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Redescription of the holotype of *Mecistogaster pronoti* Sjöstedt, 1918 (Zygoptera: Pseudostigmatidae)

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Mecistogaster pronoti Sjöstedt, 1918 was described based on a female holotype deposited in the Naturhistoriska Riksmuseet, Stockholm, collected in the state of Espírito Santo, Brazil. The original description has no illustrations, which makes its identification very difficult. Herewith we redescribe and illustrate this holotype. The species is red listed and considerations regarding its conservation are made.

Keywords: Odonata; damselfly; redescription; conservation; LED illumination

Introduction

Mecistogaster pronoti was described based on a single female specimen from the state of Espírito Santo, Brazil. The type locality is unknown but most probably it is situated in some area of Atlantic Forest, because all *Mecistogaster* species are forest dwellers and the state of Espírito Santo was almost entirely forested in the beginning of the 20th century.

In the 97 years following its description, the species has never been found again, in spite of the fact that the state of Espírito Santo is part of Southeastern Brazil, where the largest collecting effort for odonates is concentrated (De Marco & Vianna, 2005), including the genus *Mecistogaster*. Two collecting trips by the senior author in forests of western Espírito Santo in search of the species revealed no results, and no specimens of *M. pronoti* were found by the senior author in the collections of Selys-Longchamps, Brussels nor in the Museu Nacional, Rio de Janeiro and the Museu de Zoologia, São Paulo. This suggests that the species, if not extinct, is very rare. According to Heckman (2008), *M. pronoti* is a rare or unrecognized species whose redescription is imperative. We herewith redescribe the holotype of *M. pronoti* mainly as a means to provide illustrations that are completely lacking in the original description.

Materials and methods

We studied the holotype of *Mecistogaster pronoti*, loaned from the Naturhistoriska Riksmuseet, Stockholm. It arrived pinned in a small box. The body got loose from the pin and was much

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damaged, although almost complete, lacking only three legs. Five labels were attached to the pin, which can be described as follows (from top to bottom):

- Label 1: large, rectangular, white, handwritten with ink: *Mecistogaster* ♀ *pronoti* Sjöstedt, 1918.
- Label 2: small, rectangular, grayish red, printed: typus.
- Label 3: small, rectangular, white, printed: Espiritu Santo.
- Label 4: medium size, rectangular, dirty white, printed with faded letters: Rijksmuseum Stockholm.
- Label 5: very small, square, pale red, handwritten: 28/81.

To these labels we have added the following rectangular, white, handwritten label: Redescribed by Machado & Lacerda, 2016.

The meaning of the numbers in label 5 could not be ascertained, but it probably refers to some kind of register at the Museum.

The color characteristics of the apical pale area of the wings and pseudostigma were studied with a Leica M205A stereomicroscope (Leica Microsystems, Wetzlar, Germany) equipped with LED 5000-RL (Ring Light) illumination that, according to the manufacturer (website below), allows true color reproduction of the material indicating its natural color. The LED-RL provides the same distribution in wavelength and has the same incident angle of illuminating beam. The color temperature of LED is 5600 K. White balance, exposure, gain and gamma adjustments were based on QPCARD 101/V3 target applying to their reference values. The saturation range is from 0 to 3 and the indicated default is 1.7. Details and concepts of the procedure used can be obtained from Leica Microsystems (Switzerland) Ltd (2012) and http://www.leica-microsystems.com/products/stereo-microscopes-macroscopes/illumination/details/product/leica-led5000-rl/. Photos taken with low (0.55) saturation and high (2.7) saturation values were obtained and compared.

Abbreviations

Fw, forewing; Hw, hindwing; Px, postnodal; S1–S10, abdominal segments 1–10. Venation terminology after Riek and Kukalová-Peck (1984).

Redescription of *Mecistogaster pronoti* Sjöstedt, 1918

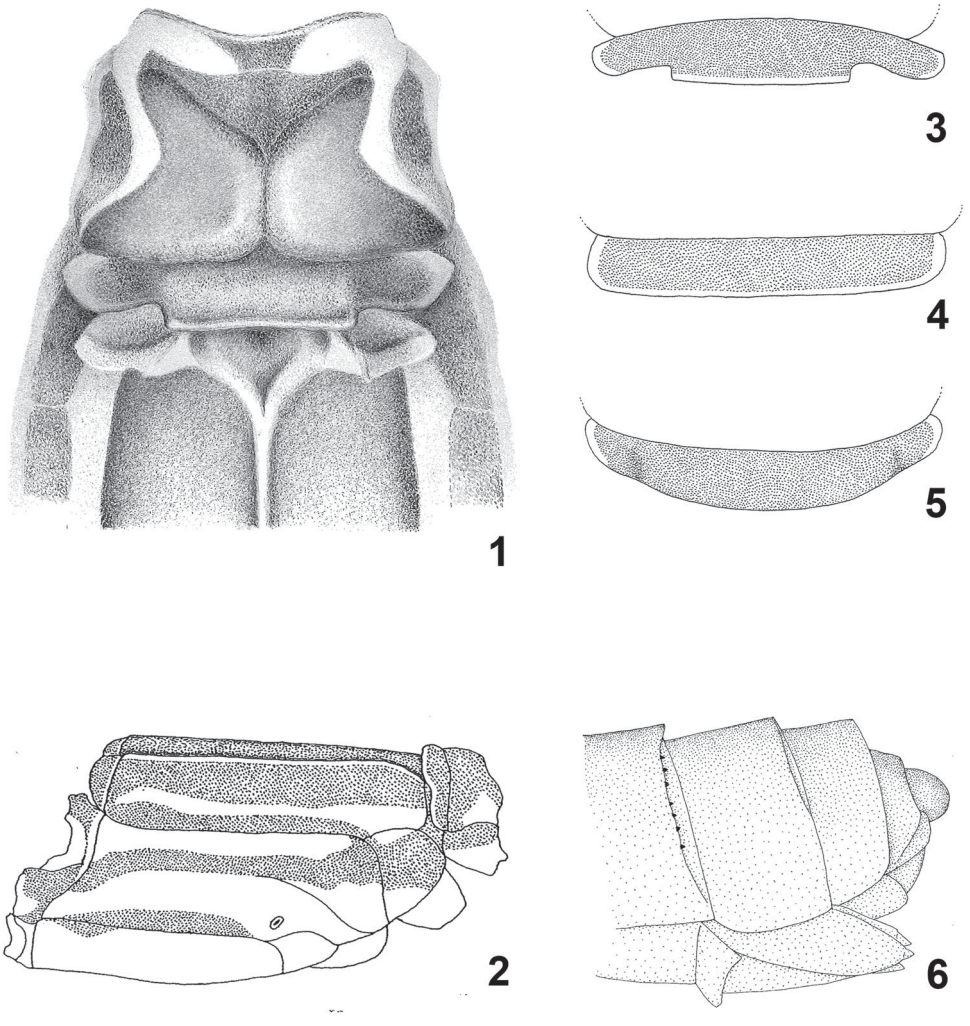
Material studied

Holotype. ♀. Brazil, Espírito Santo (no further information on the location), no further information on collectors and date (probably A. Roman, between July 1914 and July 1915), deposited in the Naturhistoriska Riksmuseet Stockholm.

Diagnosis

Head. Labium yellowish white, labrum grayish white with borders black and a central black stripe. Anteclypeus, genae and base of mandibles orange yellow, postclypeus black, antefrons orange yellow with a central black stripe. Dorsum of head black, with an orange and white spot anteriorly and another medially to the antennae base. Antennae with scape and pedicel black. Rear of head yellowish white.

Thorax. Prothorax (Figure 1): pronotum dark brown with a pair of pale yellow stripes anteriorly and laterally to the middle lobe. Hind prothorax lobe with the border of medial portion

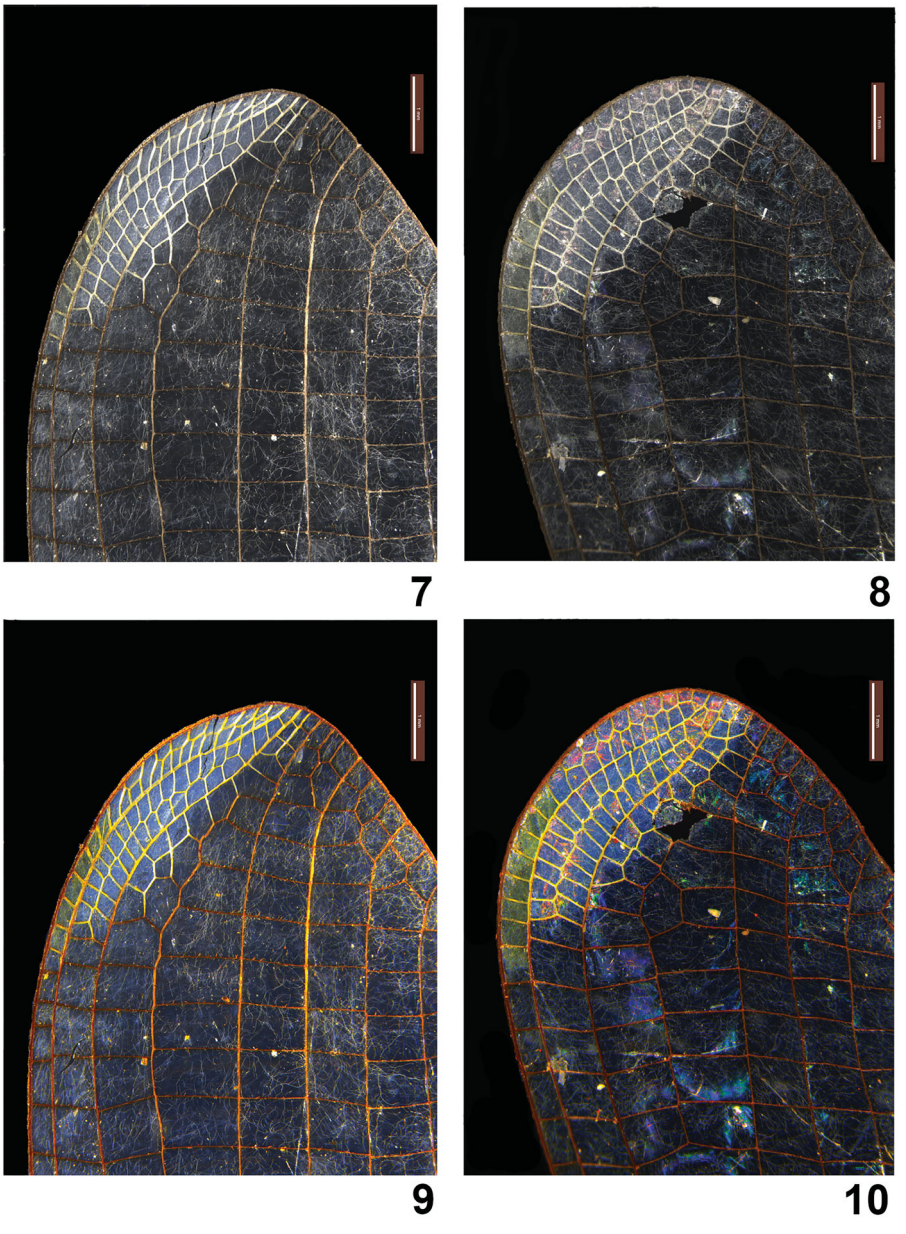


Figures 1–6. *Mecistogaster pronoti*, holotype ♀: (1) prothorax and anterior part of pterothorax in anterodorsal view; (2) pterothorax in lateral view; (3) hind prothoracic lobe in anterodorsal view; hind prothoracic lobes in anterodorsal view of females of (4) *Mecistogaster martinezi* and (5) *Mecistogaster asticta*; (6) abdominal segments 8–10 with ovipositor in lateral view.

and apex of lateral portions pale yellow. Propleuron pale yellow with a large dark brown spot. Pterothorax: Mesostigmal plates black with the margins yellow (Figure 1). Mesepisternum (Figure 2) black with an antehumeral grayish yellow stripe occupying the whole extension of the sclerite. Middorsal carina yellow (Figure 1), acrotergal area and antealar sinus brown. Mesepimeron dark brown with hardly noticeable bronze and a grayish yellow stripe not reaching the upper part of the sclerite. Mesinfraepisternum dark brown. Metapleuron (Figure 2) whitish yellow with a black stripe adjacent to the metapleural suture occupying the dorsal ¾ of the sclerite. Venter of pterothorax whitish yellow, with a narrow midventral dark stripe occupying the anterior ½ of the venter. It is impossible to know whether this stripe reaches the posterior part of the venter, because this part had been damaged.

Legs. Femora black with the flexor surface yellow. Tibiae whitish yellow, with flexural surface black. Tarsi black. Femora and tibiae spines black.

Wings. Dominantly hyaline with brown venation, except for the distal area between RA and RP1 and a row of cells posterior to RP1 that are milky white (saturation 0.55), including veins. Cells in the whitish area smaller than in the hyaline one. Pseudostigma at low saturation values (0.55) with a weakly indicated pale yellow color (Figures 7, 8). At saturation 2.7 the color of the apical part of wings changes completely and the pseudostigma becomes very evident, yellow, with six cells in Fw and eight in Hw (Figures 9, 10). Veins of the whitish area become yellow, with the cells pale blue. Venation: Px in Fw 35, in Hw 29, RP2 in Fw originating at Px 11, in



Figures 7–10. *Mecistogaster pronoti*, holotype ♀: photos with LED 5000-RL illumination. (7, 8) Saturation value 0.55 (natural color): (7) Fw; (8) Hw. (9, 10) Saturation value 2.7: (9) Fw; (10) Hw.

Hw at Px 9. Petiolation in Fw and Hw originating distal to CuP by a distance about the length of CuP.

Abdomen. S1 light brown, S2–S7 brown. S3 with a white narrow anterior ring interrupted in the middle. S8–S9 dark brown with a grayish yellow spot laterally, S10 dark brown proximally, dark distally. Cercus dark.

Structural characters: hind prothoracic lobe (Figure 1) with median portion straight, separated from the lateral portions by a deep incision at each side (Figures 1, 3). Lateral portions with the apex rounded (Figure 1). Supplementary tooth of tarsal claws absent.

Cercus (Figure 6) with the apex rounded, ovipositor (stylus lacking) reaching posteriorly about the level of S9–S10 border.

Discussion

As pointed out by Sjöstedt (1918), Heckman (2008) and Lencioni (2005) the main character separating *M. pronoti* from the other *Mecistogaster* species is the peculiar form of the hind prothoracic lobe. However, the description of this lobe made by Sjöstedt (1918) does not allow a precise visualization of its shape that is clearly shown in Figures 1 and 2.

A comparison of the hind prothoracic lobe of *M. pronoti* (Figure 1) with those of *M. asticta* Selys, 1860, *M. amalia* (Burmeister, 1839), *M. jocaste* Hagen, 1860, *M. linearis* (Fabricius, 1777), *M. lucretia* (Drury, 1773), *M. martinezi* Machado, 1985 and *M. ornata* Rambur, 1842 shows that whereas in these species the separation of the median and lateral portions of the hind lobe is not distinguishable, as in *M. martinezi* (Figure 4), or vaguely separated, as in *M. asticta* (Figure 5), in *M. pronoti* these portions are separated by a deep incision (Figure 3).

Sjöstedt (1918) stated that the claws of *M. pronoti* differ from those of *M. iphigenia* Selys, 1886 and probably also from *M. modestus* Selys, 1860 by lacking a tooth. This tooth is present not only in these two species but also in *M. amalia*, *M. linearis*, *M. lucretia* and *M. ornata*.

Remarks

The remarkable change of color in the pale apical area of the wings of *M. pronoti* using LED 5000 ring light system and at high saturation has not been reported previously. The phenomenon will be discussed in a forthcoming paper with four new species of *Mecistogaster* and also in the pale apical area of the wings of *M. amalia*, *M. hauxlari* (Selys, 1886), *M. lucretia*, *M. ornata* Rambur, 1842 and *Microstigma* sp. In all of these taxa there was change of color with high saturation values, different from what was found in *M. pronoti*. These differences support the view that changing saturation has taxonomic value in *Mecistogaster*, *Microstigma* and possibly in other genera of Pseudostigmatidae.

As regards conservation, *M. pronoti* has been listed as Critically Endangered in the red lists of Brazil, Portaria MMA n° 444/2014 and n° 445/2014, and IUCN (2006). As a main strategy for the conservation of the species, it has been recommended by Machado (2008) to intensify field collections in the state of Espírito Santo in search of the species followed by protections of its habitat. As shown in the map (Figure 11), collections of *Mecistogaster* species have been made predominantly throughout the central eastern part of the Espírito Santo State. Therefore, it seems reasonable to suggest that further collecting effort should prioritize undersampled forest habitats throughout the northern and southern part of this state. In *Mecistogaster asticta*, the closest species to *M. pronoti*, the larvae breeds in the water accumulated in bamboo internodes (Lencioni, 2005). Thus, for finding *M. pronoti*, further collections should be concentrated in bamboo rich forest habitats.

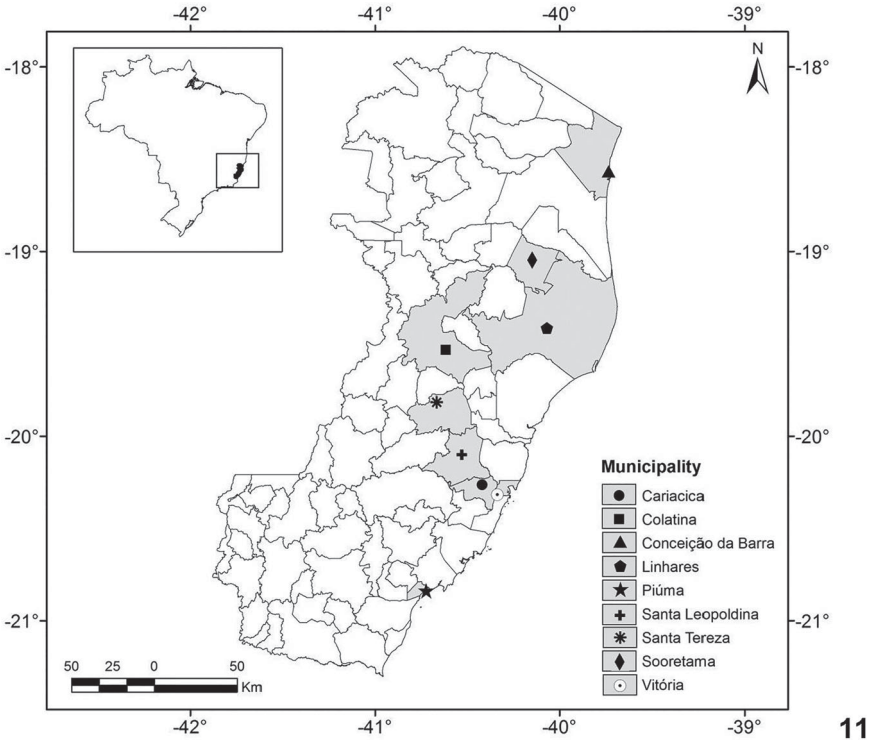


Figure 11. Municipalities in the State of Espírito Santo where specimens of *Mecistogaster* have been collected.

Acknowledgments

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