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SHORT COMMUNICATION

A NEW SPECIES OF *PROTOSTICTA* SELYS, 1885 (ODONATA: ZYGOPTERA: PLATYSTICTIDAE) FROM WESTERN GHATS, KERALA, INDIA

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A NEW SPECIES OF *PROTOSTICTA* SELYS, 1885 (ODONATA: ZYGOPTERA: PLATYSTICTIDAE) FROM WESTERN GHATS, KERALA, INDIA

K.G. Emiliyamma¹ & Muhamed Jafer Palot²

^{1,2}Zoological Survey of India, Western Ghat Regional Centre, Kozhikode, Kerala 673006, India
¹kgemily@gmail.com (corresponding author), ²palot.zsi@gmail.com

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Abstract: A new species of *Protosticta* Selys, 1885 from Kerala part of Western Ghats is described and illustrated. The holotype male and paratype female is distinguished from other *Protosticta* species based on its complete black dorsal surface of abdomen, 7th and 8th abdominal segment without yellow or blue color dorsally and its distinct anal appendages. The new species, *Protosticta monticola* sp. nov. was collected from shola forests of Idukki District, Kerala, southern Western Ghats. A key is also provided for the identification of all described species of *Protosticta* known from the Western Ghats.

Keywords: Odonata, Platystictidae, *Protosticta*, Western Ghats, Zygoptera.

The genus *Protosticta* (Zygoptera: Platystictidae) was established by Selys (1885). It is widespread in Southeast Asian countries, Philippines, Borneo and Sulawesi (van Tol 2008). The genus is characterized by the absence of the Ab vein, (Anal bridge), a cross vein in the wing venation. There are 11 species of *Protosticta* known from India (Subramanian 2014; Kiran et al. 2015). Of these, eight species, viz., *Protosticta antelopoides* Fraser, 1924, *P. davenporti* Fraser, 1931, *P. gravellyi* Laidlaw, 1915, *P. hearseyi* Fraser, 1922, *P. mortoni* Fraser, 1924, *P. ponmudiensis* Kiran, Karesh & Kunte, 2015, *P. rufostigma* Kimmins, 1958, and *P. sanguinostigma* Fraser, 1922 are known from the Western Ghats. Based

on Schorr & Paulson (2015), checklist of Indian Odonata (Subramanian 2014), and the recent publication of Kiran et al. (2015), there are 42 species of *Protosticta* known from the world. In this paper, we report the discovery of a new species of *Protosticta* from the shola forests of Idukki District, Kerala. A Key to the identification of eight species known from the Western Ghats is also provided.

Protosticta monticola sp. nov. (Images 1–12)

urn:lsid:zoobank.org:act:832C6D14-9FB6-473E-9ED2-4645F64C6D0A

Type material

Holotype: ZSI/WGRC, IR/INV-6923, male, 20.v.2014, Kambilipparachola, Marayur Forest Division, Idukki District, Kerala, India, 10°27.82'N & 77°14.21'E, 1739m, coll. P.M. Sureshan.

Paratype 1: ZSI/WGRC, IR/INV-6924, teneral male, 21.v.2014, Nagamalachola, Marayur Forest Division, Idukki District, Kerala, India, 10°15.697'N & 77°38.08'E, 1632m, coll. P.M. Sureshan.

Paratype 2: ZSI/WGRC, IR/INV-6925, female, 21.ix.2014, Mathikettan Shola National Park, Idukki District, Kerala, India, 9°97.609'N & 77°24.088'E, coll.

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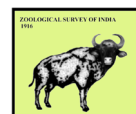
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Conflict of Interest: The authors declare no competing interests.

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P.M. Sureshan (Fig. 1).

The holotype and paratypes are preserved wet in 80% alcohol and deposited in the National Zoological Collections of WGRC, ZSI, Kozhikode.

Description

Holotype: Male. (Images: 1-12). Head: Eyes grayish-black above, pale bluish-green at sides and below. Labium bright yellow, black medially. Labrum pale blue, lower one-third shining black with long, brownish hairs. Anteclypeus creamy yellow, postclypeus shining black with long, brown hairs anteriorly. Mandible base yellow on upper part, shining black below. Genae, vertex and frons shining black with coppery reflection. Median ocelli chestnut brown, lateral ocelli chestnut brown on innerside, creamy yellow outwardly; the distance between lateral ocelli is (0.5mm) lesser than the distance between median ocelli (0.6mm). Antenna black, pedicel dull white, behind antenna a few short and long white hairs. Prothorax: propleuron pale yellow, collar of anterior lobe creamy yellow with a middle black band. Middle lobe dull brownish-white, black at the sides and in the central part. Posterior lobe dull brownish-white and medially black. Synthorax (Image 3): shining black with coppery reflection. Antehumeral stripe absent. Antealar triangle shining black; mesepisternum shining black with coppery reflection; mesepimeron metallic, shining black, metepisternum metallic black with a broad bright yellow stripe throughout its length; metepimeron bright yellow. The ventral side of thorax is pale yellow. Legs: creamy white; femur with thin black stripe dorsally throughout its length; all tarsi and claws yellowish-brown; knee joints of femora, distal end of tibiae and trochanters bluish-black. Wings (Image 12): transparent, venation black; 12 postnodals in FW, 11 in the HW. Arculus slightly distal to 2nd antenodal; R4 arising opposite of subnodus, IR3 joined to it by a short stalk. Pterostigma trapezoidal shaped, dark brownish-black with a reddish tinge, a thin pale yellowish-brown frame surrounding it, enclosed in thick black frame, covering slightly more than one underlying cell. Abdomen: Metallic black dorsally from segment 1 to segment 10. S1 bright yellow laterally and ventrally, with a broad pale yellow basal annule. S2 bright yellow laterally and ventrally; accessory genitalia brownish-black; S3 to S7 bright yellow laterally; S1 to S8 with incomplete yellow basal annulus expanded laterally; lateral and ventral surface of S8 bright yellow; ventral side of S9 yellow. Anal appendages (Images 6–9): black and dull yellow. The length of superior appendages is more than twice the length of segment 10, broad at

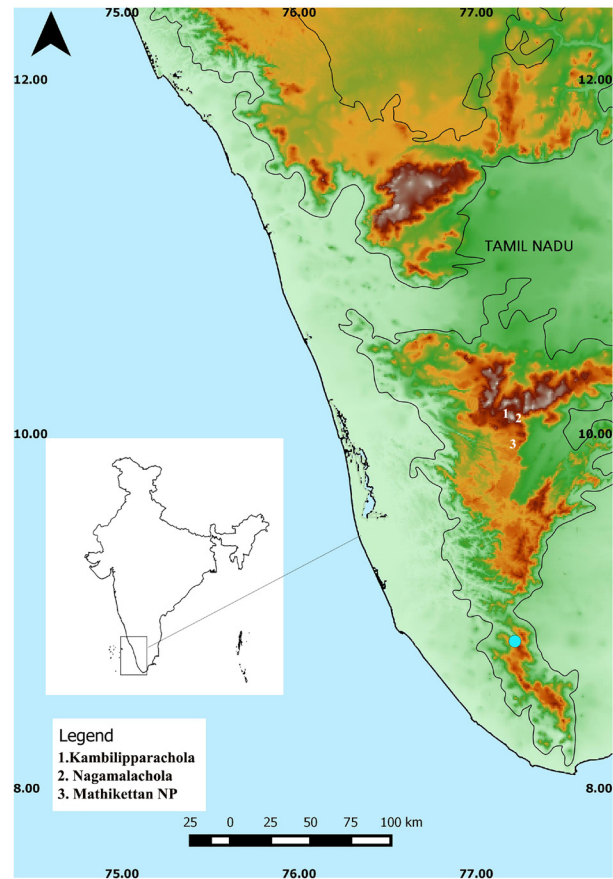


Figure 1. Southern Western Ghats showing collection localities: 1 - Kambilipparachola, 2 - Nagamalachola, 3 - Mathikettan Shola National Park

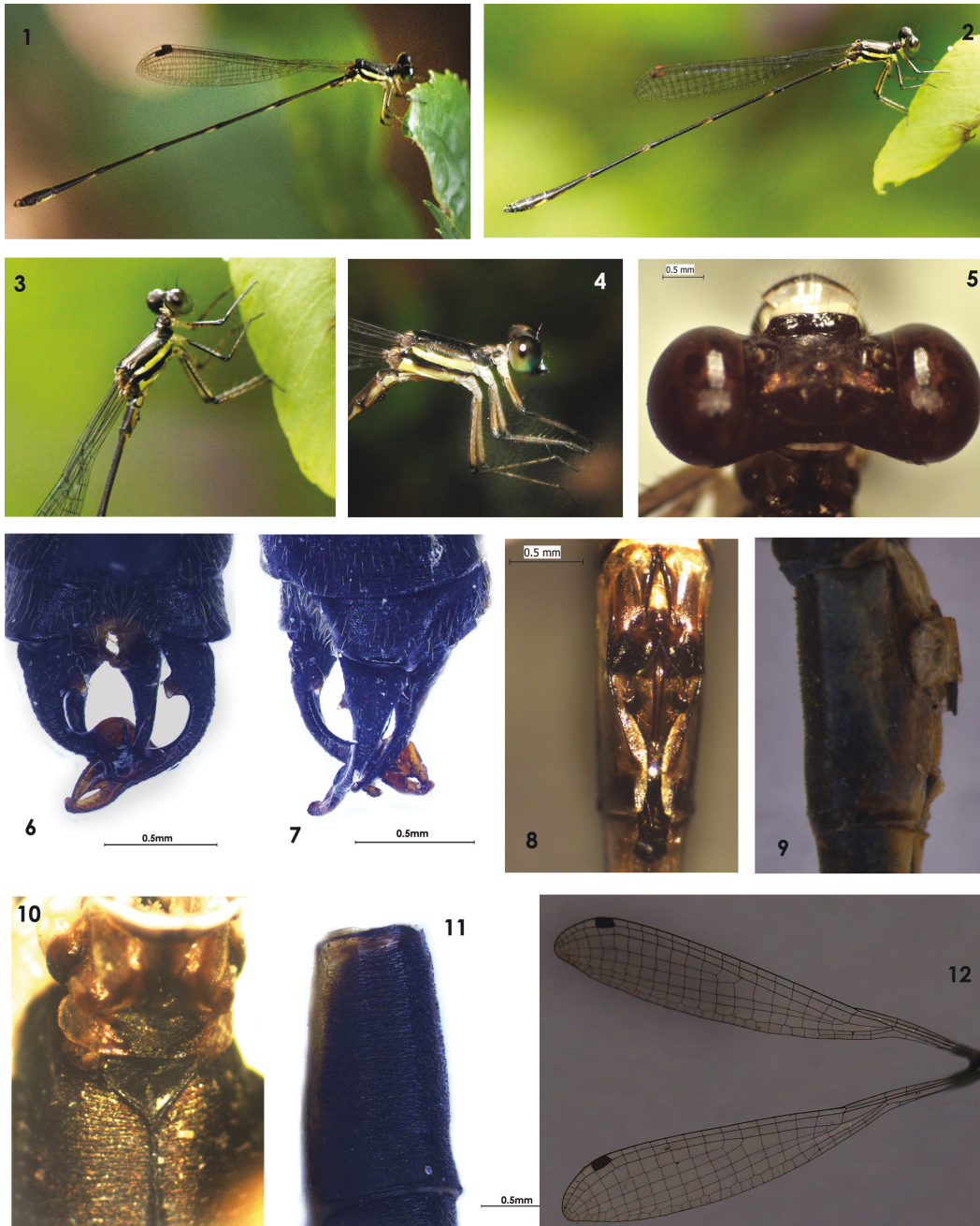
base, furnished with an inner, dorsal pointed tubercle, then tapering and expanding again in the distal part to form a finger and thumb like structure, as in all species of *Protosticta*. The finger and thumb almost in equal length or finger process slightly longer than thumb, the apex of finger broad and curved inwards; thumb process dull yellow, broad and ends in a pointed tip, like a bird’s beak. The dorsal side of superior appendage is rugose, with small spines and short, white hairs. Inferior appendages broad at base, then tapered gradually to apex, the apex flattened and pointed, bright yellow, the base furnished with a pointed tubercle; paraprocts with short, white hairs. The inferior appendage is distinctly shorter to superior.

Measurements

Holotype: Total length 44mm; abdomen length 35mm; FW 23mm; HW 21mm.

Paratype 1: Total length 41mm; abdomen length 33mm; FW 23mm; HW 21mm.

Paratype 2: Total length 42 mm; abdomen length



Images 1–12. *Protosticta monticola* sp. nov.

1 - Adult male; 2 - Teneral male; 3–5 - Head of adult male *Protosticta monticola* sp. nov.; 6–9 - Dorsal and lateral view of genitalia & anal appendages of *Protosticta monticola* sp. nov.; 10 - Prothorax; 11 - 8th abdominal appendages; 12 - wings. © Authors

34mm; FW 24mm; HW 22mm

Paratype 1: Teneral male: Exactly similar to adult male, except the colour of abdomen and thorax pale black, yellow colour brighter; pterostigma reddish-brown.

Paratype 2: Female: Exactly similar to adult male in coloration, except a few slight variations: more robust than male; labrum pale yellow, bordered with black;

abdominal segments 1 and 2 with dull yellow basal annulus, S3 to S5 with yellow markings dorsally and ventrally, wings with 13–14 postnodals in FW, 12 in HW. Vulvar scale robust, black with yellow markings.

Diagnosis

This species can be easily distinguished from all other described species of *Protosticta*, having complete

black abdomen dorsally and its distinct shape of anal appendage. In all other species of *Protosticta*, the basal part of segment 8, which is blue, yellow or with blue stripes and anal appendage is unique in each species.

Etymology

The species epithet *monticola* refer to the natural habitat of this species, the mountain dweller, where the species was discovered.

Distribution

Protosticta monticola sp. nov. is currently known from the high altitudes (above 1600m) of Anamalai Hills, Idukki, Kerala in the southern Western Ghats. The present study found this species in highland shola forest ecosystems of Kambilipparachola and Nagamalachola of Marayur forest division and Mathikettan Shola National Park in Idukki District, Kerala State, India.

Habitat and ecology

The males were found away from the forest streams,

in shaded areas among the shola forest undergrowth at Kambilipparachola. Few females and males were also found frequenting sides of the streams covered with forest canopy near Nagamalachola in Marayur forests.

Subsequently, on a visit to Mathikettan shola National Park on 21 September 2014, we found a few female specimens of *Protosticta monticola* sp. nov., in a forest stream inside the shola forest. Other species observed with them were *Euphaea cardinalis* (Fraser) and *Esme cyaneovittata* Fraser.

Even though, we surveyed the shola grassland ecosystems of adjoining areas of Anaimudi Shola NP, Pambadumshola NP, Eravikulam NP and Kurinjimala Sanctuary, we could not find any specimens of *Protosticta monticola* sp. nov. during the period.

DISCUSSION

Of the eight species of *Protosticta* known from the Western Ghats, *P. gravelyi* and *P. hearseyi* have widespread distribution and are reported from many localities in the southern Western Ghats. The suitable

Table 1. Major characters of different species of *Protosticta* recorded from Western Ghats with their distribution

	Species	Eyes	Legs	8 th abdominal segment	Distribution
1	<i>P. antelopoides</i>	Bottle green	Dirty white with a broad pale blue ring followed by a black ring towards distal end of femora, tibiae dark on flexor surface	Black	Western Ghats south of Wayanad hills
2	<i>P. davenporti</i>	Dark bottle green, paling to pale greenish beneath	Femora black, 2 hind pairs white on the extensor surface, middle pair with a large white distal spot, tibiae dirty white, tarsus black	Basal third or half pale turquoise blue	Western Ghats south of Palakkad gap
3	<i>P. gravelyi</i>	Dark bottle green, paling to pale greenish-beneath	Creamy white, knees darker; hind pair of femora occasionally marked on the extensor surface with brown stripe	Basal half turquoise blue	Western Ghats
4	<i>P. hearseyi</i>	Olivaceous above, paling and changing to pale blue beneath	Bluish-white, two hind femora with narrow blackish transverse lines on the extensor surface	Turquoise blue with a narrow black apical annulus	Western Ghats south of Goa
5	<i>P. mortoni</i>	Ultramarine blue, capped with black above, pale blue beneath	White knees and femora sparsely stippled with black	Turquoise blue at basal half	Western Ghats (between north of Palakkad gap and Goa gap)
6	<i>P. ponmudiensis</i>	Bright pale green	Coxa and trochanters creamy white; femur brownish, joints darker	Blackish-brown, with a single narrow bluish-white basal annulus	Southern Western Ghats (Ponmudi Hills, Kerala)
7	<i>P. rufostigma</i>	-	Brownish-white	Basal half blue	Southern Western Ghats (Kalakkadu-Mundanthurai TR, Tamil Nadu)
8	<i>P. sanguinostigma</i>	Bottle green, pale greenish-blue below, these two colours separated by an equatorial black band	Pale yellow; femora lined with black on extensor surface	Turquoise blue, continued basally as a narrow tongue like black colour along mid dorsal carina as far as the base of segment, apical border black.	Western Ghats south of Coorg
9	<i>P. monticola</i> sp. nov.	Eyes grayish-black above, pale bluish-green at sides and below	creamy white; femora with thin black stripe dorsally throughout its length; tarsi and claws yellowish-brown; knee joints of femora, distal end of tibiae and trochanters bluish-black	Metallic black, lateral and ventral surface of S8 bright yellow	Southern Western Ghats (Anamalai Hills, Kerala)

Key to the species of *Protosticta* Selys, 1885 (male) of the Western Ghats

- 1. Pterostigma black 2
- Pterostigma red blood *P. sanguinostigma*
- 2. Prothorax pale blue, the posterior lobe completely black *P. mortoni*
- Prothorax and its posterior lobe blue or creamy white 3
- 3. Posterior lobe of Prothorax with spine 4
- Posterior lobe of Prothorax without spine 5
- 4. Posterior lobe furnished with a pair of long, divaricate horn like spine; inferior anal appendage bifid at apex *P. antelopoides*
- Posterior lobe furnished with a pair of short lateral spine and internally two medial spines; inferior anal appendage twisted and curved inwards, not bifid *P. ponmudiensis*
- 5. Abdominal segment 8 metallic black, lateral and ventral surface of S8 bright yellow; superior anal appendage with the apex of finger broad and curved inwards, thumb process broad and ends in a pointed tip, like a bird's beak *P. monticola* sp. nov.
- Basal half of abdominal segment 8 pale blue with black markings; superior anal appendage different 6
- 6. R4+5 arising slightly or well distal to subnode 7
- R4+5 arising opposite or distal to subnode 8
- 7. Thorax metallic black marked with creamy white oblique stripe; abdomen black, marked with white and turquoise blue; superior anal appendages with finger pointed at apex; inferior appendage furnished with an inner stout spine at base.. *P. gravelyi*
- Thorax greenish-black marked with bluish-white oblique stripe; abdomen blackish-brown, marked with yellowish-white and blue; superior anal appendage with finger blunt at apex; inferior appendage without spine or tooth *P. rufostigma*
- 8. 8th segment of abdomen pale blue, with a narrow black apical annulus; superior anal appendages twice the length of segment 10; inferior appendage furnished with two or three teeth *P. hearseyi*
- The basal third or half of 8th segment of abdomen pale blue; superior anal appendage half as long as segment 10; inferior appendage without any spine or tooth *P. davenporti*

altitude preferred by the members of the genus *Protosticta* is between 180–365 m. But in the case of *P. monticola* sp. nov, the preferred elevation is between 1600–1700 m. This is the only species found within the high altitude shola forests of the southern Western Ghats.

This is one of the small sized *Protosticta* like *P. hearseyi*. Some of the main differences with other Western Ghats species are given below (Table 1) with their distribution.

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