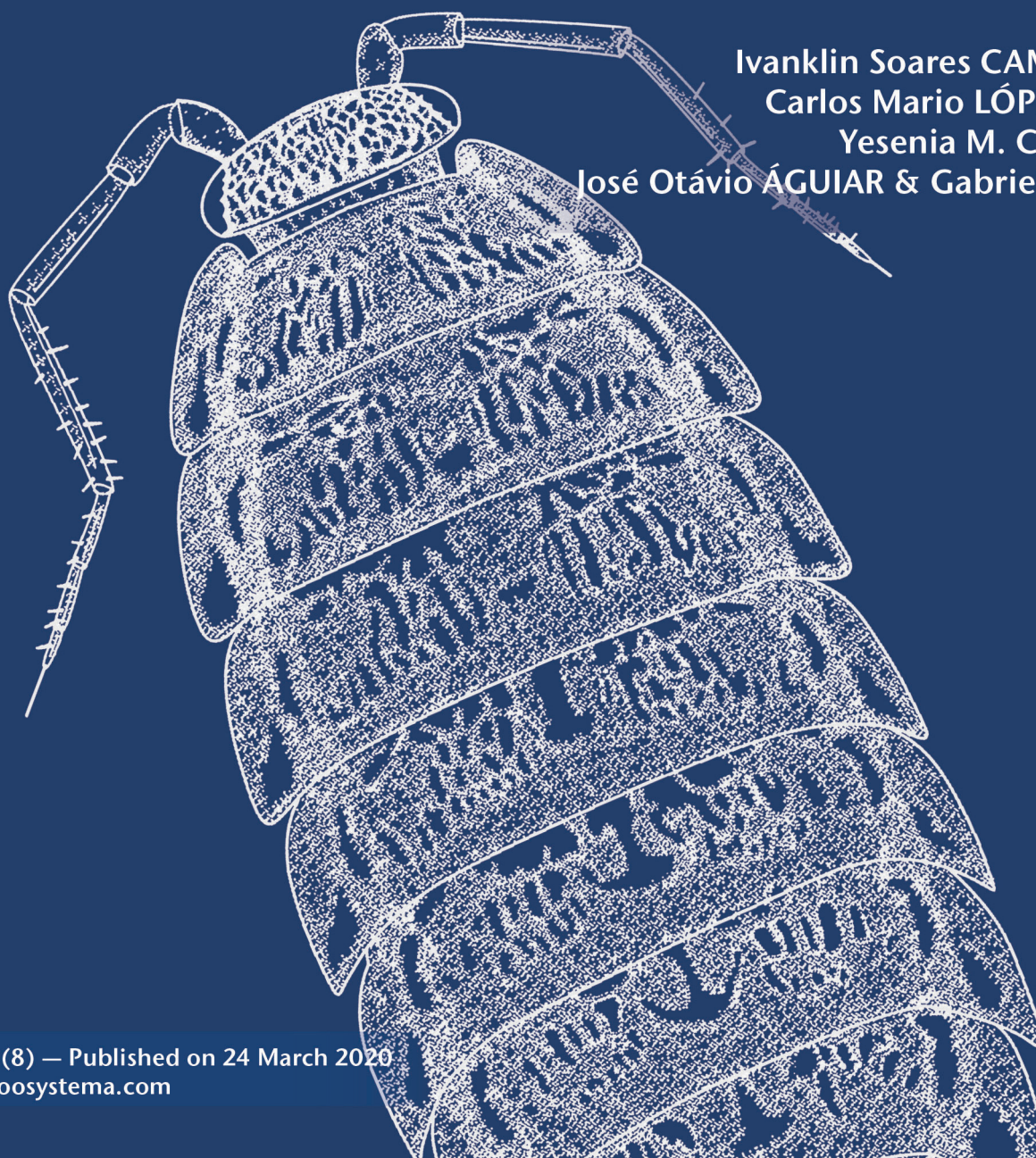


Three new species of *Ischioscia* Verhoeff, 1928 (Isopoda, Oniscidea, Philosciidae) from Serranía de Perijá, Andean Cordillera, Colombian Caribbean

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Ischioscia herrerae López-Orozco, Carpio-Díaz & Campos-Filho n. sp., female paratype (CUDC-CRU 47), habitus, dorsal view.

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Three new species of *Ischioscia* Verhoeff, 1928 (Isopoda, Oniscidea, Philosciidae) from Serranía de Perijá, Andean Cordillera, Colombian Caribbean

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ABSTRACT

The genus *Ischioscia* Verhoeff, 1928 is one of the most diverse genera in the Philosciidae Kinahan, 1857. To date, the genus comprises 26 species distributed in tropical and subtropical areas of the Neotropical region. In this work three new species from Serranía de Perijá, Andean Cordillera, Colombian Caribbean, are described: *Ischioscia herrenai* López-Orozco, Carpio-Díaz & Campos-Filho n. sp., *Ischioscia perijaensis* Carpio-Díaz, López-Orozco & Campos-Filho n. sp. and *Ischioscia unicartagenaensis* Campos-Filho, Carpio-Díaz & López-Orozco n. sp. In addition, an identification key for all species of the genus is given.

RÉSUMÉ

Trois nouvelles espèces d'*Ischioscia* Verhoeff, 1928 (Isopoda, Oniscidea, Philosciidae) de Serranía de Perijá, Cordillère des Andes, Caraïbes colombiennes.

Le genre *Ischioscia* Verhoeff, 1928 est l'un des genres les plus divers chez les Philosciidae Kinahan, 1857. À ce jour, le genre comprend 26 espèces réparties dans les zones tropicales et subtropicales de la région néotropicale. Dans ce travail, trois nouvelles espèces de Serranía de Perijá, Cordillère Andine, Colombie Caraïbes, sont décrites : *Ischioscia herrenai* López-Orozco, Carpio-Díaz & Campos-Filho n. sp., *Ischioscia perijaensis* Carpio-Díaz, López-Orozco & Campos-Filho n. sp. et *Ischioscia unicartagenaensis* Campos-Filho, Carpio-Díaz & López-Orozco n. sp. De plus, une clé d'identification pour toutes les espèces du genre est donnée.

KEY WORDS

Ischiosciini,
Serranía de Perijá,
Andean ecosystem,
Neotropical,
new species.

MOTS CLÉS

Ischiosciini,
Serranía de Perijá,
écosystème andin,
néotropical,
espèces nouvelles.

INTRODUCTION

The family Philosciidae Kinahan, 1857 constitutes one of the most diverse families within the Oniscidea Latreille, 1802 (Schmalfuss 2003; Sfenthourakis & Taiti 2015). The family comprises approximately 600 species distributed in 115 genera and constitutes an important micro-fauna component in tropical and humid environments (Leistikow 2001a; Campos-Filho *et al.* 2014, 2017, 2018; Taiti 2016; López-Orozco *et al.* 2016, 2017).

The genus *Ischioscia* Verhoeff, 1928 is one of the most diverse genera of Philosciidae in the Neotropical region (Leistikow & Schmidt 2002). Currently, it includes 26 species distributed in Brazil, Colombia, Costa Rica, Ecuador, French Guiana (doubtful record), Guatemala, Lesser Antilles (Dominica and Guadalupe), Panama, Peru and Venezuela (Schmalfuss 2003; Leistikow & Schmidt 2002; Taiti 2016). In Colombia, two species are known, *I. sturmi* (Vandel, 1972) recorded from Cundinamarca, Huila, Putumayo and Nariño departments, and *I. curvaculeus* Leistikow, 2001 from Magdalena department (Vandel 1972; Leistikow 2001c). Moreover, the genus is morphologically well defined (see Schmalfuss 1980; Leistikow 1997, 2000, 2001a, b; Leistikow & Schmidt 2002).

In the present work three new species of *Ischioscia* from Serranía de Perijá, Andean Cordillera, Colombian Caribbean, are described. These are the first records of the genus for Serranía de Perijá. In addition, an identification key for all species in the genus is given.

MATERIAL AND METHODS

The specimens were stored in 75% ethanol and identifications were based on morphological characters. The images were obtained with the aid of Axio Lab. A1 microscope and SteREO Discovery.V12 ZEISS stereomicroscope with adapted Axiocam ERc 5s camera. The final illustrations were prepared using the software GIMP (v. 2.8) with methods proposed by Coleman (2006) and Montesanto (2015, 2016). A key to all the species of *Ischioscia* is given after Leistikow & Schmidt (2002). The type material is deposited in the Crustaceans Collection of the Programa de Biología, Universidad de Cartagena (CUDC-CRU), Cartagena de Indias and in the Isopods Collection of the Instituto de Ciencias Naturales, Universidad Nacional de Colombia (ICN-CI), Bogotá, Colombia.

STUDY AREA

The material was collected in the Andean forest on the western flank of the Serranía de Perijá at an altitude of 2800 m. The area is inserted between the departments of Cesar and La Guajira, North-eastern Colombia (high-Andean-subparamo zone). According to Köppen's criteria (Rubel & Kottek 2010), this area shows warm temperate climate, dry winter and warm summer (Cwb), typical of the Andes. The average temperature is around 18°C with mild summer (temperature

not surpassing 22°C in the warmest month). The rainfall distribution regime is bimodal, tetra-seasonal and not very well defined. The total annual rainfall is *c.* 1200 mm, with an average of 97 mm monthly and multi-year in 103 mm monthly. The periods of highest rainfall occur from May to June and August to November, with the highest precipitation in October (*c.* 240 mm). The dry season occurs from December to April and in July, with the driest moment in February (*c.* 20 mm) (Arellano-P. *et al.* 2007).

SYSTEMATIC ACCOUNT

Family PHILOSCIIDAE Kinahan, 1857

Tribe ISCHIOSCIINI Leistikow, 2001

Genus *Ischioscia* Verhoeff, 1928

TYPE SPECIES. — *Ischioscia lobifera* Verhoeff, 1928 by monotypy [junior synonym of *Philoscia variegata* Dollfus, 1893].

DIAGNOSIS. — See Schmalfuss (1980) and Leistikow (1997).

Ischioscia herreraei López-Orozco,
Carpio-Díaz & Campos-Filho n. sp.
(Figs 1-3)

urn:lsid:zoobank.org:act:84046969-EDD0-4A8E-8175-7C645A1BB873

TYPE MATERIAL. — **Holotype.** Colombia • ♂; Quebrada El Jordán, El Contento Village, San José de Oriente, La Paz, Cesar; 10°17'40.4"N, 72°55'52.1"W; 13.VIII.2015; Y. Herrera-Medina leg.; CUDC-CRU 33.

Paratypes. Colombia • 1 ♂ (part in micropreparations); same locality and date as for holotype; C. M. López-Orozco leg.; CUDC-CRU 45 • 1 ♀ (part in micropreparations); same locality and date as for holotype; C. M. López-Orozco leg.; CUDC-CRU 47 • 2 ♂, 3 ♀; same locality and date as for holotype; C. M. López-Orozco leg.; ICN-CI-86 • 12 ♂, 37 ♀; same locality and date as for holotype; C. M. López-Orozco leg.; CUDC-CRU-37 • 1 ♂, 13 ♀; Cerro Pintao, La Jagua del Pilar, La Guajira; 10°25'41.8"N, 72°56'8.3"W; 10.VIII.2015; C. M. López-Orozco leg.; CUDC-CRU-36.

ETYMOLOGY. — The new species is named after Yeison Herrera-Medina who collected part of the specimens used in this study.

DESCRIPTION

Maximum body size: male 9 mm × 3.5 mm (holotype); female 9.8 mm × 3.8 mm. Body as in Fig. 1A. Colour dark brown: antennal peduncle with first and second articles slightly pigmented, third to fifth articles and flagellum strongly pigmented; cephalon with irregular unpigmented spots; pereon with longitudinal unpigmented areas on paramedian region, pereonites 4-7 with one longitudinal unpigmented spot on median portion, epimera with two distinct unpigmented spots near posterior portions; pleon, telson and uropod exopods strongly pigmented (Fig. 1A). Dorsal surface bearing short triangular scale-setae (Fig. 1B). Cephalon (Fig. 1C, D) lateral lobes and frontal line absent, supra-antennal line almost straight; vertex dorsoventrally flattened

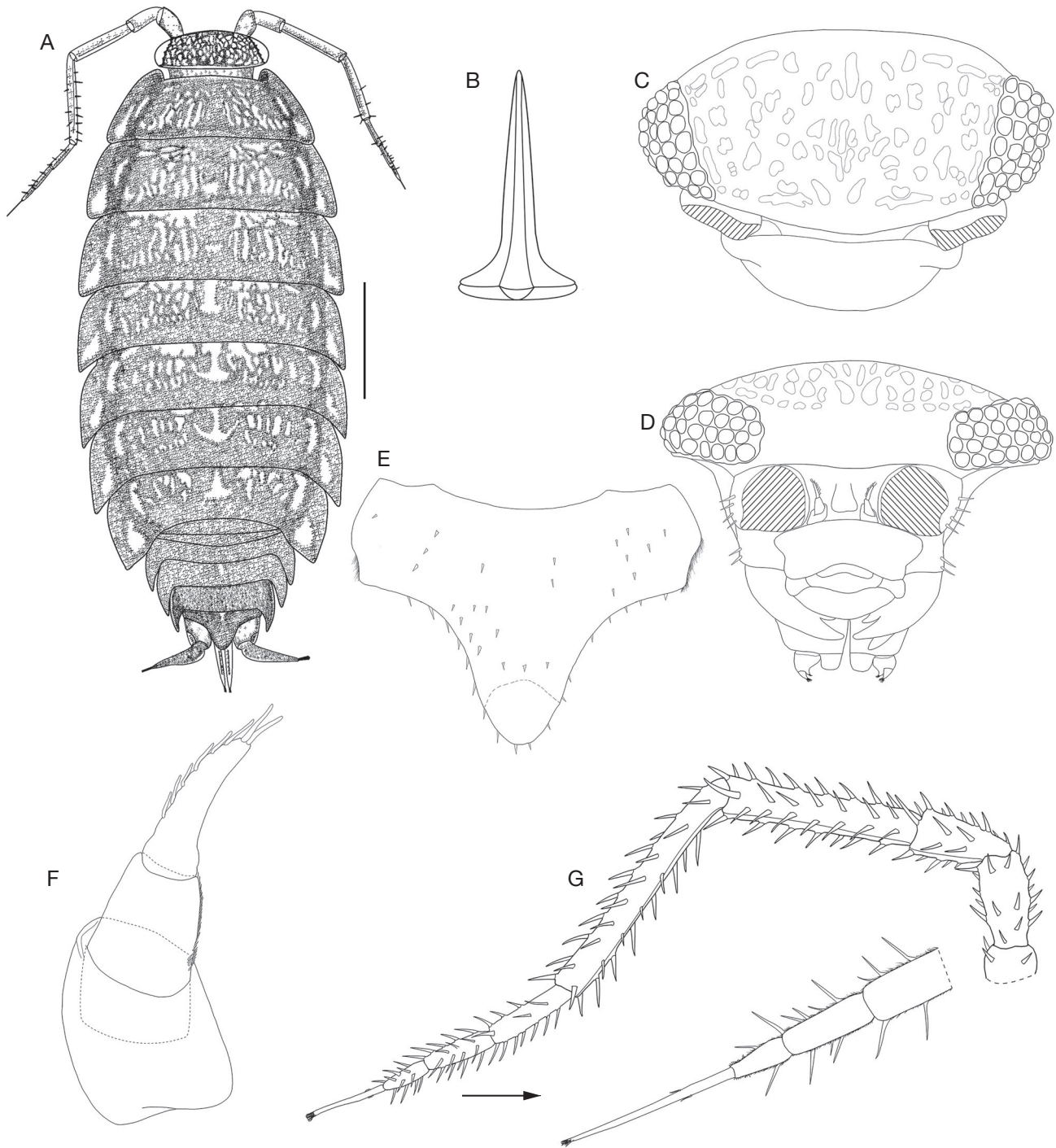


FIG. 1. — *Ischioscia herrerae* López-Orozco, Carpio-Díaz & Campos-Filho n. sp., female paratype (CUDC-CRU 47): **A**, habitus, dorsal view; **B**, dorsal scale-seta; **C**, cephalon, dorsal view; **D**, cephalon, frontal view; **E**, telson; **F**, antennula; **G**, antenna. Scale bar: 1 mm.

with prominent compound eyes on lateral protrusions; eyes with 27 ommatidia arranged in four rows. Pleon (Fig. 1A) narrower than pereon, neopleurae 3-5 well developed and directed backwards. Telson (Fig. 1E) with lateral margins concave, apex rounded. Antennula (Fig. 1F) of three articles, distal article bearing six superimposed aesthetascs plus apical pair. Antenna (Fig. 1G) when extended posteriorly reaching

anterior portion of pereonite 3; flagellum of three articles subequal in length, apical organ very long. Mandibles with molar penicil composed of seven branches, left mandible (Fig. 2A) with 2+1 penicils, right mandible (Fig. 2B) with 1+1 penicils. Maxillula (Fig. 2C) inner endite with distal margin rounded bearing two hairy penicils; outer endite of 4+5 teeth, two of them with cleft apex. Maxilla (Fig. 2D) outer

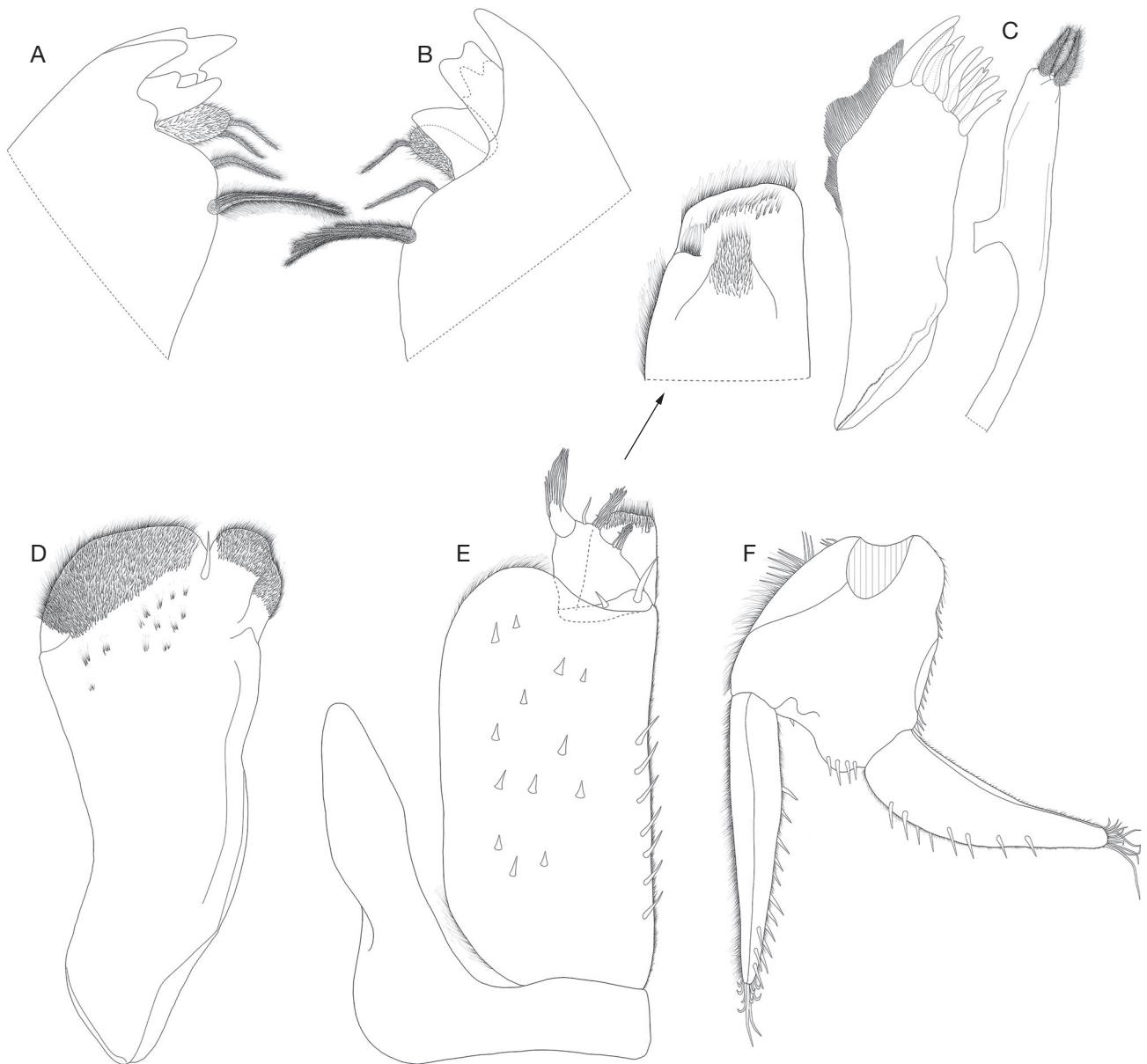


FIG. 2. — *Ischioscia herrerae* López-Orozco, Carpio-Díaz & Campos-Filho n. sp., female paratype (CUDC-CRU 47): **A**, left mandible; **B**, right mandible; **C**, maxillula inner endite (right), outer endite (left); **D**, maxilla; **E**, maxilliped; **F**, uropod.

lobe almost three times as wide as inner lobe, distal margin rounded and covered with thin setae, one thick seta on inner portion; inner lobe rounded bearing thick setae. Maxilliped (Fig. 2E) basis rectangular bearing sparse setae; palp with two setae on proximal article; endite sub-rectangular, rostral and caudal surfaces hairy, medial seta not surpassing distal margin. Uropod (Fig. 2F) protopod and exopod grooved on lateral margin, exopod as long as endopod, endopod inserted proximally. Pereopods 1-7 long and slender; carpus 1 with antennal grooming brush transverse and distal setae apically cleft; dactylus of two claws, inner claw not surpassing outer claw, ungual seta long, dactylar seta apically plumose. Pleopod exopods without respiratory areas.

Male

Pereopods 1-3 with carpus enlarged, rostral portion bearing dense field of setae. Pereopod 1 and 2 propodus and pereopods 1-3 merus bearing dense field of setae on rostral and sternal portions (Fig. 3A). Pereopod 7 (Fig. 3B) ischium with rounded lobe bearing one strong seta on caudal surface, and distal sternal portion prominent. Genital papilla (Fig. 3C) truncated apically, triangular ventral shield and two apical orifices. Pleopod 1 (Fig. 3D) exopod cordiform, inner margin slightly sinuous, outer margin with distinct lateral incision, apical lobe triangular, directed outwards; endopod stout, almost twice as long as exopod, distal portion straight with row of small setae on medial portion, apex rounded with

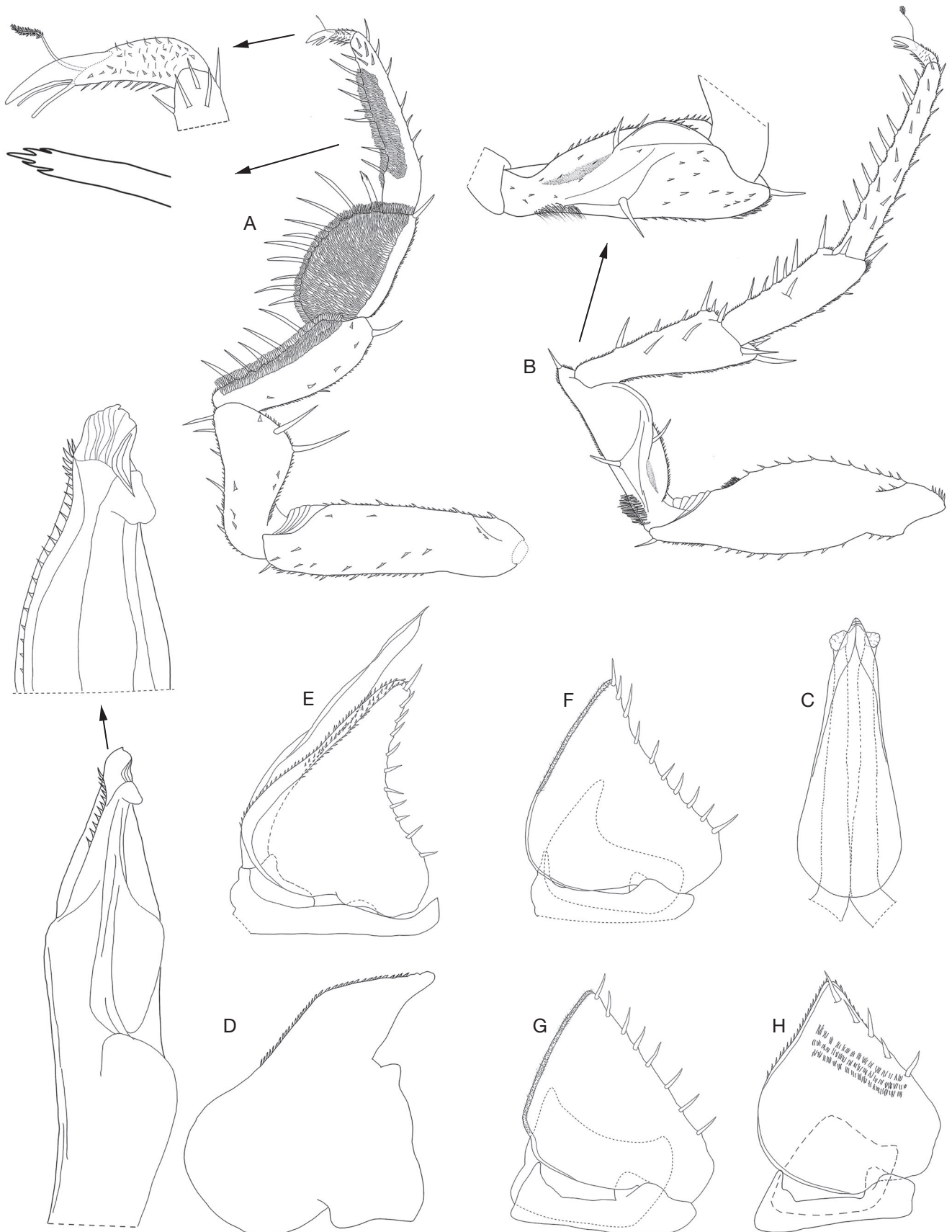


FIG. 3. — *Ischioscia herrerae* López-Orozco, Carpio-Díaz & Campos-Filho n. sp., male paratype (CUDC-CRU 45): **A**, pereopod 1; **B**, pereopod 7; **C**, genital papilla; **D**, pleopod 1, exopod (right), endopod (left); **E**, pleopod 2; **F**, pleopod 3; **G**, pleopod 4; **H**, pleopod 5.

subapical lobe on outer margin. Pleopod 2 (Fig. 3E) exopod triangular, outer margin concave bearing several setae; endopod stout, longer than exopod, apex pointed. Pleopods 3 and 4 as in Fig. 3F and G, respectively. Pleopod 5 (Fig. 3H) exopod triangular, transverse rows of scales, outer margin straight bearing five setae.

REMARKS

In the shape of the male pleopod 1 exopod *Ischioscia herrerae* López-Orozco, Carpio-Díaz & Campos-Filho n. sp. resembles *I. martinae* Leistikow, 1997 and *I. muelleri* Leistikow, 1997, but it differs in the shape of the male pereopod 1-2 carpus and the presence of a lobe on the male pereopod 7 ischium. In having a lobe on the male pereopod 7 ischium *I. herrerae* López-Orozco, Carpio-Díaz & Campos-Filho n. sp. is similar to *I. variegata* (Dollfus, 1893), *I. panamaensis* Leistikow, 1999, *I. marmorata* Leistikow, 2000, *I. hirsuta* Leistikow, 2001, *I. colorata* Leistikow, 2001, *I. pariae* Leistikow, 2001, *I. guamae* Leistikow, 2001, and *I. trifasciata* Leistikow, 2001; however, it differs from all these species in the colour pattern, shape of the male pereopods 1-3 carpus, of the lobe on the male pereopod 7 ischium, and of the male pleopod 1 exopod.

Ischioscia perijaensis Carpio-Díaz,
López-Orozco & Campos-Filho n. sp.
(Figs 4-6)

urn:lsid:zoobank.org:act:DC17E8EB-202D-4FBE-BB4A-40F721BD516A

TYPE MATERIAL. — **Holotype.** Colombia • ♂ (parts in micropreparations); Quebrada El Jordán, El Contento Village, San José de Oriente, La Paz, Cesar; 10°17'40.4"N, 72°55'52.1"W; 14.VIII.2015; C. M. López-Orozco leg.; CUDC-CRU 40.

ETYMOLOGY. — The new species is named after the locality where the specimens were collected: Serranía de Perijá.

DESCRIPTION

Body size: 6 mm × 2.9 mm. Body as in Fig. 4A. Colour dark brown: antennal peduncle with first and second articles slightly pigmented, third to fifth article and flagellum strongly pigmented; cephalon with irregular unpigmented spots; pereon with longitudinal unpigmented spots on paramedian region, epimera with one unpigmented spot; pleon and telson strongly pigmented; uropods slightly pigmented (Fig. 4A). Dorsal surface bearing short triangular scale-setae (Fig. 4B). Cephalon (Fig. 4C, D) without lateral lobes, frontal line and supra-antennal slightly bent downwards medially; vertex dorsoventrally flattened with prominent compound eyes on lateral protrusions; eyes with 25 ommatidia arranged in four rows. Pleon (Fig. 4A) narrower than pereon, neopleurae 3-5 well developed and directed backwards. Telson (Fig. 4E) with lateral margins concave, apex rounded. Antennula (Fig. 4F) of three articles, distal

article bearing six aesthetascs in three sets plus apical pair. Antenna (Fig. 4G) when extended posteriorly reaching anterior margin of pereonite 3; flagellum of three articles subequal in length, apical organ very long. Mandibles with molar penicil composed of 5 to 6 branches, left mandible (Fig. 5A) with 2+1 penicils, right mandible (Fig. 5B) with 1+1 penicils. Maxillula (Fig. 5C) inner endite with distal margin rounded bearing two stout hairy penicils; outer endite of 4+6 teeth, two of them with cleft apex. Maxilla (Fig. 5D) outer lobe twice as wide as inner lobe, distal margin rounded and covered with thin setae, two thick setae on inner portion; inner lobe rounded bearing thick setae. Maxilliped (Fig. 5E) basis rectangular bearing sparse setae; palp with two setae on proximal article; endite sub-rectangular, median seta surpassing distal margin, strong seta on distal outer portion, ventral surface setose. Uropod (Fig. 5F) protopod and exopod grooved on lateral margin, exopod longer than endopod, endopod inserted proximally. Pereopods 1-7 long and slender, carpus 1 with antennal grooming brush transverse; dactylus of two claws, inner claw not surpassing outer claw, ungual seta long, dactylar seta apically plumose. Pleopod exopods without respiratory areas.

Male

Pereopod 1 (Fig. 6A) with merus, carpus and propodus, and pereopod 2 merus and carpus bearing dense field of setae. Pereopod 7 (Fig. 6B) ischium with rounded depression on rostral surface, sternal margin bearing brush of thin setae on central part. Genital papilla (Fig. 6C) truncated apically, triangular ventral shield and two apical orifices. Pleopod 1 (Fig. 6D) exopod cordiform, inner margin almost straight, outer margin without lateral incision, distal margin rounded, lateral process short; endopod stout, almost twice as long as exopod, distal portion straight bearing row of small setae on medial margin and subapical lobe on outer margin. Pleopod 2 (Fig. 6E) exopod triangular, outer margin concave bearing several setae; endopod stout, slightly longer than exopod. Pleopods 3 and 4 as in Fig. 6F and G, respectively. Pleopod 5 (Fig. 6H) exopod rhomboid slightly wider than long, transverse rows of scales, outer margin sinuous bearing four setae, inner and outer margins densely covered with thin setae.

REMARKS

Ischioscia perijaensis Carpio-Díaz, López-Orozco & Campos-Filho n. sp. is readily distinguishable from their congeners in having the male pereopod 1 carpus not enlarged, the male pereopod 7 ischium with a rounded depression on rostral surface, and the male pleopod 1 exopod cordiform with lateral process short and outer margin lacking the lateral incision. In addition, *I. perijaensis* Carpio-Díaz, López-Orozco & Campos-Filho n. sp. differs from *I. herrerae* López-Orozco, Carpio-Díaz & Campos-Filho n. sp. in having the male pereopod 1 carpus not enlarged, the male pereopod 7 ischium without lobe and in the shape of the male pleopod 1 exopod.

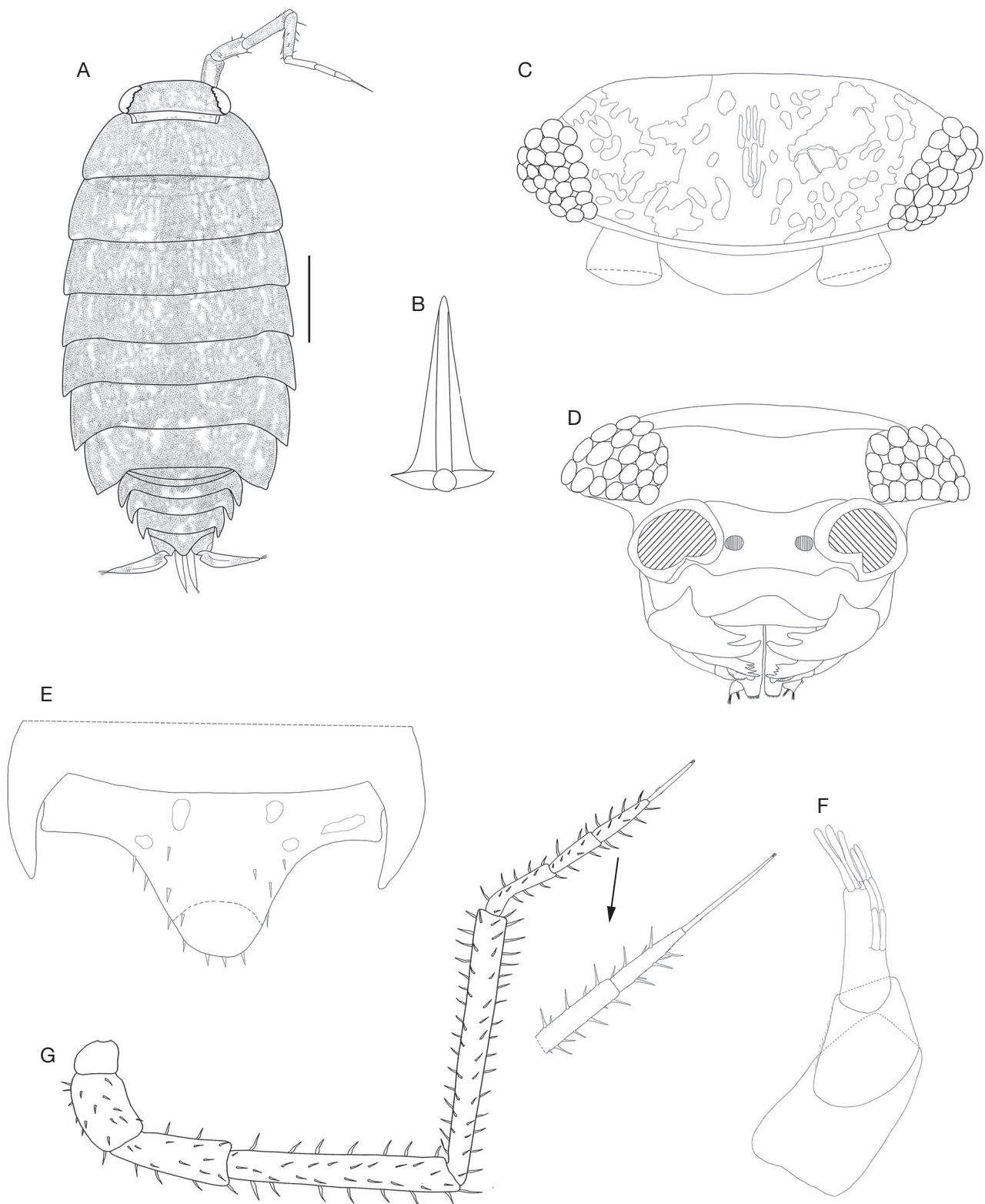


FIG. 4. — *Ischioscia perijaensis* Carpio-Díaz, López-Orozco & Campos-Filho n. sp., male paratype (CUDC-CRU 40): **A**, habitus, dorsal view; **B**, dorsal scale-seta; **C**, cephalon, dorsal view; **D**, cephalon, frontal view; **E**, pleonite 5 and telson; **F**, antennula; **G**, antenna. Scale bar: 1 mm.

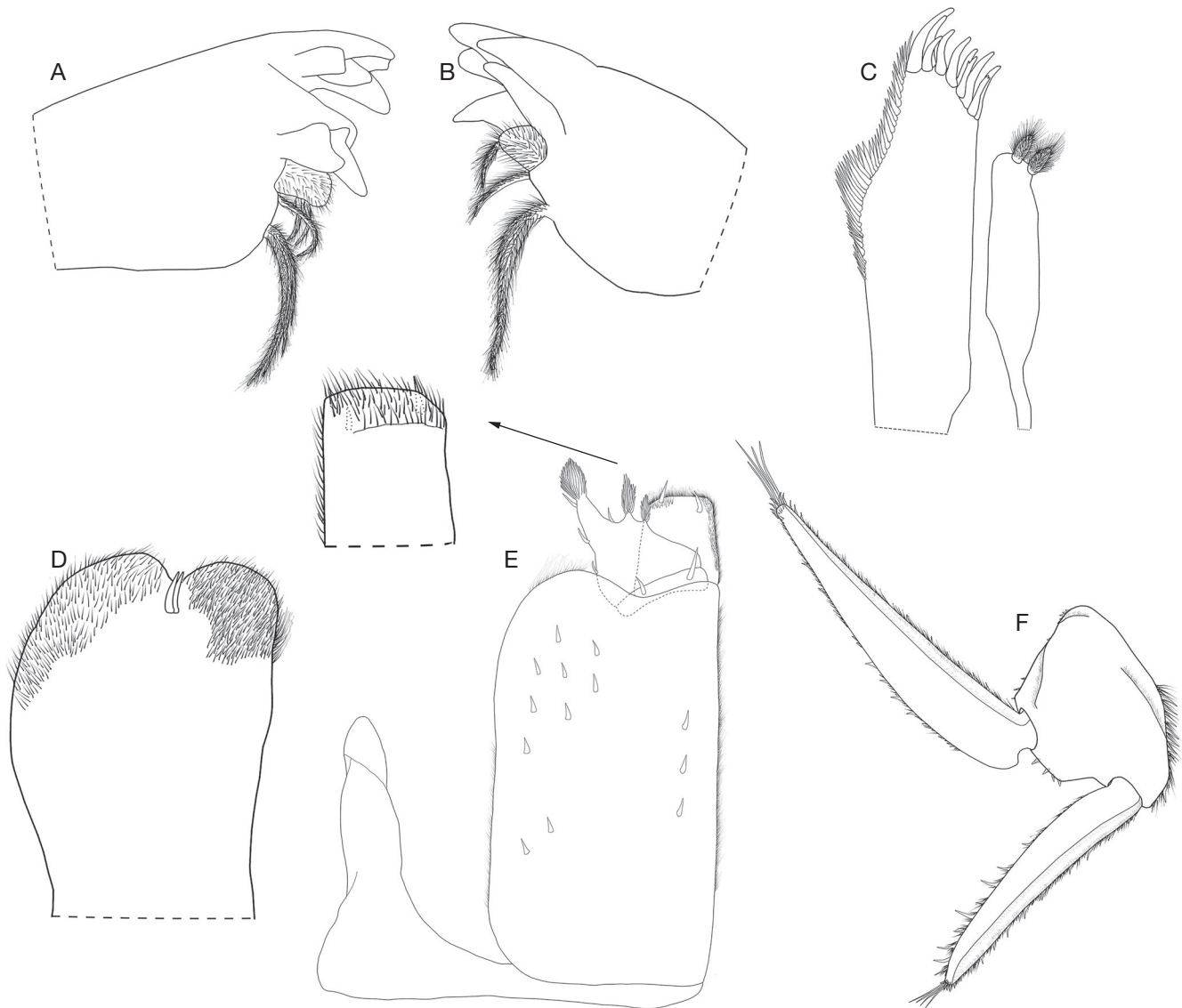


FIG. 5. — *Ischioscia perijaensis* Carpio-Díaz, López-Orozco & Campos-Filho n. sp., male paratype (CUDC-CRU 40). **A**, left mandible; **B**, right mandible; **C**, maxillula inner endite (right), outer endite (left); **D**, maxilla; **E**, maxilliped; **F**, uropod.

Ischioscia unicartagena Campos-Filho,
Carpio-Díaz & López-Orozco n. sp.
(Figs 7-9)

urn:lsid:zoobank.org:act:38E5D677-A988-4B85-AC82-F78325E4C9C8

TYPE MATERIAL. — **Holotype.** Colombia • ♂; Quebrada El Jordán, El Contento Village, San José de Oriente, La Paz, Cesar; 10°17'40.4"N, 72°55'52.1"W; 13.VIII.2015; C. M. López-Orozco leg.; CUDC-CRU 104.

Paratypes. Colombia. 1 ♂ (parts in micropreparations); same locality and date as for holotype; Y. Herrera-Medina leg.; CUDC-CRU 105 • 1 ♀ (parts in micropreparations); same locality and date as holotype; Y. Herrera-Medina leg.; CUDC-CRU 106 • 1 ♂, 4 ♀; same locality and date as for holotype; C. M. López-Orozco leg.; ICN-CI-87 • 4 ♂, 6 ♀; same locality and date as for holotype; C. M. López-Orozco leg.; CUDC-CRU-34 • 4 ♀; Cerro Pintao, La Jagua del Pilar, La Guajira; 10°25'41.8"N, 72°56'8.3"W; 10.VIII.2015; C. M. López-Orozco leg.; CUDC-CRU-50.

ETYMOLOGY. — The new species name honours the University of Cartagena (UDC), on the 193rd anniversary of its foundation, which has contributed to the academic and research training of professionals in different science fields.

DESCRIPTION

Maximum body size: male 6.9 mm × 3 mm (holotype); female 7 mm × 2.5 mm. Body as in Fig. 7A. Colour dark brown: antennae and uropods weakly pigmented; cephalon with irregular unpigmented spots; pereon with longitudinal unpigmented spots on paramedian region, median portion strongly pigmented, epimera pigmented; pleon and telson strongly pigmented, telson one unpigmented spot on median region (Fig. 7A). Dorsal surface bearing short triangular scale-setae (Fig. 7B). Cephalon (Fig. 7C, D) lateral lobes and frontal line absent, supraantennal line straight; vertex dorsoventrally flattened with prominent compound eyes on lateral protrusions; eyes with 27 ommatidia arranged in four

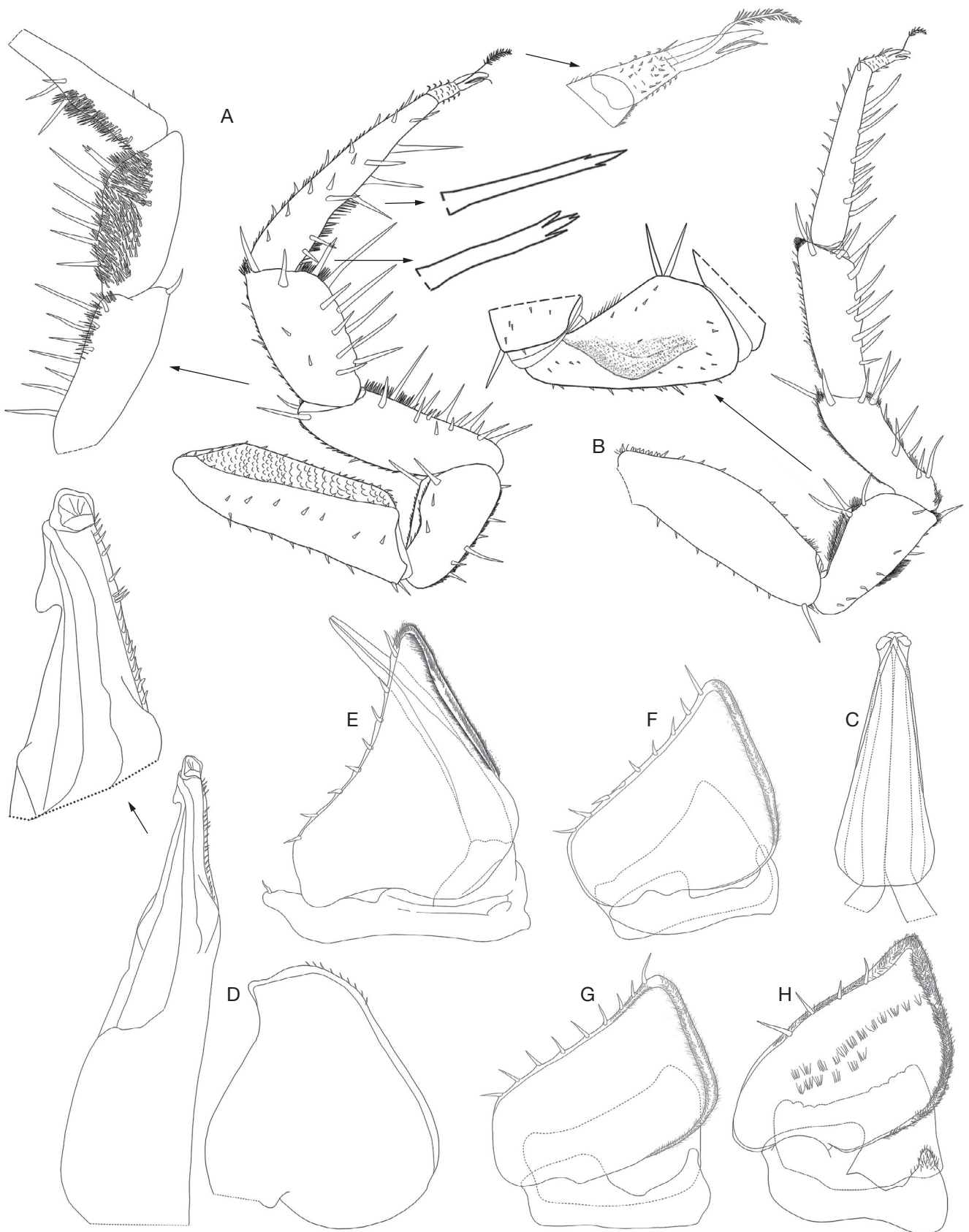


FIG. 6. — *Ischioscia perjaensis* Carpio-Díaz, López-Orozco & Campos-Filho n. sp., male paratype (CUDC-CRU 40): **A**, pereopod 1; **B**, pereopod 7; **C**, genital papilla; **D**, pleopod 1, exopod (right), endopod (left); **E**, pleopod 2; **F**, pleopod 3; **G**, pleopod 4; **H**, pleopod 5.

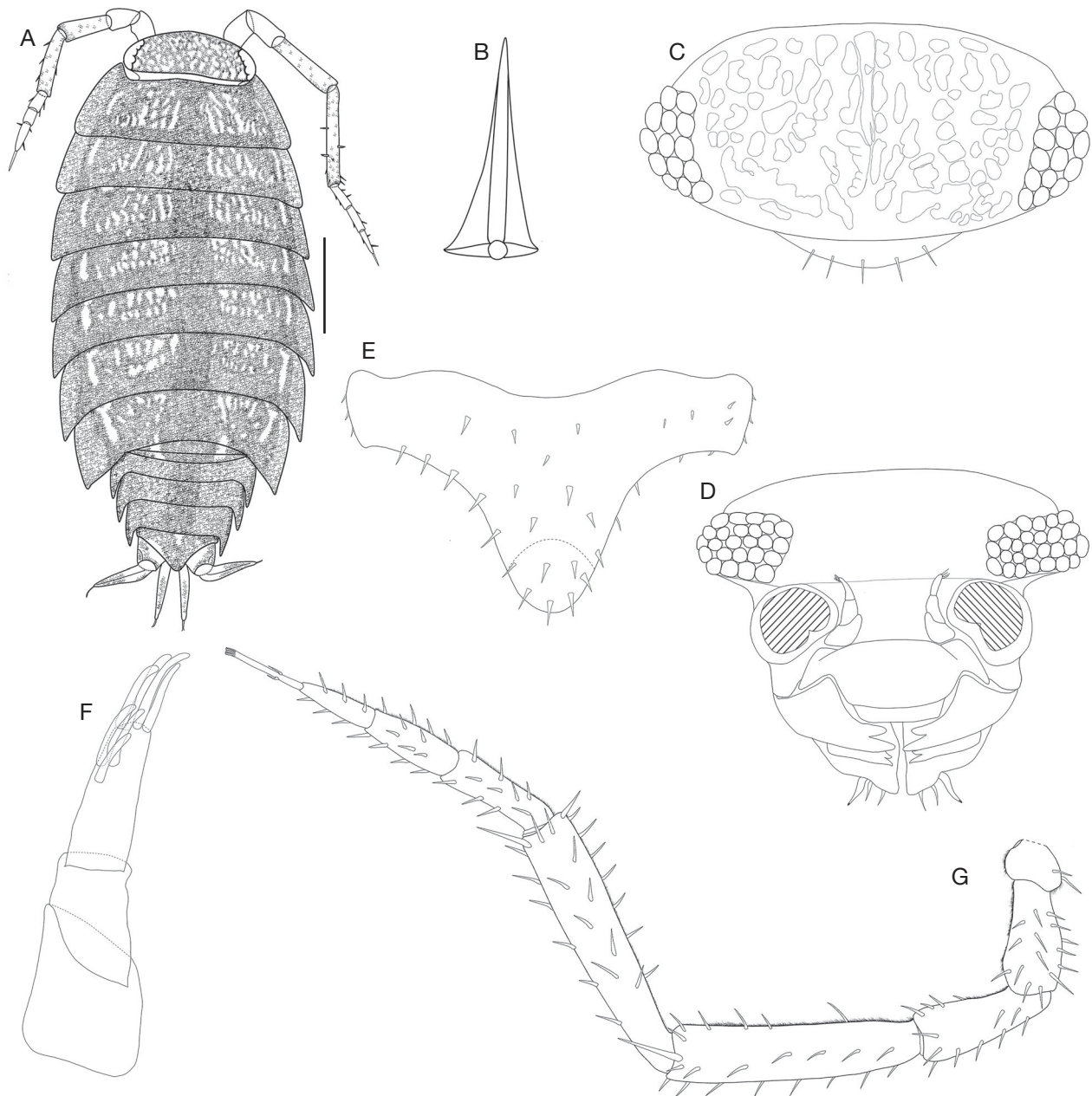


FIG. 7. — *Ischioscia unicartagenae* Campos-Filho, Carpio-Díaz & López-Orozco n. sp., female paratype (CUDC-CRU 106). **A**, habitus, dorsal view; **B**, dorsal scale-seta; **C**, cephalon, dorsal view; **D**, cephalon, frontal view; **E**, telson; **F**, antennula; **G**, antenna. Scale bar: 1 mm.

rows. Pleon (Fig. 7A) narrower than pereon, neopleurae 3-5 well developed, directed backwards. Telson (Fig. 7E) with lateral margins concave, apex rounded. Antennula (Fig. 7F) of three articles, distal article bearing five lateral aesthetascs plus apical pair. Antenna (Fig. 7G) when extended posteriorly reaching posterior margin of pereonite 4; flagellum of three articles subequal in length, apical organ very long. Mandibles with molar penicil composed of 6 to 7 branches, left mandible (Fig. 8A) with 2+1 penicils, right mandible (Fig. 8B) with 1+1 penicils. Maxillula (Fig. 8C) inner endite with distal margin rounded, outer distal margin with tip and bearing two hairy penicils; outer endite with 5+5

teeth, three of them with cleft apex. Maxilla (Fig. 8D) outer lobe more than twice as wide as inner lobe, distal margin rounded covered with setae; inner lobe rounded bearing thick setae. Maxilliped (Fig. 8E) basis rectangular bearing sparse setae; palp with one seta on proximal article, outer distal margin with fringe of thin setae; endite sub-rectangular, ventral and dorsal surfaces hairy, medial seta surpassing distal margin, outer distal portion with one seta. Uropod (Fig. 8F) protopod and exopod grooved on lateral margin, exopod longer than endopod, endopod almost at same level of exopod. Pereopods 1-7 long and slender, sternal margin bearing sparse long setae; carpus 1 with transverse anten-

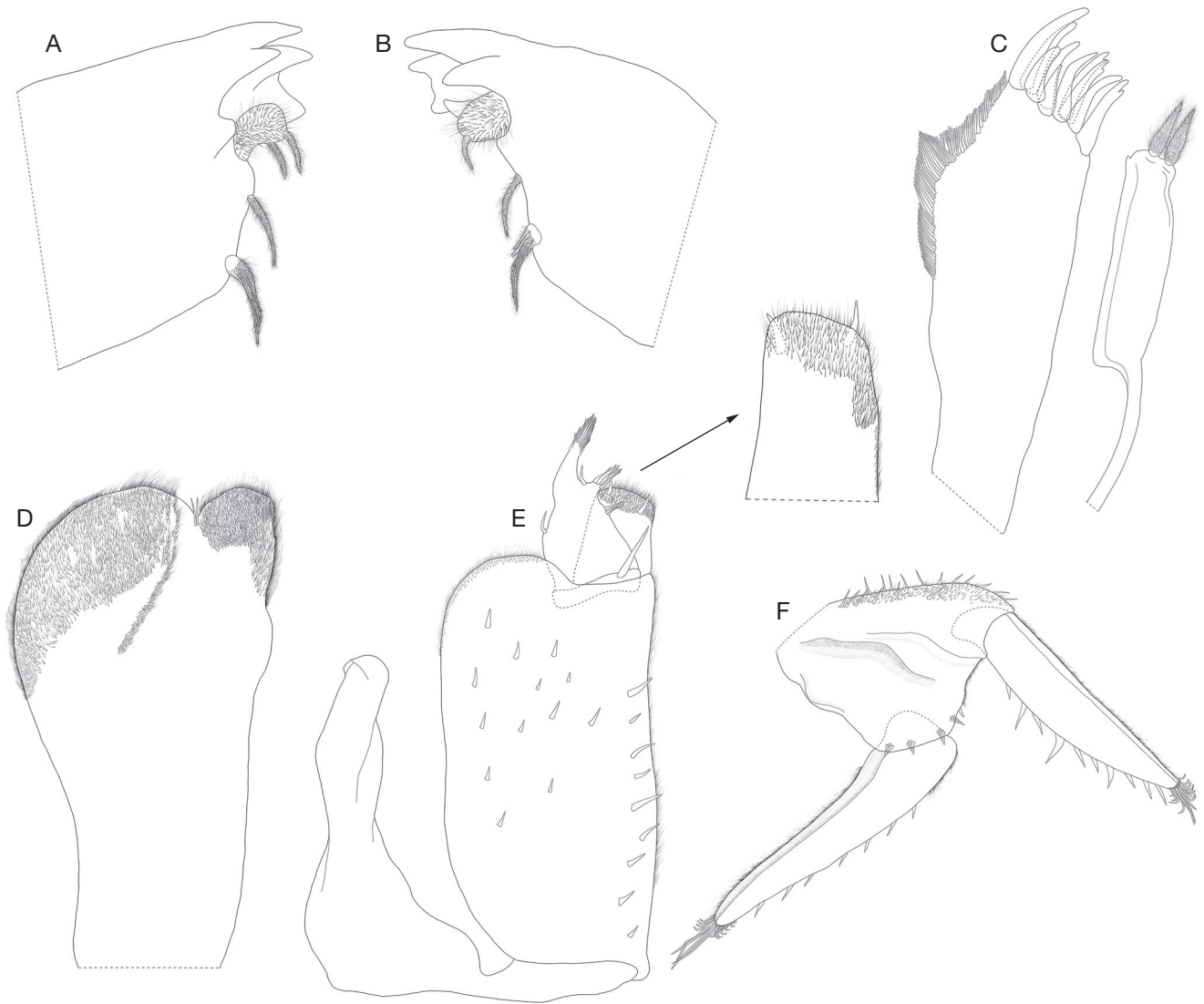


FIG. 8. — *Ischioscia uncartagena* Campos-Filho, Carpio-Díaz & López-Orozco n. sp., female paratype (CUDC-CRU 106). A, left mandible; B, right mandible; C, maxillula inner endite (right), outer endite (left); D, maxilla; E, maxilliped; F, uropod.

nal grooming brush; dactylus of two claws, inner claw not surpassing outer claw, ungual seta longer than outer claw, dactylar seta apically plumose. Pleopod exopods without respiratory areas.

Male

Pereopod 1 (Fig. 9A) merus and carpus with dense field of setae. Pereopod 7 (Fig. 9B) without any morphological modifications. Genital papilla (Fig. 9C) truncated apically, triangular ventral shield and two apical orifices. Pleopod 1 (Fig. 9D) exopod cordiform, distal margin rounded, outer margin with lateral incision, lateral process short and rounded; endopod stout, distal portion straight, apex rounded and arched bearing row of small setae on medial margin, outer distal margin bearing subapical small lobe. Pleopod 2 (Fig. 9E) exopod triangular, outer margin concave bearing several setae; endopod stout, slightly longer than exopod. Pleopods 3 and 4 as in Fig. 9F and G, respectively. Pleopod 5 (Fig. 9H) exopod triangular,

outer margin almost straight bearing three setae, median portion with transverse rows of thin setae.

REMARKS

In the shape of the male pleopod 1 endopod *Ischioscia uncartagena* Campos-Filho, Carpio-Díaz & López-Orozco n. sp. is similar to *I. martinae* Leistikow, 1997 and *I. elongata* Leistikow, 1997, but it is readily distinguishable in the shape of the male pleopod 1 exopod. In the shape of the male pleopod 1 exopod *I. uncartagena* Campos-Filho, Carpio-Díaz & López-Orozco n. sp. resembles *I. curvaculeus* Leistikow, 2001, but it differs in the cephalon without lamina frontalis, broader distal portion of telson, male pereopod 7 merus without proximal lobe, and male pleopod 1 endopod stout. Moreover, *I. uncartagena* Campos-Filho, Carpio-Díaz & López-Orozco n. sp. differs from *I. herrerae* López-Orozco, Carpio-Díaz & Campos-Filho n. sp. and *I. perijaensis* Carpio-Díaz, López-Orozco & Campos-Filho n. sp. in the shape of the male pleopod 1 exopod.

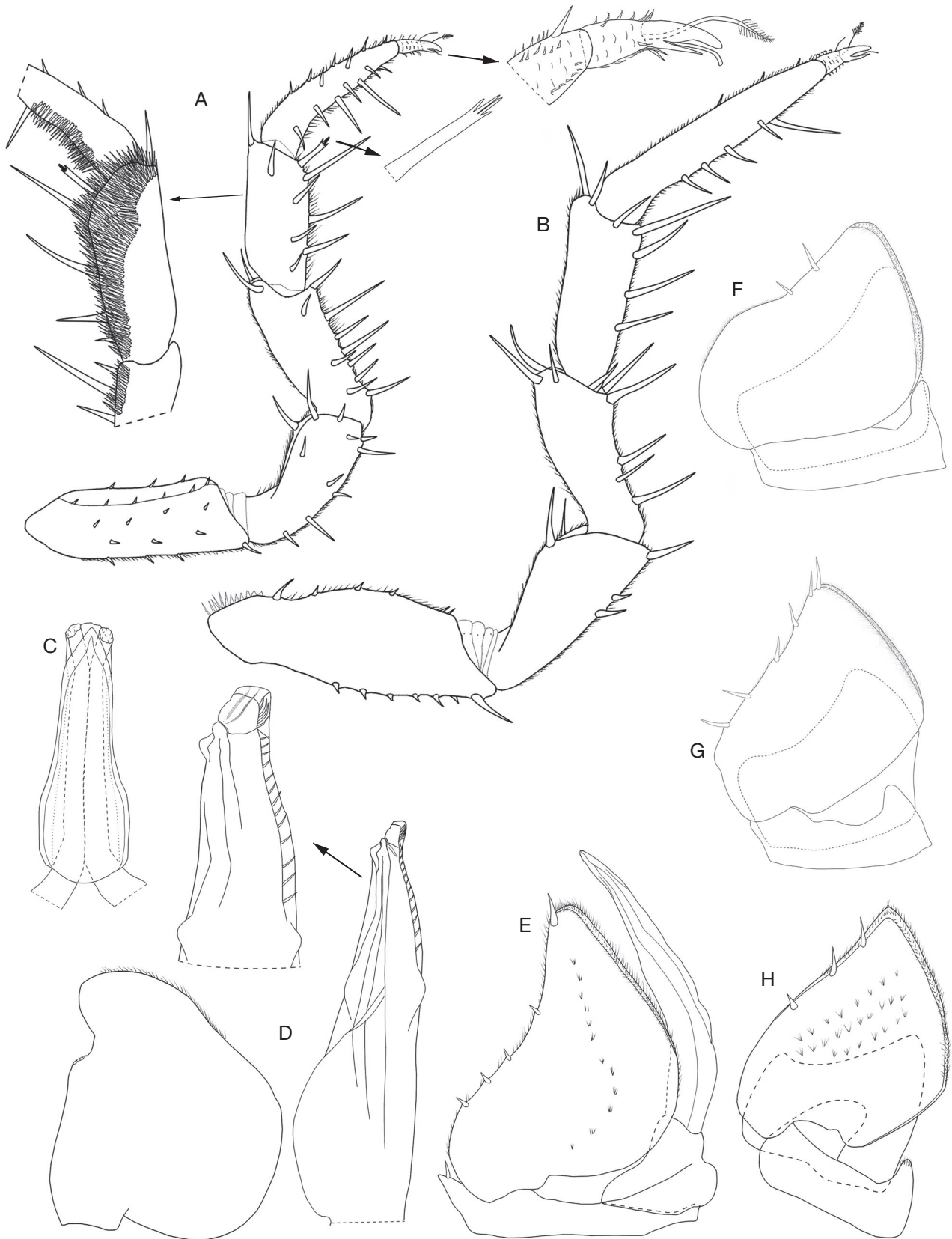


FIG. 9. — *Ischioscia uncartagenae* Campos-Filho, Carpio-Díaz & López-Orozco n. sp., male paratype (CUDC-CRU 105). **A**, pereopod 1; **B**, pereopod 7; **C**, genital papilla; **D**, pleopod 1, exopod (left), endopod (right); **E**, pleopod 2; **F**, pleopod 3; **G**, pleopod 4; **H**, pleopod 5.

KEY TO THE SPECIES OF *ISCHIOSCIA* VERHOEFF, 1928

1. Pereonites 1-7 dorsally pigmented in brown colour with typical unpigmented spots at muscle insertions; male pleopod 1 exopod cordiform 2
 — Pereonites 1 and 5 completely pigmented, 2-4 and 7 with well pigmented areas or spots, conferring zebra-like appearance; male pleopod 1 exopod sub-rectangular, lateral process not developed, outer distal margin serrate near indentation *I. zebricolor* Leistikow, 1999 (Leistikow 1999: pls 1-5).
2. Male pereopods 1-3 carpus strongly enlarged, sometimes pereopod 4 carpus 13
 — Male pereopods 1-3 carpus not enlarged 3
3. Male pereopod 7 merus without lobe 4
 — Male pereopod 7 merus with proximal lobe *I. curvaceus* Leistikow, 2001 (Leistikow 2001c: pls 1-5).
4. Male pleopod 1 exopod with lateral process directed outwards (surpassing outer margin) 5
 — Male pleopod 1 exopod without lateral process directed downwards (or not surpassing outer margin) 10
5. Dactylar seta surpassing outer claw and apically plumose 6
 — Dactylar seta not surpassing outer claw and apically pointed
 *I. fasciifrons* Leistikow, 2001 (Leistikow 2001b: figs 1-4).
6. Male pereopod 7 ischium with rounded depression on rostral surface 7
 — Male pereopod 7 ischium without rounded depression on rostral surface 8
7. Male pereopod 7 ischium with short rounded depression on rostral surface; male pleopod 1 exopod with lateral process well developed and obliquely directed outwards, endopod with reduced subapical outer lobe
 *I. plurimaculata* Leistikow, 2000 (Leistikow 2000: figs 12-16).
 — Male pereopod 7 ischium with wide rounded depression on rostral surface; male pleopod 1 exopod with lateral process reduced and laterally directed outwards, endopod with developed subapical outer lobe
 *I. perijaensis* Carpio-Díaz, López-Orozco & Campos-Filho n. sp.
8. Male pereopod 2 carpus with dense field of setae of about half of its width; male pleopod 1 exopod with lateral process directed outward, downwards or reduced 9
 — Male pereopod 2 carpus with dense field of setae of about one quarter of its width; male pleopod 1 exopod with lateral process obliquely directed outwards and distal margin rounded
 *I. bolivari* Vandel, 1968 (Leistikow & Schmidt 2002: figs 22-27).
9. Male pleopod 1 exopod with lateral process directed outwards and distal margin straight
 *I. muelleri* Leistikow, 1997 (Leistikow 1997: figs 14-19).
 — Male pleopod 1 exopod with lateral process obliquely directed outwards and distal margin rounded
 *I. cadoangelis* Leistikow, 2000 (Leistikow 2001b: figs 1-6).
10. Male pleopod 2 endopod slightly longer than exopod 11
 — Male pleopod 2 endopod twice as long as exopod *I. andina* (Vandel, 1968) (Vandel 1968: fig. 11).
11. Male pereopod 7 ischium with fringe of setae on sternal margin 12
 — Male pereopod 7 ischium without fringe of setae on sternal margin
 *I. stenocarpa* Schmalfuss, 1980 (Schmalfuss 1980: figs 9-14).
12. Cephalon with frontal line marked; maxilla subequal lobes; pereopods 1 and 2 merus and carpus with dense field of setae; dactylar seta apically enlarged, conferring spatuliform-like appearance; male pleopod 1 endopod without subapical lobe *I. amazonica* Lemos de Castro, 1965 (Leistikow & Schmidt 2002: figs 17-21).
 — Cephalon without frontal line well-marked; maxilla outer lobe wider than inner lobe; pereopod 2 merus and carpus without dense field of setae; dactylar seta apically plumose; male pleopod 1 exopod with lateral process rounded, endopod with short subapical lobe *I. unicartagena* Campos-Filho, Carpio-Díaz & López-Orozco n. sp.
13. Male pereopod 1-2 or 1-3 carpus enlarged 17
 — Male pereopod 1 carpus enlarged 14
14. Male pereopod 7 ischium with distal sternal portion prominent 15
 — Male pereopod 7 ischium with distal sternal portion not prominent 16
15. Dactylar seta apically enlarged, conferring spatuliform-like appearance; male pereopod 7 ischium with sternal margin concave and rounded depression on rostral surface ... *I. parie* Leistikow, 2001 (Leistikow 2001b: figs 13-16).
 — Dactylar seta apically plumose; male pereopod 7 ischium with sternal margin straight and lobe bearing one strong setae on caudal surface *I. herrerae* López-Orozco, Carpio-Díaz & Campos-Filho n. sp.

16. Male pereopod 7 ischium with sternal margin concave bearing dense fringe of thin setae; male pleopod 1 exopod with lateral process directed downwards, endopod with distal portion sinuous *I. irmleri* Schmalfuss, 1980 (Schmalfuss 1980: figs 27-31).
 — Male pereopod 7 ischium with sternal margin sinuous and without fringe of thin setae; pleopod 1 exopod with lateral process not developed, endopod with distal portion straight *I. sturmi* (Vandel, 1972) (Leistikow & Schmidt 2002: figs 11-16).
17. Male pereopod 1-2 carpus enlarged (sometimes male pereopod 3 carpus slightly enlarged) 18
 — Male pereopod 1-3 carpus enlarged 23
18. Male pleopod 1 exopod with lateral process directed outwards (surpassing outer margin), endopod with subapical lobe 19
 — Male pleopod 1 exopod with lateral process directed downwards, endopod without subapical lobe *I. longicauda* Schmalfuss, 1980 (Schmalfuss 1980: figs 21-26).
19. Male pereopod 7 ischium with distal sternal portion prominent 20
 — Male pereopod 7 ischium without distal sternal portion prominent 22
20. Dactylar seta longer than outer claw and apically plumose 21
 — Dactylar seta shorter than outer claw and apically acute *I. marmorata* Leistikow, 2000 (Leistikow 2000: figs 7-11).
21. Maxilla outer lobe wider than inner lobe; male pereopod 3 carpus with wide field of setae reaching half of its width; male pereopod 7 ischium with distal sternal portion distinctly prominent *I. guamae* Leistikow, 2001 (Leistikow 2001b: figs 17-20).
 — Maxilla with lobes subequal width; male pereopod 3 carpus with wide field of setae in almost all its width; male pereopod 7 ischium with distal sternal portion slightly prominent *I. mineri* (Van Name, 1936) (Leistikow 2001d: figs 1-4).
22. Cephalon with frontal line not well marked; maxilla with lobes subequal in width; male pereopod 3 carpus with wide field of setae of about one quarter of its width; male pleopod 1 exopod with distal margin straight *I. elongata* Leistikow, 1997 (Leistikow 1997: figs 20-25).
 — Cephalon with frontal line well marked; maxilla outer lobe wider than inner lobe; male pereopod 3 carpus slightly enlarged, wide field of setae of about half of its width; male pleopod 1 exopod with distal margin rounded ... *I. martinae* Leistikow, 1997 (Leistikow 1997: figs 8-13)
23. Male pereopod 4 carpus enlarged, dense field of setae covering almost all carpus width; male pereopod 7 ischium with distal sternal portion slightly prominent *I. quadrispinis* Leistikow, 2000 (Leistikow 2000: figs 17-22).
 — Male pereopod 4 carpus not enlarged; male pereopod 7 ischium with distal sternal portion prominent or not prominent 24
24. Male pleopod 1 exopod with lateral process directed downwards 25
 — Male pleopod 1 exopod with lateral process directed outwards 27
25. Male pereopods 1-3 carpus enlargement and wide field of setae progressively decreasing; male pereopod 7 ischium with distal margin strongly prominent or not prominent 26
 — Male pereopods 1-3 carpus strongly enlarged; male pereopod 7 ischium with distal margin strongly prominent bearing distinct brush of thin setae *I. panamensis* Leistikow, 1999 (Leistikow 1999: figs 6-9).
26. Cephalon with frontal line well marked; male pereopod 7 ischium with sternal margin concave and distal sternal portion not prominent *I. hanagarthi* Schmalfuss, 1980 (Schmalfuss 1980: figs 15-20).
 — Cephalon with frontal line not well marked; male pereopod 7 ischium with sternal margin straight and concave depression on rostral surface *I. colorata* Leistikow, 2001 (Leistikow 2001b: figs 9-12).
27. Male pereopod 7 ischium with distal sternal prominence triangular; male pleopod 1 endopod with apical portion directed downwards 28
 — Male pereopod 7 ischium with distal sternal prominence rounded; male pleopod 1 endopod with apical portion slightly bent outwards *I. trifasciata* Leistikow, 2001 (Leistikow 2001b: figs 21-24).
28. Male pereopod 6 merus with proximal portion swelled, conferring a lobe aspect; male pereopod 7 ischium without depressions on rostral surface; male pleopod 1 endopod with triangular subapical lobe directed downwards *I. variegata* (Dollfus, 1893) (Leistikow 1997: figs 27-32).
 — Male pereopod 6 merus not swelled on proximal portion; male pereopod 7 ischium with two rounded depressions on rostral surface; male pleopod 1 endopod with triangular subapical lobe directed upwards *I. hirsuta* Leistikow, 2001 (Leistikow 2001b: figs 5-8).

DISCUSSION

The access to the biodiversity constitutes one of the first steps to develop further studies in other science fields (Dudgeon *et al.* 2006; Lamoreux *et al.* 2006; Tundisi & Matsumura-Tundisi 2008; Rull 2011). Since many ecosystems in the world are suffering high alterations, such as habitat loss due to urban expansions, fragmentation and climate change, knowledge of biodiversity will identify priority areas for conservation and management strategies (Myers *et al.* 2000).

Considering the distribution of the species of *Ischioscia* (see Schmalfuss 2003), together with the high diversity of ecosystems in the Neotropical region (Olson *et al.* 2001), the number of species in the genus is certainly not complete. Most species of *Ischioscia* occur at high altitudes (up to 4200 m a.s.l.), which probably is related to historic events (e.g. Andean uplift, tectonic events, marine transgressions) (Haffer 2008; Weir & Price 2011; Morrone 2014; Dagosta & de Pinna 2017). Future studies are needed for a better understanding about the biodiversity and ecological-evolutionary processes of the species of the genus.

The three new species of *Ischioscia* were collected in Quebrada El Jordán, San José de Oriente (c. 2800 m a.s.l.), and *I. herrerae* López-Orozco, Carpio-Díaz & Campos-Filho n. sp. and *I. unicartagenae* Campos-Filho, Carpio-Díaz & López-Orozco n. sp. also in Cerro Pintao, La Jagua del Pilar (c. 2800 m a.s.l.). The specimens were found during the morning under rocks, trunks and among the litter together with other representatives of the families Philosciidae and Stylognathidae Vandel, 1952. In other works on Neotropical Philosciidae the presence of more than one species living together at the same micro-environment was recorded, e.g., *Ischioscia* (Leistikow & Schmidt 2002), and *Atlantoscia* Ferrara & Taiti, 1981 (Zimmermann *et al.* 2015). At Cerro Pintao, the specimens of *I. herrerae* López-Orozco, Carpio-Díaz & Campos-Filho n. sp. and *I. unicartagenae* Campos-Filho, Carpio-Díaz & López-Orozco n. sp. were collected during the afternoon on leaf-litter and under rocks, also coexisting with other species of Philosciidae and Scleropactidae Verhoeff, 1938.

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