

**TWO NEW ANDEAN SPECIES OF THE GENUS *ISCHNURA*
CHARPENTIER FROM COLOMBIA,
WITH A KEY TO THE REGIONAL SPECIES
(ZYGOPTERA: COENAGRIONIDAE)**

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I. chingaza sp. n. (holotype ♂: Cundinamarca Dept, Parque Nacional Natural Chingaza, Quebrada La Playa, alt. 3164 m a.s.l., 10-V-2005) and *I. cyane* sp. n. (holotype ♂: Cundinamarca Dept, Francisco de Sales, Vereda San Miguel, alt. 1984 m a.s.l., 1-XII-2004) are described and illustrated. The types are deposited at Mus. Hist. Nat., Univ. Andes, Bogotá. A key to the regional spp. is appended.

INTRODUCTION

The Coenagrionidae is one of the most diverse and ancient extant odonate families (JARZEMBOWSKI, 1984) and *Ischnura* is the most cosmopolitan genus of all odonates (FRASER, 1957), a very important component of lentic freshwater communities. Some 65 species were so far described, but the phylogeny and the distribution of the genus in the tropics are little known (CHIPPENDALE et al., 1999). Five species have hitherto been reported from Colombia, viz.: *I. ramburii* (Sel.) (RIS, 1916), *I. (Ceratura) capreola* (Hag.) (PRINZESSIN VON BAYERN et al., 1900), *I. fluviatilis* Sel. (in MIZA, Maracay, Venezuela), *I. (Ceratura) indivisa* (Ris) (RIS, 1916; RACENIS, 1958) and *I. (Anomalagrion) cruzi* DE MARMELS, 1987.

Here, two new species are described from the eastern Andes.

MATERIAL AND METHODS

Samples were collected in the high mountains of Colombia Eastern Cordillera, near Bogotá D.C., in Cundinamarca department; where a number of studies are ongoing. At Páramo de Chingaza, five samples were taken between September 2003 and May 2004. The captured specimens were placed in acetone for 24 hours and stored at the Museo de Historia Natural ANDES of the Universidad de los Andes ANDES-E. For the altitudinal profile study, samples were taken at each of the 14 chosen localities distributed in an altitudinal range between 242 and 4164 m a.s.l.

For the description of the species morphology, we used the terminology and protocols of DE MARMELS (1987; 1997) and WESTFALL & MAY (2006).

ISCHNURA CHINGAZA SP. NOV.

Figures 1-3

Material. – **Holotype** ♂ and **Allotype** ♀: COLOMBIA, Dept Cundinamarca, Parque Nacional Natural Chingaza, Quebrada La Playa, 4°33'05" N / 73°46'17" W, 3164 m a.s.l., 10-V-2005, E. Realpe leg.; deposited at ANDES-E 10571, 10575. – **Paratypes**: 9 ♂, 10 ♀ data as holotype; deposited at MIZA 17634, ANDES-E 2907-2911; – 4 ♂, 8 ♀, Dept Cundinamarca, Guasca, 4°51'14" N / 73°55'21" W, 2880 m a.s.l., 13-X-2007; – 4 ♂, 2 ♀, Bogotá, Humedal La Conejera, 4.75953° N / 74.10768° W, 2563 m a.s.l., 21-VIII-2008; deposited at ANDES-E.

Etymology. – Adjectivized name of the type locality: Parque Nacional Natural Chingaza.

MALE (holotype). – **Head.** – Labium white; labrum light yellow with a basal black stripe that shows a triangular projection in the medial part and widens

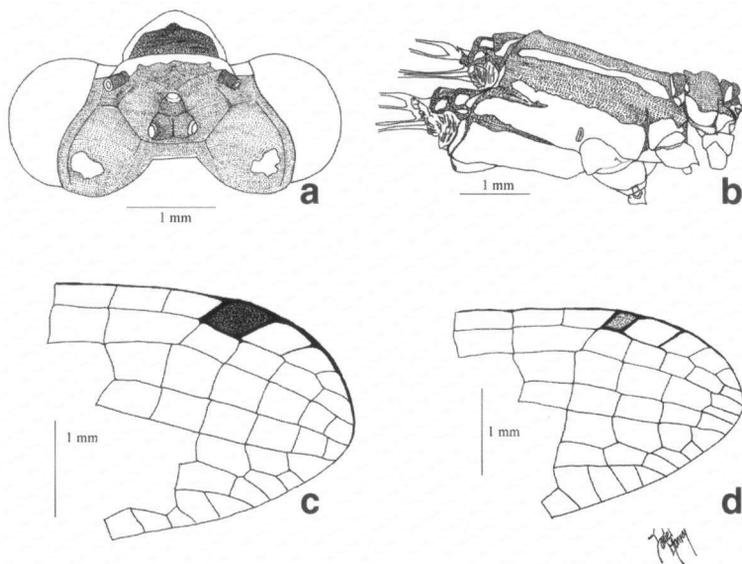


Fig. 1. *Ischnura chingaza* sp. n., male: (a) head, dorsal view; – (b) thorax, lateral view; – (c) forewing, pterostigma; – (d) hindwing, pterostigma.

at the extremes; anteclypeus greenish yellow, postclypeus black forming a roof over the anteclypeus; frons with a greenish yellow transversal stripe, with irregular superior border; frons dorsal portion and epicranium black, with conspicuous postocular spots, which are greenish yellow with irregular borders, and bilaterally asymmetric (Fig. 1a). Compound eyes dark above and light yellow below; genae and mandibles light yellowish green. Posterior part of head light yellow with margin along the compound eyes greenish yellow.

T h o r a x. — Anterior lobe of pronotum black, each side with wedge-shaped, yellow spot; middle lobe mostly black with two small, discrete, yellow dorsal spots on posterior part, laterally greenish yellow. Pronotal hind lobe narrow, black with

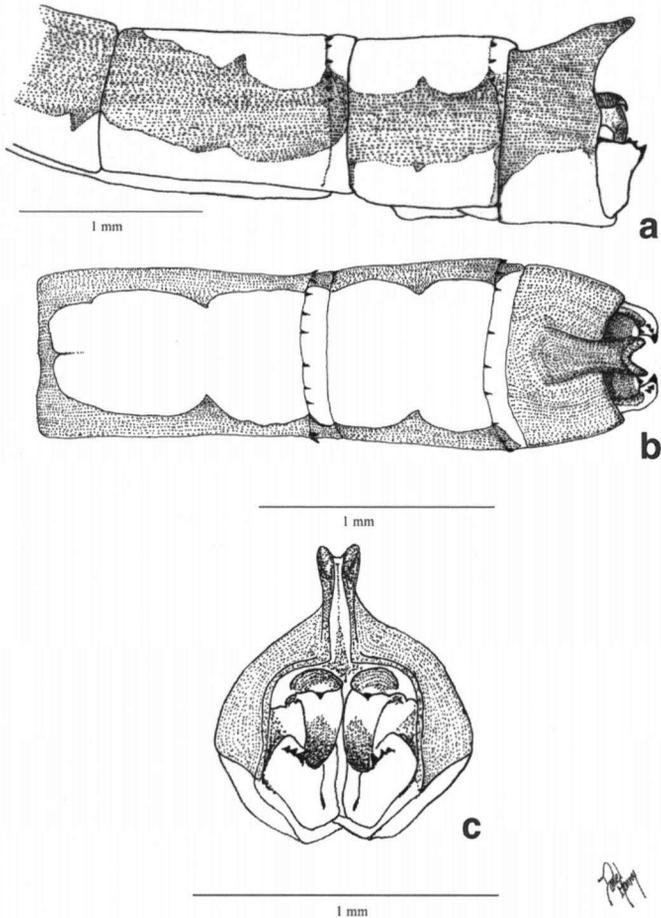


Fig. 2. *Ischnura chingaza* sp. n., male abdomen: (a) lateral view; — (b) dorsal view; — (c) posterior view.

yellow spot at lateral angle; propleuron, coxae and trochanters greenish yellow (Fig. 1b). Pterothorax: Mesepisternum iridescent black with greenish yellow anthehumeral stripe, humeral stripe black and wide (Fig. 1b). Mesepimeron, metepisternum and metepimeron and rest of the smaller pleural sclerites, including sternites, all greenish yellow (Fig. 1b). Interpleural suture with a cuneiform black spot at antealar carina, and metapleural suture narrowly black with pigmented metapleural fossa (Fig. 1b). Femora black externally, light yellow internally; tibiae yellow with a well marked black line externally. Both femoral and tibial spurs, black and well developed. Dark yellow tarsi with black rings at articulations, claws long, yellow, with brown tip and a small subapical tooth.

Wings hyaline; forewing pterostigma black, rhomboidal, much larger than the yellowish hindwing pterostigma (Figs 1c-d), forewing with seven postnodal cross-veins, hindwing with eight; forewing with three (two) cross-veins after pterostigma in costal space, hind wing with three (Figs 1c-d). RP_2 arises between third and fourth postnodals in forewing and between second and third in hindwing.

Abdomen. — Black above, first segment presenting a bluish-green transverse stripe at the inter-segmental membrane, segments 8 and 9 light blue dorsally (Figs 2a-b). All abdominal segments lateroventrally yellowish-green (Fig. 2a) pale sternites from third to eighth sternites with a black median carina. Tergum of segment 10 is ending posteriorly in a large black median spine with bifid tip (Figs 2a-c). Cerci are colored yellow and black, hook-shaped, with distal half arched downwards in a right angle and bearing a distally directed spine dorsally at angulation (Figs 2a-c). Paraproct short, yellowish, and directed upwards, ending with a black, medially directed hook

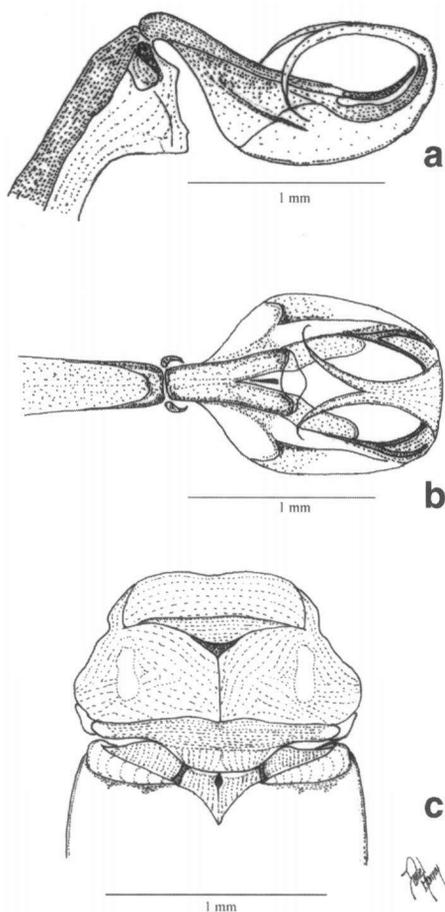


Fig. 3. *Ischnura chingaza* sp. n.: (a) distal segment of penis, lateral view; — (b) same, ventral view; — (c) female prothorax, dorsal view.

and proximally of it with two smaller black teeth (Figs 2a-c).

Penis: distal segment oval shaped deeply bifid tip. There is a pair of sclerotized, spine-shaped and slightly curved internal processes (Figs 3a-b).

M e a s u r e m e n t s (in mm). — Total length with caudal appendages 25.5, abdomen 20, forewing 14.5, hindwing 13.5.

FEMALE (allotype). — **H e a d.** — Similar to the male but with partly differing coloration; labium white; labrum greenish yellow with a black basal stripe, anteclypeus yellow with some bluish; vertical portion of frons greenish yellow, pruinose black dorsally, as well is epicranium; postocular spots brown with regular margins. Compound eyes dark brown dorsally, and light blue below. The genae and mandibles are yellowish-green. The rear of head yellow, a little bit more intense along eye border.

T h o r a x. — In dorsal view prothorax as wide as pterothorax (Fig. 3c). Anterior, median and posterior lobes of pronotum are black and a bit pruinose. Median lobe showing two greenish yellow laterodorsal stripes; posterior lobe narrow with well defined trapezoidal median projection, and with a small yellowish-green spot at each lateral angle; middle part with golden iridescences, overlapping mesostigmal plates (Fig. 3c). Propleuron light yellow next to coxae and trochanters. Black mesostigmal plates are oval shaped, with thick edges (Fig. 3c). Pterothorax: as in male but with slightly differing coloration. Mesepisternum pruinose black with brownish-yellow ante-humeral stripe; humeral stripe wide and black. Mesepimeron, metepisternum, metepimeron, and the rest of lower pleural sclerites to the coxae, and sternites yellowish-green. Interpleural suture shows a wedge-shaped black spot at antealar carina. Metapleural suture is complete and pigmented. All femora black externally and light yellow internally; tibiae yellow with external black line; tarsi pale, and claws as in male.

Wings hyaline; pterostigma in all wings yellowish, but the difference in size between the fore- and hindwings is slightly smaller. Forewing with ten post-nodal cross-veins, and hindwing with eight. Three cross-veins after pterostigma in costal space are present in all wings; second cross-vein in hindwings bifurcate. RP_2 arises between third and fourth post-nodals in forewings, and between second and third in hindwings.

A b d o m e n. — All abdominal terga black dorsolaterally, strongly pruinose: lateroventral parts of terga yellow, anteriorly paler and posteriorly darker. All sternites are pale with fine black carina. The carina of eighth sternite produced into a short vulvar spine. Valvae of ovipositor light yellow ending at the posterior edge of tenth segment. Cerci black, paraprocts light-yellow reaching to mid-length of the cercus.

M e a s u r e m e n t s (in mm). — Total length with cerci 26, abdomen 20, forewing 15, hindwing 15.

ISCHNURA CYANE SP. NOV.

Figures 4-6

Material. — **Holotype** ♂ and **Allotype** ♀: COLOMBIA, Cundinamarca Dept, Municipality of San Francisco de Sales, Vereda San Miguel, Finca la Soledad, 5°00'05" N / 74°15'30" W, 1984 m a.s.l., 1-XII-2004, Pérez & S. Cardona leg.; deposited at ANDES-E 10582, 10584. — **Paratypes:** 5 ♂, 2 ♀, same place and date as holotype; — 4 ♂, 4 ♀, Boyacá Dept., Villa de Leyva, 5°38'31" N / 73°31'50" W, 2112 m a.s.l., 11-XI-2007, E. Realpe leg.; — 4 ♂, Cundinamarca Dept, Municipality of San Francisco de Sales, Vereda San Miguel, Lago Verde (fish pond), 4.98960° N / 74.28824° W, 1627 m a.s.l., 11-V-2008, E. Realpe leg.; — 13 ♂, 8 ♀, Cundinamarca Dept., Anolaima, finca Limaná, Vereda San Agustín, 4°47'07" N / 74°28'42" W, 1370 m a.s.l., 7-V-2006, 15-VI-2006, N. Valencia, L. Pérez, M. Sánchez & E. Ortiz leg.; all deposited at ANDES-E.

Etymology. — (Greek: *kyanos* = blue); this is the species with the greatest extension of blue color in males of all *Ischnura* species caught in the region studied.

MALE (holotype). — **Head.** — Labium white; labrum lemon green with a black basal stripe that shows a projection in medial part and widens towards lateral angles, anteclypeus blue, postclypeus deep black (Fig. 4a). Frons with greenish blue transversal stripe and black anteromedial part as a continuation of postclypeus, antenna black (Fig. 4a); epicranium black with large, oval, symmetric, blue postocular spots. Occiput superior edge of occiput with a short, blue stripe (Fig. 4a). Compound eyes dark in superior third, rest yellow with two horizontal dark lines. The genae and mandibles are bluish-green, as the frons. Posterior part of

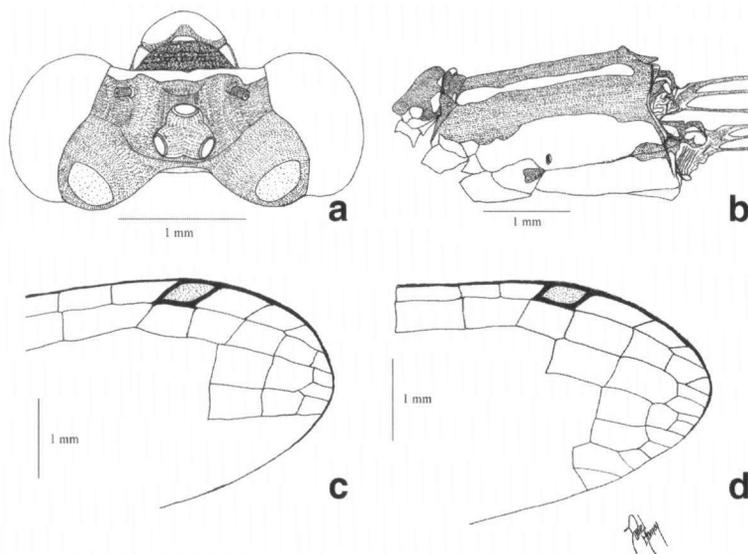


Fig. 4. *Ischnura cyane* sp. n., male: (a) head, dorsal view; — (b) thorax, lateral view; — (c) forewing, pterostigma; — (d) hindwing, pterostigma.

head is light blue in proximity of the eyes and black in the medial part.

T h o r a x. — Prothorax with anterior lobe of pronotum black and with a long, blue with dorsolateral stripe. Median lobe of pronotum black with a blue spot at each lateral end. Posterior lobe of pronotum narrow, black and blue (Fig. 4b). Pterothorax: mesepisternum shiny black with well defined blue ante-humeral stripes; broad, black humeral stripe; mesepimeron, metepisternum, metepimeron along with lower pleural sclerites until the coxae and sternites, are blue (Fig. 4b). Metapleural suture narrowly black with metapleural fossa also black (Fig. 4b).

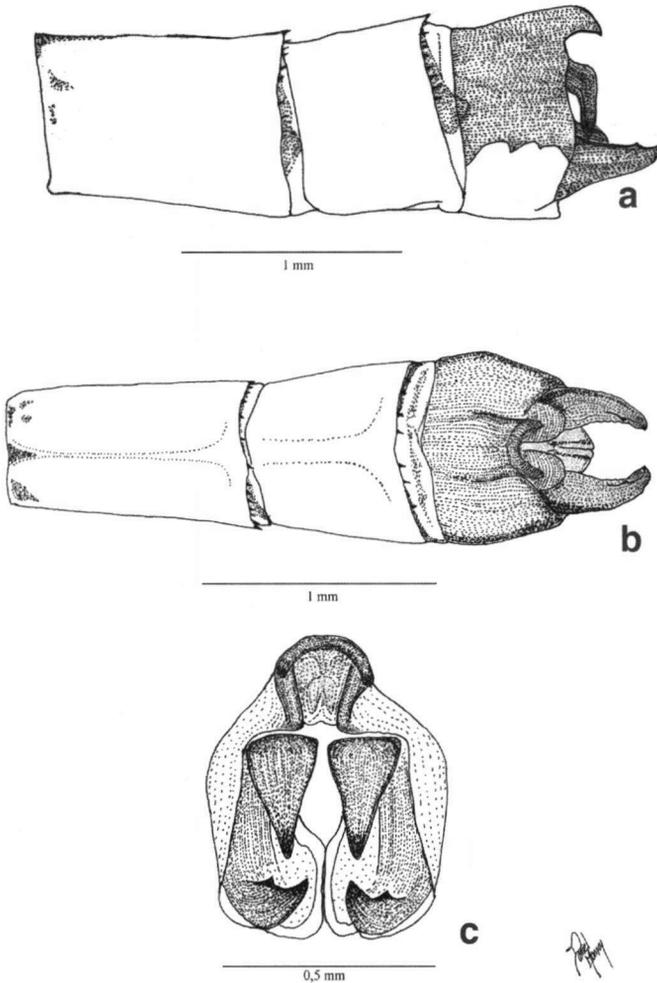


Fig. 5. *Ischnura cyane* sp. n., male abdomen: (a) lateral view; — (b) dorsal view; — (c) posterior view.

All femora are light cream colored with some pigmentation laterally. Tibial spines more or less twice as long as femoral spines; tarsi pale, dark at articulations; claws pale with dark tips and a short subapical tooth.

Wings hyaline, pterostigma rhomboidal, and brown, and of similar size in fore- and hindwing (Figs 4c-d). Forewing has nine post-nodals and hindwing has seven. There are three (two) cross-veins after pterostigma in forewing costal space, and three in hindwing (Figs 4c-d). RP_2 arises between third and fourth post-nodals in forewing and between second and third in hindwing.

A b d o m e n. – Segments 1-7 and 10 dorsolaterally black; segment 1 laterally blue, and with a blue stripe distally; segment 2 also blue laterally; segment 3 with a blue basal ring. Lateroventral parts of terga from third to seventh segment light yellow or cream coloured. Sternites from third to seventh segment are black-lined; segments 8 and 9 are intensely blue, including sternites, genital plates and lateroventral part of segment 10 also blue (Figs 5a-b).

Anterior dorsal part of segment 8 shows variable black marks; black lines also along the subapical spines in segments 8 and 9 (Figs 5a-b). The tenth segment shows a robust postero-dorsal projection robust bifid in the end. (Figs 5a-c). Cerci black, hook-shaped, arched ventral in an almost right angle (Figs 5a, c); paraprocts as long as segment ten, black, conical with tip directed mesad and presenting a small, dorsal-lateral sub-apical tooth (Figs 5a-c).

Penis: distal segment long, deeply bifid with both lobes long and slightly curved; second segment internally with a pair of slender, sclerotized distal processes. There are three short spinules on each side near the shaft's articulation with second segment (Figs 6a-b).

M e a s u r e m e n t s (in mm). – Total

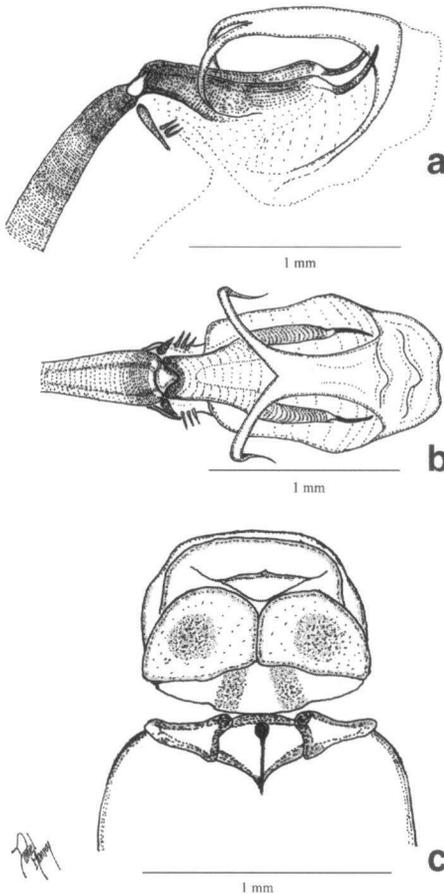


Fig. 6. *Ischnura cyane* sp. n.: (a) distal segment of penis, lateral view; – (b) same, ventral view; – (c) female prothorax, dorsal view.

length including caudal appendages 26; abdomen 22.5; forewing 14; hindwing 13.

FEMALE (allotype). — **H e a d.** — Similar to the male's but with differing coloration. Labium white; labrum bluish-green pruinose, with a black basal stripe, forming a semicircle in the medial part, anteclypeus bluish-green, postclypeus intense black, with a purple iridescence and forming a roof over the anteclypeus. Antenna black. Frons and anterior part of black epicranium greenish-yellow; postocular spots bluish green, more or less rounded with a light tip mesad. A blue occipital line present; compound eyes black above and bluish-green below; genae and mandibles also bluish-green. Posterior part of head light bluish-green with dark spots towards occiput.

T h o r a x. — Prothorax in dorsal view narrower than pterothorax (Fig. 6c). Anterior lobe of pronotum blue, median lobe darker above with well marked medial suture, laterally blue colored. Posterior lobe of pronotum is small and crescent-shaped, with medial part darker, laterally blue (Fig. 6c); propleuron pale blue. Pterothorax: mesostigmal plates triangular and black (Fig. 6c). Mesepisternum with blue antehumeral stripe narrower than in male, but broadening at each end. The humeral stripe is wide and black. Mesepimeron, metepisternum and metepimeron, and the remaining lower pleural sclerites are blue. Metapleural fossa dark brown. The coxae and sternites are between light-yellow and greenish. Femora of all legs are black externally, and light yellow and somewhat pruinose internally; tibiae are yellow with a black lateral stripe. Spines, tarsi and claws as in the male.

Wings hyaline, pterostigma similar in all wings, rhomboidal, dark yellow. Right forewing has nine post-nodals and left forewing has ten. Both hindwings have eight post-nodals. There are three cross-veins after the pterostigma in costal space of hindwing; RP_2 arises between post-nodals three and four in forewing; and between post-nodals two and (close to) three in hindwing.

A b d o m e n. — Segments 1-8 black dorsally, yellow laterally and ventrally, except for segments 1 and 2, which are blue laterally. The first segment has a blue stripe along distal border. Segment 9 blue dorsally and yellow laterally. Anterior dorsal portion of segment 10 blue, posterior part narrowly black and lateral-ventral parts are yellow. Sternites of segments 2-9 pruinose black-lined, including the vulvar spine. Valves of ovopositor yellowish-green and slightly surpassing distal border of segment 10, stylus dark brown. Cerci black, short and rounded; para-procts black dorsally and light yellow ventrally.

M e a s u r e m e n t s (in mm). — Total length including caudal appendages 26,5; abdomen 21; forewing 16; hindwing 14.5.

PARATYPES. — In males, the color pattern of head and thorax very constant, but the black spots in the blue anterior dorsal part of segment 8 are variable, and may even be absent in some. There is some variability in the pattern of the lateral markings of segments 1 and 2. Number of cross-veins also varies, and although the predominant formula of postnodals is 9 + 7, the number 8 + 6 is also found;

the cross-veins in costal space distally of pterostigma Usually 2 + 2, but in one case that a single cross-vein is present in one wing, and four in one other. In one specimen RP2 originates between second and third post-nodal in one forewing. Total length averages 25.2 mm

DISCUSSION

The species described here, *I. chingaza* sp. n. and *I. cyane* sp. n., together with *I. (Anomalagrion) cruzi* De Marmels 1987, form a group of species vertically distributed between 1300 and 3200 m a.s.l. in a particular area of the eastern Andean mountain range. At lower elevations (1300 and 2000 m a.s.l.), *I. cyane* is sharing habitats with *I. capreolus* and *I. ramburii*. At 2600 m a.s.l., in the Sabana de Bogota, *I. cruzi* and *I. chingaza* occur, and towards the higher elevations (3200 m a.s.l.) only *I. chingaza* is found. Morphologically at first sight, the males show similarities in size and color pattern, but with a gradient from dominant blue (*I. cyane*), passing through blue-green (*I. cruzi*) to yellow-green or dominant green (*I. chingaza*). The main differences can be observed in the morphology of the male caudal appendages and the female pronotum, as traits that support their reproductive isolation. In populations of these species, female color polymorphism was not found so far, in contrast to the lowland species *I. capreolus* and *I. ramburii*, where androchromous females occur along with the gynochromous individuals (CORDERO & ANDRES, 1996; SVENSSON et al., 2007; VAN GOSSUM et al., 2008). We observed the intense yellow in juvenile females (especially *I. cyane*) and less intense in *I. chingaza*. Mature *I. chingaza* females were more robust than those of *I. cyane*, as noted by a thicker abdomen. Dark color and pruinescence give both species a greyish appearance. This interesting phenomenon may perhaps be related to their occurrence at high mountain sites.

KEY TO THE *ISCHNURA* MALES OF COLOMBIAN EASTERN CORDILLERA

- | | | |
|-------|---|---------------------------|
| 1 | Paraproct at least as long as segment 10 | 2 |
| 1' | Paraproct shorter than segment 10 | 4 |
| 2(1) | Paraproct divided into a short dorsal branch and a falciform, pointed ventral branch | <i>I. capreola</i> |
| 2' | Paraproct not divided into two branches | 3 |
| 3(2') | Cercus undivided in lateral view; pterostigma similar in all wings | <i>I. cyane</i> sp. n. |
| 3' | Cercus bifid in lateral view; pterostigma of forewing notably larger and darker than hindwing pterostigma, which is pale | <i>I. cruzi</i> |
| 4(1') | Paraproct directed dorsally, its truncated tip armed with three denticles; forewing pterostigma larger and darker than pterostigma of hindwing, which is yellowish | <i>I. chingaza</i> sp. n. |
| 4' | Paraproct directed distally with pointed tip; pterostigma not as above | 5 |
| 5(4') | Cercus in lateral view without finger-like dorsal-lateral process; pterostigma of similar size and shape in both wings, in forewing darker than in hindwing | <i>I. ramburii</i> |
| 5' | Cercus with finger-like dorsal-lateral process; forewing pterostigma orange colored and | |

separated from costal margin by a cross-vein; hindwing pterostigma normal, smaller, dark colored *I. hastata*

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REFERENCES

- CHIPPINDALE, P.T., K.D. VARSHAL, D.H. WHITMORE & J.V. ROBINSON, 1999. Phylogenetic relationship of North American damselflies of the genus *Ischnura* (Odonata: Zygoptera: Coenagrionidae) based on sequences of three mitochondrial genes. *Mol. Phylog. Evol.* 11: 110-121.
- CORDERO, A. & J.A. ANDRÉS, 1996. Colour polymorphism in odonates: females that mimic males? *J. Br. Dragonfly Soc.* 12(2): 50-60.
- DE MARMELS, J., 1987. *Ischnura* (*Anomalagrion*) *cruzi* sp. n., eine neue Kleinlibelle aus Kolumbien (Odonata: Coenagrionidae). *Mitt. ent. Ges. Basel* 37(1): 1-6.
- DE MARMELS, J., 1997. New and little-known species of *Cyanallagma* Kennedy, 1920 from the Andes and from Pantepui (Zygoptera: Coenagrionidae). *Odonatologica* 26(2): 135-157.
- FRASER, F.C., 1957. *A reclassification of the order Odonata*. Zool. Soc. New South Wales, Sydney.
- JARZEMBOWSKI, E.A., 1984. Early Cretaceous insects from southern England. *Modern Geol.* 9: 71-93.
- PRINZESSIN VON BAYERN, T. [E. DE SELYS LONGCHAMPS & F. BRAUER], 1900. Von Ihrer Königl. Hoheit der Prinzessin Therese von Bayern auf einer Reise in Südamerika gesammelte Insekten. *Berl. ent. Z.* 45: 258-267.
- RACENIS, J., 1958. Los odonatos neotropicales en la colección de la Facultad de Agronomía de la Universidad Central de Venezuela. *Acta biol. venez.* 2(19): 179-226.
- RIS, F., 1916. Libellen (Odonata) aus der Region der amerikanischen Kordilleren von Costa Rica bis Catamarca. *Arch. Naturg.* (A) 9: 1-197.
- SVENSSON, E., J. ABBOT, T. GOSDEN & A. COREAU, 2007. Female polymorphism, sexual conflict and limits to speciation processes in animals. Springer. DOI:10.1007/s10682 007 9208 2.
- VAN GOSSUM, H., T.N. SHERRATT & A. CORDERO RIVERA, 2008. The evolution of sex-limited colour polymorphism. In: A. Córdoba-Aguilar, [Ed.], *Dragonflies and damselflies: model organisms for ecological and evolutionary research*, pp. 219-229, Oxford Univ. Press, Oxford.
- WESTFALL, M.J., Jr & M.L. MAY, 2006. *Damselflies of North America*. [Revised edn]. Scient. Publishers, Gainesville/FL.