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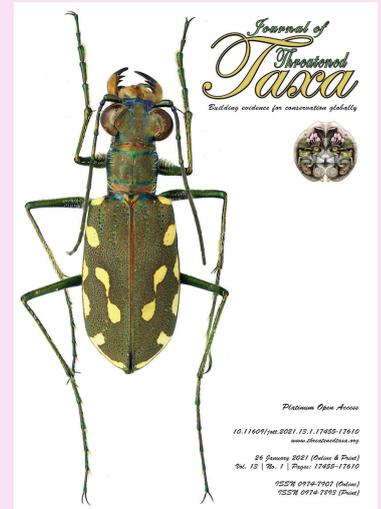
SHORT COMMUNICATION

A NOTE ON THE CURRENT DISTRIBUTION OF REEDTAIL DAMSELFLY *PROTOSTICTA RUFOSTIGMA* KIMMINS, 1958 (ODONATA: ZYGOPTERA: PLATYSTICTIDAE) FROM WESTERN GHATS, AND ITS ADDITION TO THE ODONATE CHECKLIST OF KERALA

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A note on the current distribution of reedtail damselfly *Protosticta rufostigma* Kimmins, 1958 (Odonata: Zygoptera: Platystictidae) from Western Ghats, and its addition to the odonate checklist of Kerala

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Abstract: The genus *Protosticta* (Odonata, Zygoptera, Platystictidae) is represented by nine species in the Western Ghats of peninsular India, of which seven are reported for the state of Kerala. Our recent records of *Protosticta rufostigma* Kimmins, 1958 from the Western Ghats of Kerala State is discussed, and despite a thorough literature search no collection records or photographs of the species has been found after the original description from Tamil Nadu. The species is, thus, added to the checklist of odonates of Kerala State. The description of the live insect, its ecology, status and distribution is discussed.

Keywords: Agasthyamalai, broad-leaved evergreen forests, Kakkayam, Malabar Wildlife Sanctuary, *Myristica* swamps, Ponnudi, *Ochlandra* reed brakes, rediscovery, western coast evergreen forest.

The genus *Protosticta* Selys, 1885 consists of zygopterous damselflies of small size and slender built commonly called Reed-tails or Shadow-damsels, inhabiting hill streams of tropical, subtropical and southern montane wet temperate sholas of southern India and forests of south east Asia. In India, they are distributed in the Western Ghats of peninsular India, parts of north-eastern India and Burma (Fraser 1933;

Emiliyamma & Palot 2016). The genus has 49 extant species (Schorr & Paulson 2020), distributed from Pakistan, through Indian subcontinent to Indo-China and southeastern Asian Islands (van Tol 2000). There are 12 species of *Protosticta* in India and of them nine inhabit Western Ghats of peninsular India. These are *Protosticta gravellyi* Laidlaw, 1915, *P. hearseyi* Fraser, 1922, *P. sanguinostigma* Fraser, 1922, *P. antelopoides* Fraser, 1924, *P. mortoni* Fraser, 1924, *P. davenporti* Fraser, 1931, *P. rufostigma* Kimmins, 1958, *P. ponmudiensis* Kiran, Kalesh & Kunte, 2015, and *P. monticola* Emiliyamma & Palot, 2016 (Subramanian et al. 2018). Other species recorded within Indian limits are *P. himalaica* Laidlaw, 1917, *P. fraseri* Kennedy, 1936, and *P. damacornu* Terzani & Carletti, 1998 (Fraser 1933; Kennedy 1936; Terzani, & Carletti 1998; Subramanian, 2014; Kiran et al. 2015; Emiliyamma & Palot 2016). Of these, all except *P. mortoni* and *P. rufostigma* had been recorded from Kerala (Subramanian et al. 2018). *P. rufostigma* was only known from its type locality in

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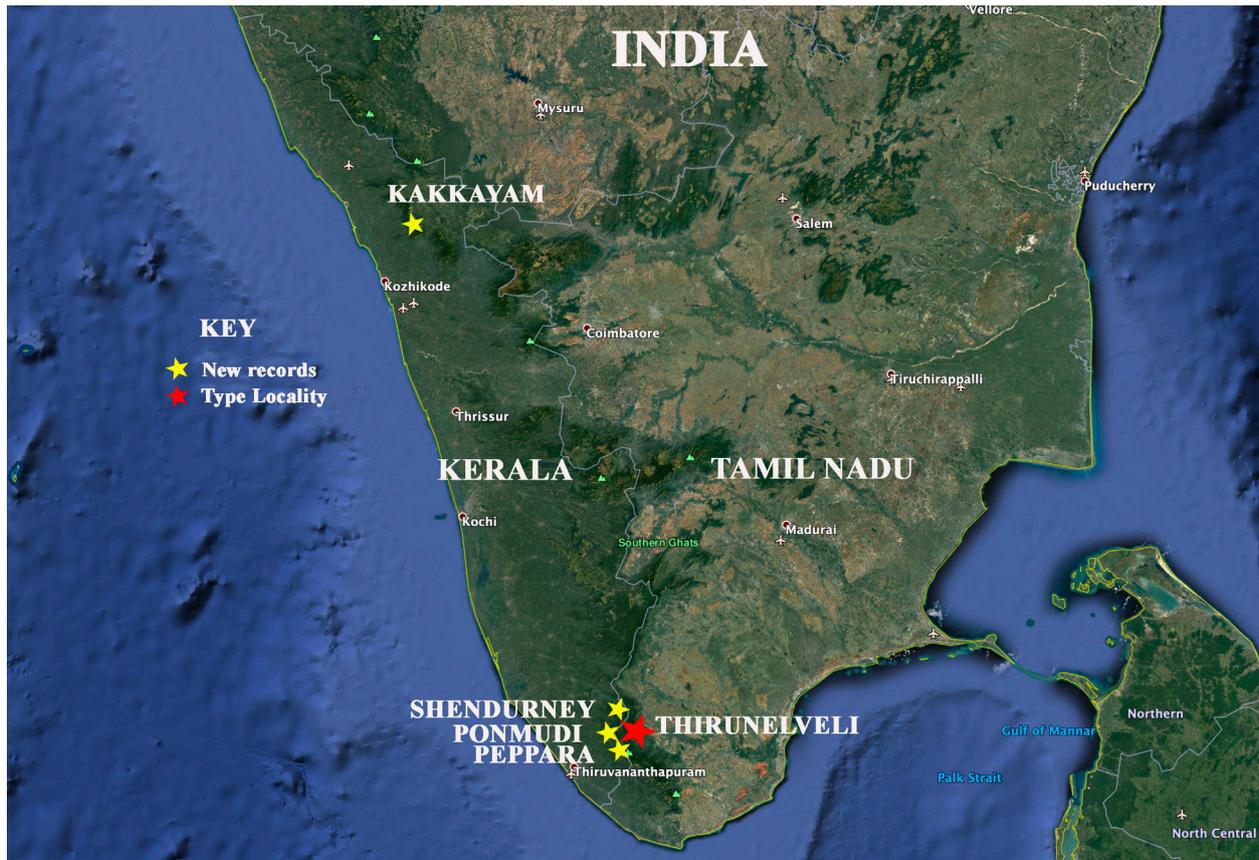


Image 1. Type locality and recent spot records of *Protosticta rufostigma* Kimmins, 1958 in Kerala.

Tinnevely, Tamil Nadu (Kimmins 1958); and was likely to occur in the hill streams with good riparian forest cover in Agasthyamalai Hills (Subramanian et al. 2018). No records of the species, however, had been found after a search of peer-reviewed literature and the first confirmed records for state of Kerala is provided here based on field records of the authors since 2006.

MATERIALS AND METHODS

The field data on odonates of the authors since 2000 from expeditions to Western Ghats of Kerala State was analysed for this work (full work will be published later). Whenever possible the species photographs were taken with special emphasis on the structure of prothorax and anal appendages of the insects. The morphological descriptions follow Fraser (1933) and Garrison et al. (2006). The central depression in the middle lobe of the prothorax is referred to as the sulcus in the description below. Measurements of specimens were taken using a vernier caliper. Morphometrics of species are based on specimens in NCBS (National Centre for Biological Sciences, Bengaluru, India) collections. Images of the holotype (NHMUK 01332477) and allotype (NHMUK

013324264) from Naraikadu, 2500–3000 ft, Tinnevely Dt, S.India, 3-8-X-1938, were referred from online portals of the Natural History Museum London <https://data.nhm.ac.uk/>, accessible at Natural History Museum (2014). Dataset: Collection specimens. Resource: Specimens. Natural History Museum Data Portal (data.nhm.ac.uk). <https://doi.org/10.5519/0002965>, Retrieved: 06.15 23 July 2020 (GMT). Current distribution is based on personal records and published literature. Unless specified, all the results including locality records are of the authors. Photographs of the specimens were taken with Canon (Canon Inc., Japan) EOS 70D DSLR and 180mm macro lens. Taxonomy of the group follows Fraser (1933). The current taxonomic checklist for Kerala follows scientific names in Subramanian & Babu (2017). The current distribution of the odonates of the Western Ghats region is based on Subramanian et al. (2018). Weather conditions were documented for the Agasthyamalai sightings of 2019 using Kestrel 5500 (Nielsen-Kelleran, USA). Initials of the names of the authors are used in text below in describing the details of field observation.

RESULTS

***Protosticta rufostigma* Kimmins, 1958**

(Image 2&3)

Material examined

NCBS-BH878, male, vii.2014, brook in a private estate, Ponmudi, Thiruvananthapuram, Kerala, India; 800m, coll. Kalesh Sadasivan; NCBS-BH879, male, vii.2014, stream side in a private estate, Ponmudi, Thiruvananthapuram, Kerala, India; 700m, coll. Kalesh Sadasivan.

Measurements

NHMUK 01332477 holotype male abdomen 46mm, hindwing 23mm (Kimmins, 1958).

NHMUK 013324264 allotype female abdomen 36mm, hindwing 22mm (Kimmins, 1958).

NCBS-BH878 male abdomen 49mm, hindwing 22mm.

NCBS-BH879 male abdomen 52mm, hindwing 23mm.

Historical distribution

The type locality is 'Naraikadu in Tinnelvely (Thirunelveli) District Tamil Nadu 2500–3000 ft, September 1938' (Kimmins 1958). No other distribution records of the species are available.

Recently observed field records of *Protosticta rufostigma* Kimmins, 1958 (not collected) and its current distribution:

All observation are from the montane seepages and brooks of low to mid-elevation evergreen forests of Western Ghats above 200m (Image 1).

1. Male; 1 January 2006; Kakkayam, Malabar Wildlife Sanctuary, Kozhikode District, Kerala State, 709m (KS & MJP).
2. Female; 22 April 2012; Pandipathu, Peppara Wildlife Sanctuary, Thiruvananthapuram District, Kerala State, 702m (KS) (Image 2C).
3. Male; 31 May 2013; Ponmudi-Kallar Valley, Thiruvananthapuram District, Kerala State, 898m (KS). (Image 2D).
4. Male; 6 June 2013; Pandipathu, Peppara



Image 2. *Protosticta rufostigma* Kimmins, 1958: A—male, 8 June 2013 Pandimotta in Shendurney in Kollam District | B—male, 6 June 2013, Pandipathu, Peppara Wildlife Sanctuary, Thiruvananthapuram District | C—female, 22 April 2012, Pandipathu, Peppara Wildlife Sanctuary | D—male, 31 May 2013, Ponmudi-Kallar Valley, Thiruvananthapuram District.



Wildlife Sanctuary, Thiruvananthapuram District, Kerala State, 695m (KS) (Image 2C). (Image 2B).

5. Male; 8 June 2013 Pandimotta in Shendurney in Kollam District, Kerala State, 898m (KS) 900m Ochlandra reed brake (KS) (Image 2A).

6. Male June 2, 2019; Ponmudi-Kallar Valley, Thiruvananthapuram District, Kerala State, 196m (KS).

7. Male; June 2, 2019; Ponmudi-Kallar Valley, Thiruvananthapuram District, Kerala State, 198m (KS).

Thus, all our records are from Kerala part of the Western Ghats from Kakkayam in Kozhikode District and Agasthyamalais of Thiruvananthapuram District.

Description and field identification of males

The features that are consistent, as per the original description of Kimmins (1958) are as follows. The variations observed in the species is mentioned separately below.

Head: labium is brownish-black; labrum is light blue broadly bordered with brownish-black; clypeus is pale blue. Frons: glossy blue-black; vertex and occiput are dull black. Prothorax: greenish white, posterior lobe blackish, this colour extending into the middle lobe. Synthorax: dark metallic green, with bluish-white oblique stripe on lateral thorax to mid legs and similar one to the hindlegs behind it. Legs: brownish-white. Abdomen: black-brown, marked with yellow and blue; S1 and S3 laterally yellowish-white; S3 narrow basal annulus yellowish-white, divided dorsally with black; S4-7 broader yellowish-white annuli, slightly widened laterally; S8 with basal half blue, not extending apically at sides; 9 and 10 black. Anal Appendages: black, similar to *P. davenporti* in general, but the cerci with basal tooth less acute and the thumb-like process more slender; paraprocts in dorsal aspect a little stouter. Wings hyaline, faintly smoky; pterostigma reddish-brown; 14 post nodals in FW, 13 in HW; Riv+v arising well distal to node. Female is similar to male, legs paler, knees and dorsal carinae brown; abdomen marked in bluish-white instead of yellowish-white; S7 annulus occupying the basal fourth.

Additional morphological and taxonomic notes based on NCBS-BH878 and NCBS-BH879

Head: eyes in the live insect are turquoise greenish-blue, capped dark brownish-black on the posterosuperior aspect, pale blue below and more or less whitish behind. Vertex is dark metallic green with golden shine; occiput and post ocular region black; Antennae are dark blackish-brown (Image 3D). Prothorax: unarmed with no spines or ornamentations to lobes, posterior lobe fully metallic

black with dark green reflux, middle lobe is pale bluish-white with lateral borders dirty yellow; anterior lobe is pale brown with a central transverse triangular black streak and a lateral bluish suffusion. Sulcus of middle lobe of prothorax dark blackish-brown and this colour is confluent with the black of the posterior lobe (Image 3B). Thorax: the ground colour is dark metallic green with scattered golden sheen. The dorsal carina black; lateral stripes may be very pale blush white to almost white. Coxae pale bluish. Trochanters white. Femora all dirty pale ashy brown with black thick stripe on the extensor aspect. Knees and extensor keels are black; tibia is brown and tarsus dark brown. Claws are dark brown (Image 3B&C). Wings: venation with 1A reaching the posterior wing margin after 5–6 cells in FW and 5–6 in HW; Post-nodals 13–14 in FW and 12–13 in HW; FW IR₃ origin near origin of Px₆ in FW and Px₅ in HW (Image 3A). Abdomen: S8 with a complete basal annulus occupying just a little lesser than half of the segment. The black of the dorsal carina on S8 encroaches into the band as a small convex intrusion from either side on the dorsal midline. Length of S9 is a little more than half of that of S8. Anal appendages (Image 3E&F). The external deviation of the cerci at the tip seen in *P. davenporti* is not appreciable in *P. rufostigma*, where the outer border is uniformly converging. Cerci with a basal tooth pointing inwards; tip of the finger process is thickened; outer border of cerci gradually converging and not sinuous, the thumb with a medial angulation, a small tubercle before this angle and the tip tapering and spine like (Image 4). The paraprocts bears a basal spine pointing inwards.

Females

Females were not collected, but were observed in field and photographed. The female from Agasthyamalai had darker brownish legs, yellowish annuli, and lateral thoracic stripes (Image 2C).

Ecological notes

The species generally flies during May–July, 200–1,200 m elevation in the Agasthyamalai Hills in small brooks and seepages in evergreen forests, broad-leaved evergreen forests, *Myristica* swamps, and *Ochlandra* reed brakes. It was also seen at elevation of 700m as observed at Kakkayam in Malabar Wildlife Sanctuary on 01 January 2006, in the dry winter. It always keeps to cooler and darker shady jungles and perches on overhanging vegetation, branches of *Ochlandra* reeds, and *Schumannianthus* plants (Marantaceae) in these marshes. The weather conditions observed at the Agasthyamalai site was as follows: temperature



Image 3. *Protosticta rufostigma* Kimmins, 1958: A—male | B—dorsum of prothorax and thorax | C—lateral view of head and thorax | D—close-up of head | E—anal appendages lateral view | F—anal appendages dorsal view.

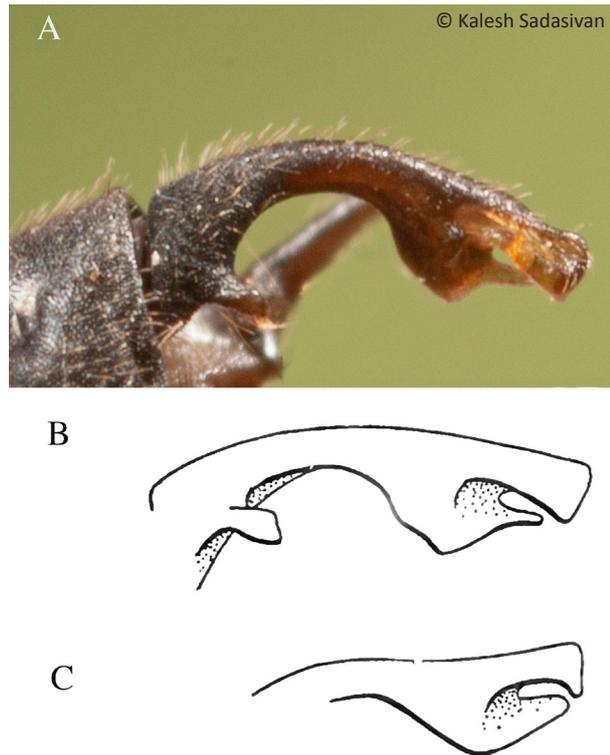


Image 4. Anal appendages: **A**—*Protosticta rufostigma* Kimmins, 1958, male cerci dorsal view of NCBS-BH878 | **B**—*P. rufostigma* Kimmins, 1958, male cerci (adapted from Kimmins, 1958) | **C**—*P. davenporti* Fraser, 1931 male cerci (adapted from Kimmins 1958).

26–28°C, relative humidity 86–96% and no wind. The species shares its habitat with other odonates like *Heliogomphus promelas* (Selys, 1873), *Hylaeothemis indica* Fraser, 1946, *Idionyx travancorensis* Fraser, 1931, *Vestalis submontana* Fraser, 1934, *Euphaea cardinalis* (Fraser, 1924), *E. fraseri* (Laidlaw, 1920), *Caconeura ramburi* (Fraser, 1922), *C. risi* (Fraser, 1931), *Esme mudiensis* Fraser, 1931, *Melanoneura bilineata* Fraser, 1922, *Indosticta deccanensis* (Laidlaw, 1915), *Protosticta gravelyi* Laidlaw, 1915, and *P. ponmudiensis* Kiran et al., 2015.

DISCUSSION

This paper confirms the presence of *Protosticta rufostigma* Kimmins, 1958, from the Western Ghats of Kerala, thus adding it to the checklist of odonates of Kerala. The species is similar to *P. davenporti* Fraser, 1931, but may be distinguished by the larger pterostigma, pattern of prothorax, S8 and the structure of the male cerci. Though the pterostigma is similar to that of *P. sanguinostigma* Fraser, 1922, the anal appendages are

very different from it, as the latter has a prominent dorsal spine on the cerci. The original description of the species was based on specimens deposited in the Natural History Museum, London. So the colours on the live insect were not mentioned in the description by Kimmins (1958). Here an additional description of the insect is provided based on live individuals. The dark bottle green colour of the eyes are diagnostic of the species, along with the characteristic anal appendages of males. As per our field experience the species is not uncommon in the Agasthyamalais in suitable habitats. Given the similarities of the species in morphology and ecology, it can be considered closely related to *P. davenporti* of Anamalais, in the Agasthyamalais. It is to be also noted that despite best efforts *P. davenporti* has not been recorded by us until now in the Agasthyamalais, though recorded in Kerala from the Anamalais (Fraser 1933; Subramanian et al. 2018).

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