

A collecting trip to San José del Guaviare, Colombia, with the description of a new species of *Perissolestes* (Zygoptera: Perilestidae)

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Research Article



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All relevant data are within the paper.

Abstract. This study aims to preliminary assess the taxonomic diversity of dragonflies and damselflies from San José del Guaviare, Guaviare Department, Colombia. A total of 47 species were collected at five localities in different freshwater ecosystems during a field trip. We highlight three new species records for the country: *Erythrodiplax tenuis* Borror, 1942, *Micrathyria spinifera* Calvert, 1909, and *Perithemis rubita* Dunkle, 1982. Finally, a new species of *Perissolestes* is described from Guaviare and Casanare, Colombia.

<https://zoobank.org/References/D42E3580-32D3-4677-81B8-8E405F8B8E26>

Key words. Odonata, damselfly, dragonfly, new *Perissolestes*, Amazon, diversity

Introduction

The department of Guaviare lies in the southeast of Colombia, where the homonymous river of the same name is the longest tributary to the Orinoco River in that country. This area is also where the transition between the Amazon region and the savanna ecosystems in the Orinoco basin plains occurs. It is a territory that used to be under the control of various armed groups, which prevented researchers from carrying out biodiversity surveys for a long time (Murillo-Sandoval et al., 2020), resulting in only four Odonata species having been recorded from this department thus far (Bota-Sierra et al., 2015).

The dominant type of ecosystem in Guaviare is the flooded savanna, which is threatened mainly by deforestation due to the expansion of African oil palm (*Elaeis guineensis* Jacq.) plantations and cattle ranching. These activities have intensified and increased after the armed groups that used to control the region signed a peace accord with the Colombian government, and subsequent land colonization has led to an increase in the loss of biodiversity and the destruction of habitats (Clerici et al., 2020). In this context, the remaining forest areas have become important biodiversity reservoirs and thus, the biological information held in these areas is of crucial importance for understanding the changing Orinoco savanna landscape (González-Abella et al., 2021).

In order to enrich our knowledge of Odonata to the region, a field trip was carried out in the area surrounding the Department, San José del Guaviare. A list of

the sampled taxa is presented, with emphasis on new records for Colombia, together with biological notes and habitat descriptions. In addition, a new species of *Perissolestes* is described from the Guaviare and Casanare Departments, Colombia, constituting the first record of Perilestidae Kennedy, 1920 from these departments.

Materials and methods

Study area

Five localities (Fig. 1b) around San José del Guaviare, Guaviare Department, Colombia were sampled:

1. “Naturlog” Nature Reserve, Playa Güio Township (2.574722° N, 72.713889° W, 180 m a.s.l.): slow flowing river tributaries embedded in a flooded forest ecosystem, together with stagnant ponds and puddles; large white-water river floodplains and beaches bordering the Río Guaviare (Figs 2a–b).
2. Laguna Negra (2.569767° N, 72.697533° W, 187 m a.s.l.): dark-water lagoon ecosystem with abundant aquatic plants and leaf litter in the littoral zone (Fig. 2c).
3. Road to Puentes Naturales (2.5518° N, 72.710333° W, 220 m a.s.l.): small, clear-water creek close to human settlements in a rural area, with small patches of riparian forest (Fig. 2d).

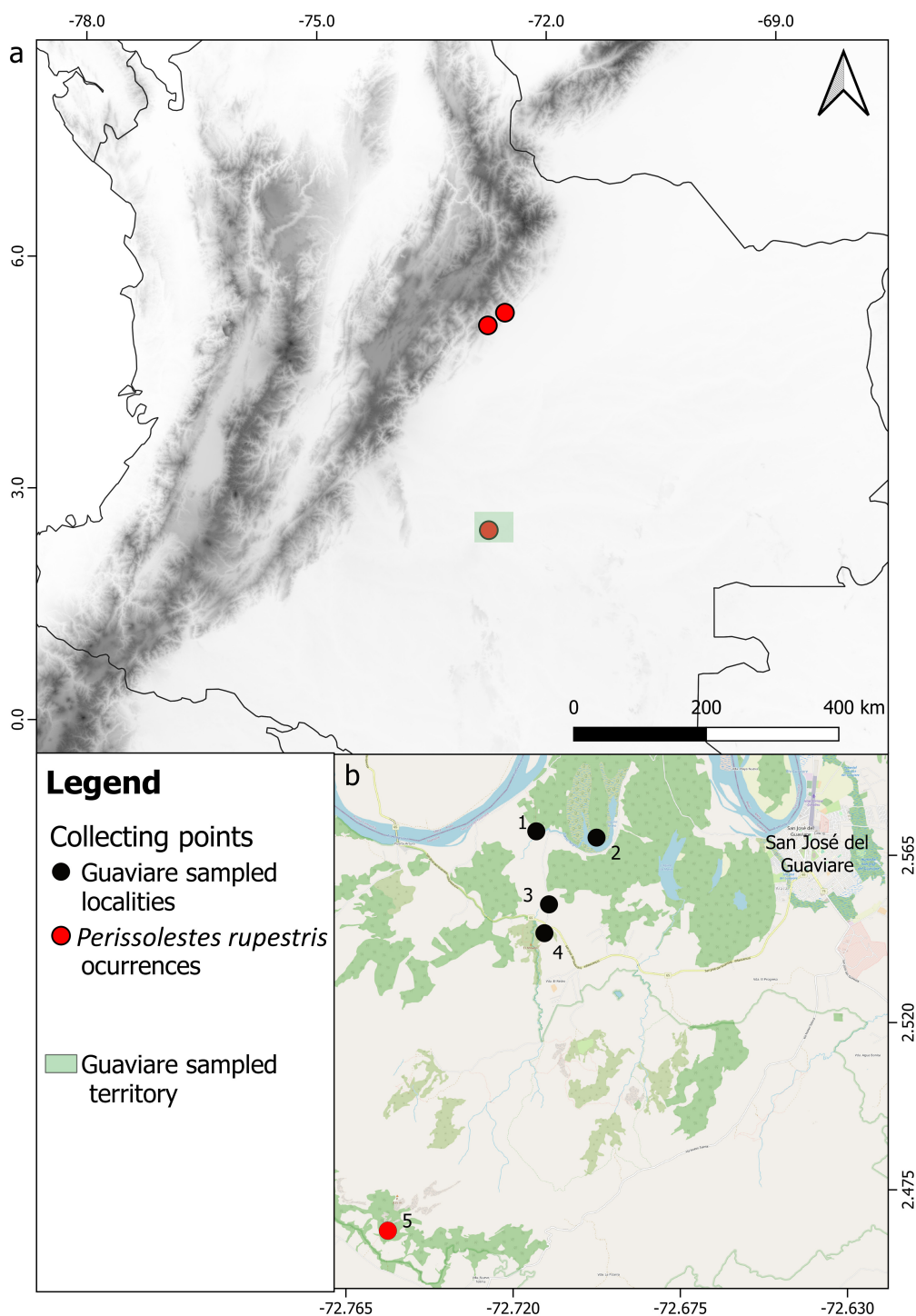


Figure 1. a – Records of *Perissolestes rupestris* sp. nov.; b – sampled localities.

4. Puentes Naturales (2.540317° N, 72.714267° W, 210 m a.s.l.): flowing clear-water creeks, temporary ponds, and puddles in forest and exposed granite-formation habitats as well as a large river tributary with large puddles and secondary forest (Fig. 2e).
5. Nuevo Tolima Township (2.455583° N, 72.753717° W, 273 m a.s.l.): clear-water creeks near human settlement and pastures in a rural area. Large-rock environment with abundant mosses and puddles in carved-out rock. Small creeks and puddles were also found in this area (Fig. 2f).

Sampling

Sampling was conducted from March 20 to March 24, 2022. Only adult specimens were captured. Sweep nets were used to actively collect between 9:00 and 16:00, whereas at night, between 18:00 and 5:00, specimens were attracted to a light trap (installed at locality 1). Specimens were preserved in 96% ethanol, then dried overnight, and finally stored in glassine envelopes. Elevation data and longitude/latitude coordinates were taken with a Garmin eTrex GPS. The map was composed using



Figure 2. Habitats. a – Ecotourism trail inside the Reserva Playa Guio; b – Guaviare River; c – Laguna Negra; d – stream on the road to Puentes Naturales; e – Puentes Naturales; f – Nuevo Tolima. Photos by TF.

the Geographic Information System QGIS 3.16 Hannover (<https://qgis.org/es/site/index.html>). The samples were collected under permit # 1177 granted by the National Authority of Environmental Licenses (ANLA) to the Universidad de los Andes, Bogotá, Colombia.

Identification

Collected specimens were identified and deposited in the entomological collection of the Museo de Historia Natural C. J. Marinkelle of Universidad de los Andes, Bogotá, Colombia (ANDES-E). Casanarean paratypes of *Perissolestes rupestris* are stored in the entomological collection of the Universidad de Antioquia, Medellín, Colombia (CEUA). The identification was carried out using the taxonomic keys in Borror (1942); Costa & Santos (1997); Garrison (1990, 2009); Garrison & von Ellenrieder (2015); Garrison et al. (2006, 2010); Heckman (2006, 2008); Leonard (1977); Stand-Pérez et al. (2019); and Williamson & Williamson (1924).

Species description

Measurements were taken using graph paper and a stereoscope grid. Total lengths and abdominal lengths do not include appendages. Laboratory photographs were taken with a Leica stereoscope EZ4 HD and processed with the software LAS v4.13 (<https://danaherlifesciences.ent.box.com/v/LeicaLASv413>). Abbreviations for structures are as follows: Fw: forewing; Hw: hindwing; pt: pterostigma; Px: postnodal cross veins; S1–10: abdominal segments 1 to 10. Terminology for the external morphology follows Garrison et al. (2010). The diagnosis of the new species was made out based on comparisons with museum specimens deposited at the CEUA and the drawings and descriptions in Williamson & Williamson (1924), Kennedy (1937, 1941a, 1941b), and De Marmels (1989).

Results

A total of 209 Odonata were collected and identified to species level, except for some females. 47 species were recorded (Table 1), including 45 new records for the Guaviare Department, three new records for Colombia, and one new species. Only a male of *Palaemnema* Selys, 1860 could not be identified to species level. The new country records and the description of the new species are as follows:

Erythrodiplax tenuis Borror, 1942

This species has previously been recorded from Brazil, Ecuador, and Peru (Borror, 1942; Garcia Junior et al., 2022; Mauffray & Tennesen, 2019). It was common in the vegetation near still water and ponds along the ecotourism trail in the Reserva Playa Güio and in the macrophytes at Laguna Negra lake. One female was

captured with the aid of the light trap installed at the beginning of the ecotourism trail.

Micrathyria spinifera Calvert, 1909

This species is known to occur from Trinidad throughout South America to Bolivia and Brazil (Belle, 2002; De Marmels, 2015; Garcia Junior et al., 2022; Mauffray & Tennesen, 2019; Michalski, 1988; Vallejo & Ledezma, 2010; von Ellenrieder et al., 2017), thus it was expected to occur in Colombia, too. One male was caught perched on a tree branch in a still-water zone at the ecotourism trail in the Reserva Playa Güio.

Perithemis rubita Dunkle, 1982

This species was previously recorded from Brazil, Ecuador, and Peru (Butt, 1995; Mauffray & Tennesen, 2019; Miranda Filho et al., 2022). In the Reserva Playa Güio, it was observed perching in the middle of a still river near the cabins.

Perissolestes rupestris Florez, Bota-Sierra & Cano-Cobos sp. nov.

Etymology

Latin *rupestris*, masculine, third-declension two-termination adjective derived from *rupes*. The species name means that lives on cliffs or rocks and refers to the rock walls that rise on the sides of the small stream where the type material was collected (Fig. 2f). It is also a tribute to the pre-Columbian cultures of the area whose legacy survives in the form of rock paintings at the type locality (Fig. 3).

Material examined

9 males, 2 females

Holotype

Colombia, Guaviare Department, San José del Guaviare Municipality, Nuevo Tolima Township, stream near Painted Rocks Trail, 2.463967° N, 72.753700° W, 270 m a.s.l., 23-03-2022, L. Comoglio leg (ANDES-E 28363). Allotype: Same as holotype but Y. Cano leg (ANDES-E 28361).

Paratypes

3 males, same data as holotype but Y. Cano leg (ANDES-E 28364); T. Florez leg (ANDES-E 28362); T. Florez leg (ANDES-E 28358). 3 males, Casanare Department, Tauromena Municipality, Visinaca Township, stream in forest, 5.12745° N, 72.76492° W, 820 m a.s.l., 07-11-2017, C. Bota leg (CEUA 119389). 1 male and 1 female, Agua Azul Municipality, Las Brisas Township, stream in for-

Table 1. List of the Odonata collected during the field trip. * New record for Colombia. °Species captured with the aid of the light trap. + Species previously recorded from Guaviare.

Family	Species	Localities	Collected specimens
Lestidae	<i>Lestes curvatus</i> Belle, 1997	1	1♂, 1♀
Perilestidae	<i>Perissolestes rupestris</i> sp. nov.	5	5♂, 2♀
Platystictidae	<i>Palaemnema</i> sp.	4	1♂
Heteragrionidae	<i>Heteragrion bari</i> De Marmels, 1989	4,5	9♂, 1♀
	<i>Heteragrion breweri</i> De Marmels, 1989	4,5	3♂
	<i>Heteragrion inca</i> Calvert, 1909	5	1♀
Calopterygidae	<i>Hetaerina caja</i> (Drury, 1773)	3,5	7♂, 2♀
	<i>Hetaerina charca</i> Calvert, 1909	3	1♂
	<i>Hetaerina sanguinea</i> Selys, 1853	3	1♂
	<i>Hetaerina westfalli</i> Rácenis, 1968	3	1♂
	<i>Mnesarete metallica</i> (Selys, 1869)	4	1♂
Coenagrionidae	<i>Acanthagrion apicale</i> Selys, 1876	2,4	5♂, 1♀
	<i>Acanthagrion ascendens</i> Calvert, 1909	1,2,3	26♂
	<i>Acanthagrion cuyabae</i> Calvert, 1909	2	2♂, 1♀
	<i>Acanthagrion minutum</i> Leonard, 1977	2	2♂
	<i>Argia collata</i> Selys, 1865	4	1♂
	<i>Argia oculata</i> Hagen in Selys, 1865	4,5	5♂
	<i>Epipleoneura metallica</i> Rácenis, 1955	4	9♂
	<i>Epipleoneura venezuelensis</i> Rácenis, 1955	5	10♂, 1♀
	<i>Homeoura obrien</i> (von Ellenrieder, 2008)	2	1♂
	<i>Neoneura rufithorax</i> (Selys, 1886)	1	1♂
	<i>Protoneura tenuis</i> Selys, 1860	4	1♂
	<i>Telebasis griffinii</i> (Martin, 1896)	2	4♂
Aeshnidae	<i>Anax concolor</i> Brauer, 1865°	1	3♀
	<i>Coryphaeschna adnexa</i> (Hagen, 1861)°	1	1♂
	<i>Gynacantha membranalis</i> Karsch, 1891°	1	1♀
	<i>Gynacantha mexicana</i> Selys, 1868°	1	1♂
	<i>Triacanthagyna ditzleri</i> Williamson, 1923°	1	1♂
Libellulidae	<i>Anatya guttata</i> (Erichson, 1848)°	1	3♂, 3♀
	<i>Diastatops intensa</i> Montgomery, 1940	2	4♂
	<i>Erythemis haematogastra</i> (Burmeister, 1839)°+	1	1♂
	<i>Erythemis peruviana</i> (Rambur, 1842)	2	1♂
	<i>Erythrodiplax attenuata</i> (Kirby, 1889)	1,3	1♂, 1♀
	<i>Erythrodiplax basalis</i> (Kirby, 1887)	1,2	2♂, 1♀
	<i>Erythrodiplax fusca</i> (Rambur, 1842)°	1	1♀
	<i>Erythrodiplax tenuis</i> Borror, 1942°*	1,2	5♂, 7♀
	<i>Erythrodiplax unimaculata</i> (De Geer, 1773)°	1,2,3	8♂, 12♀
	<i>Fylgia amazonica</i> Kirby, 1889	3	2♂
	<i>Miathyria simplex</i> (Rambur, 1842)	2	1♀
	<i>Micrathyria dido</i> Ris, 1911	3	1♂
	<i>Micrathyria spinifera</i> Calvert, 1909*	1	1♂
	<i>Orthemis attenuata</i> (Erichson, 1848)°	1	1♀
	<i>Perithemis lais</i> (Perty, 1834)	2	1♂
	<i>Perithemis rubita</i> Dunkle, 1982*	1	1♂
	<i>Tramea darwini</i> Kirby, 1889°	1	1♀
	<i>Uracis fastigiata</i> (Burmeister, 1839)	1,3	1♂, 3♀
	<i>Uracis imbuta</i> (Burmeister, 1839)+	1,3	3♂, 3♀
	<i>Uracis infumata</i> (Rambur, 1842)	4	1♂

est, 5.29258° N, 72.54315° W, 580 m a.s.l., 08-11-2017, C. Bota leg (CEUA 119468).

Male holotype

Head. Labium, labrum, and base of mandibles dark yellow, basal half of genae with metallic green reflections, antennal socket dark brown, basal half of pedicel light brown, apical half of pedicel and flagellum dark brown. Clypeus, frons, and upper part of head with metallic green reflections. Eyes green in life (Figs 4a–b). Postocular area dark, and the rear of the head iridescent black. Frons rounded. Postocular lobes at the level of the hind margins of the compound eyes (Figs 5a, f).

Thorax. Prothorax (Fig. 5f) brown with a yellow lateral stripe, anterior lobe and propleuron black, and posterior lobe lighter brown, posterior prothoracic lobe rounded. Pterothorax brown, middorsal carina, antehumeral stripe, metepisternal stripe, metepimeron, and venter pale yellow (Figs 4a–b, 5a). Coxae pale yellow, leg armature brown, nodus dark brown. Spurs gradually increase in size towards the apex of the femur and towards the base of tibia except for the protibia in which

the apical third bear tibial combs on the external sides (Fig. 5i).

Wings. Hyaline. Pt dark brown, surmounting two cells in all wings (Fig. 5a). Px = 16 in Fw, 16 in left – 15 in right Hw. RP2 arising at = 9th Px in Fw, 9th Px in left and 8th Px in right Hw. IRP1 arising at the 13th Px in all wings. Cells below CuA = 16 in Fw, 13 in left – 15 in right Hw.

Abdomen. Dark brown, S1–2 with pale yellow lateral stripe and a black ring at the ends of segments; pale yellow basal ring in S3–7, pale area in the anterior fourth in S4–7, S4–6 with brown on the posterior ¾; S8–10 black, venter and cercus pale yellow (Figs 3a–b, 4a). Genital ligula apical portion broad and not elongated (undeveloped), with convex apex (Figs 5g–h).

Caudal appendages. Cercus in dorsal view with an internal subbasal tooth perpendicularly directed at ¼ of the length, there is a medial convex lobe and a roughly triangular subapical lobe; apices incurving with rounded tips and slightly thickened (Fig. 5b), in lateral view the cercus apical third curves upward (Figs 5d–e). Para-procts undeveloped, with a pale coloration.



Figure 3. Rock paintings that inspired the name of the new species, at Nuevo Tolima Township, San José del Guaviare. Photo by YC-C.

Measurements (length in mm): Fw = 25; Hw = 24; abdomen = 47; total = 55.

Allotype

Similar to the holotype, except as follows:

Head. Labrum and base of mandibles light brown, basal half of genae yellow (Figs 6a, c).

Thorax. Anterior and posterior lobes of prothorax paler brown (Figs 6a, c). Mesostigmal plates ridged and concave (Figs 6b–c). Interesternite elongated with dorsal apex rounded (Fig. 6d).

Wings. Px = 16 in left Fw, 17 in right Fw, 16 in left, 15 in right Hw. RP2 arising at 9th Px in left Fw, at 10th Px in right Fw, and at 9th Px in Hw. IRP1 arising at 13th Px in left Fw, at 15 Px in right Fw, and at 13th Px in Hw. Cells below CuA = 16 in left Fw, 18 in right Fw, 15 in left and 17 in right Hw.

Abdomen. Paler and dark brown on S9–10. S9 with large, oval pale lateral spot (Fig. 6a). Genital valves black; stylus pale, place of attachment of vulvar stylus ventral to the cercus (Fig. 6e). Cercus dark brown and conical. Paraproct blackish yellow and rounded.

Measurements (lengths in mm): Fw = 26; Hw = 24; abdomen = 44; total = 54.

Variation in paratypes

Males. Coloration paler in the abdomen and legs of Casanare specimens. Internal subbasal tooth of cerci directed laterodistally (Fig. 5c). In some cases, wings with dark brown Pt surmounting one and a half to three cells in Fw, although these are close in size to the holotype. Px in Fw 13–19, Px in Hw 12–17; RP2 arising at 8–11th Px in Fw and at 8–10th in Hw; IRP1 arising at 12–16th Px in Fw and at 12–15th Px in Hw; cells behind CuA in Fw 16–19 and in Hw 15–18.

Measurements (lengths in mm): FW = 25–26; HW = 24–25; abdomen = 47–50; total = 55–60.

Female. Basal half of genae and ventral half of rear of head iridescent black. Px = 15 in Fw, 14 in Hw; RP2 arising at 9th Px in Fw and at 8th in Hw; IRP1 arising at 13th Px in Fw and at 11th Px in Hw.

Measurements (lengths in mm): FW = 27; HW = 25; abdomen = 43; total = 52.

Diagnosis

The genus *Perissolestes* was introduced by Kennedy (1941) based on wing venation, and it currently includes 11 species that range from the Amazon in Peru and Bra-

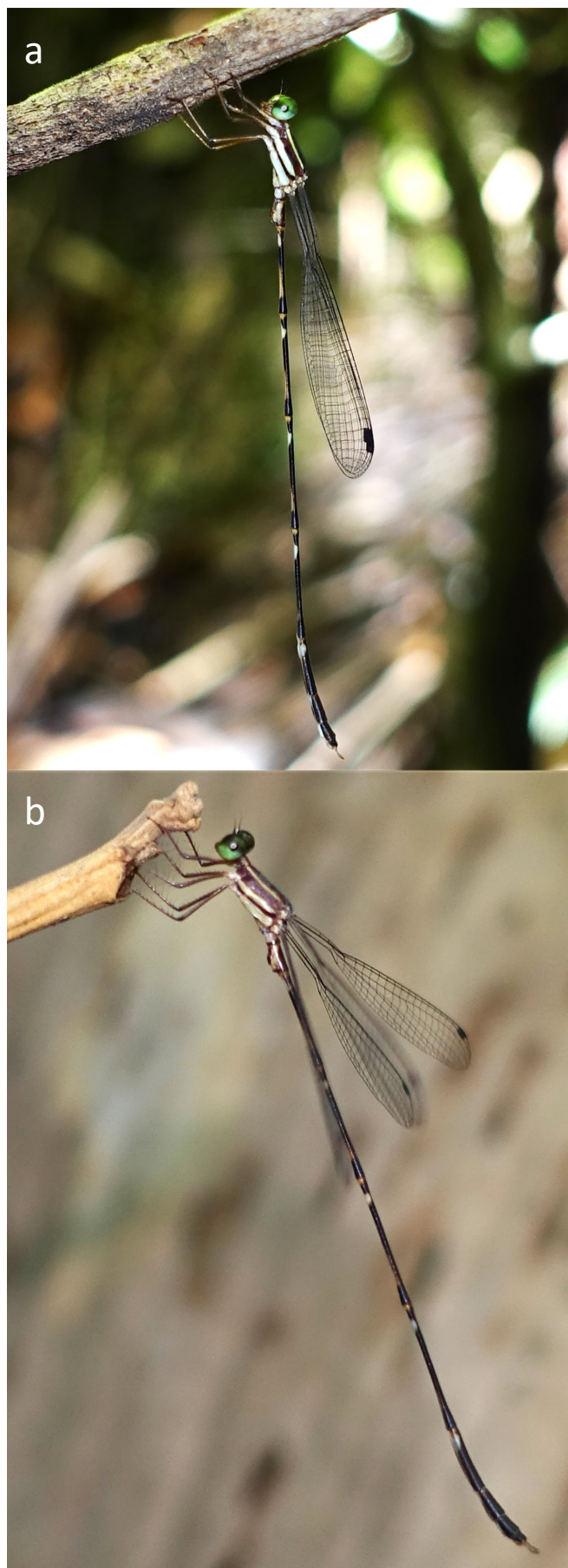


Figure 4. Habitus of a male *Perissolestes rupestris* sp. nov. in Tauramena Casanare hanging with the abdomen bent dorsally (a), perching with closed wings. b – perched as it usually does with its wings opened. Photos by CAB-S.

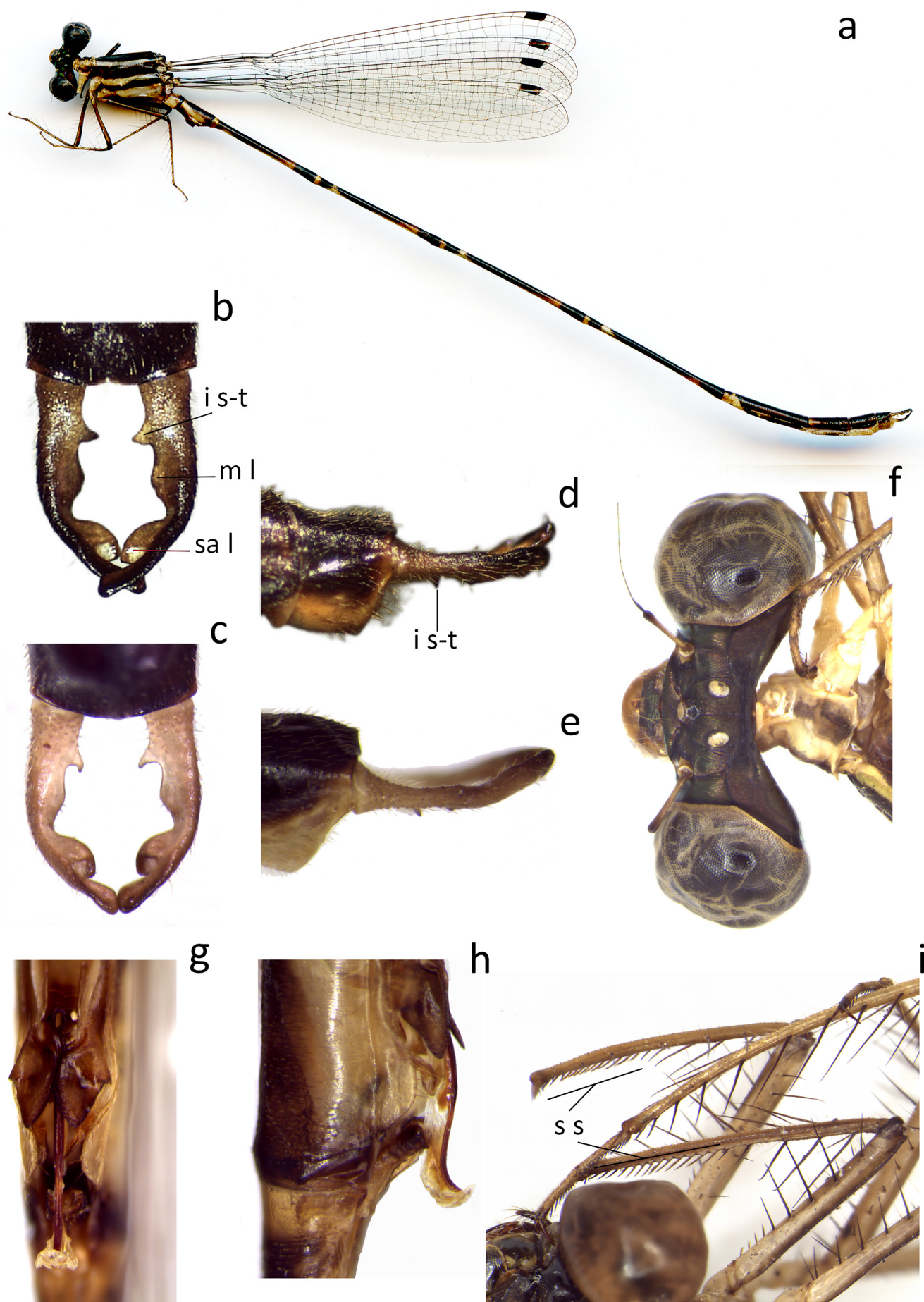


Figure 5. Male holotype (a, b, d); c, e–i – paratype from Casanare Department: Tauramena. a – Habitus; b, c – cerci in dorsal view; d, e – cercus in lateral view; f – head and prothorax in dorsal and lateral views. Ligula in dorsal (g) and lateral (h) views. i – Legs with tibial combs. i s-t – internal subbasal tooth; m l – medial lobe; sa l – subapical lobe; s s – specialized spines.

zil and the Guiana Shield in eastern South America to southern Mexico (Garrison et al., 2010). The males of this genus can be divided into two morphogroups: one with a well-developed internal subbasal tooth in the basal fourth of the cercus (Figs 5b–c), in which we in-

clude *P. rupestris* together with *P. klugi* Kennedy, 1941, *P. paprzyckii* Kennedy, 1941, and *P. remotus* (Williamson & Williamson, 1924); the other group lacks the internal subbasal tooth or it is located close to the middle of the cercus. *P. rupestris* can be differentiated from *P. klugi* by

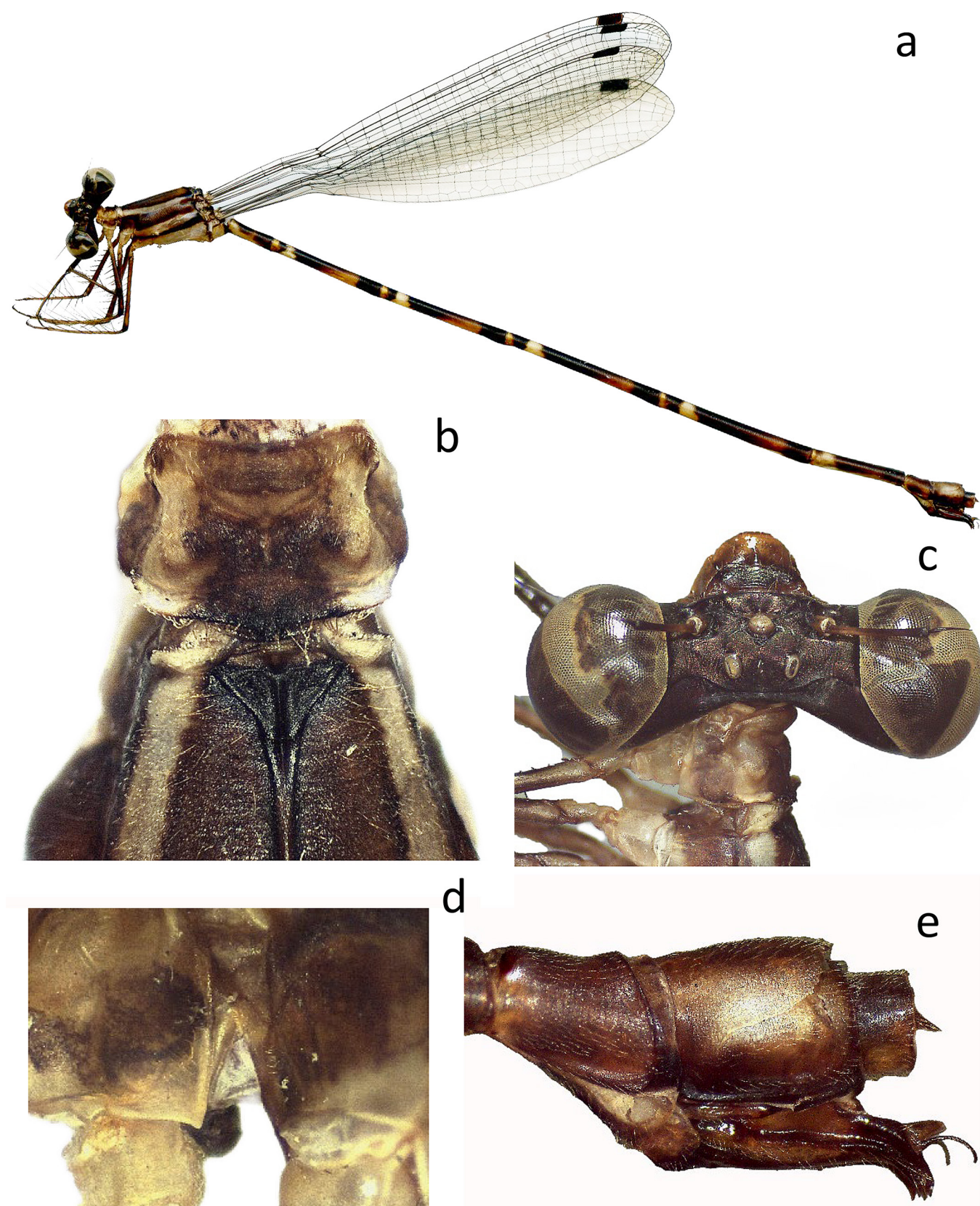


Figure 6. Female allotype. a – Habitus; b – prothorax and mesostigmal plates in dorsal view; c – head and prothorax in dorsal and lateral views, respectively; d – intersternite in lateral view; e – S8–10 in lateral view.

the preapical process in *P. klugi* being not developed. *P. rupestris* can be differentiated from *P. paprzyckii* and *P. remotus* in dorsal view, by its medial convex lobe in the cercus after the subbasal tooth (Figs 5b–c) whereas in the other species the internal side of the cercus after the internal basal tooth is concave. Although the genital ligula is not well developed it is similar to what is seen in *P. klugi* and *P. paprzyckii* where the convex apical lobe is larger (Figs 5g–h) compared to *P. remotus*.

Females of *P. flinti* De Marmels, 1988 and *P. remus* Kennedy, 1941 are unknown. Kennedy (1941a) used some structural characters, but mostly coloration, to key out females in this genus. However, the lack of an erect median spine in the hind lobe of the prothorax (Figs 6b–c), and the point of attachment of vulvar styles ventral to the cerci (Fig. 6e) will group *P. rupestris* females with *P. guianensis* (Williamson & Williamson, 1924) and *P. castor* (Kennedy, 1937). At the current state of knowledge, it is hard to separate these three female species. A detailed study of other structural characters, such as the intersternites, that have underscored their importance in distinguishing females in other groups where cercus morphology is similar to *Perissolestes*, such as *Heteragrion* (Stand-Pérez et al., 2019) or *Hetaerina* (Garrison, 1990), is needed to help diagnosing the females of this genus.

Biology

Perissolestes rupestris sp. nov. was observed on a clear-water creek and streams with rocky beds, perched on vines hanging close to stone walls and on the riparian vegetation. It usually hangs with the abdomen bent dorsally from S7 to S10 with the wings opened to around 100° (Fig. 4b), but may also sometimes hang with the wings closed (Fig. 4a).

Distribution and conservation

Three localities are known for this new species, all of them in eastern Colombia, two in the foothills of the Cordillera Oriental (Colombian Eastern Andean Range), in the department of Casanare between 580 and 820 m a.s.l., and one 296 km to the southeast, in the Amazonian foothills at 270 m a.s.l. in the department of Guaviare (Fig. 1a). None of these three locations lies inside a protected area. The rapid expansion of agriculture in this region during recent years may lead to the transformation of these localities and probably result in its extinction, therefore we consider it a threatened species.

Discussion

This study provides a preliminary assessment of the taxonomic diversity of Odonata found near San José del Guaviare, located in one of the less sampled areas (Bota-Sierra et al., 2015) where rapid environmental transformations now follows peace agreements in Colombia

(Clerici et al., 2020). The find of an undescribed species, three new records for the country, and 45 new records for the department demonstrate the great importance of biodiversity inventories as a base for future scientific studies and the creation of conservation strategies in these highly diverse and poorly explored regions.

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