceriagrion cerinorubellum</i>	(Brauer, 1865)	LC	✓	✓	✓
16	<i>Ceriagrion chromothorax</i> [*]	Joshi & Sawant, 2019	NE	✓	✓	✓
17	<i>Ceriagrion coromandelianum</i>	(Fabricius, 1798)	LC	✓	✓	✓
18	<i>Ceriagrion olivaceum</i>	Fraser, 1924	LC	✓	✓	—
19	<i>Ceriagrion rubiae</i>	Laidlaw, 1916	NE	✓	✓	✓
20	<i>Ischnura rubilio</i>	Selys, 1876	NE	✓	✓	✓
21	<i>Ischnura senegalensis</i>	(Rambur, 1842)	LC	✓	—	✓
22	<i>Mortonagrion varralli</i>	Fraser, 1920	DD	✓	✓	✓
23	<i>Pseudagrion decorum</i>	(Rambur, 1842)	LC	—	—	✓
24	<i>Pseudagrion malabaricum</i>	Fraser, 1924	LC	✓	✓	✓
25	<i>Pseudagrion microcephallum</i>	(Rambur, 1842)	LC	✓	✓	✓
26	<i>Pseudagrion rubriceps</i>	Selys, 1876	LC	✓	✓	✓
	Family Aeshnidae Leach, 1815					
27	<i>Anax guttatus</i>	(Burmeister, 1839)	LC	✓	✓	✓
28	<i>Gynacantha dravida</i>	Lieftinck, 1960	DD	✓	—	—
29	<i>Gynacantha khasiaca</i> ²⁰	MacLachlan, 1896	DD	✓	—	—
	Family Gomphidae Rambur, 1842					
30	<i>Ictinogomphus rapax</i>	(Rambur, 1842)	LC	✓	—	✓
31	<i>Paragomphus lineatus</i>	(Selys, 1850)	LC	—	✓	✓
	Family Macromiidae Needham, 1903					
32	<i>Epophthalmia vittata</i>	Burmeister, 1839	LC	✓	✓	✓
	Family Libellulidae Leach, 1815					
33	<i>Acisoma panorpoides</i>	Rambur, 1842	LC	✓	—	✓
34	<i>Brachydiplax sobrina</i>	(Rambur, 1842)	LC	✓	✓	✓
35	<i>Brachythemis contaminata</i>	(Fabricius, 1793)	LC	✓	✓	✓
36	<i>Bradinopyga geminata</i>	(Rambur, 1842)	LC	✓	✓	✓
37	<i>Bradinopyga konkanensis</i> [*]	Joshi & Sawant, 2020	NE	—	—	✓
38	<i>Cratilla lineata</i>	(Brauer, 1878)	LC	✓	✓	—

	Scientific name	Authority	IUCN status	Location		
				Thakur-wadi Wetland	Bambuli Wetland	Chipi Plateau
39	<i>Crocothemis servilia</i>	(Drury, 1770)	LC	✓	✓	✓
40	<i>Diplacodes lefebvrii</i>	(Rambur, 1842)	LC	✓	—	—
41	<i>Diplacodes nebulosa</i>	(Fabricius, 1793)	LC	✓	✓	✓
42	<i>Diplacodes trivialis</i>	(Rambur, 1842)	LC	✓	✓	✓
43	<i>Hydrobasileus croceus</i>	(Brauer, 1867)	LC	✓	✓	✓
44	<i>Indothemis carnatica</i>	(Fabricius, 1798)	LC	—	✓	✓
45	<i>Indothemis limbata sita</i>	Campion, 1923	LC	✓	—	—
46	<i>Lathrecista asiatica</i>	(Fabricius, 1798)	LC	✓	✓	—
47	<i>Neurothemis fulvia</i>	(Drury, 1773)	LC	✓	—	—
48	<i>Neurothemis intermedia</i>	(Rambur, 1842)	LC	✓	—	✓
49	<i>Neurothemis tullia</i>	(Drury, 1773)	LC	✓	—	—
50	<i>Orthetrum luzonicum</i>	(Brauer, 1868)	LC	✓	✓	✓
51	<i>Orthetrum chrysis</i>	(Selys, 1891)	LC	✓	✓	✓
52	<i>Orthetrum glaucum</i>	(Brauer, 1865)	LC	✓	—	—
53	<i>Orthetrum pruinosum</i>	(Burmeister, 1839)	LC	✓	✓	✓
54	<i>Orthetrum sabina</i>	(Drury, 1770)	LC	✓	✓	✓
55	<i>Pantala flavescens</i>	(Fabricius, 1798)	LC	✓	✓	✓
56	<i>Potamarcha congener</i>	(Rambur, 1842)	LC	✓	—	✓
57	<i>Rhodothemis rufa</i>	(Rambur, 1842)	LC	✓	✓	✓
58	<i>Rhyothemis variegata</i>	(Linnaeus, 1763)	LC	✓	✓	✓
59	<i>Tetrathemis platyptera</i>	Selys, 1878	LC	—	✓	—
60	<i>Tholymis tillarga</i>	(Fabricius, 1798)	LC	✓	✓	✓
61	<i>Tramea limbata</i>	(Desjardins, 1832)	LC	✓	✓	✓
62	<i>Trithemis aurora</i>	(Burmeister, 1839)	LC	✓	✓	✓
63	<i>Trithemis festiva</i>	(Rambur, 1842)	LC	✓	✓	✓
64	<i>Trithemis pallidinervis</i>	(Kirby, 1889)	LC	—	✓	✓
65	<i>Urothemis signata</i>	(Rambur, 1842)	LC	—	✓	—

* Species endemic to Western Ghats | # New records for the Maharashtra State | NE—Not Evaluated | DD—Data deficient | LC—Least Concern

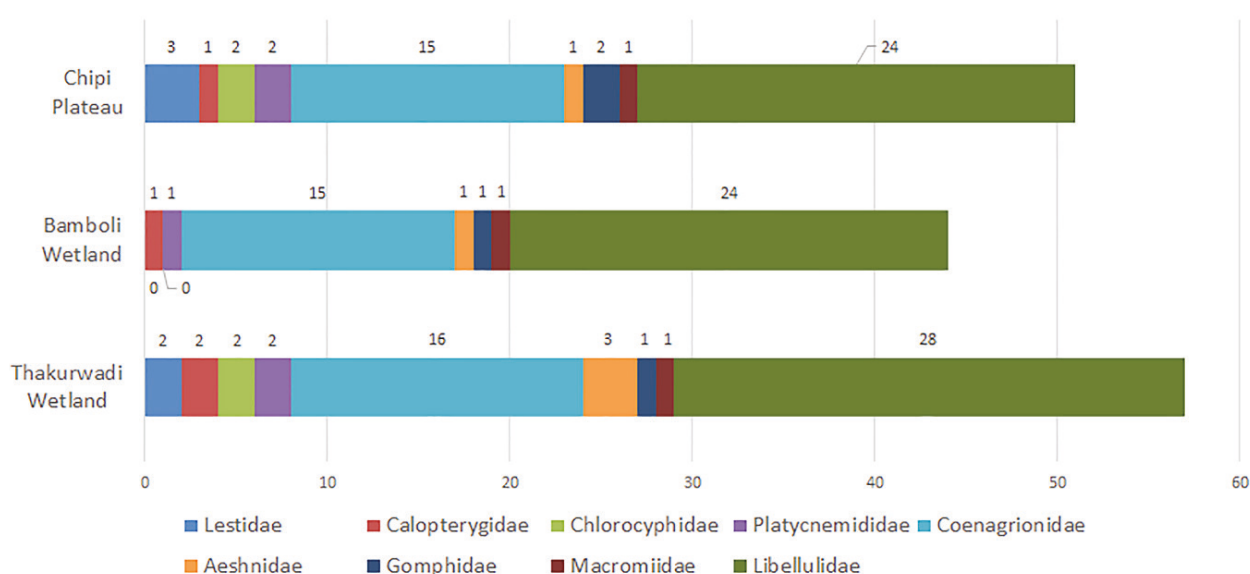


Figure 1. Graphical representation of family-wise distribution of Odonata in Thakurwadi & Bambuli wetlands and Chipi Plateau.

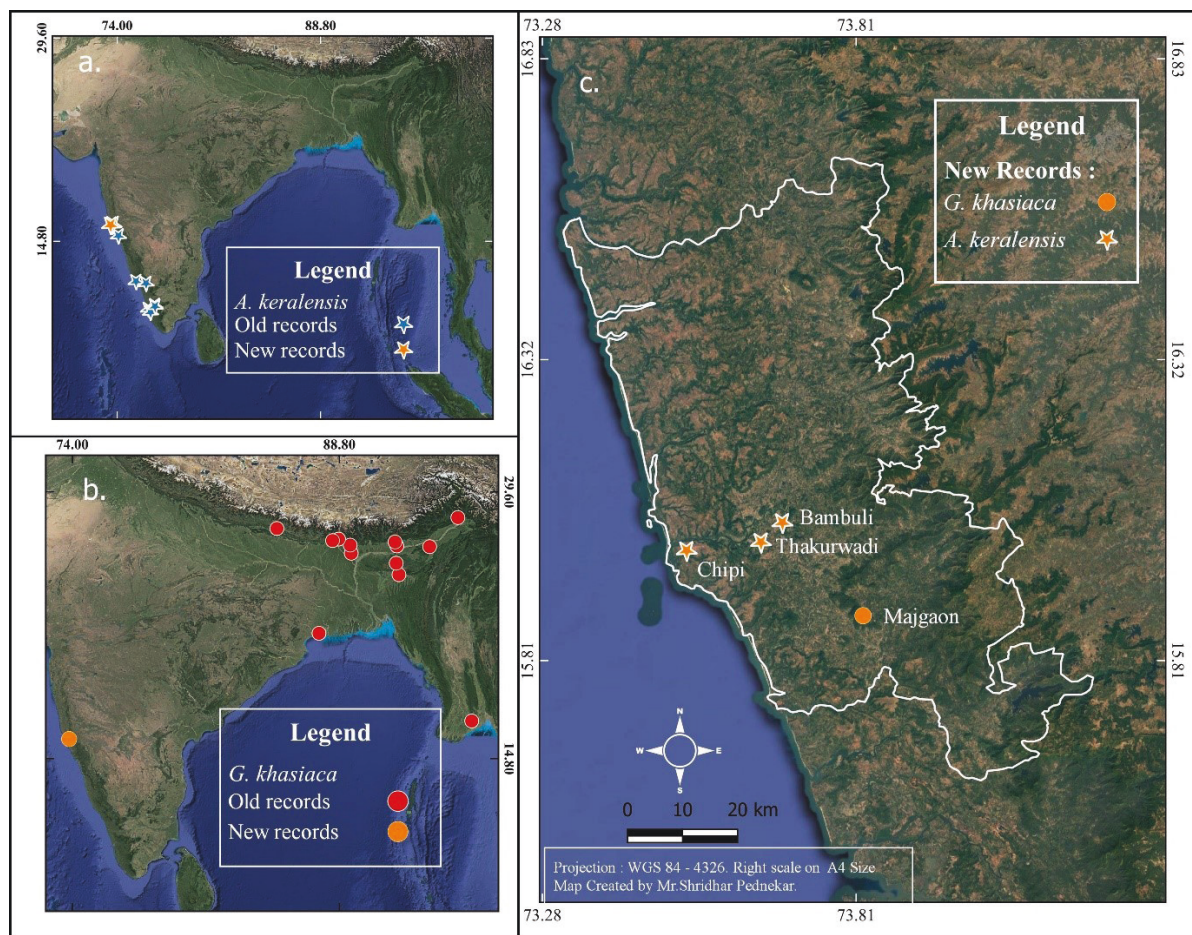


Image 8. Maps depicting the known distribution of: a—*Agriocnemis keralensis* (Peters, 1981) | b—*Gynacantha khasiaca* (MacLachlan, 1896) | c—Map of Sindhudurg District with distribution of *A. keralensis* and *G. khasiaca*.

locations in the district, which may reveal new records in terms of biodiversity. Hence, systematic surveys of such areas should be conducted for documentation of biodiversity so that long term measures for conserving the habitats can be taken effectively.

Sindhudurg District is one of the richest biodiversity hotspots in India. But there are many threats to the environment due to manmade activities. Rampant deforestation in the foothills of the Sahyadri range, monoculture farming, raw mining on lateritic plateaus, excessive sand mining in river beds are major threats which are causing habitat destruction. Wetlands like Thakurwadi and Bambuli are rich in terms of not only Odonata fauna but also other organisms. There is an immediate need to conserve such wetlands and other water bodies for long term benefits to humans and other organisms. Plateaus like Chipi are unique lateritic plateaus and are facing habitat disturbances due to raw mining, constructions of houses, and roads. The current checklist of Odonata from these localities shows

the richness of biodiversity and highlights the need for effective conservation measures.

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Image 9. Field images of: a—*Lestes praemorsus* (Selys, 1862) male | b—*Heliocypha bisignata* (Hagen, 1853) male | c—*Copera marginipes* (Rambur, 1842) male | d—*Aciagrion occidentale* (Laidlaw, 1919) male | e—*Ceriagrion cerinorubellum* (Brauer, 1865) copula | f—*Ceriagrion chromothorax* (Joshi & Sawant, 2019) male | g—*Gynacantha dravida* (Lieftinck, 1960) male | h—*Ictinogomphus rapax* (Rambur, 1842) male | i—*Epophthalmia vittata* (Burmeister, 1839) male | j—*Indothemis limbata sita* (Selys, 1891) male immature | k—*Trithemis aurora* (Burmeister, 1839) male | l—*Trithemis festiva* (Rambur, 1842) male. © a, e, f, h, j, k, l—Dattaprasad Sawant, © c, d—Yogesh Koli, © b, g, i—Akshay Dalvi.

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