

## Four New Species of “Hooded Tick-Spiders” (Ricinulei, Ricinoididae) from South and Central America, with Clarification of the Identity of *Cryptocellus leleupi* Cooreman, 1976

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### ABSTRACT

The Ricinulei Thorell, 1876, or “hooded tick-spiders,” are among the least studied arachnid orders. Knowledge of ricinuleid diversity has been slow to accumulate because these arachnids are underrepresented in biological collections. Despite an increase in the pace of new species descriptions in recent decades, the species richness of the order probably remains vastly underestimated. Large areas in some of the world’s most biodiverse countries are without a single record for the order, hence new records invariably turn out to be new species. The present contribution describes four new species of the mostly South American genus *Cryptocellus* Westwood, 1874: *Cryptocellus canutama*, sp. nov., and *Cryptocellus jamari*, sp. nov., from Brazil; *Cryptocellus islacolon*, sp. nov., from Panama; and *Cryptocellus macagual*, sp. nov., from Colombia. Additionally, a new diagnosis and description are provided for *Cryptocellus leleupi* Cooreman, 1976, long considered a nomen dubium. The known locality records of the five species and their putative relatives are mapped. The present contribution raises the number of *Cryptocellus* species to 45 and the number of extant species of Ricinulei to 101.

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## INTRODUCTION

Ricinulei Thorell, 1876, or “hooded tick-spiders,” are among the least studied arachnid orders, exemplifying all seven biodiversity shortfalls (Hortal et al., 2015). Thirty-eight of the extant species of Ricinulei currently considered valid were described from 1960 to 1999, averaging fewer than one species per year. The pace of species discovery and description accelerated in recent years, with 41 species described since 2000, 26 of which were described since 2010, slightly more than two species per year (Harvey, 2003; Botero-Trujillo and Flórez, 2017; Valdez-Mondragón et al., 2020; Valdez-Mondragón and Juárez-Sánchez, 2021; Botero-Trujillo et al., 2021). Nevertheless, the species richness of the order probably remains vastly underestimated, given the cryptic habits and restricted distributions of most Ricinulei (Cooke and Shadab, 1973; Platnick and Shadab, 1977; Platnick, 1988, 2002; Harvey, 2002, 2003; Platnick and García, 2008; Valdez-Mondragón et al., 2018). Large areas in some of the world’s most biodiverse countries are without a single record for the order, and new records invariably turn out to be new species, reflecting how little is known about the geographical distributions and species diversity of Ricinulei.

One family, Ricinoididae Ewing, 1929, and three genera accommodate the extant diversity of Ricinulei. The 16 described species of Old World Ricinulei are accommodated within the tropical African genus *Ricinoides* Ewing, 1929, which extends from the Gambia and Senegal, southeast to Gabon and the Congo (Botero-Trujillo et al., 2021). Two genera occur in the New World. *Pseudocellus* Platnick, 1980, which comprises 40 valid species, occurs from southern Texas, in the United States, to Panama, and on the island of Cuba (Harvey, 2003; Armas, 2017; Teruel, 2018; Valdez-Mondragón et al., 2018, 2020; Valdez-Mondragón and Juárez-Sánchez, 2021). The primarily South American genus *Cryptocellus* Westwood, 1874, comprising 40 valid species at the outset of this study, is distributed from Honduras southward to the Brazilian state of Rondônia (Harvey, 2003; Botero-Trujillo and Valdez-Mondragón, 2016; Botero-Trujillo and Flórez, 2017).

The present contribution describes four new species of *Cryptocellus* based on adult morphology: *Cryptocellus canutama*, sp. nov., and *Cryptocellus jamari*, sp. nov., from Brazil; *Cryptocellus islacolon*, sp. nov., from Panama; and *Cryptocellus macagual*, sp. nov., from Colombia (fig. 1). Additionally, a new diagnosis and description are provided for *Cryptocellus leleupi* Cooreman, 1976, long considered a nomen dubium, by means of which it may be distinguished from other *Cryptocellus* species. The known locality records of the five species, and putative relatives, are mapped. The present contribution raises the number of *Cryptocellus* species to 45 and the number of extant species of Ricinulei to 101.

## MATERIAL AND METHODS

**MATERIAL AND TAXON SAMPLING:** Material is deposited in the following collections: the American Museum of Natural History (AMNH), New York; the Coleção de História Natural, Universidade Federal do Piauí (CHNUFPI), Floriano, Brazil; the Arachnological Collection of the Instituto de Ciencias Naturales (ICN), Universidad Nacional de Colombia, Bogotá; the Insti-

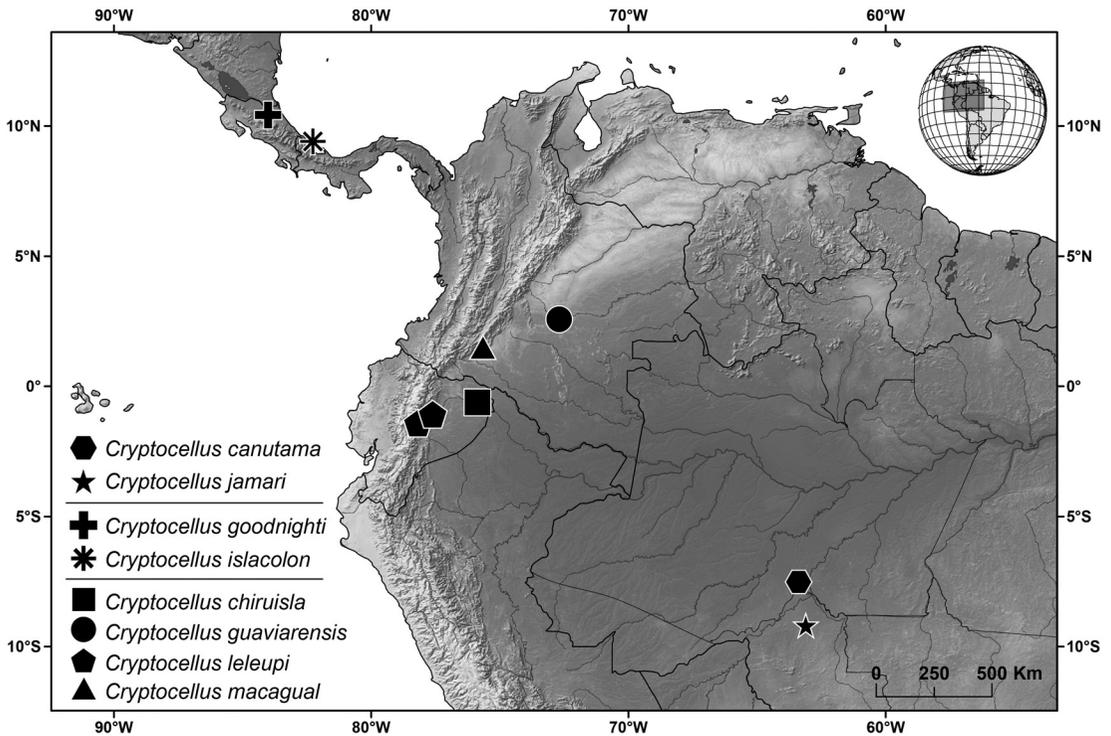


FIGURE 1. Map of South and Central America, plotting known locality records of *Cryptocellus canutama*, sp. nov., *Cryptocellus chiruisla* Botero-Trujillo and Flórez, 2017, *Cryptocellus goodnighti* Platnick and Shadab, 1981, *Cryptocellus guaviarensis* Botero-Trujillo and Flórez, 2017, *Cryptocellus islacolon*, sp. nov., *Cryptocellus jamari*, sp. nov., *Cryptocellus leleupi* Cooreman, 1976, and *Cryptocellus macagual*, sp. nov. Horizontal lines separate groups of putative relatives.

tuto Nacional de Pesquisas da Amazônia (INPA), Manaus, Brazil; the Institut Royal des Sciences Naturelles de Belgique (IRSNB), Brussels, Belgium; the Museo Argentino de Ciencias Naturales “Bernardino Rivadavia” (MACN), Buenos Aires, Argentina; the Museu de Zoologia, Universidade de São Paulo (MZSP), Brazil; the Oxford University Museum of Natural History (OUMNH), U.K.; the Museo de Zoología (QCAZ), Pontificia Universidad Católica del Ecuador, Quito; the Coleções Taxonômicas, Universidade Federal de Minas Gerais (UFMG), Belo Horizonte, Brazil.

**EXAMINATION AND DOCUMENTATION:** Specimens were examined with Leica M165 C and Nikon SMZ1500 stereomicroscopes. The dissected copulatory apparatus of the males of the four new species and the spermathecae of the females of *C. islacolon*, *C. jamari*, and *C. leleupi* are stored in microvials with the specimens. Digital photomicrographs were taken with a Nikon DS-Ri2 camera adapted to a Nikon SMZ 18 stereomicroscope with a SHR Plan Apo 1x Objective, using NIS-Elements Imaging Software ver. 4.60, at the AMNH Microscopy and Imaging Facility. Fifty-eight linear measurements were recorded, following the methodology outlined by Botero-Trujillo et al. (2021), using a calibrated ocular micrometer fitted to a Nikon SMZ 1500 stereomicroscope, from specimens submerged in 75% ethanol.

**GEOREFERENCING AND MAPPING:** Locality records from the material examined were retroactively georeferenced, as required, using Google Earth Pro 7.3.3. A distribution map was produced by plotting the georeferences onto a Natural Earth surface cover raster (<https://www.naturalearthdata.com/downloads/10m-natural-earth-2/10m-natural-earth-2-with-shaded-relief-water-and-drainages/>), using ArcGIS 10.3 (Environmental Systems Research Institute, Redlands, CA). The map presents distributional data only for the new species and their putatively closest relatives.

**COMPARATIVE MATERIAL:** The following specimens, belonging to other species of *Cryptocellus*, were examined during the present investigation.

*Cryptocellus adisi* Platnick, 1988: **BRAZIL:** Amazonas: Tarumã Mirím river, 03°02'S 60°17'W, 24.viii.1983, J.M. Gomes Rodrigues, secondary dryland forest, Kempson soil extract, holotype ♂ (INPA Ri 001), allotype ♀ (INPA Ri 002), 1 ♂, 1 ♀ paratypes (AMNH IZC 324890), same data, except: 25.viii.1982, paratype ♂ (INPA Ri 003).

*Cryptocellus canga* Pinto-da-Rocha and Andrade, 2012: **BRAZIL:** Pará: Floresta Nacional de Carajás, Gruta S11D-12, 06°23'45"S 50°21'34"W, 13–30.i.2010, R. Andrade, paratype ♂ (MZUSP 46555), paratype ♀ (MZUSP 46556), same data, except: Gruta Cav19 S11, 06°24'20"S 50°22'07"W, 22–31.v.2010, paratype ♂ (MZUSP 46558), Gruta S11D-40, 06°24'37"S 50°19'29"W, 3–19.viii.2010, 1 ♂, 1 ♀ paratypes (MZUSP 46563).

*Cryptocellus chiruisla* Botero-Trujillo and Flórez, 2017: **ECUADOR:** Orellana: Chiruisla km 0.2, 00°36'50"S 75°52'34"W, 218 m, 8–13.xii.2005, J. Viera, primary forest, Winkler trap, holotype ♂ (QCAZI 3440), 1 ♀, 1 tritonymph paratypes (QCAZI 3441).

*Cryptocellus goodnighti* Platnick and Shadab, 1981: **COSTA RICA:** Heredia: La Selva [10°26'N 84°02'W], 4.vii.1975, C. Goodnight, holotype ♂ (AMNH IZC 324859); La Selva Research Station [10°26'N 84°02'W], 11.ii.1976, V. Roth and R. Schroeffer, 1 ♂ (AMNH IZC 324882).

*Cryptocellus guaviarensis* Botero-Trujillo and Flórez, 2017: **COLOMBIA:** Guaviare: San José del Guaviare, Playa Güio, 02°34'16"N 72°41'51.80"W, 185 m, 6.x.2013, E. Flórez, sifted leaf litter, holotype ♂ (ICN Ari 013).

*Cryptocellus tarsilae* Pinto-da-Rocha and Bonaldo, 2007: **BRAZIL:** Pará: Floresta Nacional de Carajás, Gruta N5S-07 [06°23'45"S 50°21'34"W], 3–13.v.2005, R. Andrade and Y. Arnoni, horizontal cave, 50 m deep, holotype ♂ (MZUSP 27805), paratype ♀ (MZUSP 27806).

## SYSTEMATICS

### Family Ricinoididae Ewing, 1929

#### *Cryptocellus* Westwood, 1874

*Cryptocellus* Westwood, 1874: 201, type species by monotypy: *Cryptocellus foedus* Westwood, 1874; Ewing, 1929: 588; Beck and Schubart, 1968: 68–73.

*Heteroricinoides* Dumitresco and Juvara-Balș, 1977: 148 (synonymized by Platnick and Shadab, 1977: 16), type species by original designation: *Heteroricinoides bordoni* Dumitresco and Juvara-Balș, 1977.

*Cryptocellus canutama*, sp. nov.

Figures 1, 2A–C, 3, 4, 17A; table 1

**TYPE MATERIAL:** Holotype ♂ (CHNUFPI 2215), **BRAZIL:** Amazonas: Canutama, near road BR-230, 07°30'41.5"S 63°23'28.3"W, 78 m, 22.x.2016, L.S. Carvalho. Paratypes: 1 ♂ (CHNUFPI 2502), 1 ♂ (UFMG 24332), deutonymph (CHNUFPI 3387), same data as holotype.

**DIAGNOSIS:** *Cryptocellus canutama* resembles *C. adisi*, *C. canga*, *C. jamari*, and *C. tarsilae* in the presence of a moundlike excrescence posteromedially on the carapace (fig. 3A). *Cryptocellus canutama* most closely resembles *C. jamari* in the fusion of the median sclerites of tergites X and XI (figs. 3C, 4B), a character unique to the two species, and in the presence of a pair of submedian moundlike excrescences on median sclerite of tergite XI of the male (fig. 3C), a character also observed in both sexes of *C. adisi*. The male of *C. canutama* can be distinguished from that of *C. jamari* by the moundlike excrescences of tergite XI, which are smaller and less prominent than the posteromedian excrescence of the carapace, in *C. canutama*, but well developed, only slightly smaller than the posteromedian excrescence, in *C. jamari*. Additionally, the fixed process of the male copulatory apparatus of *C. canutama* is crooked, weakly sclerotized, and flexible subbasally (figs. 4E, 17A), able to bend prolaterally (fig. 17A), and unmodified basally whereas the copulatory apparatus of *C. jamari* is almost straight, heavily sclerotized, and inflexible subbasally, with a distinct ventral swelling basally.

**ETYMOLOGY:** The specific epithet is a noun in apposition taken from the type locality, Canutama, in Amazonas, Brazil.

**DESCRIPTION OF MALE:** Based on the holotype (CHNUFPI 2215).

**Measurements:** Total length, 3.68 mm (table 1).

**Coloration:** Soma and appendages reddish (fig. 2A, B); pedipalps slightly paler. Carapace dorso-lateral translucent areas yellow. Cheliceral manus yellow; fingers and finger dentition reddish.

**Setation:** Soma and appendages covered with short, translucent, bristlelike setae, slightly expanded, especially on carapace and dorsal surface of opisthosoma (fig. 3A, C), but fine, hair-like on coxosternal region, pedipalps, ventral half of cucullus, ventromedial surface of opisthosoma, and leg tarsi (e.g., figs. 3B, D, 4A, F).

**Tegument surface macrosculpture:** Tegument without cuticular pits. Carapace entirely and densely covered with conspicuous, round, iridescent granules (fig. 3A). Cucullus, coxosternal region, and legs with granulation similar to carapace, except for smooth medial surface on coxae of legs IV (figs. 3B, 4A, C, D). Opisthosoma dorsal surface with granulation similar to carapace, except along outer margin of opisthosoma, along which dorsal sclerites are predominantly smooth (fig. 3C); ventral surface sparsely granular (fig. 3D); lateral membranes granular. Pedipalp trochanter 1 and, to lesser extent, trochanter 2 granular; femur densely granular proximally and ventrosubmedially (fig. 4F); tibia entirely smooth.

**Carapace:** Carapace trapezoidal, as long as wide (table 1), broadest between coxae of legs II and III; lateral margins curved, converging anteriorly (fig. 3A); anterior margin linear in dorsal aspect, sublinear in frontal aspect; posterior margin procurved; median longitudinal sulcus shallow, partial, terminating at base of posteromedian moundlike excrescence; paired



FIGURE 2. *Cryptocellus canutama*, sp. nov., male (A, B) and nymph (C), and *Cryptocellus jamari*, sp. nov., female (D, E) and nymphs (F), habitus in life.

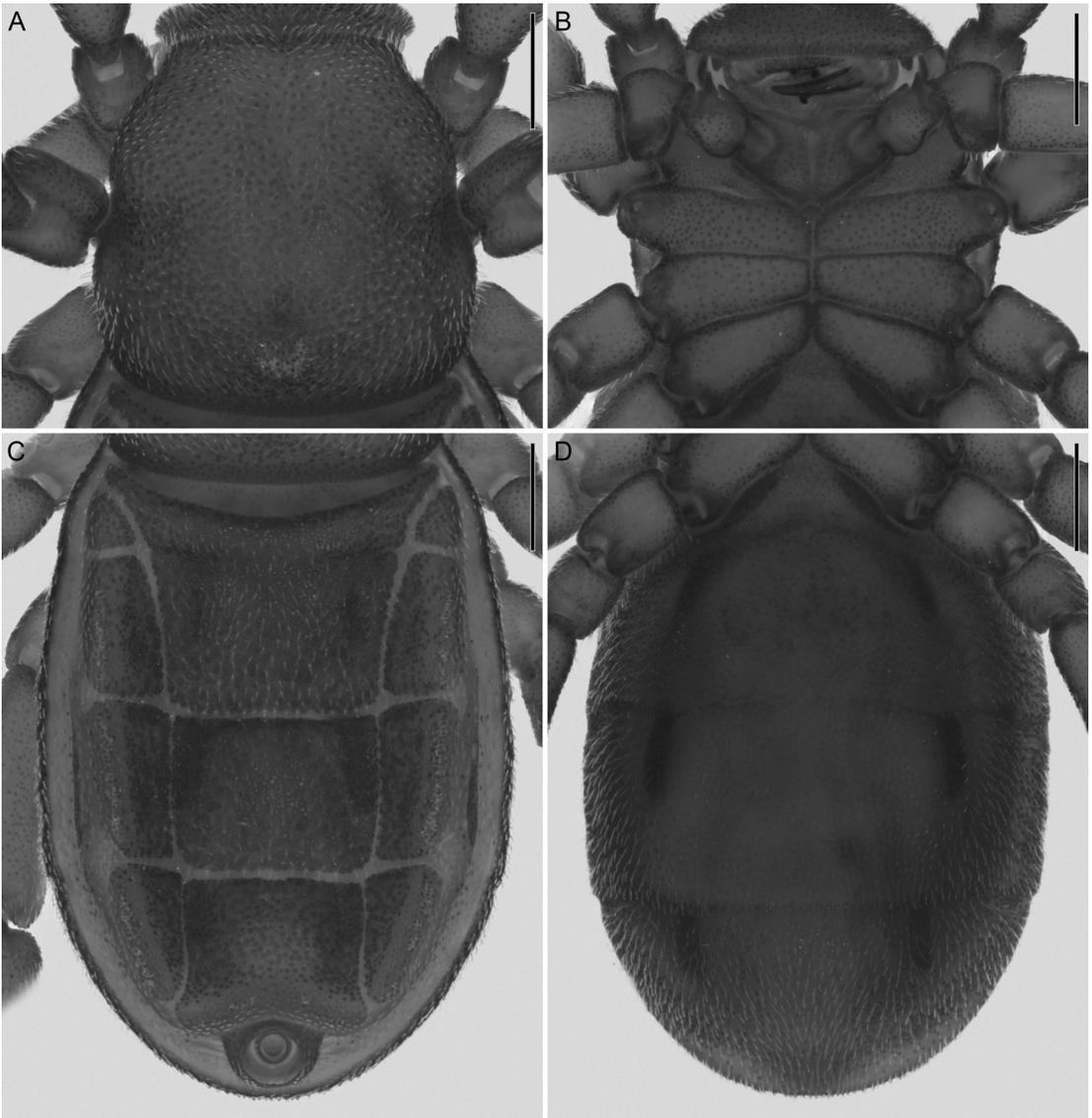


FIGURE 3. *Cryptocellus canutama*, sp. nov., holotype ♂ (CHNUFPI 2215). **A.** Carapace, dorsal aspect. **B.** Coxosternal region, ventral aspect. **C, D.** Opisthosoma, dorsal (C) and ventral (D) aspects. Scale bars = 0.5 mm.

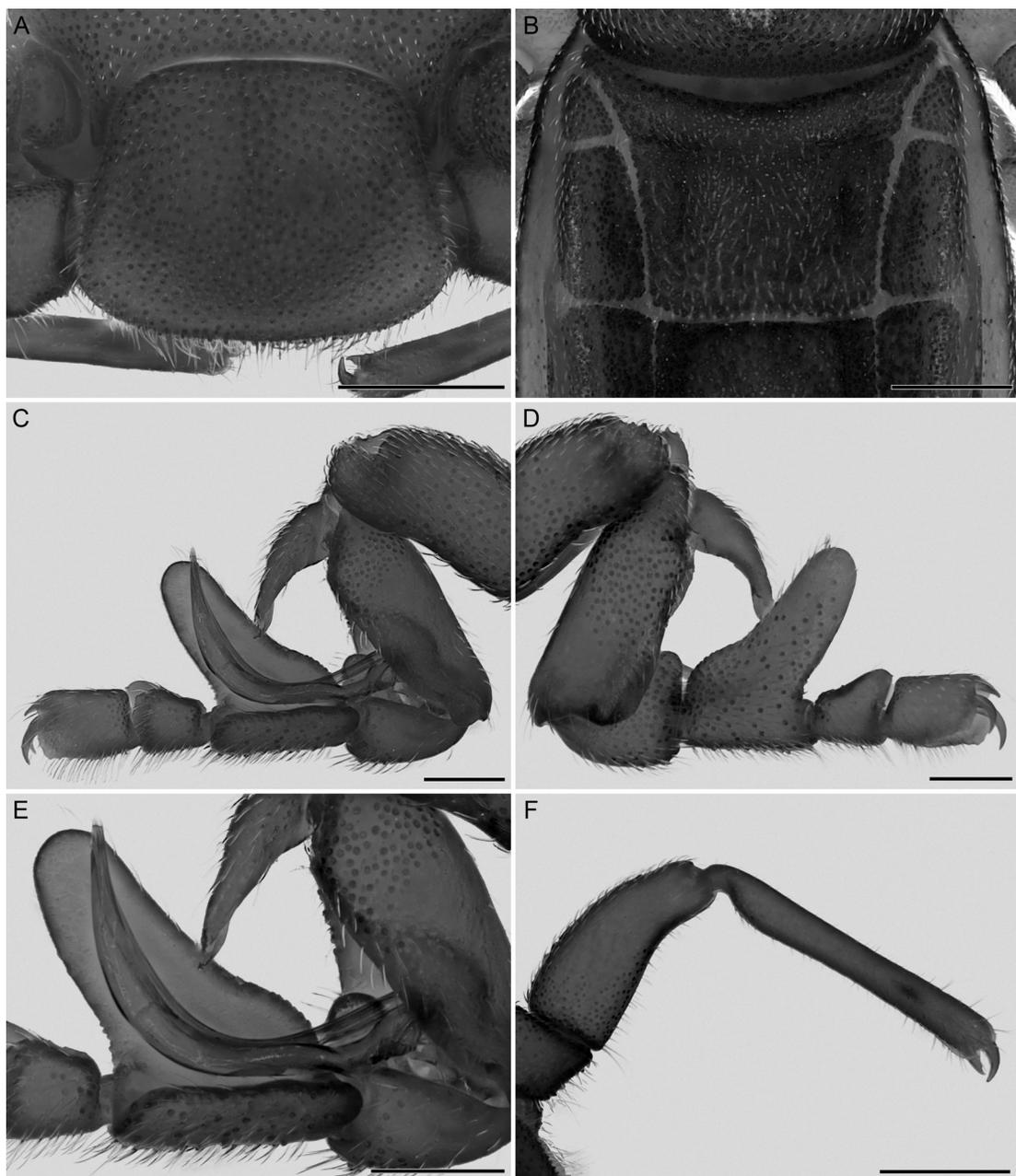


FIGURE 4. *Cryptocellus canutama*, sp. nov., holotype ♂ (CHNUFPI 2215). A. Cucullus, anterior aspect. B. Anterior part of opisthosoma, dorsal aspect. C, E. Leg III distal segments, prolateral aspect (C) and closeup of copulatory apparatus (E). D. Leg III distal segments, retrolateral aspect. F. Pedipalp, prolateral aspect. Scale bars = 0.5 mm (A, B, F), 0.25 mm (C–E).

lateral depressions present near lateral margins, adjacent to coxae of legs II; dorsolateral translucent areas well defined, visible in lateral aspect but not in dorsal aspect, glabrous and planar, aligned with intersection between coxae of legs I and II.

*Cucullus*: Cucullus trapezoidal, wider than long (table 1); lateral margins diverging ventrally (fig. 4A); ventral margin predominantly linear in anterior aspect, slightly concave in ventral aspect.

*Chelicerae*: Movable finger longer than fixed finger, not widened; mucron sharp; tooth row comprising seven or eight small teeth. Fixed finger tooth row comprising two or three small to medium-sized teeth and one markedly larger distal tooth.

*Coxosternal region*: Tritosternum small, tuberculate, not abutting coxae of legs I (fig. 3B); coxae of legs II–IV abutting one another medially along entire length; coxae of legs II, anterior and posterior margins almost perpendicular to median axis, not forming angle medially; coxae of legs II–IV progressively decreasing in length (table 1); suture between coxae of legs III slightly shorter than sutures between coxae of legs II and IV.

*Opisthosoma*: Opisthosoma oval, longer than wide (fig. 3C, D, table 1), broadest at tergite XII. Median sclerites of tergites X and XI fused, lateral sclerites separated (fig. 4B); median sclerites of tergites XI–XIII each with paired, shallow submedian depressions, lateral margins converging posteriorly on XI, subparallel on XII and XIII; of tergites XI, XII and, to lesser extent, XIII, wider than long (table 1), of XI anteriorly with obscure pair of low, moundlike excrescences submedially; of tergite XIII, lateral margins sinuous, forming right angle with posterior margin, posterior corners slightly protruding laterally. Sternites XI–XIII each with paired submedian depressions similar to tergites (fig. 3D). Pygidium basal segment, posterior margin with shallow V-shaped notch dorsally, entire ventrally.

*Pedipalps*: Femur robust (table 1), dorsal surface convex. Tibia longer than femur (table 1), entirely linear (fig. 4F), slightly swollen proximally, rest of segment narrower in dorsal aspect and, to lesser extent, lateral aspect; elevated oval tubercles absent. Movable finger longer and more robust than fixed finger.

*Legs*: Leg II longest; I–IV similar in width, no segments swollen (table 1). Legs I–IV femora, dorsal and ventral surfaces each with moderate projection proximally, protecting articulation with trochanter. Legs without modifications except those associated with copulatory apparatus. Leg III metatarsus with moderate concavity dorsodistally; metatarsal process situated basally near tibia, tapering and curving retrolaterally, apex dorsoventrally compressed and truncate (fig. 4C, D); *lamina cyathiformis* approximately as deep as long, with rounded apex (fig. 4D).

*Copulatory apparatus*: Fixed and movable processes U-shaped. Fixed process crooked, weakly sclerotized, and flexible subbasally (figs. 4E, 17A), able to bend prolaterally (fig. 17A); ridges, basal swelling, or other modifications absent; apex pointed. Movable process similar in length to fixed process, narrowing distally; apex simple, entire.

FEMALE: Unknown.

DISTRIBUTION: *Cryptocellus canutama* is known only from the type locality, Canutama, in the state of Amazonas, Brazil (fig. 1).

TABLE 1

Measurements (mm) for *Cryptocellus canutama*, sp. nov., *C. islacolon*, sp. nov., *C. jamari*, sp. nov.,  
*C. leleupi* Cooreman, 1976, and *C. macagual*, sp. nov.

Material deposited in the Coleção de História Natural, Universidade Federal do Piauí (CHNUFPI), Floriano, Brazil; the Instituto de Ciencias Naturales (ICN), Universidad Nacional de Colombia, Bogotá; the Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" (MACN), Buenos Aires; and the Oxford University Museum of Natural History (OUMNH), U.K. Abbreviations: L, length; W, width; H, height.

Type/sex Collection	<i>C. canutama</i>	<i>C. islacolon</i>		<i>C. jamari</i>		<i>C. leleupi</i>	<i>C. macagual</i>
	Holotype ♂ CHNUFPI 2215	Holotype ♂ OUMNH 2010-028-001	Paratype ♀ OUMNH 2010-028-002	Holotype ♂ CHNUFPI 2221	Paratype ♀ CHNUFPI 3622	♀ MACN Ar 37274	Holotype ♂ ICN Ari 019
Total body L <sup>1</sup>	3.68	4.49	4.17	3.66	3.53	4.26	4.77
Cucullus L	0.77	0.84	0.86	0.88	0.77	0.84	0.90
Cucullus W <sup>2</sup>	1.01	1.01	0.95	1.10	1.05	1.03	1.38
Carapace L	1.53	1.74	1.59	1.53	1.44	1.72	1.89
Carapace W <sup>2</sup>	1.53	1.87	1.76	1.48	1.44	1.74	1.89
Opisthosoma L <sup>1</sup>	2.15	2.75	2.58	2.13	2.09	2.54	2.88
Opisthosoma W <sup>2</sup>	1.76	2.41	2.49	1.74	1.74	2.24	2.37
Median sclerite XI L	0.65	0.82	0.75	0.69	0.67	0.88	0.92
Median sclerite XI W <sup>2</sup>	1.05	1.46	1.59	1.14	1.16	1.38	1.38
Median sclerite XII L	0.65	0.71	0.65	0.65	0.65	0.62	0.75
Median sclerite XII W <sup>2</sup>	0.86	1.20	1.29	0.84	0.88	0.99	0.99
Median sclerite XIII L	0.69	0.86	0.86	0.60	0.65	0.71	0.92
Median sclerite XIII W <sup>2</sup>	0.84	1.12	1.05	0.77	0.80	0.88	0.92
Suture between coxae II L	0.15	0.28	0.24	0.17	0.15	0.13	0.17
Suture between coxae III L	0.14	0.15	0.13	0.14	0.13	0.13	0.32
Suture between coxae IV L	0.15	0.17	0.13	0.15	0.09	0.11	0.24
Pedipalp Femur L	0.75	0.90	0.90	0.73	0.71	0.86	0.84
Pedipalp Femur H <sup>3</sup>	0.32	0.45	0.43	0.32	0.29	0.39	0.39
Pedipalp Tibia L	1.16	1.33	1.33	1.14	1.10	1.29	1.29
Pedipalp Tibia H <sup>3</sup>	0.13	0.19	0.19	0.13	0.12	0.14	0.14
Leg I Coxa L	0.65	0.77	0.73	0.69	0.58	0.77	0.75
Leg I Trochanter L	0.39	0.49	0.47	0.39	0.34	0.43	0.62
Leg I Femur L	0.73	0.97	0.88	0.71	0.69	0.75	1.01
Leg I Femur W <sup>4</sup>	0.34	0.45	0.39	0.32	0.28	0.41	0.69
Leg I Femur H <sup>4</sup>	0.34	0.49	0.43	0.34	0.32	0.43	0.86
Leg I Patella L	0.62	0.75	0.67	0.58	0.54	0.71	0.92
Leg I Tibia L	0.54	0.73	0.65	0.52	0.45	0.67	0.90
Leg I Metatarsus L	0.86	1.12	1.03	0.86	0.80	0.99	1.14
Leg I Tarsus L	0.41	0.52	0.45	0.43	0.41	0.43	0.47
Leg II Coxa L	0.86	0.99	1.01	0.86	0.77	0.99	1.18
Leg II Trochanter L	0.49	0.71	0.69	0.52	0.45	0.62	0.67
Leg II Femur L	1.23	1.74	1.61	1.27	1.20	0.97	1.57
Leg II Femur W <sup>4</sup>	0.32	0.58	0.52	0.30	0.26	0.43	0.58
Leg II Femur H <sup>4</sup>	0.39	0.62	0.54	0.37	0.37	0.47	0.65
Leg II Patella L	0.75	1.16	1.08	0.75	0.69	0.82	1.18
Leg II Tibia L	0.82	1.35	1.20	0.86	0.75	0.60	1.23
Leg II Metatarsus L	1.14	1.78	1.61	1.12	1.05	1.42	1.70
Leg II Tarsus L	1.27	1.72	1.57	1.29	1.23	1.29	1.57
Leg III Coxa L	0.73	0.88	0.86	0.75	0.71	0.86	1.08
Leg III Trochanter 1 L	0.41	0.54	0.52	0.41	0.34	0.43	0.54

TABLE 1 *continued*

Type/sex Collection	<i>C. canutama</i>	<i>C. islacolon</i>		<i>C. jamari</i>		<i>C. leleupi</i>	<i>C. macagual</i>
	Holotype ♂ CHNUFPI 2215	Holotype ♂ OUMNH 2010-028-001	Paratype ♀ OUMNH 2010-028-002	Holotype ♂ CHNUFPI 2221	Paratype ♀ CHNUFPI 3622	♀ MACN Ar 37274	Holotype ♂ ICN Ari 019
Leg III Trochanter 2 L	0.41	0.60	0.54	0.45	0.39	0.45	0.65
Leg III Femur L	0.97	1.23	1.05	0.90	0.82	0.97	1.23
Leg III Femur W <sup>4</sup>	0.33	0.52	0.43	0.32	0.28	0.45	0.52
Leg III Femur H <sup>4</sup>	0.37	0.54	0.45	0.32	0.32	0.39	0.65
Leg III Patella L	0.67	0.86	0.80	0.62	0.56	0.77	0.95
Leg III Tibia L	0.56	0.73	0.62	0.56	0.47	0.60	0.95
Leg III Metatarsus L	0.82	0.99	0.99	0.82	0.71	0.95	1.23
Leg III Tarsus L	1.20	1.48	0.84	1.16	0.62	0.84	1.29
Leg IV Coxa L	0.71	0.86	0.86	0.69	0.69	0.82	0.86
Leg IV Trochanter 1 L	0.41	0.60	0.56	0.43	0.37	0.45	0.43
Leg IV Trochanter 2 L	0.39	0.56	0.56	0.39	0.37	0.47	0.54
Leg IV Femur L	0.95	1.29	1.18	0.92	0.86	1.08	1.57
Leg IV Femur W <sup>4</sup>	0.28	0.45	0.41	0.26	0.24	0.43	0.84
Leg IV Femur H <sup>4</sup>	0.37	0.52	0.43	0.34	0.32	0.47	1.18
Leg IV Patella L	0.60	0.86	0.82	0.58	0.56	0.77	1.01
Leg IV Tibia L	0.45	0.71	0.71	0.54	0.47	0.65	0.65
Leg IV Metatarsus L	0.77	1.14	1.03	0.75	0.71	0.97	1.08
Leg IV Tarsus L	0.75	1.03	0.90	0.75	0.67	0.84	0.97

<sup>1</sup> Excludes pygidium and cucullus.

<sup>2</sup> Maximum width.

<sup>3</sup> Maximum height.

<sup>4</sup> Midline.

**NATURAL HISTORY:** The type locality is a secondary unflooded rainforest ("terra firme"), with minimal disturbance, in the Brazilian Amazon. Specimens were extracted from among shells of the Brazil nut tree, *Bertholletia excelsa* Humb. and Bonpl. (Lecythidaceae) and dead leaves on the ground.

**ADDITIONAL MATERIAL EXAMINED:** **BRAZIL:** Amazonas: Canutama, near road BR-230, 07°30'41.5"S 63°23'28.3"W, 78 m, 22.x.2016, L.S. Carvalho, 1 deutonymph (CHNUFPI 2216).

### *Cryptocellus jamari*, sp. nov.

Figures 1, 2D–F, 5–8, 17B, 19A; table 1

**TYPE MATERIAL:** Holotype ♂ (CHNUFPI 2221), **BRAZIL:** Rondônia: Jamari, Floresta Nacional do Jamari, 09°11'32.7"S 63°06'32.3"W, 143 m, 23.x.2016, L.S. Carvalho. Paratypes: 1 ♀ (CHNUFPI 3622), 4 tritonymphs, 1 deutonymph (CHNUFPI 3623), tritonymph (CHNUFPI 2222), tritonymph (CHNUFPI 2223), same data as holotype.

**DIAGNOSIS:** *Cryptocellus jamari* resembles *C. adisi*, *C. canga*, *C. canutama*, and *C. tarsilae* in the presence of a moundlike excrescence posteromedially on the carapace (figs. 5A, 6A, 7A). *Cryptocellus jamari* most closely resembles *C. canutama* in the fusion



FIGURE 5. *Cryptocellus jamari*, sp. nov., holotype ♂ (CHNUFPI 2221). A. Carapace, dorsal aspect. B. Coxosternal region, ventral aspect. C, D. Opisthosoma, dorsal (C) and ventral (D) aspects. Scale bars = 0.5 mm.

of the median sclerites of tergites X and XI (figs. 5C, 6C, 7C), a character unique to the two species, and in the presence of a pair of submedian moundlike excrescences on the median sclerite of tergite XI of the male (figs. 5C, 7A), a character also observed in both sexes of *C. adisi*. The male of *C. jamari* can be distinguished from that of *C. canutama* by the moundlike excrescences of tergite XI, which are well developed, only slightly smaller than the posteromedian excrescence of the carapace, in *C. jamari* (fig. 7A), but smaller and less prominent than the posteromedian excrescence, in *C. canutama*. Additionally, the fixed process of the male copulatory apparatus of *C. jamari* is almost

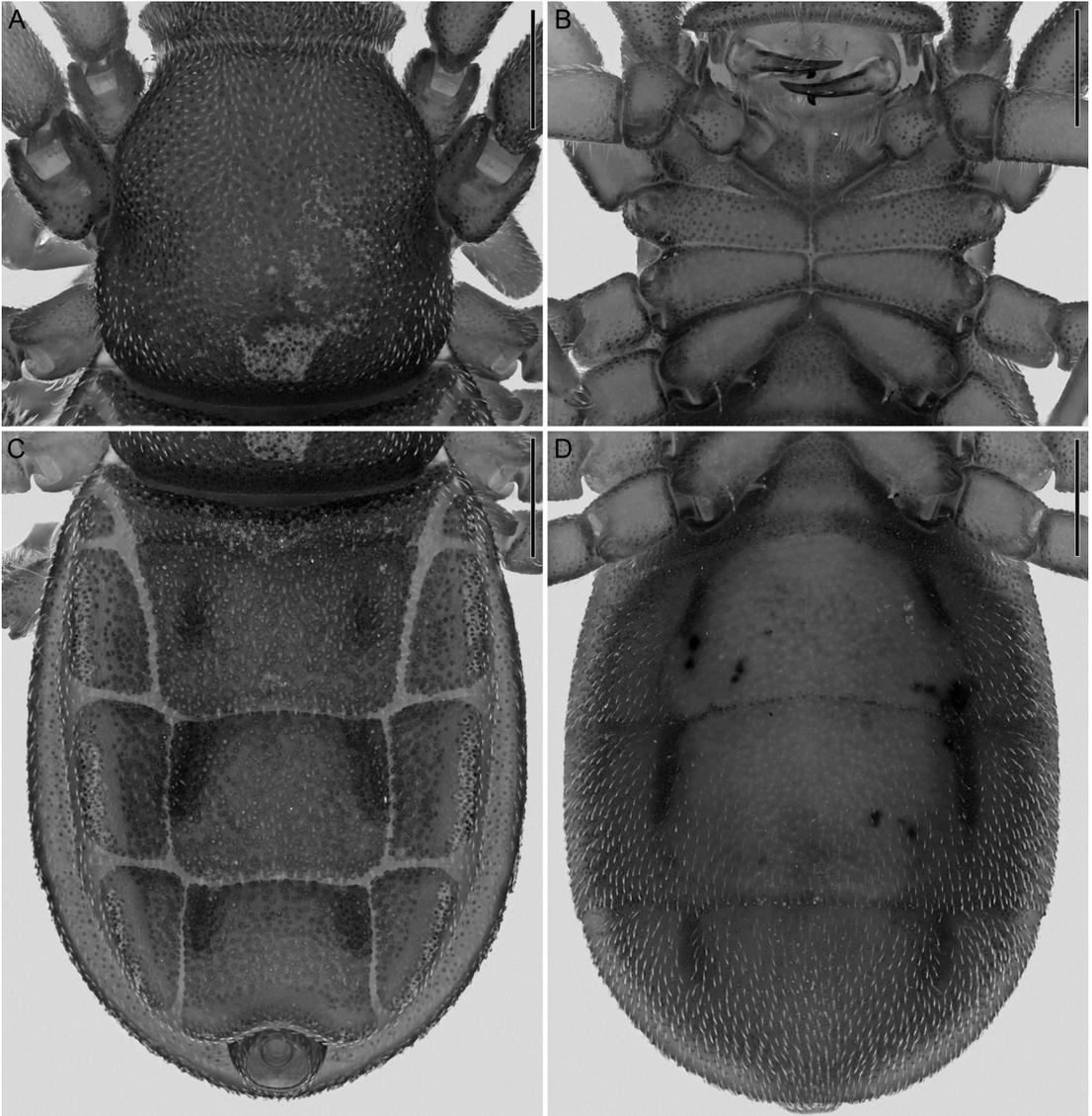


FIGURE 6. *Cryptocellus jamari*, sp. nov., paratype ♀ (CHNUFPI 3622). A. Carapace, dorsal aspect. B. Coxosternal region, ventral aspect. C, D. Opisthosoma, dorsal (C) and ventral (D) aspects. Scale bars = 0.5 mm.

straight, heavily sclerotized, and inflexible subbasally (figs. 8C, 17B), with a distinct ventral swelling basally (fig. 17B) whereas the copulatory apparatus of *C. canutama* is crooked, weakly sclerotized, and flexible subbasally, able to bend prolaterally, and unmodified basally.

**ETYMOLOGY:** The specific epithet is a noun in apposition taken from the type locality, Floresta Nacional do Jamari, in Rondônia, Brazil.

**DESCRIPTION OF MALE:** Based on the holotype (CHNUFPI 2221).

**Measurements:** Total length, 3.66 mm (table 1).

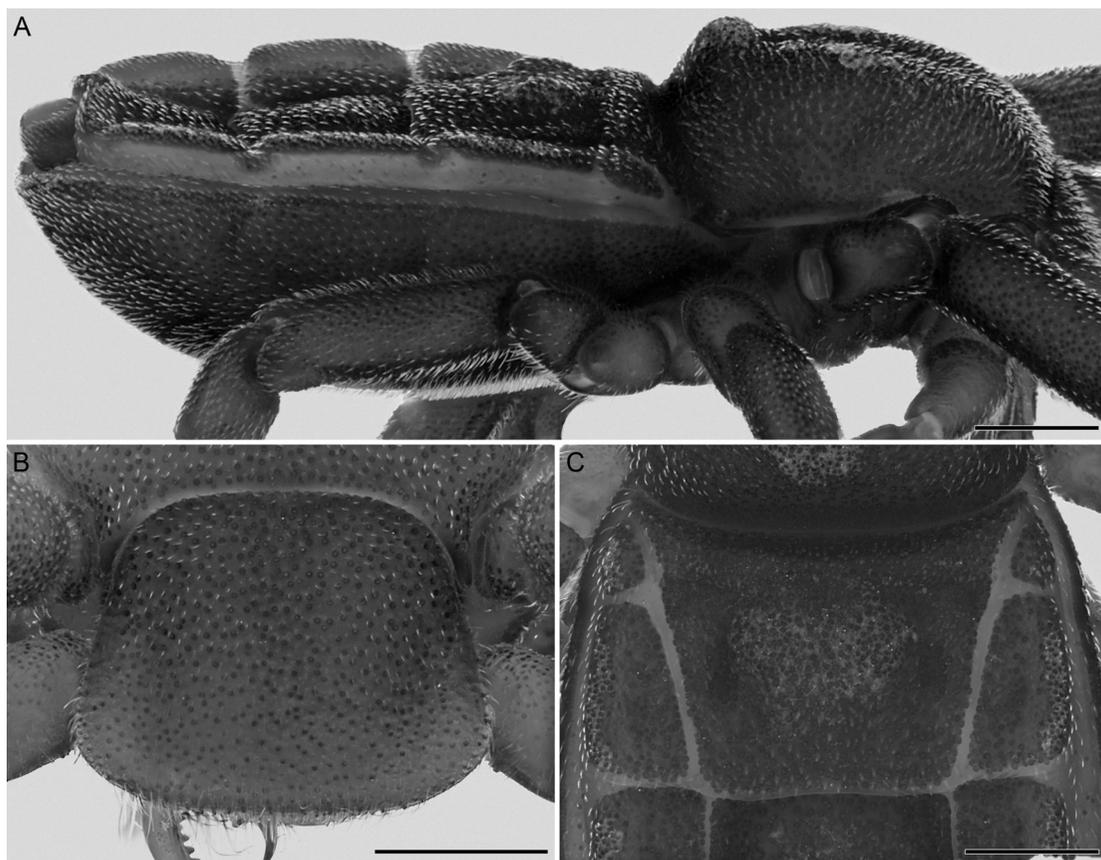


FIGURE 7. *Cryptocellus jamari*, sp. nov., holotype ♂ (CHNUFPI 2221). A. Soma, lateral aspect. B. Cucullus, anterior aspect. C. Anterior part of opisthosoma, dorsal aspect. Scale bars = 0.5 mm.

**Coloration:** Soma and appendages dark red; coxosternal region and pedipalps slightly paler. Carapace dorsolateral translucent areas yellow. Cheliceral manus yellow; fingers and finger dentition reddish.

**Setation:** Soma and appendages covered with short, translucent, bristlelike setae, slightly expanded on most surfaces (e.g., figs. 6A, C, 7A) but fine, hairlike on coxosternal region, pedipalps, ventral half of cucullus, ventromedial surface of opisthosoma, and leg tarsi (figs. 5B, D, 6B, 7B, 8D).

**Tegument surface macrosculpture:** Tegument without cuticular pits. Carapace entirely and densely covered with conspicuous, round, iridescent granules (fig. 5A). Cucullus, coxosternal region, and legs with granulation similar to carapace, except for small, smooth area subdistally on coxae of legs III, and predominantly smooth coxae of legs IV (figs. 5B, 7B, 8A, B). Opisthosoma dorsal surface with granulation similar to carapace, except along outer border of opisthosoma, along which dorsal sclerites are predominantly smooth (fig. 5C); ventral surface sparsely granular (fig. 5D); lateral membranes granular. Pedipalp trochanter 1, trochanter 2, and retrolateral surface of proximal part of femur densely granular; femur dorsal, prolateral, and ventral surfaces predominantly smooth (fig. 8D); tibia entirely smooth.

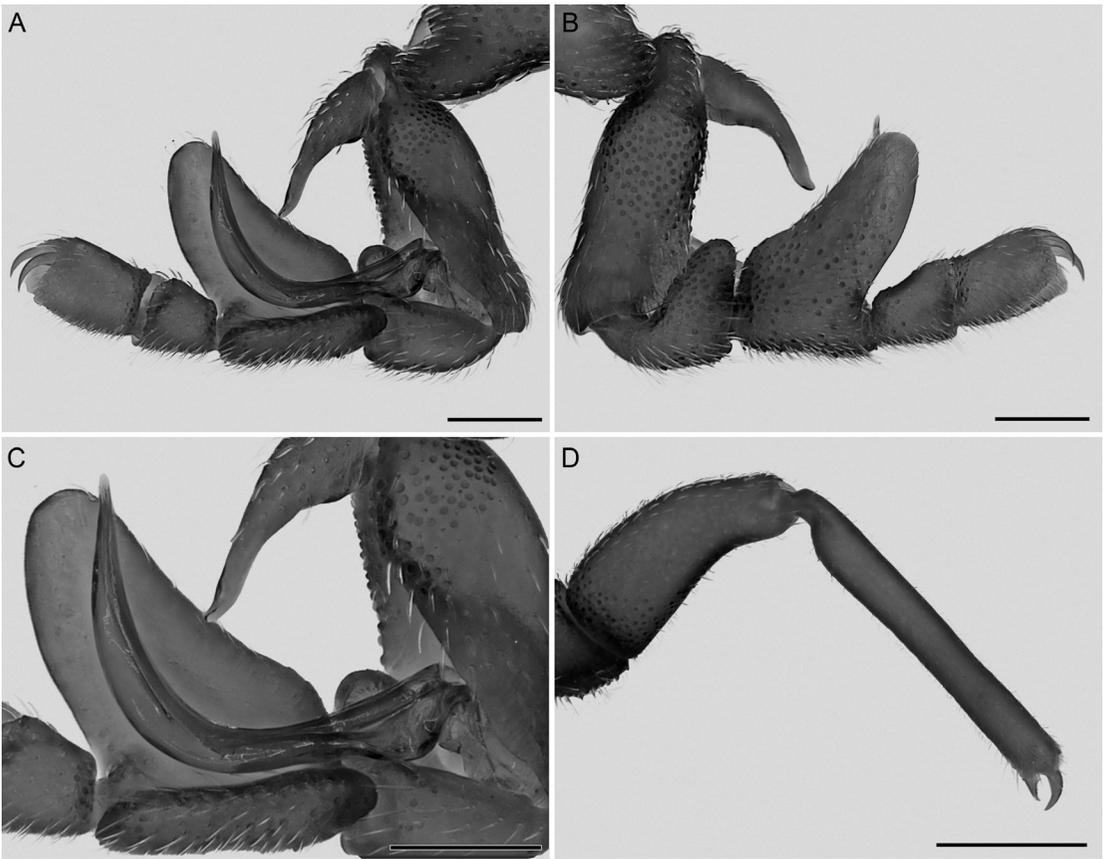


FIGURE 8. *Cryptocellus jamari*, sp. nov., holotype ♂ (CHNUFPI 2221). **A**, **C**. Leg III distal segments, prolateral aspect (**A**) and closeup of copulatory apparatus (**C**). **B**. Leg III distal segments, retrolateral aspect. **D**. Pedipalp, prolateral aspect. Scale bars = 0.25 mm (**A–C**), 0.5 mm (**D**).

**Carapace:** Carapace trapezoidal, approximately as long as wide (table 1), broadest between coxae of legs II and III; lateral margins curved, converging anteriorly (fig. 5A); anterior margin linear in dorsal aspect, sublinear in frontal aspect; posterior margin procurved; median longitudinal sulcus shallow, partial, terminating at base of posteromedian moundlike excrescence (fig. 7A); paired lateral depressions present near lateral margins, adjacent to coxae of legs II; dorsolateral translucent areas well defined, visible in lateral aspect but not dorsal aspect, glabrous and planar, aligned with intersection between coxae of legs I and II.

**Cucullus:** Cucullus trapezoidal, wider than long (table 1); lateral margins diverging ventrally (fig. 7B); ventral margin predominantly linear in anterior aspect, shallowly concave in ventral aspect.

**Chelicerae:** Movable finger longer than fixed finger, not widened; mucron sharp; tooth row comprising seven or eight small teeth. Fixed finger tooth row comprising two or three small to medium-sized sharp teeth and one markedly larger distal tooth.

**Coxosternal region:** Tritosternum small, tuberculate, not abutting coxae of legs I (fig. 5B); coxae of legs II–IV abutting one another medially along entire length; coxae of legs II, anterior

and posterior margins almost perpendicular to median axis, not forming angle medially; coxae of legs II–IV progressively decreasing in length (table 1); suture between coxae of legs II slightly longer than sutures between coxae of legs III and IV.

*Opisthosoma*: Opisthosoma oval, longer than wide (fig. 5C, D, table 1), broadest at tergite XII. Median sclerites of tergites X and XI fused, lateral sclerites separated (fig. 7C); median sclerites of tergites XI–XIII each with paired, shallow submedian depressions, lateral margins converging posteriorly on XI, subparallel on XII and XIII; of tergites XI, XII and, to lesser extent, XIII, wider than long (table 1); of XI anteriorly with pair of moundlike excrescences submedially (fig. 7A), similar to but slightly smaller than carapacial excrescence; of tergite XIII, lateral margins sinuous, forming approximately right angle with posterior margin, rear corners slightly protruding laterally. Sternites XI–XIII each with paired submedian depressions similar to tergites (fig. 5D). Pygidium basal segment, posterior margin shallowly emarginate dorsally, entire ventrally.

*Pedipalps*: Femur robust (table 1), dorsal surface convex. Tibia longer than femur (table 1), entirely linear (fig. 8D), slightly swollen proximally, rest of segment narrower in dorsal aspect and, to lesser extent, lateral aspect; elevated oval tubercles absent. Movable finger longer and more robust than fixed finger.

*Legs*: Leg II longest; I–IV similar in width, no segments swollen (table 1). Legs I–IV femora, dorsal and ventral surfaces each with moderate projection proximally, protecting articulation with trochanter. Legs without modifications except those associated with copulatory apparatus. Leg III metatarsus with moderate concavity dorsodistally; metatarsal process situated basally near tibia, tapering and curving retrolaterally, apex rounded and dorsoventrally compressed (fig. 8A, B); *lamina cyathiformis* approximately as deep as long, with rounded apex (fig. 8B).

*Copulatory apparatus*: Fixed and movable processes U-shaped. Fixed process almost straight, heavily sclerotized, and inflexible subbasally (figs. 8C, 17B), with distinct ventral swelling basally (fig. 17B); ridges or other modifications absent; apex pointed. Movable process similar in length to fixed process, narrowing distally; apex simple, entire.

SUPPLEMENTARY DESCRIPTION OF FEMALE: Based on the paratype (CHNUFPI 3622). Resembles male except as noted.

*Measurements*: Total length, 3.53 mm (table 1).

*Tegument surface macrosculpture*: Coxae of legs I and II granular, of legs III predominantly smooth, of legs IV entirely smooth (fig. 6B).

*Coxosternal region*: Suture between coxae of legs IV shorter than sutures between coxae of legs II and III (fig. 6B, table 1).

*Opisthosoma*: Median sclerites of tergites X and XI fused, as in male. Tergite XI median sclerite without moundlike excrescences (fig. 6C). Lateral margins of median sclerites converging posteriorly on tergite XI, subparallel on XII and XIII.

*Pedipalps*: Trochanter 1, trochanter 2, and femur slightly less granular than in male. Tibia more distinctly swollen proximally; swelling evident in both dorsal and lateral aspects.

*Spermathecae*: Spermathecae moderately sclerotized, subspherical, approximately as deep as wide (fig. 19A); narrowly adjacent; internal cavity ample, simple, sinistral and dextral sper-

mathecae symmetric. Posterior genital lip flat dome shaped (fig. 19A), markedly wider than deep, with one ventromedian macroseta on posterior surface; anterior genital lip missing.

**DISTRIBUTION:** *Cryptocellus jamari* is known only from the type locality, Floresta Nacional do Jamari, in the state of Rondônia, Brazil (fig. 1).

**NATURAL HISTORY:** The type locality is a secondary forest with minimal disturbance in a sustainable-use conservation area. Specimens were found under a rotten tree trunk (Arecaceae).

***Cryptocellus islacolon*, sp. nov.**

Figures 1, 9–11, 17C, 18A–D, 19B; table 1

**TYPE MATERIAL:** Holotype ♂ (OUMNH 2010-028-001), **PANAMA:** *Bocas del Toro:* Isla Colón [09°24'N 82°16'W], 24.i–7.iii.2010, M. Sears and R. Wallace, under rotten wood. Paratypes: 15 ♂ (OUMNH 2010-028-003 to 017), 13 ♀ (OUMNH 2010-028-018–030), 1 ♀ (OUMNH 2010-028-002), same data as holotype.

**DIAGNOSIS:** *Cryptocellus islacolon* most closely resembles *C. goodnighti* in the apically bilobate fixed process of the male copulatory apparatus. The fixed process is moderately bilobate (fig. 18B–D), with the retrolateral apical lobe noticeably smaller than the prolateral apical lobe (fig. 18C, D), in *C. islacolon*, but markedly bilobate (fig. 18E–H), with the retrolateral lobe larger than the prolateral apical lobe (fig. 18E, G, H), in *C. goodnighti*. Additionally, the fixed process bears a round knob subdistally on the prolateral surface in *C. islacolon* (figs. 11E, 18A, D), which is absent in *C. goodnighti* (fig. 18E, H).

**ETYMOLOGY:** The specific epithet is a noun in apposition taken from the type locality, Isla Colón, in Bocas del Toro, Panama.

**DESCRIPTION OF MALE:** Based on the holotype (OUMNH 2010-028-001).

**Measurements:** Total length, 4.49 mm (table 1).

**Coloration:** Soma and appendages dark red; pedipalps slightly paler. Carapace dorsolateral translucent areas yellowish. Cheliceral manus yellow; fingers and finger dentition reddish.

**Setation:** Soma and appendages covered with short and medium-sized, translucent, bristle-like setae (figs. 9, 11).

**Tegument surface macrosculpture:** Tegument without cuticular pits. Carapace and cucullus smooth (figs. 9A, 11A). Coxosternal region predominantly smooth, with fine granulation restricted to anterior and posterior margins of coxae (fig. 9B). Opisthosoma dorsal surface, ventral surface, and pleural membranes smooth (fig. 9C, D). Pedipalp femur predominantly smooth, ventral surface with few subspiniform granules proximally, retrolateral surface finely and densely granular proximally (fig. 11B, C); tibia entirely smooth (fig. 11D). Legs predominantly smooth, with scattered granules on tibiae, metatarsi, and tarsi.

**Carapace:** Carapace subtriangular, wider than long (table 1), broadest between coxae of legs II and III; lateral margins markedly curved, converging anteriorly (fig. 9A); anterior margin linear in dorsal aspect, sublinear in frontal aspect; posterior margin procurved; median longitudinal sulcus shallow, partial; paired lateral depressions present near lateral margins, adjacent to coxae of legs II; dorsolateral translucent areas very large, visible in dorsal and lateral

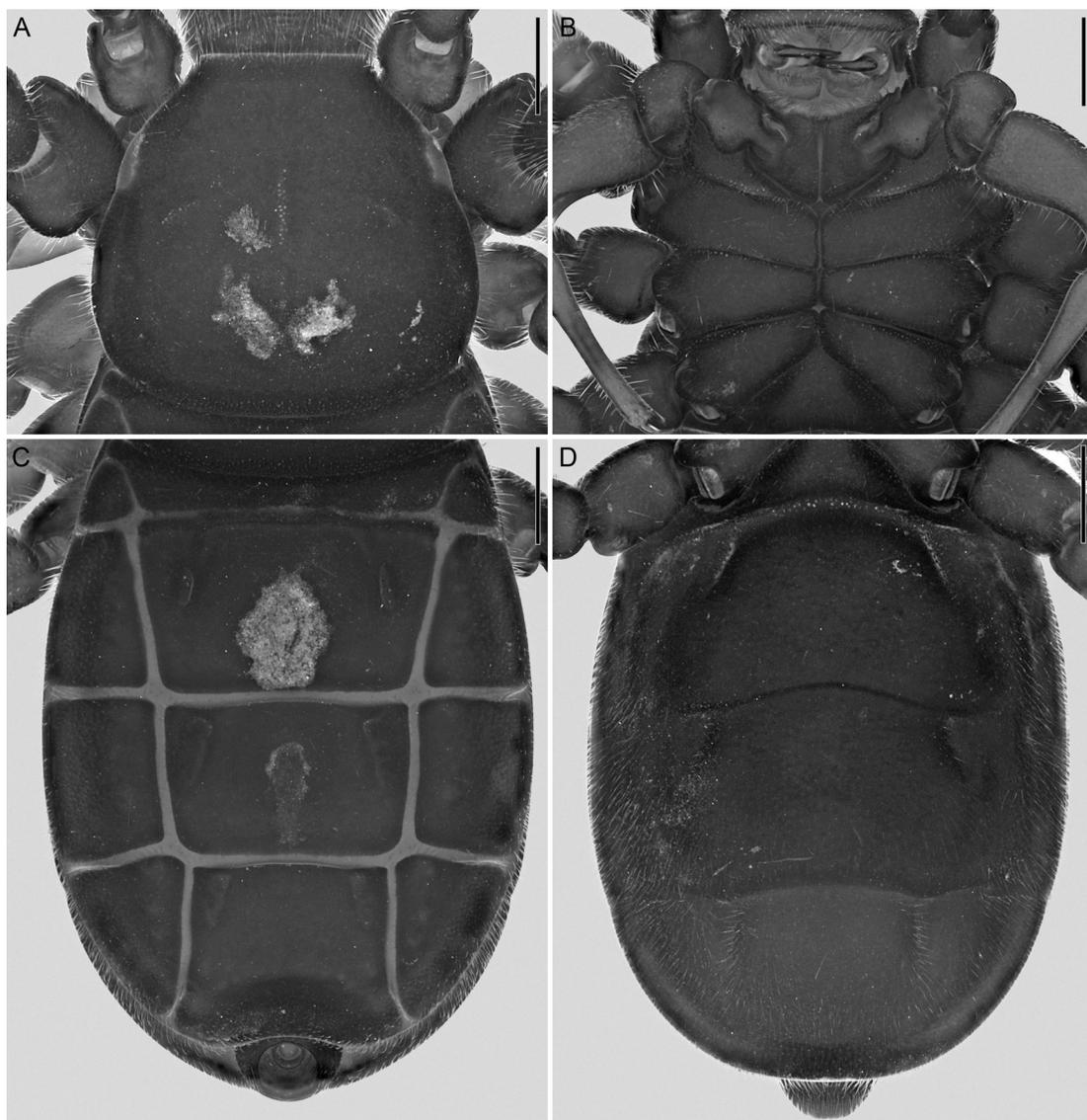


FIGURE 9. *Cryptocellus islacolon*, sp. nov., holotype ♂ (OUMNH 2010-028-001). **A.** Carapace, dorsal aspect. **B.** Coxosternal region, ventral aspect. **C, D.** Opisthosoma, dorsal (C) and ventral (D) aspects. Scale bars = 0.5 mm.

aspects, distinctly convex and entirely smooth, aligned with intersection between coxae of legs I and II.

*Cucullus*: Cucullus trapezoidal, slightly wider than long (table 1); lateral margins diverging slightly ventrally (fig. 11A); ventral margin predominantly linear in anterior aspect, with shallow median concavity in ventral aspect.

*Chelicerae*: Movable finger longer than fixed finger, not widened; mucron sharp; tooth row comprising 10 or 11 small teeth. Fixed finger tooth row comprising four small to medium-sized teeth and one markedly larger distal tooth.

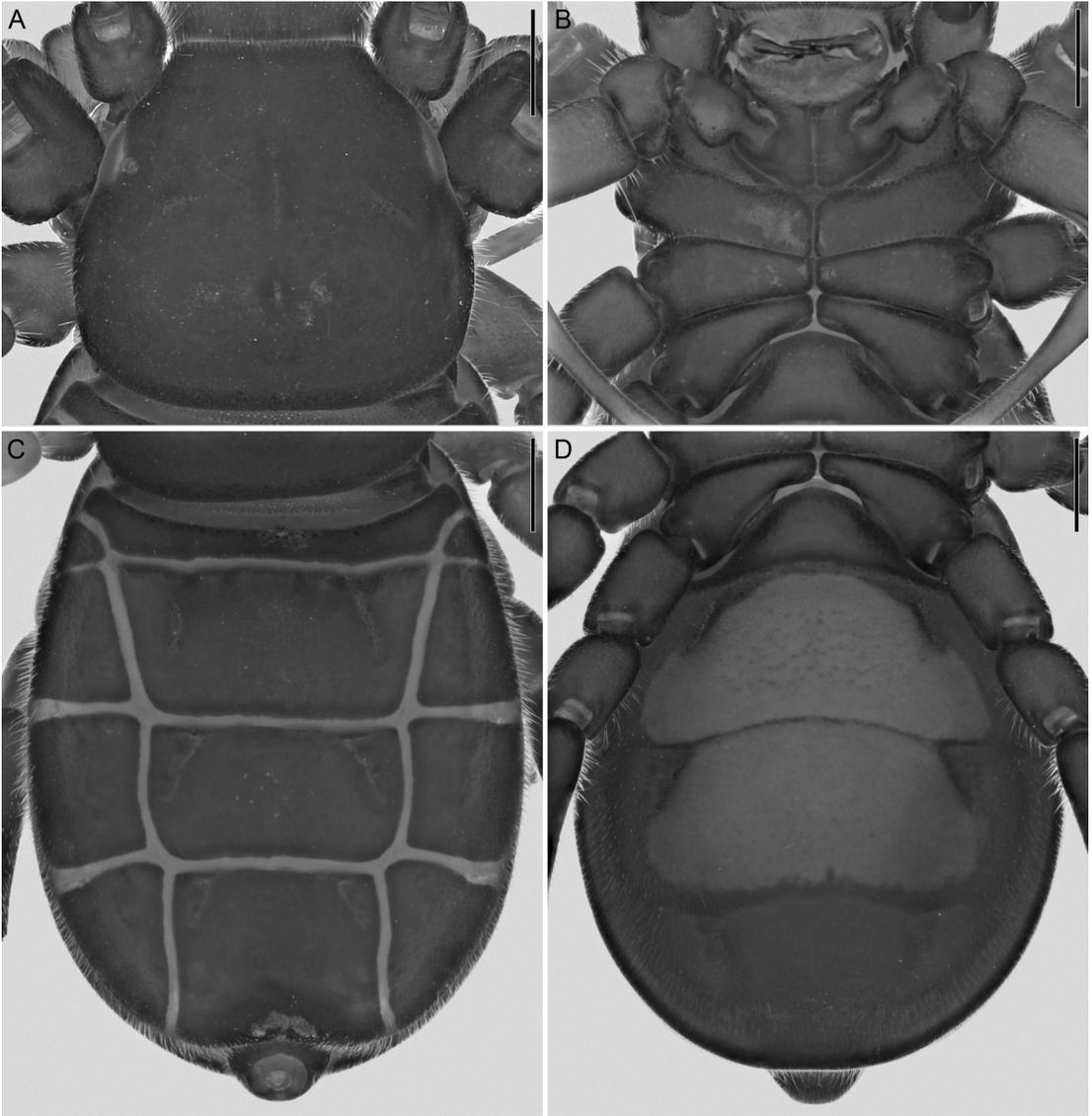


FIGURE 10. *Cryptocellus islacolon*, sp. nov., paratype ♀ (OUMNH 2010-028-002). A. Carapace, dorsal aspect. B. Coxosternal region, ventral aspect. C, D. Opisthosoma, dorsal (C) and ventral (D) aspects. Scale bars = 0.5 mm.

*Coxosternal region*: Tritosternum small, tuberculate, not abutting coxae of legs I (fig. 9B); coxae of legs II–IV abutting one another medially along entire length; coxae of legs II, anterior and posterior margins not perpendicular to median axis, posterior margin forming obtuse angle medially; coxae of legs II–IV progressively decreasing in length (table 1); suture between coxae of legs II longer than sutures between coxae of legs III and IV.

*Opisthosoma*: Opisthosoma oval, longer than wide (fig. 9C, D, table 1), broadest at tergite XII. Median sclerites of tergites XI–XIII each with paired, shallow submedian depressions, lateral margins converging posteriorly on XI and, to lesser extent, XII, subparallel on XIII; of

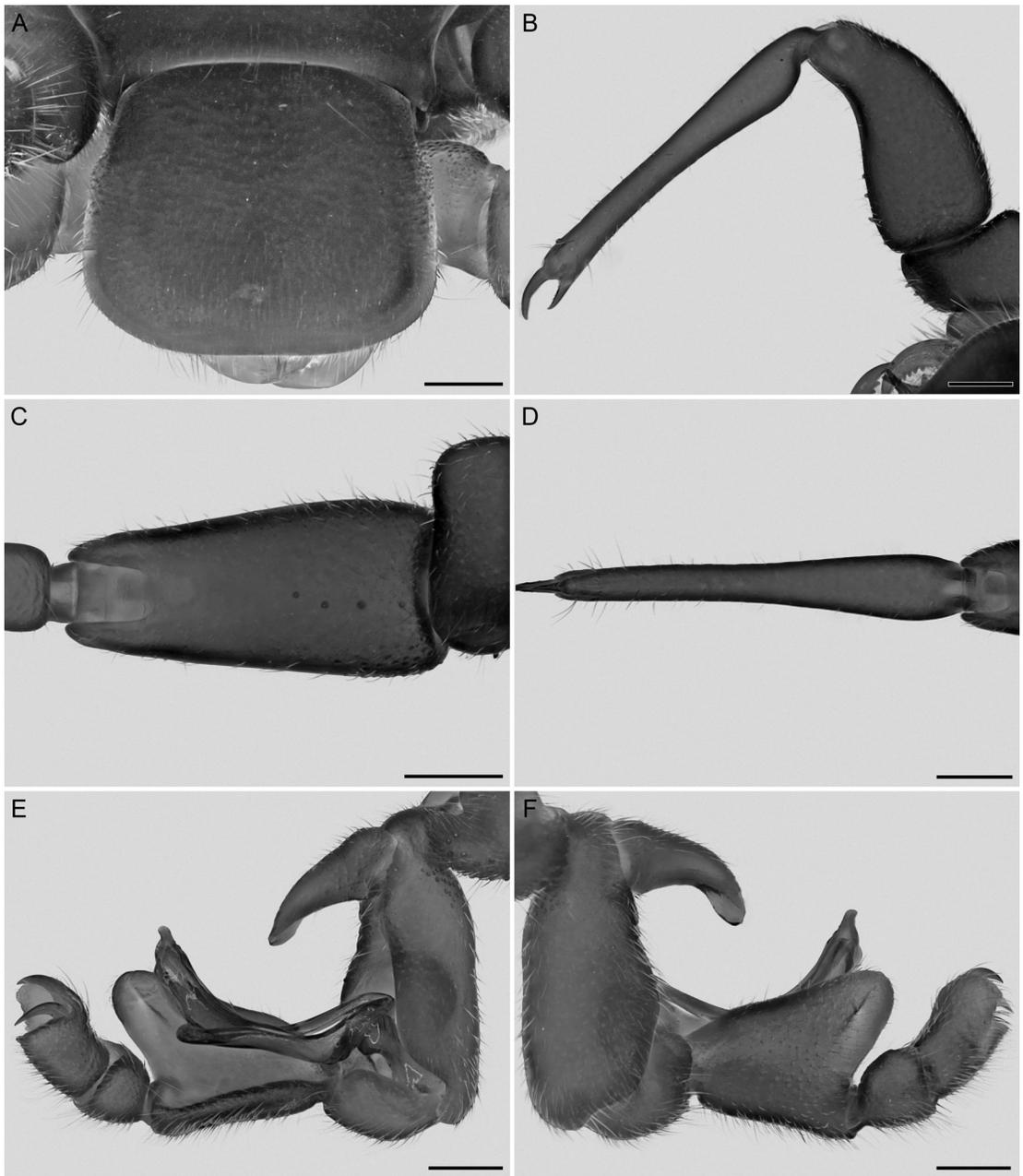


FIGURE 11. *Cryptocellus islacolon*, sp. nov., holotype ♂ (OUMNH 2010-028-001). A. Cucullus, anterior aspect. B–D. Dextral pedipalp, prolateral aspect (B), femur, ventral aspect (C), and tibia, ventral aspect (D). E, F. Leg III distal segments, prolateral (E) and retrolateral (F) aspects. Scale bars = 0.25 mm.

tergites XI–XIII wider than long (table 1); of tergite XIII, lateral margins forming right angle with posterior margin, posterior corners protruding laterally. Sternites XI–XIII each with paired submedian depressions similar to tergites (fig. 9D). Pygidium basal segment, posterior margin shallowly emarginate dorsally, entire ventrally.

*Pedipalps*: Femur robust (table 1), dorsal surface convex. Tibia longer than femur (table 1), entirely linear (fig. 11B), markedly swollen proximally, rest of segment noticeably narrower (fig. 11D); elevated oval tubercles absent. Movable finger longer and more robust than fixed finger.

*Legs*: Leg II longest; I–IV similar in width, no segments swollen (table 1). Legs without modifications except those associated with copulatory apparatus. Leg III metatarsus moderately concave dorsodistally; metatarsal process situated basally near tibia, tapering and curving retrolaterally, apex acute and dorsoventrally compressed (fig. 11E, F); *lamina cyathiformis* longer than deep, with rounded apex (fig. 11F).

*Copulatory apparatus*: Fixed process robust; proximal two thirds of ventral surface predominantly linear in lateral aspect (figs. 11E, 17C); basal part distinctly bent, ventral margin markedly curved in lateral aspect (fig. 18A); proventral submedian ledge well developed, semi-circular in dorsal aspect (fig. 18B); distal part broad in ventral aspect (fig. 18D); apex moderately bilobate, retrolateral lobe smaller than prolateral lobe (fig. 18B–D); prolateral surface with rounded knob subdistally (fig. 18A, D). Movable process similar in length to fixed process, narrowing distally; apex simple, entire.

**SUPPLEMENTARY DESCRIPTION OF FEMALE**: Based on the paratype (OUMNH 2010-028-002). Resembles male except as noted.

*Measurements*: Total length, 4.17 mm (table 1).

*Coloration*: Predominantly intense red, paler than male.

*Coxosternal region*: Suture between coxae of legs II  $2\times$  length of sutures between coxae of legs III and IV (fig. 10B, table 1).

*Opisthosoma*: Opisthosoma more rounded than in male (fig. 10C, D). Lateral margins of median sclerites converging posteriorly on tergite XI and, to lesser extent, XII, subparallel on XIII.

*Pedipalps*: Femur ventral surface smooth, without subspiniform granules (fig. 10B).

*Spermathecae*: Spermathecae heavily sclerotized, approximately as deep as wide (fig. 19B); adjacent but separated; internal cavity convoluted, pattern of convolution bilaterally symmetrical. Anterior genital lip subtriangular; posterior genital lip subtrapezoidal, wider than deep (fig. 19B).

**DISTRIBUTION**: *Cryptocellus islacolon* is known only from the type locality, Isla Colón, in the province of Bocas del Toro, Panama (fig. 1).

### *Cryptocellus macagual*, sp. nov.

Figures 1, 12–14, 17D; table 1

**TYPE MATERIAL**: Holotype ♂ (ICN Ari 019), **COLOMBIA**: *Caquetá*: Florencia, Centro de Investigaciones Amazónicas Macagual (CIMAZ), 01°30'5.364"N 75°39'46.26"W, 250 m, 27.iii–5.iv.2017, E. Flórez and students, pitfall trap.

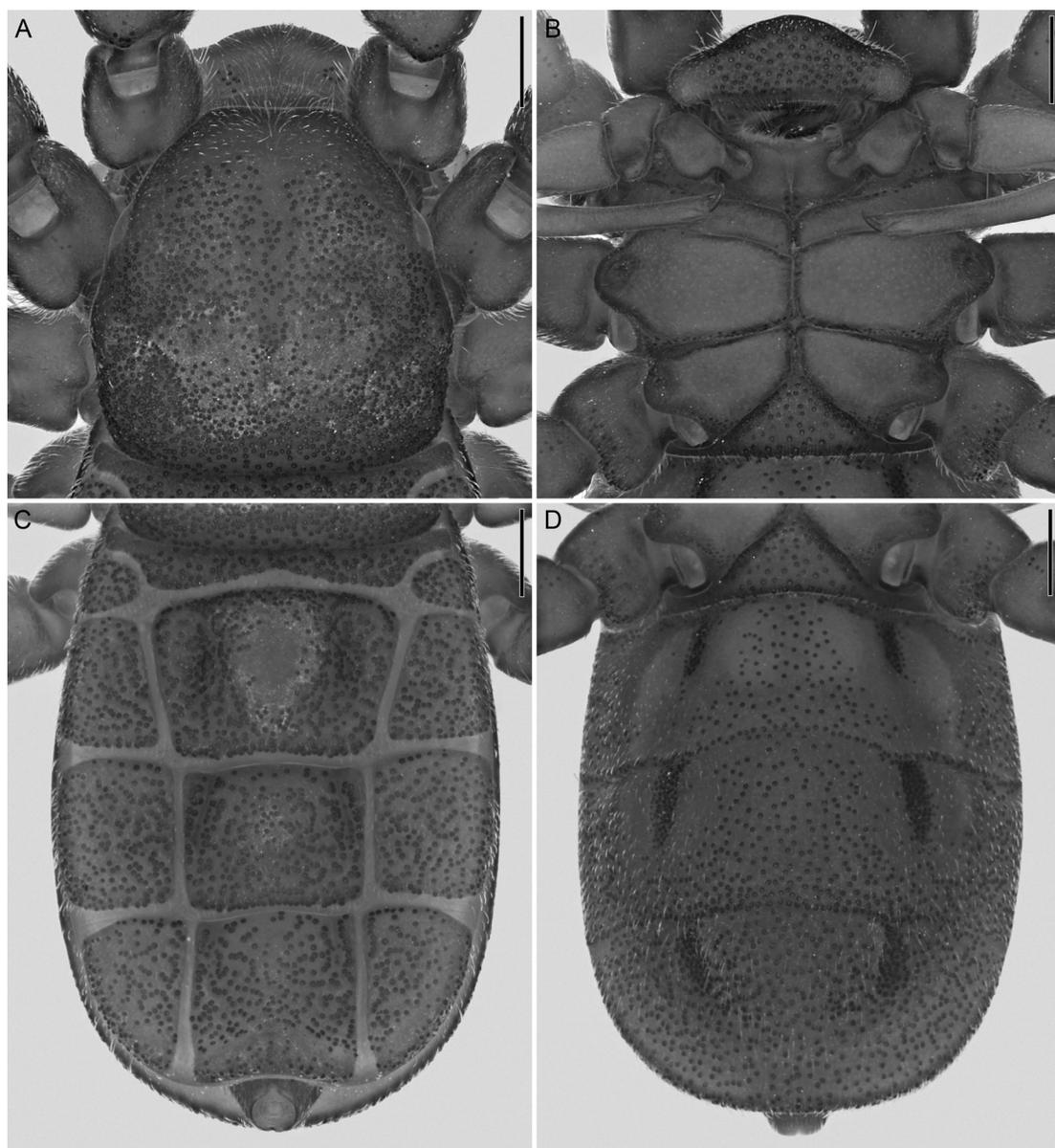


FIGURE 12. *Cryptocellus macagual*, sp. nov., holotype ♂ (ICN Ari 019). **A.** Carapace and cucullus, dorsal aspect. **B.** Coxosternal region and cucullus, ventral aspect. **C, D.** Opisthosoma, dorsal (**C**) and ventral (**D**) aspects. Scale bars = 0.5 mm.

**DIAGNOSIS:** *Cryptocellus macagual* most closely resembles *C. chiruisla*, *C. guaviarensis*, and *C. leleupi*. The four species share several characters of the male, including a pronounced median elevation (fig. 12A, B) and a distinct, granular, triangular surface (figs. 12B, 13A) of the cucullus, a wide movable finger of the chelicera (fig. 13A), a well-developed distal expansion proventrally on the tibia of leg I (fig. 13C), a tuft of long setae ventrodistally on the metatarsus of leg III (figs. 14E, F, 17D), and a robust femur of leg IV and, to lesser extent, legs I and III (fig.

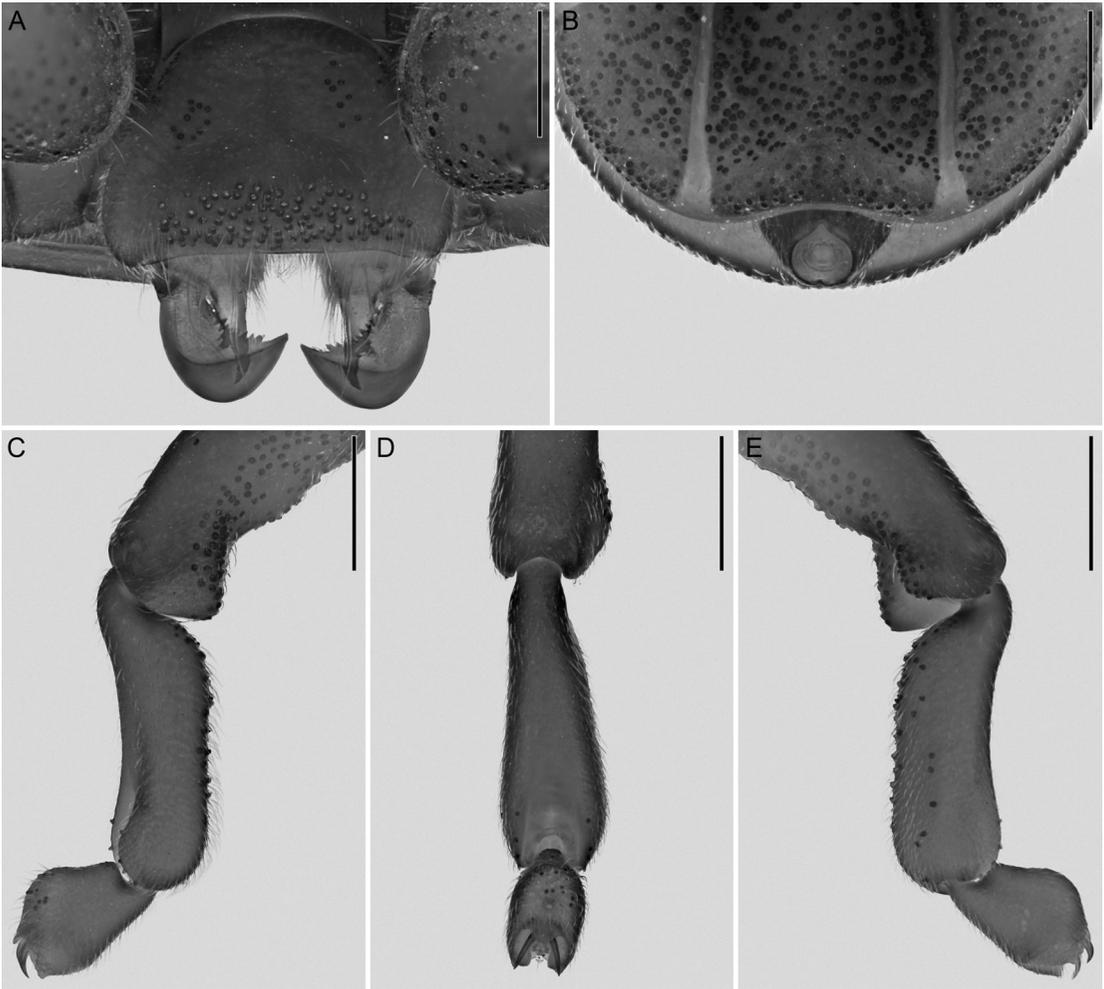


FIGURE 13. *Cryptocellus macagual*, sp. nov., holotype ♂ (ICN Ari 019). **A.** Cucullus and chelicerae, anterior aspect. **B.** Posterior end of opisthosoma, dorsal aspect. **C–E.** Leg I distal segments, prolatateral (**C**), dorsal (**D**), and retroventral (**E**) aspects. Scale bars = 0.5 mm.

14A–D, table 1). The male of *C. macagual* differs from the males of *C. chiruisla*, *C. guaviarensis*, and *C. leleupi* in the ventrolateral margins of the cucullus projecting beyond the ventral margin in anterior aspect (fig. 13A), a character not observed in the other species. Additionally, the tibia of leg I bears a distinct retroventral longitudinal carina (fig. 13C, E) and lacks a ventral notch in *C. macagual*, whereas the tibia of leg I bears a pronounced ventral notch but no retroventral longitudinal carina in *C. chiruisla*, *C. guaviarensis*, and *C. leleupi*. Finally, the prolatateral and ventral surfaces of the metatarsus of leg I are unmodified in *C. macagual* (fig. 13C–E), whereas the prolatateral surface is compressed, and the ventral surface distinctly expanded distally, in the other species.

**ETYMOLOGY:** The specific epithet is a noun in apposition taken from the type locality, the Centro de Investigaciones Amazónicas Macagual, in Caquetá, Colombia.

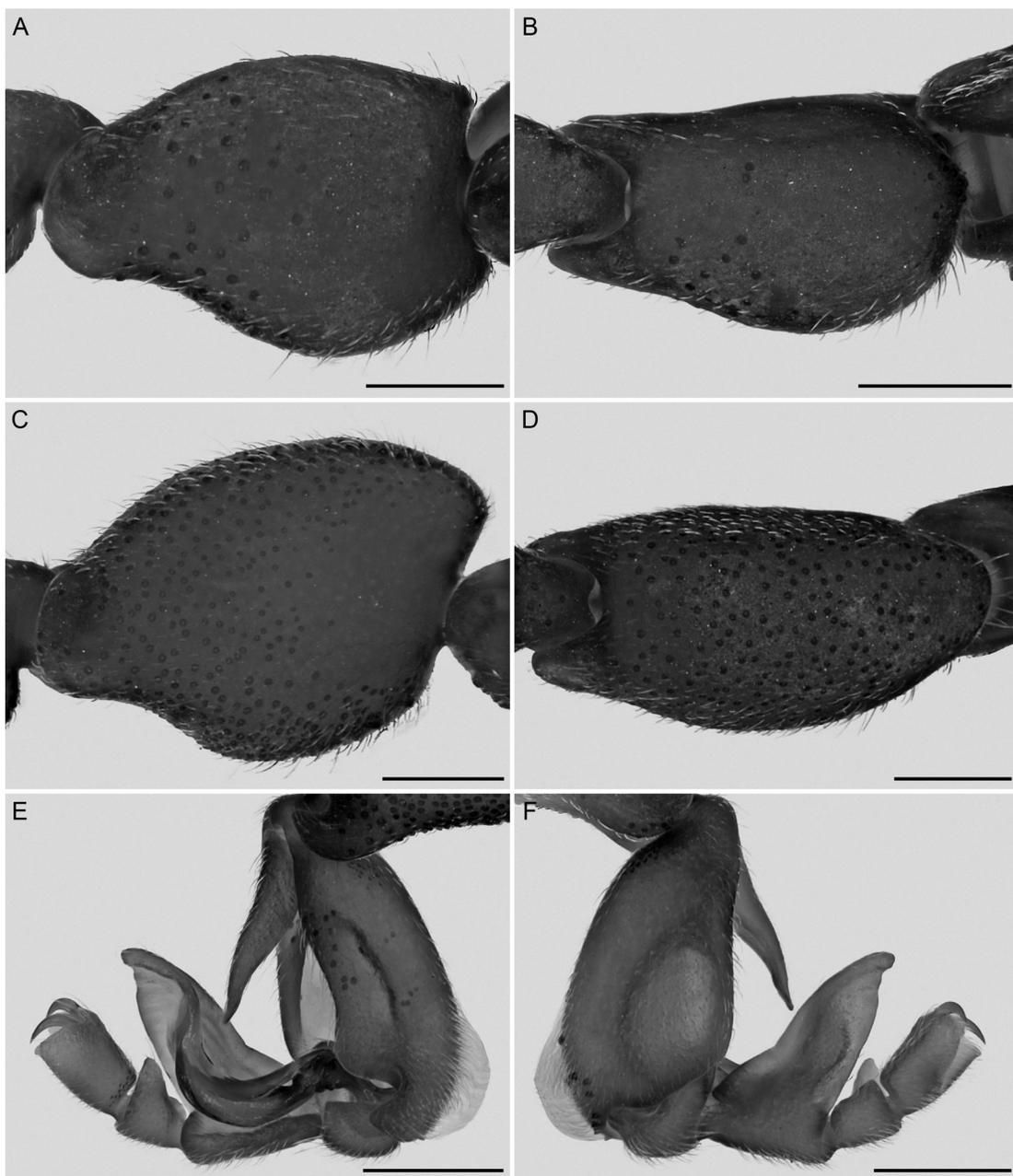


FIGURE 14. *Cryptocellus macagual*, sp. nov., holotype ♂ (ICN Ari 019). **A, B.** Leg I femur, prolateral (**A**) and dorsal (**B**) aspects. **C, D.** Leg IV femur, retrolateral (**C**) and dorsal (**D**) aspects. **E, F.** Leg III distal segments, prolateral (**E**) and retrolateral (**F**) aspects. Scale bars = 0.5 mm.

DESCRIPTION OF MALE: Based on the holotype (ICN Ari 019).

*Measurements:* Total length, 4.77 mm (table 1).

*Coloration:* Soma and appendages predominantly dark red; coxosternal region and legs II–IV metatarsus and tarsus reddish orange; pedipalps and legs I metatarsus and tarsus yellow. Carapace dorsolateral translucent areas yellow. Cheliceral manus yellow; fingers and finger dentition slightly reddish.

*Setation:* Soma and appendages covered with fine, translucent, bristlelike setae (figs. 12, 13, 14); setae on pedipalps shorter than elsewhere.

*Tegument surface macrosculpture:* Tegument without cuticular pits. Carapace densely covered with conspicuous, round, iridescent granules, smooth anteriorly (fig. 12A). Cucullus with flat, coarsely granular triangular surface ventrally (figs. 12B, 13A), two small granular surfaces on either side, remaining surface smooth. Coxosternal region predominantly smooth, intercoxal margins finely granular (fig. 12B). Opisthosoma, dorsal and ventral surfaces with granulation similar to carapace, except on raised surface of tergite XI which is smooth (fig. 12C, D). Pedipalp predominantly smooth (fig. 12B), retrolateral surfaces of trochanter 1, trochanter 2, and base of femur finely and sparsely granular. Legs with granulation similar to carapace (figs. 13C–E, 14).

*Carapace:* Carapace trapezoidal, as long as wide (table 1), broadest between coxae of legs II and III; lateral margins curved, converging anteriorly (fig. 12A); anterior margin linear in dorsal aspect, procurved in frontal aspect; posterior margin procurved; median longitudinal sulcus shallow, partial; paired lateral depressions present near lateral margins, adjacent to coxae of legs II; dorsolateral translucent areas well defined, visible in dorsal and lateral aspects, glabrous and slightly convex, aligned with intersection between coxae of legs I and II.

*Cucullus:* Cucullus dome shaped, wider than long (table 1); lateral margins markedly diverging ventrally (fig. 13A); ventral margin predominantly linear with ventrolateral margins projecting in anterior aspect, linear in ventral aspect; pronounced median elevation visible in dorsal and ventral aspects (fig. 12A, B); cucullus with flat triangular surface ventrally.

*Chelicerae:* Movable finger longer than fixed finger, greatly widened and hook shaped (fig. 13A); mucron sharp, not truncated; tooth row comprising seven or nine small, sharp teeth. Fixed finger tooth row comprising four small, sharp teeth and one markedly larger distal tooth.

*Coxosternal region:* Tritosternum very small, barely visible, not abutting coxae of legs I (fig. 12B); coxae of legs II–IV abutting one another medially along entire length; coxae of legs II, anterior and posterior margins not perpendicular to median axis, forming angle medially; coxae of legs II–IV progressively decreasing in length (table 1); coxae of legs II very narrow, of legs III and, to lesser extent, IV, very broad; suture between coxae of legs II approximately half length of suture between coxae of legs III.

*Opisthosoma:* Opisthosoma oblong truncate, longer than wide (fig. 12C, D, table 1), broadest at tergite XII. Median sclerite of tergite X slitlike, trapezoidal, posterior margin shallowly emarginate medially; of tergites XI–XIII each with paired, shallow submedian depressions, lateral margins converging posteriorly on XI, subparallel on XII and XIII; of tergites XI and XII wider than long, of XIII as wide as long (table 1); of tergite XI with distinct, round raised surface medi-

ally; of tergite XIII, lateral margins forming right angle with posterior margin, posterior corners not protruding laterally. Sternites XI–XIII each with paired submedian depressions similar to tergites (fig. 12D). Pygidium basal segment, posterior margin with distinct notch dorsally and, to lesser extent, ventrally (fig. 13B).

*Pedipalps*: Femur robust (table 1), dorsal surface convex. Tibia longer than femur (table 1), slightly curved ventrally (fig. 12B), moderately swollen proximally, rest of segment noticeably narrower; elevated oval tubercles absent. Movable finger longer and more robust than fixed finger.

*Legs*: Leg II longest; femora width (at midline) increasing in order III < II < I < IV (table 1). Leg I femur markedly swollen in proximal two thirds (fig. 14A, B); tibia with well-developed, ventrally protruding, proventral and retroventral distal expansions (fig. 13C, E), proventral expansion slightly larger; tibia proventral surface moderately concave, without proximal protrusion; tibia with distinct retroventral longitudinal carina (fig. 13C, E); tibia without ventral notch; metatarsus ventral surface planar in distal two thirds, otherwise unmodified (fig. 13C–E). Leg II femur only, proximal end with moderate projection ventrally, protecting articulation with trochanter. Leg III metatarsus moderately swollen, deeply excavated dorsally (fig. 14E), with tuft of long setae ventrodistally (fig. 17D); metatarsal process situated basally near tibia, tapering and curving retrolaterally, apex rounded and dorsoventrally compressed (fig. 14E, F); *lamina cyathiformis* deeper than long, with markedly pointed apex (fig. 14F). Leg IV, trochanter 1 with moderate retroventral expansion (fig. 12B); femur markedly swollen (fig. 14C, D).

*Copulatory apparatus*: Sinistral copulatory apparatus abnormal. Dextral copulatory apparatus, fixed process S-shaped (figs. 14E, 17D); distal half with pronounced proventral ridge submedially (fig. 17D); apex acute, sublinear, moderately broad, directed subhorizontally; ventral surface with longitudinal fold subdistally (fig. 17D), retrolateral edge of fold smooth in lateral aspect, more developed than prolateral edge, which is slightly irregular. Movable process resting on shallow longitudinal groove along retrolateral surface of fixed process (fig. 17D); markedly shorter than fixed process, curved, narrowing distally; apex simple, entire.

FEMALE: Unknown.

DISTRIBUTION: *Cryptocellus macagual* is known only from the type locality in the department of Caquetá, Colombia (fig. 1).

### *Cryptocellus leleupi* Cooreman, 1976

Figures 1, 15, 16, 19C; table 1

*Cryptocellus leleupi* Cooreman, 1976: 27–50, figs. 1–18; Platnick and Paz, 1979: 1 [considered nomen dubium]; Platnick, 2002: 386; Harvey, 2003: 179; Platnick and García, 2008: 145; Botero-Trujillo and Pérez, 2009: 57; Botero-Trujillo and Valdez-Mondragón, 2016: 330, 334, fig. 55; Botero-Trujillo and Flórez, 2017: 490.

*Cryptocellus* cf. *leleupi*: Fernández and Giribet, 2015: 4.

TYPE MATERIAL: Three juveniles [1 protonymph holotype?, 1 deutonymph, 1 larva paratypes] (IRSNB), **ECUADOR**: *Oriente*: Río Negro [01°24'32"S 78°11'28"W], under stones in



FIGURE 15. *Cryptocellus leleupi* Cooreman, 1976, ♀ (MACN Ar 37274). **A.** Carapace, dorsal aspect. **B.** Coxosternal region and cucullus, ventral aspect. **C, D.** Opisthosoma, dorsal (**C**) and ventral (**D**) aspects. Scale bars = 0.5 mm.

transition forest, 1600 m (E.C.27), iv.1965, J. and N. Leleup; 1 juvenile [paratype?] (IRSNB), same data except: forêt tropical à arehido, humus, 750 m (E.C.19), iv.1965, J. and N. Leleup. Photos examined.

According to Cooreman (1976: 47), the type series of *C. leleupi* comprised four juveniles, but only three were found in the vial of specimens listed as types. A second vial containing another juvenile, with slightly different collection data from the original description, is assumed to be the fourth type specimen.

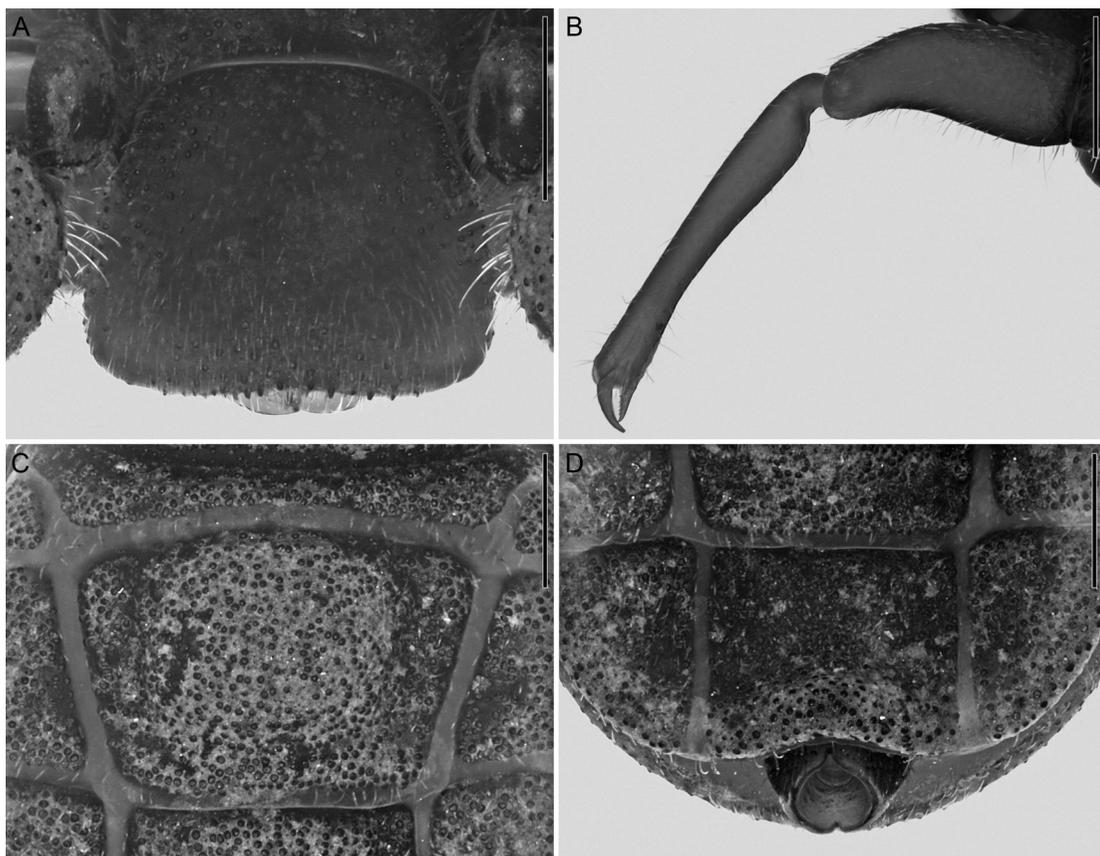


FIGURE 16. *Cryptocellus leleupi* Cooreman, 1976, ♀ (MACN Ar 37274). **A.** Cucullus, anterior aspect. **B.** Pedipalp, prolateral aspect. **C.** Tergite XI, median sclerite. **D.** Posterior end of opisthosoma, dorsal aspect. Scale bars = 0.5 mm.

**DIAGNOSIS:** *Cryptocellus leleupi* closely resembles *C. chiruisla* and *C. guaviarensis*, with which it shares several morphological characters of the male: a pronounced median elevation and distinct, granular triangular surface of the cucullus; a wide movable finger of the chelicera; a well-developed ventral notch, ventral subbasal protrusion, and proventral distal expansion of the tibia of leg I; the metatarsus of leg I compressed prolaterally in proximal two thirds, with a distinct distal expansion ventrally; and a tuft of long setae ventrodistally on the metatarsus of leg III. The male of *C. leleupi* is most similar to that of *C. chiruisla* in the tibia of leg I, notably the subbasal protrusion situated proventrally in the proximal half of the segment, and the short ventral notch, visible in dorsal and prolateral aspects. The two species also resemble each other in the subapically truncated retrolateral margin of the cheliceral movable finger and in the similar shape of the fixed process of the male copulatory apparatus. The male of *C. leleupi* differs from the males of *C. chiruisla* and *C. guaviarensis* in the absence of a retroventral distal expansion of the tibia of leg I that, although small, is present in the other two species and in the anterior triangular surface of the cucullus, which is slightly concave in *C. leleupi*, but planar

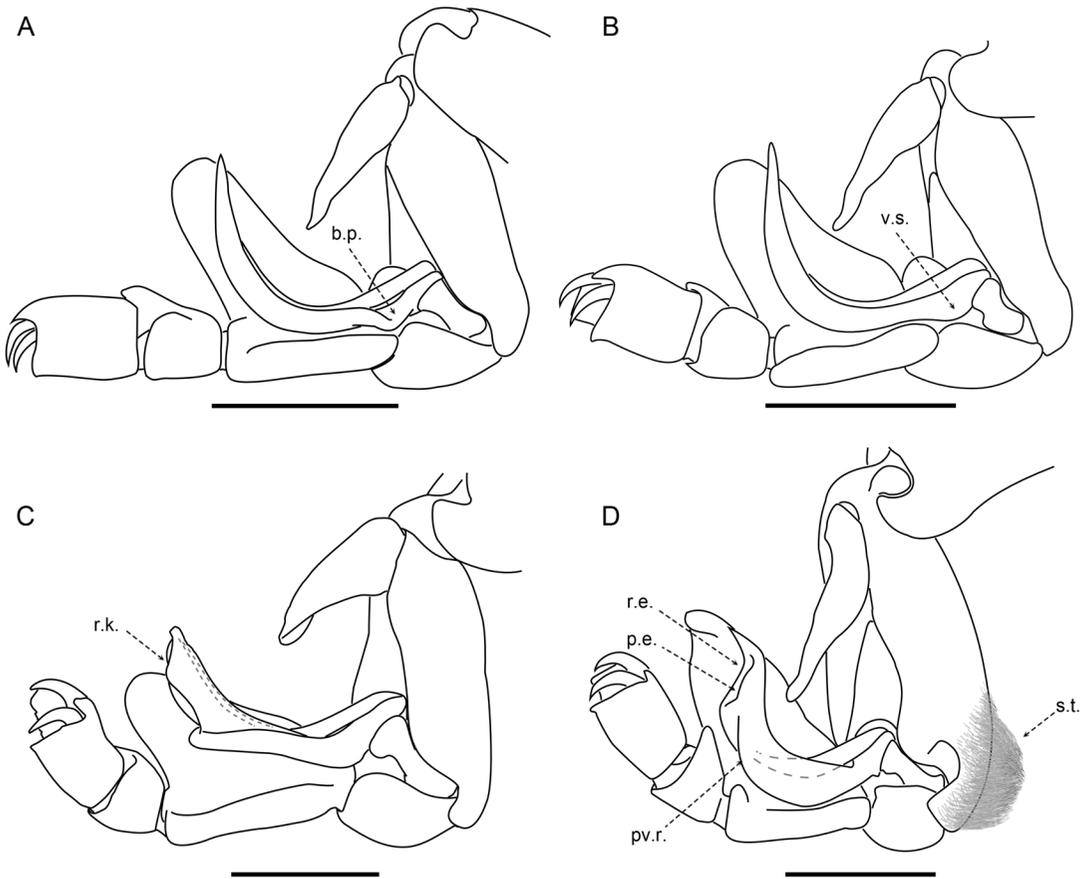


FIGURE 17. **A.** *Cryptocellus canutama*, sp. nov., holotype ♂ (CHNUFPI 2215), **B.** *Cryptocellus jamari*, sp. nov., holotype ♂ (CHNUFPI 2221), **C.** *Cryptocellus islacolon*, sp. nov., holotype ♂ (OUMNH 2010-028-001), and **D.** *Cryptocellus macagual*, sp. nov., holotype ♂ (ICN Ari 019), leg III distal segments, prolatral aspect. Scale bars = 0.5 mm. Abbreviations: b.p., bending point; p.e., r.e., prolatral and retrolateral edges of ventral longitudinal fold; pv.r., proventral ridge; r.k., rounded knob; s.t., setal tuft; v.s., ventral swelling.

in the other species. Additionally, the posterodorsal margin of the basal segment of the pygidium is notched in *C. leleupi* and *C. chiruisla*. This notch is deep, with the ventral margin distinctly notched, in the female of *C. leleupi* (fig. 16D) (both are shallow in the male); in contrast, the pygidium is more shallowly notched dorsally, whereas the ventral margin is entire, in the female (and male) of *C. chiruisla*. Furthermore, the posterior genital lip is acute in the female of *C. leleupi* (fig. 19C) but trilobate in the female of *C. chiruisla*, and the spermathecal morphology also differs slightly in the two species.

**MALE:** The only male that has hitherto been located (UFMG 9099) is currently mislaid (see Remarks).

**DESCRIPTION OF FEMALE:** Based on the female from Estación Biológica Jatun Sacha (MACN Ar 37274).

**Measurements:** Total length, 4.26 mm (table 1).

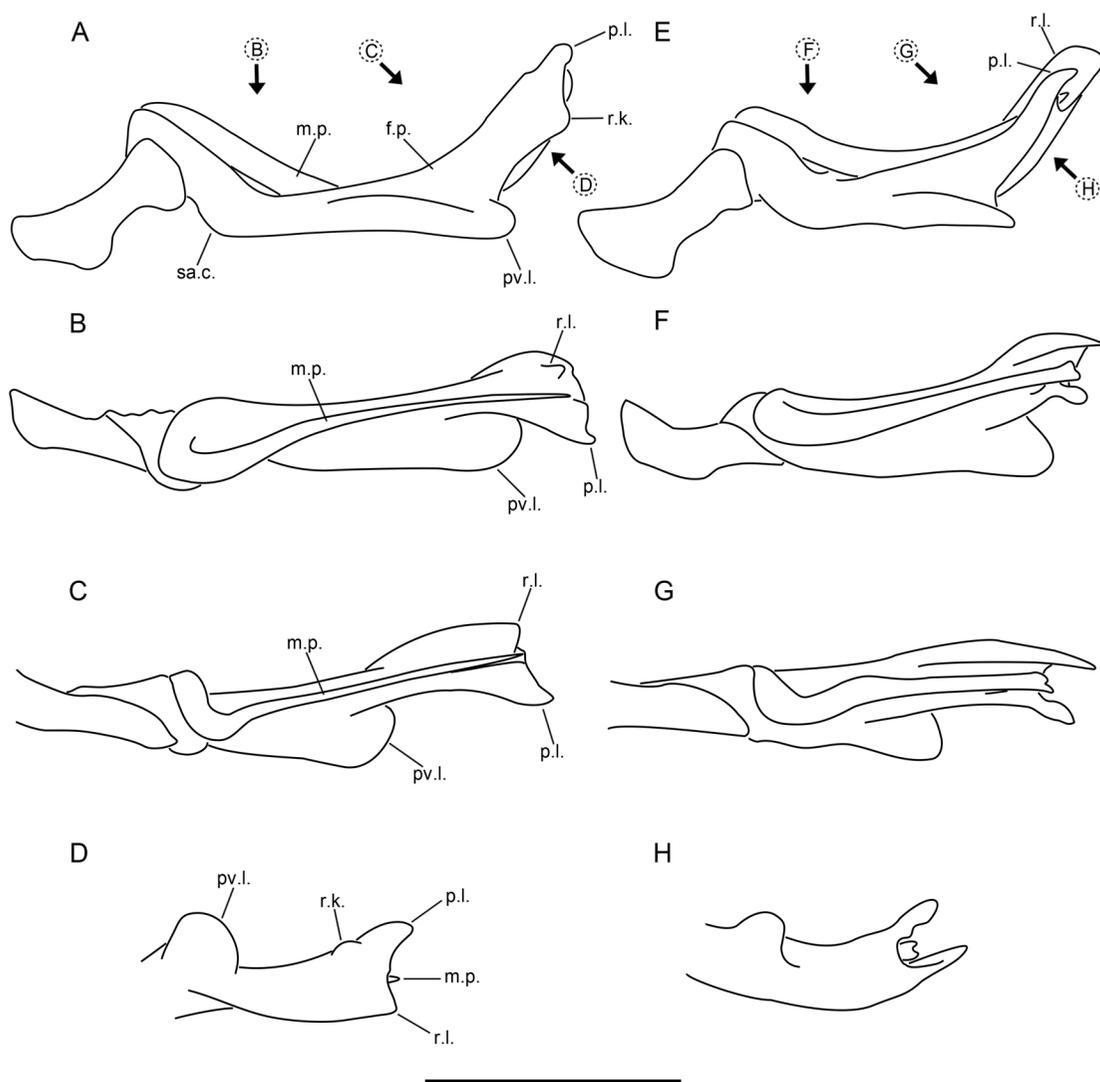


FIGURE 18. **A–D.** *Cryptocellus islacolon*, sp. nov., holotype ♂ (OUMNH 2010-028-001) and **E–H.** *Cryptocellus goodnighti* Platnick and Shadab, 1981, holotype ♂ (AMNH IZC 324859), leg III copulatory apparatus, prolateral aspect (**A, E**), dorsal aspect (**B, F**), dorsal aspect, inclined (**C, G**), and ventral aspect, inclined (**D, H**). Arrows in **A, E** indicate perspective of other illustrations. Scale bar = 0.5 mm. Abbreviations: f.p., fixed process; m.p., movable process; p.l., r.l., prolateral and retrolateral lobes; pv.l., proventral submedian ledge; r.k., rounded knob; sa.c., subangular curvature of ventral margin.

**Coloration:** Soma and appendages predominantly reddish brown; pedipalps yellowish red. Carapace dorsolateral translucent areas yellow. Cheliceral manus yellow; fingers and finger dentition reddish.

**Setation:** Soma and appendages covered with fine, translucent, bristlelike setae (figs. 15, 16).

**Tegument surface macrosculpture:** Tegument without cuticular pits. Carapace densely covered with conspicuous, round, iridescent granules, sparsely granular anteriorly (fig. 15A). Cucullus

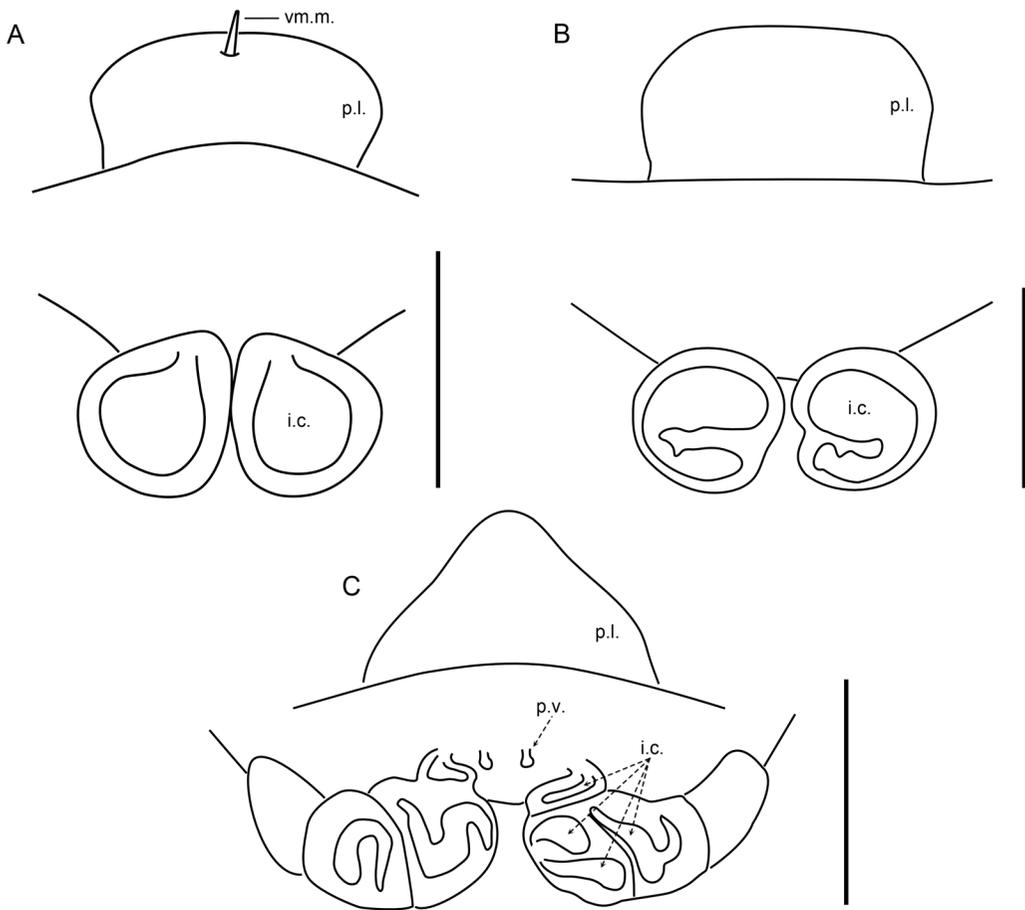


FIGURE 19. **A.** *Cryptocellus jamari*, sp. nov., paratype ♀ (CHNUFPI 3622), **B.** *Cryptocellus islacolon*, sp. nov., paratype ♀ (OUMNH 2010-028-002), and **C.** *Cryptocellus leleupi* Cooreman, 1976, ♀ (MACN Ar 37274), spermathecae, posterior aspect. Scale bars = 0.25 mm. Abbreviations: i.c., internal cavity; p.l., posterior genital lip; p.v., papillate vesicles; vm.m., ventromedian macroseta.

sparsely granular, granulation similar to carapace, with some larger granules ventrally (fig. 16A). Coxosternal region predominantly smooth, intercoxal margins finely granular (fig. 15B). Opisthosoma dorsal and ventral surfaces densely granular (fig. 15C, D), similar to carapace. Pedipalp predominantly smooth (fig. 16B), retrolateral surfaces of trochanter 1, trochanter 2, and base of femur finely granular. Legs with granulation similar to carapace, but more sparse.

**Carapace:** Carapace trapezoidal, approximately as long as wide (table 1), broadest between coxae of legs II and III; lateral margins curved, converging anteriorly (fig. 15A); anterior margin linear in dorsal aspect, sublinear in frontal aspect; posterior margin procurved; median longitudinal sulcus shallow, partial; paired lateral depressions present near lateral margins, adjacent to coxae of legs II; dorsolateral translucent areas well defined, visible in dorsal and lateral aspects, glabrous and slightly convex, aligned with intersection between coxae of legs I and II.

*Cucullus*: Cucullus trapezoidal, wider than long (table 1); lateral margins diverging ventrally (fig. 16A); ventral margin predominantly linear in anterior aspect, shallowly concave in ventral aspect.

*Chelicerae*: Movable finger longer than fixed finger, not widened; mucron sharp; tooth row comprising 10 or 11 small teeth. Fixed finger tooth row comprising five small, sharp teeth and one markedly larger distal tooth.

*Coxosternal region*: Tritosternum moderately small, tuberculate, not abutting coxae of legs I (fig. 15B); coxae of legs II–IV abutting one another medially along entire length; coxae of legs II, anterior and posterior margins not perpendicular to median axis, forming angle medially; coxae of legs II–IV progressively decreasing in length (table 1); sutures between coxae of legs II and III slightly longer than suture between coxae of legs IV.

*Opisthosoma*: Opisthosoma oval, longer than wide (fig. 15C, D, table 1), broadest at tergite XII. Median sclerite of tergite X slitlike, trapezoidal; of tergites XI–XIII each with paired, shallow submedian depressions, lateral margins converging posteriorly on XI, subparallel on XII and XIII; of tergites XI–XIII wider than long (table 1); of tergite XI with raised surface medially (fig. 16C); of tergite XIII, lateral margins forming right angle with posterior margin, posterior corners not protruding laterally. Sternites XI–XIII each with paired submedian depressions similar to tergites (fig. 15D). Pygidium, basal segment posterior margin with distinct notch dorsally and ventrally (fig. 16D).

*Pedipalps*: Femur robust (table 1), dorsal surface convex. Tibia longer than femur (table 1), entirely linear (fig. 16B), moderately swollen proximally, rest of segment noticeably narrower; elevated oval tubercles absent. Movable finger longer and more robust than fixed finger.

*Legs*: Leg II longest; I–IV similar in width, no segments swollen (table 1). Legs I and II femora, dorsal and ventral surfaces each with moderate projection on proximal end, protecting articulation with trochanter. Legs unmodified.

*Spermathecae*: Spermathecae heavily sclerotized, wider than deep (fig. 19C), separated from one another by approximately one seventh of spermathecal width; internal cavities markedly convoluted, pattern of convolution bilaterally asymmetrical. Anterior and posterior genital lips subtriangular (fig. 19C); anterior lip apex acuminate, posterior lip apex acute. Pair of small papillate vesicles situated submedially on posterior surface, aligned with base of spermathecae (fig. 19C).

**DISTRIBUTION**: *Cryptocellus leleupi* has been recorded from the Jatun Sacha Biological Station and the Río Negro, respectively situated in the Napo and Tungurahua provinces of Ecuador (fig. 1).

**REMARKS**: *Cryptocellus leleupi* was described from a juvenile specimen which, based on the number of tarsomeres on the walking legs (I:1, II:4, III:3, IV:2), can be recognized as a protonymph. The type series consists entirely of juveniles, thus failing to provide information concerning the adult morphology necessary for species diagnosis and was therefore considered a nomen dubium by Platnick and Paz (1979).

No other published records of ricinuleids occur in the immediate proximity of the type locality of *C. leleupi*, Río Negro, situated in the eastern foothills of the Ecuadorian Andes.

However, a juvenile identified as *Cryptocellus* cf. *leleupi*, from the Jatun Sacha Biological Station, situated ca. 73 km northeast of the type locality, was included in a molecular study by Fernández and Giribet (2015). The taxonomic identification of the cytochrome oxidase *c* subunit I DNA sequence (GenBank accession KR180410) is listed as *C. leleupi* although the voucher (IZ-130032) is listed as *Cryptocellus* sp. in MCZbase, the database of the Zoological Collections (<https://mczbase.mcz.harvard.edu/SpecimenSearch.cfm>).

A male and a female from the Jatun Sacha Biological Station were examined during the present investigation and confirmed to differ from all other ricinuleid species. Given the relative proximity of this station to the type locality of *C. leleupi*, it seems reasonable to consider these specimens to be conspecific.

The male (UFMG 9099) was examined in December 2017, when the species diagnosis was prepared. Soon after, the vial with the specimen was mislaid in UFMG and, despite extensive searches, has not been located, preventing a more detailed and thorough documentation of the male morphology. Nevertheless, the diagnosis presented herein is sufficient to permit recognition of the species. The structures noted in the diagnosis have been well documented in the description of the two other *Cryptocellus* species to which *C. leleupi* is compared (Botero-Trujillo and Flórez, 2017).

Although knowledge of the adult morphology of *C. leleupi* remains incomplete, it is now possible to recognize this species. Therefore, *C. leleupi* is no longer considered a nomen dubium.

**MATERIAL EXAMINED: ECUADOR:** *Napo*: Cantón Tena, Parroquia Puerto Napo, Estación Biológica Jatun Sacha, 01°03'57.5"S 77°37'0.2"W, 410 m, 1–5.xii.2009, C. Grismado and F. Labarque (Oonopidae Planetary Biodiversity Inventory Expedition), humid forest, leaf litter, 1 ♀ (MACN Ar 37274), same data, except: A.J. Santos, 1 ♂ (UFMG 9099).

#### ACKNOWLEDGMENTS

R.B.-T. was supported by a Theodore Roosevelt Postdoctoral Research Fellowship from the AMNH Richard Gilder Graduate School (RGGS) and U.S. National Science Foundation (NSF) grant DEB 1655050 to L.P. L.S.C. was supported by grant 407288/2013-9 from the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq). The expedition to the CIMAZ, Caquetá by E.F.D., was financially supported by the Universidad Nacional de Colombia. R.B.-T. thanks John J. Flynn (Dean of the RGGS), Rebecca Johnson (RGGS Director of Administration), James M. Carpenter and David A. Grimaldi (Chair and Acting Chair, Division of Invertebrate Zoology), and Edward Gaughan (Invertebrate Zoology Administrative Assistant) for support and assistance during the covid-19 pandemic, when this work was completed. L.S.C. thanks Bernhard A. Huber (ZFMK) for assistance during fieldwork in the Brazilian Amazon. The authors thank the curators and managers of institutional collections who loaned material for study: Adalberto J. Santos (UFMG); Álvaro Barragán and Verónica Crespo Pérez (QCAZI); Andrés A. Ojanguren-Affilastro and Martín J. Ramírez (MACN); Marcio L. de Oliveira and Célio Magalhães (INPA); Ricardo Pinto-da-Rocha (MZUSP); Zoë Simmons (OUMNH); Léon Baert, Wouter Dekoninck, and Julien Lalanne (IRSNB) for information and photos of the types of *C. leleupi*; Steve Thurston

(AMNH) for assistance with preparing the plates for this contribution; Andrew K. Smith and Morgan Hill for access to imaging equipment at the AMNH Microscopy and Imaging Facility; Stephanie F. Loria, Louis N. Sorkin, and Pío A. Colmenares for logistical assistance at the AMNH; two anonymous reviewers for helpful comments on an earlier draft of the manuscript.

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