



<https://www.doi.org/10.33910/2686-9519-2023-15-4-847-853>
<http://zoobank.org/References/724B3C19-7A35-4A87-B37C-A83D34C95545>

UDC 595.733

New spatial records of three Odonata species from the Western Ghats, India (Coenagrionidae, Aeshnidae)

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Abstract. Opportunistic records can add valuable insights into the diversity and distribution of several taxa, especially those that are not captured well within a systematic framework of sampling. During our two-year-long surveys in the Western Ghats region, we came across notable spatial records of two damselflies belonging to Coenagrionidae Kirby, 1890 family, and one dragonfly belonging to Aeshnidae Leach, 1815. Here, we report for the first time the presence of *Agriocnemis keralensis* Peters, 1981, an endemic species of the Western Ghats, from the State of Karnataka. We also add *Pseudagrion spencei* Fraser, 1922 to the Western Ghats odonate species list. We further report the northernmost spatial record of *Gynacantha khasiaca* MacLachlan, 1896 from the Western Ghats of the State of Maharashtra. Our new spatial records add valuable knowledge to the current Indian odonatological literature.

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Keywords: spatial data, diversity, *Agriocnemis keralensis*, *Pseudagrion spencei*, *Gynacantha khasiaca*, opportunistic records

Новые находки трех видов стрекоз (Odonata) в районе Западных Гат в Индии (Coenagrionidae, Aeshnidae)

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Аннотация. Важные сведения о разнообразии и распределении некоторых таксонов, в особенности тех, которые сложно зафиксировать в рамках систематического отбора образцов, можно получить с помощью метода так называемой удобной выборки. В статье представлены результаты двухлетнего исследования, которое проводилось в Индии, в районе горной цепи Западные Гаты. В ходе исследования были обнаружены важные для этой местности находки: две равнокрылые стрекозы семейства Coenagrionidae Kirby, 1890, и одна разнокрылая стрекоза семейства Aeshnidae Leach, 1815. В статье впервые для фауны штата Карнатака отмечен вид эндемичный для Западных Гат – *Agriocnemis keralensis* Peters, 1981. Дополнительно в список видов стрекоз этого региона включен *Pseudagrion spencei* Fraser, 1922. Также сообщается о самом северном для Западных Гат (штата Махараштра) местонахождении *Gynacantha khasiaca* MacLachlan, 1896. Информация о новых находках значительно расширяет данные индийской одонатологии.

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Ключевые слова: находка, разнообразие, *Agriocnemis keralensis*, *Pseudagrion spencei*, *Gynacantha khasiaca*, метод удобной выборки

Introduction

The Western Ghats is one of the four biodiversity hotspots of India, located along the west coast of India from the south of the Tapi River of Gujarat to Kanyakumari of Tamil Nadu (Subramanian et al. 2018). The region is a rich biodiversity repository, which includes many globally threatened species. It is also a home for many endemic floral and faunal elements (Molur et al. 2011). Species richness of odonates (dragonflies and damselflies) of the Western Ghats is being increasingly updated and modified at the regional and state level. According to Nair et al. (2021), the known number of odonate species of Western Ghats was 203. As a result of recent discovery of three new damselflies (*Protosticta anamalaica* Sadasivan, Nair & Samuel, 2022; *Protosticta francyi* Sadasivan, Vibhu, Nair & Palot in Vijayakumaran et al., 2022, and *Protosticta armageddonia* Chandran, Payra, Deshpande & Koparde in Payra et al., 2023) and two dragonflies (*Burmagomphus chaukulensis* Joshi, Ogale & Sawant, 2022, and *Gynacantha anandmati* Sawant & Kambli, 2023) from the Western Ghats, the known number of odonate species of the Western Ghats increased to 208 (Sadasivan et al. 2022; Vijayakumaran et al. 2022; Joshi et al. 2022; Sawant, Kambli 2023; Payra et al. 2023), while the number of endemic odonate species increased to 89. As per the IUCN Red List, this biodiversity hotspot harbours ten (four Near Threatened, five Vulnerable and one Endangered) globally threatened odonate species and about 46 species are Data Deficient (IUCN 2023).

To strengthen the knowledge of odonate species distribution, several surveys were carried out in different parts of the Western Ghats Biodiversity Hotspot for about two years. In the present communication we report new spatial records for three odonates, namely, *Agriocnemis keralensis* Peters, 1981 for the first time from the State of Karnataka; *Pseudagrion spencei* Fraser, 1922 as an addition to the Odonata list of the Western Ghats, and record of *Gynacantha khasiaca* MacLachlan, 1896 representing its northernmost range in the Western Ghats.

Material and methods

Opportunistic field surveys were conducted from January 2021 to January 2023 in different parts of the Western Ghats region. Photographs of the observed specimens were taken with the help of Digital Camera Canon 1200D and Smartphone Camera (Xiaomi Redmi 9). Identification was done following keys of Fraser (1933, 1936); Nair, Subramanian (2014) and the photographic guide book of Subramanian et al. (2018). Morphological terminology follows Garrison et al. (2006). No voucher specimen was collected.

Results and discussion

Family: Coenagrionidae Kirby, 1890

***Agriocnemis keralensis* Peters, 1981** (Fig.1) **Material examined.** India, Karnataka, Udupi, Kudkunde Gorpalli Bridge (13°24'12.36"N, 74°49'15.29"E, Elevation: 28 m a. s. l.), 2♂, 1♀, 9.06.2022.

Distribution in India. Goa, Kerala, Maharashtra (Rangnekar et al. 2010; Nair, Subramanian 2014; Subramanian et al. 2018; Koli et al. 2021), Karnataka (new record)

Diagnosis. In India, genus *Agriocnemis* is represented by 10 species (Kalkman et al. 2020; Kalkman 2021). *A. pygmaea* (Rambur, 1842); *A. femina* (Brauer, 1868), *A. lacteola* Selys, 1877; *A. pieris* Laidlaw, 1919, and *A. splendidissima* Laidlaw, 1919 can be separated from *A. keralensis* by lacking the 'cobra hood' mark on the dorsum of the second abdominal segment. In *A. keralensis*, abdominal segments 8–10 bright ochreous and with 5 postocular spots, while in *A. clauseni* Fraser, 1922 abdominal segment 8 entirely black; in *A. dabreui* Fraser, 1919 abdominal segment 8 ochreous with anchor shaped mark on dorsum; in *A. nana* (Laidlaw, 1914) abdominal segment 8 blue with black markings enclosed two blue spots and in closely similar *A. kalinga* Nair & Subramanian, 2014 abdominal segments 8–10 bright yellow and the occiput has 3 postocular spots (Nair, Subramanian 2014).

Remarks. *A. keralensis* was described based on three specimens collected from Karamana, Thiruvananthapuram, Kerala (Peters 1981).



Fig. 1. Photographs of *Agriocnemis keralensis* Peters, 1981 taken at Udupi, Karnataka, India
Рис. 1. *Agriocnemis keralensis* Peters, 1981, Удупи, Карнатака, Индия



Fig. 2. Map showing the locality records of *A. keralensis* (AK), *P. spencei* (PS) and *G. khasiaca* (GK) in the Western Ghats, India
Рис. 2. Карта с указанием местонахождений *A. keralensis* (AK), *P. spencei* (PS) и *G. khasiaca* (GK) в Западных Гатах, Индия



Fig. 3. Photograph of *Pseudagrion spencei* Fraser, 1922 taken at Satara, Maharashtra, India
Рис. 3. *Pseudagrion spencei* Fraser, 1922, Сатаре, Махараштра, Индия

The damselfly is endemic to the Western Ghats and reported only from the states of Kerala, Goa, and Maharashtra (Rangnekar et al. 2010; Nair, Subramanian 2014; Koli et al. 2021). Our present record of *A. keralensis* from Kudkunje Gorpalli Bridge of Udupi (Fig. 2) designates its first record from the state Karnataka. Our record bridges the crucial geographic gap in the distribution of the species. It also provides further opportunity to conduct studies on the geographical distribution and ecology considering its distribution from Maharashtra to Kerala.

***Pseudagrion spencei* Fraser, 1922 (Fig. 3)**

Material examined. India, Maharashtra, Satara, Marathwadi (17°26'14.53"N, 73°53'17.82"E, Elevation: 635 m a. s. l.), 1♂, 20.11.2021.

Distribution in India. Andhra Pradesh, Assam, Bihar, Gujarat, Himachal Pradesh, Madhya Pradesh, Maharashtra, Meghalaya, Uttar Pradesh, Odisha, West Bengal (Babu 2014; Tiple et al. 2013; Rathod et al. 2016; Payra et al. 2022)

Diagnosis. *P. spencei* is one of the 13 species of *Pseudagrion* occurring in India (Kalkman et al. 2020; Kalkman, Blagoderov 2022). The species can be distinguished from its Indian congeners by a bright blue face and an

azure blue synthorax with black humeral and dorsal stripes. Cerci equal in length to abdominal segment 10. Cerci bifid at apex, inner side of cerci not expanded and with robust inner basal spine (Fraser 1933).

Remarks. *P. spencei* is a widely distributed species in India, described based on a male collected from Shillong, Meghalaya (Fraser 1933). In Maharashtra, the species was reported from the Vidarbha region of Central Indian landscape (Tiple et al. 2013). Further, the species was recorded from Southern Gujarat (Rathod et al. 2016), but has never been reported from the Western Ghats region (Subramanian et al. 2018). Here, we added *P. spencei* to the Odonata list of the Western Ghats based on the record of a single male from Marathwadi of Satara District, Maharashtra. Our present record is suggestive of the need of intensive surveys to uncover the geographical distribution of widespread species.

Family: Aeshnidae Leach, 1815

***Gynacantha khasiaca* MacLachlan, 1896 (Fig. 4)**

Material examined. India, Maharashtra, Raigad, Karnala Bird Sanctuary (18°53'30.52"N, 73°6'47.74"E, Elevation: 74 m a. s. l.), 4♂, 3♀, 22.11.2022.



Fig. 4. Photographic records of *Gynacantha khasiaca* MacLachlan, 1896 taken at Raigad, Maharashtra, India

Рис. 4. *Gynacantha khasiaca* MacLachlan, 1896, Райгаде, Махараштра, Индия

Distribution in India. Arunachal Pradesh, Assam, Maharashtra, Meghalaya, Uttarakhand, West Bengal (Fraser 1936; Mitra 2002; Payra et al. 2017; Mujumdar et al. 2020; Koli et al. 2021; Singh 2022)

Distribution elsewhere. Bangladesh, Bhutan, Nepal (Khan 2015; Koli et al. 2021)

Diagnosis. In India, the genus *Gynacantha* is represented by 15 species (Sawant, Kamblı 2023). *G. khasiaca* can easily be separated from its Indian congeners by having a long epiproct, more than half the length of cerci, and two lateral blackish brown stripes on each side of synthorax. *G. khasiaca* is closely similar to *G. cattienensis* Kompier & Holden, 2017 (which is confined to Vietnam), but can be distinguished by having lateral blackish brown stripes on synthorax (stripes absent in *G. cattienensis*) and a rounded auricle (slender auricle in *G. cattienensis*) (Kompier, Holden 2017).

Remarks. In India, the hitherto published records show that *G. khasiaca* was mainly confined to Eastern and Northeastern India (Fraser 1936; Mitra 2002; Payra et al. 2017). Recently, Mujumdar et al. (2020) reported *Gynacantha cf. khasiaca* from Thakurwadi wetland of Sindhudurg District, Maharashtra.

Later, Koli et al. (2021) recorded the species from Majgaon of Sindhudurg District and confirmed its presence in the state of Maharashtra, as well as in the Western Ghats Biodiversity Hotspot. Our present record from Karnala Bird Sanctuary (Fig. 2) represents the northernmost locality of this species in the Western Ghats and is located about 350 km (aerial distance) north from its previously known nearest locality of Majgaon, Sindhudurg District. Our record is the third in a row, indicating the presence of the species in the Western Ghats of Maharashtra State. The observation of egg laying by one female individual at the muddy edges of water pool also suggests that the species is breeding in the Karnala Bird Sanctuary. Moreover, our record opens up a new avenue for future researchers to understand the biology of *G. khasiaca* in Maharashtra State. Our record is also suggestive of possibilities of disjoint populations of the species in Maharashtra and Eastern and Northeastern India as well as the possibility of undiscovered populations present in the intervening areas. We recommend that future research on the species should focus on its ecology and migration and aim at discovering new populations.

Conclusion

Our opportunistic records of odonates from the Western Ghats add additional knowledge to the current odonatological literature. As per Mujumdar et al. (2020), opportunistic records can add missing information due to their non-random nature. Our records support the argument; at the same time, we recommend that systematic sampling should be

prioritized over opportunistic sampling to derive the best results (Darshetkar et al. 2023).

Acknowledgements

The authors are grateful to the Department of Science and Technology, Government of India (DST-SERB/SRG/2020/000190) for funding. We are thankful to Forest Department of Maharashtra State for the necessary permission and facilities.

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For citation: Payra, A., Deshpande, A., Koparde, P. (2023) New spatial records of three Odonata species from the Western Ghats, India (Coenagrionidae, Aeshnidae). *Amurian Zoological Journal*, vol. XV, no. 4, pp. 847–853. <https://www.doi.org/10.33910/2686-9519-2023-15-4-847-853>

Received 21 September 2023; reviewed 13 November 2023; accepted 21 November 2023.

Для цитирования: Пайра, А., Дешпанде, А., Копарде, П. (2023) Новые находки трех видов стрекоз (Odonata) в районе Западных Гат в Индии (Coenagrionidae, Aeshnidae). *Амурский зоологический журнал*, т. XV, № 4, с. 847–853. <https://www.doi.org/10.33910/2686-9519-2023-15-4-847-853>

Получена 21 сентября 2023; прошла рецензирование 13 ноября 2023; принята 21 ноября 2023.