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# Peering beyond the monotypic veil: taxonomy and notes on the parental care of *Neocranaus* (Opiliones: Gonyleptoidea: Cranaidae)

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**Abstract.** The genus *Neocranaus* Roewer, 1913 is revisited, its composition is expanded from two to five species and a new generic diagnosis is presented. *Neocranaus albiconspersus* Roewer, 1913, type species of the genus, is redescribed. The genus *Tolimaius* Roewer, 1915 syn. nov. is considered as a junior subjective synonym of *Neocranaus*, its sole member being transferred to *Neocranaus* – *N. pectinitibialis* (Roewer, 1915) comb. nov. – and redescribed here. The new combination *Neocranaus laevifrons* (Roewer, 1917) comb. nov. is proposed for *Holocranaus laevifrons* Roewer, 1917. The new species *Neocranaus gladius* Villarreal & Kury sp. nov. is described, from P.N.N. Yariguíes, Santander Department, Colombia. For the first time, the genital structure of this genus is illustrated. A key to the identification of the males of *Neocranaus* and some considerations about the reproductive biology of *N. albiconspersus* and *N. pectinitibialis* are presented.

**Keywords.** Colombia, Ecuador, Laniatores, taxonomy, Venezuela.

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## Introduction

The family Cranaidae Roewer, 1913 has undergone several structural changes in composition since its creation in the late 20th century (Kury 1994). It comprises a core, defined by a diverse range of historically grouped genera in Cranainae Roewer, 1913. Additional subfamilies and genera, with disputed taxonomic placement, have been both criticized and alternatively categorized by different authors and at distinct taxonomic junctures (e.g., Kury 1994, 2003; Orrico & Kury 2009; Kury & Villarreal 2015). Moreover, the family's presence within Gonyleptidae Sundevall, 1833 (Gonyleptidae: Cranainae) has been limited to only two historical instances (Roewer 1913; Pinto-da-Rocha *et al.* 2014). However, subsequent researchers have universally refuted this inclusion (e.g., Derkarabetian *et al.* 2023).

Cranaidae needs restructuring and redefinitions at generic and supra-generic levels, however, until a review is published, the present definition of groups as proposed originally by Kury (1994) is followed here. The family has 51 valid genera, grouped in three subfamilies: Cranainae (47 gen., 129 spp.), Heterocranainae Roewer, 1913 (1 gen., 2 spp.) and Stygnicranainae Roewer, 1913 (3 gen., 6 spp.) even though the genera remain poorly diagnosed.

The genus *Neocranaus* Roewer, 1913 is poorly known; it was created to include the single Colombian species *Neocranaus albiconspersus* Roewer, 1913, with an imprecise type locality: Colombia, Maracaibo (Roewer 1913). Two years later, Roewer (1915) described another monotypic genus in the subfamily Cranainae, this time from the Colombian Andes, i.e., *Tolimaius* Roewer, 1915 (with the species *T. pectinitibialis* Roewer, 1915), which was subsequently considered a junior subjective synonym of *Holocranaus* Roewer, 1913 by Soares & Soares (1948).

Mello-Leitão (1941) described the genus *Mitobatulina* Mello-Leitão, 1941, also monotypic, and originally in Gonyleptidae: Mitobatinae Simon, 1879, along with the species *Mitobatulina armatissima* Mello-Leitão, 1941 from Putumayo, Colombia and Roewer (1943) described *Cranaus albipustulatus* Roewer, 1943, from La Guajira, Colombia.

Kury (2003) considered *Mitobatulina* as a junior subjective synonym of *Neocranaus*, combining its species *M. armatissima* Mello-Leitão, 1941 with *Neocranaus*. Based on the suggested modifications, the genus *Neocranaus* encompasses a total of five species, with four of them found in the Andean regions of Ecuador and Colombia. Among these, one species is newly described in this study, while the fifth species originates from the Amazon region in Colombia.

In addition to the lack of knowledge of the real taxonomic richness of the group and the taxonomic identity of cranaid members, the behavior and biology of this group remains virtually unknown, with scarce and anecdotic observations regarding the feeding (Villarreal *et al.* 2008), defensive (Colmenares & Tourinho 2014), agonistic (García-Hernández & Machado 2017), as well as homing behavior (Proud & Towsend Jr 2008). Several records about Cranaidae biology are focused on observations about parental care (see Hunter *et al.* 2007; García-Hernández & Machado 2017), however, information about this aspect is still scarce when compared to other families like Gonyleptidae. Knowledge about parental care in harvestmen has been particularly important and turned these organisms into a model for evaluating the evolution of parental care (e.g., Nazareth & Machado 2010; Quesada-Hidalgo *et al.* 2019). The crescent interest might be explained since some species display biparental as well as only paternal care (Machado *et al.* 2004; Villarreal & Machado 2011). In addition, knowledge about parental care has shown to display evolutionary signal when constructing the phylogeny of some harvestman families (Caetano & Machado 2013). Therefore, new and occasional records about parental care in different harvestman families are relevant, since they might contribute to reconstruct the evolution of this behavior in the group (Iglesias *et al.* 2022). For example, it has been suggested that highly conservative behaviors like the parental care in the family Gonyleptidae might be used to define monophyletic units in this family (Caetano & Machado 2013).

In the present work, the genus *Neocranus* is revisited, a group of Andean species is newly detected and proposed. In addition, the taxonomic status of *Tolimaius* is evaluated and a new generic synonymy and the subsequent new combinations are presented; *Tolimaius pectinitibialis* (from Tolima, Colombia) and *Neocranaus albiconspersus* (from Huila, Colombia) are redescribed; and a new species (from Santander Department, Colombia) is described. For the first time the male genitalia of *Neocranaus* are described, allowing us to comment on the hypothetical relationships of this group within Cranaidae.

## Material and methods

Pictures at different focal planes were taken as a Z-stack with a camera Nikon D7000 and the Entomopixel Stack Rail–ENT-FSV1 (www.entomopixel.com) then assembled into a focused image using Helicon Focus Software. Measurements were taken with a caliper and are presented in millimeters. Setiferous tubercles on pedipalps and cheliceral teeth are given in proximal to distal order (i = small, I = large, _ = empty space). Color descriptions refer either to specimens preserved in ethanol or in vivo, which is indicated in each case. Descriptions of colors use the standard names of the 267 Color Centroids of the NBS/IBCC Color System (online at http://people.csail.mit.edu/jaffer/Color/Dictionaries#nbs-iscc). The description pattern follows Villarreal *et al.* (2015, 2021), the integumentary ornamentation follows DaSilva & Gnaspini (2010), the terminology for chaetotaxy of penis ventral plate and truncus follows Kury & Villarreal (2015) and terminology of dorsal scutum outline types follows Kury & Medrano (2016). All geographic coordinates are given in decimal degrees (DATUM WGS 84). The mesotergal areas III–IV are here interpreted as fused to each other and named as 'area III', and the original area V is called 'posterior margin of scutum'. The type material of *Neocranaus gladius* Villarreal & Kury sp. nov. was unfortunately destroyed during the fire at the MNRJ (Data), limiting certain aspects of the description of this species. Nonetheless, the information presented is considered sufficient for the accurate diagnosis and future unequivocal identification of the species. As a working strategy, we used as comparison some species sharing similar facies to ours and/or which we suspected could be transferred to *Neocranaus*. We have used several potential sources of similarity (e.g., the relative shape of truncus and ventral plate, structure of macrosetae) in several species that have been historically or which could have been described in various poorly known genera, i.e., *Nieblia* Roewer, 1925, *Bucayana* Mello-Leitão, 1942 and *Macuchicola* Mello-Leitão, 1943.

### Abbreviations

**Repositories (curator)**

| | | |
|---|---|---|
| ICN-Ao | = | Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá, Colombia (Eduardo Flórez) |
| MUSENUV-Ar | = | Museo de Entomología de la Universidad del Valle, Cali, Colombia (Jimmy Cabra-García) |
| MNRJ | = | Museu Nacional do Rio de Janeiro, Rio de Janeiro, Brazil (Adriano B. Kury) |

**Taxonomic characters**

| | | |
|---|---|---|
| A1–A3 | = | basal macrosetae of VP |
| B | = | ventro-basal macrosetae of VP |
| C1–C3 | = | distal macrosetae of VP |
| ChI | = | chelicera segment I (= basichelicerite) |
| CL | = | cephalothorax maximum length |
| CW | = | carapace maximum width |
| D1 | = | dorso-lateral subdistal small setae of VP |
| DS | = | dorsal scutum |
| DSL | = | dorsal scutum maximum length |
| E1–E2 | = | ventrodistal short macrosetae of VP |

fe = femur
MDW = maximum dorsal width
MS = macrosetae of VP
pa = patella
ta = tarsus
ti = tibia
tr = trochanter
VP = ventral plate (ventrodistal setigerous region of penis)

## Results

### *Taxonomic account*

Class Arachnida Lamarck, 1801
Order Opiliones Sundevall, 1833
Family Cranaidae Roewer, 1913
Subfamily Cranainae Roewer, 1913

Genus ***Neocranaus*** Roewer, 1913

*Neocranaus* Roewer, 1913: 408. Type species: *Neocranaus albiconspersus* Roewer, 1913, by monotypy.
*Tolimaius* Roewer, 1915: 125 [junior subjective synonym of *Holocranaus* Roewer, 1913 by Soares & Soares (1948: 601); synonymy herein rejected]. Type species by monotypy: *Tolimaius pectinitibialis* Roewer, 1915. **Syn. nov.**

*Tolimaius* – Roewer 1923: 558. — Mello-Leitão 1926: 363. — Roewer 1932: 281.
"*Tolimaiius*" – Mello-Leitão 1932: 121. Incorrect subsequent spelling.
"*Tolimalius*" – Mello-Leitão 1935: 96. Incorrect subsequent spelling.

#### Diagnosis

Median-sized cranaine (DSL = 7.1–9.9 mm) with DS outline gamma pyriform, with some yellow tubercles on the lateral and posterior margins (Figs 2A, 3A, 6A, 7A). Mesotergum divided into three areas: I divided medially into two halves by a medial suture, with one medium tubercle on each side; III with two wide paired spines, blunt (*N. laevifrons* (Roewer, 1917) and *N. pectinitibialis*) (Fig. 10A–B) or sharp (*N. albiconspersus* and *N. gladius* sp. nov.) (Figs 3A–B, 7A–B), scattered granulation on the medial region on the DS, including ocularium and mesotergal areas. Males with a ventral projection on the posterior border of the stigmatic area (Figs 2B, 3B, 6B–D) (males unknown in *N. laevifrons*). Males with prolaterodistal curved spine in the femur IV and retrolateral row of spines in the tibia IV (unknown in *N. laevifrons*) (Figs 2G–I, 3D–F, 6F–G, 7C–D). Penis: follis is an elongate turgid sac (Fig. 4B, D–E). Outline of ventral plate variable: cordiform (heart-shaped) (Fig. 8A) or rounded trapezoid (Fig. 11A–B), but always with an apical trapezoid cleft, lateral margins convex (Fig. 8A) or with medial bulge (Fig. 4A, C). Stylus curved, with reduced stylar caps, formed by two small lateral points (Fig. 4A). Eight pairs of MS: A1–A2 substraight, lateral, C1–C2 more prominently curved, placed more distally on lateral margins, C3 close to D1, D1 large and located dorsally, strongly curved, D2 absent. B absent, D1 larger or at least the same size as C1–C2. E1–E2 short, situated on a lateroapical flange (Fig. 4D–F).

#### Included species

*Neocranaus albiconspersus* Roewer, 1913 (type species)
*Neocranaus armatissimus* Mello-Leitão, 1941
*Neocranaus gladius* Villarreal & Kury sp. nov.
*Neocranaus laevifrons* (Roewer, 1917) comb. nov.
*Neocranaus pectinitibialis* (Roewer, 1915) comb. nov.

**Combined distribution**

Colombia: Huila, Santander and Tolima; Ecuador: Chimborazo (Fig. 1).

**Rationale of the synonymies**

See Discussion below.

**Key for identification of *Neocranaus***

1. Area I spines as large as area III spines; carapace and mesotergum with diamond-shaped dark-yellow fine granular area, contrasting with dark brown scutum background; free tergites II–III glossy, each with a pair of smooth high divergent spines .....***N. armatissimus*** (Mello-Leitão, 1941)
– Area I spines much smaller than area III spines; scutum without diamond-shaped area, only with larger yellow granules following different patterns; free tergites II–III granulous, each with a pair of smaller blunt tubercles ..... 2

2. Paired spines of the mesotergal area III and ocularium large and sharp (Figs 2B, D, 5C, 6B, D) ... 3
– Paired spines of the mesotergal area III and ocularium low and rounded (Figs 9B, D, 10B) ..... 4

3. Pedipalpal femur with dorsal keel (Fig. 2E–F); coxa II as large as coxa III (Fig. 2C); paired spines of the mesotergal area III subparallel (Fig. 2D); coxa IV with external (prolateral) yellow and large tubercle (Fig. 2B) .....***N. albiconspersus*** Roewer, 1913
– Pedipalpal femur without dorsal keel (Fig. 6E); coxa II greatly swollen, much larger than coxa III (Fig. 6B–C); paired spines of the mesotergal area III divergent (Fig. 6D); coxa IV without external (prolateral) yellow and large tubercle (Figs 6B, 7B) .....***N. gladius*** Villarreal & Kury sp. nov.

4. Anterior margin of the dorsal scutum and posterior part of ocularium with large yellow tubercles (Figs 9A–B, 12A, C) .....***N. pectinitibialis*** (Roewer, 1915) comb. nov.
– Anterior margin of the dorsal scutum and posterior part of ocularium with concolorous tubercles .. .....***N. laevifrons*** (Roewer, 1917) comb. nov.

**Reamrks**

Males of *N. laevifrons* are unknown, however females of this species are very similar to those of *Neocranaus pectinitibialis*, which suggest they could be synonymous. We have only had access to photos of the somewhat discolored female holotype, which limits the survey of characters. A detailed comparison of both species will only be possible when males of *N. laevifrons* are available.

***Neocranaus albiconspersus*** Roewer, 1913
Figs 1–5

*Neocranaus albiconspersus* Roewer, 1913: 409, fig. 162.

*Neocranaus albiconspersus* – Roewer 1923: 562, fig. 703. — Soares & Soares 1948: 610. — Kury 2003: 95.

**Type data**

"COLOMBIA" • 1 ♂, 1 ♀ (syntypes); "Maracaibo"; SMF RI 861.

**Remark**

Incorrectly interpreted by Kury (2003) as "Venezuela, Zulia, Maracaibo". The label reads: "Columbien: Cañea". Cañea could be a hard to guess misspelling of anything like Cañon, Cauca, Cabaña, Carmen.

Orrico & Kury (2009), noted that there are many places called Maracaibo in Colombia, and that of Valle del Cauca (4.67361° N, 76.12062° W, alt. ca 1800 m) was the strongest candidate for *Stygnicranaus abnormis* Roewer, 1913. Given the record of fresh material from Merenberg, in Huila State, Roewer's locality should be best interpreted as Maracaibo, Huila (2.26035° N, 75.99412° W), a locality only 14 km away from Merenberg (see the map in Fig. 1).

## Material examined

COLOMBIA • 4 ♂♂, 3 ♀♀; Huila, La Plata, Corregimiento de Belén, Vereda Cachipay; 2.221028° N, 76.074603° W; alt. 2100 m; 2 Feb. 2019; L. Martínez, J. González and Y. Mazabuel leg.; MUSENUV-Ar 2120 • 3 ♂♂, 3 ♀♀; Huila, La Plata, Corregimiento de Belén, Centro de Investigación y Educación Ambiental Merenberg; 2.218717° N, 76.116761° W; alt. 2300 m; 19 Jan. 2021; J. González, L. Martínez and M.D. Pulido leg.; MUSENUV-Ar 2122 • 1 ♂, 1 ♀; same collection data as for preceding; MUSENUV-Ar 2121 • 2 ♂♂, 1 ♀; Huila, 10 km E of Santa Leticia, Finca Merenberg; alt. 2300 m; Mar. 1979; W. Eberhard leg.; MCZ AK 012.

## Redescription

**Male** (MUSENUV-Ar 2121)

Measurements. Variation in size found in males (n = 7) is denoted in parentheses. DSL = 9.3 (7.1–9.3); MDW = 8 (6.3–8.1); CL = 3.6 (2.4–3.6); CW = 5.1 (4.1–5.1); IOD = 1.8 (1.4–2.3); ChI = 1.6 (2.4–3.6); pedipalp: tr = 1.1 (0.9–1.3), fe = 2.7 (2.1–3.1), pa = 1.5 (1.0–1.7), ti = 2.2 (1.2–2.3), ta = 3.3 (2.6–3.4); leg I: tr = 1.2 (0.8–1.4), fe = 4.5 (3.5–4.8), pa = 1.4 (1.2–1.6), ti = 3.4 (2.4–3.4), mt = 5.1 (4.1–5.4), ta =

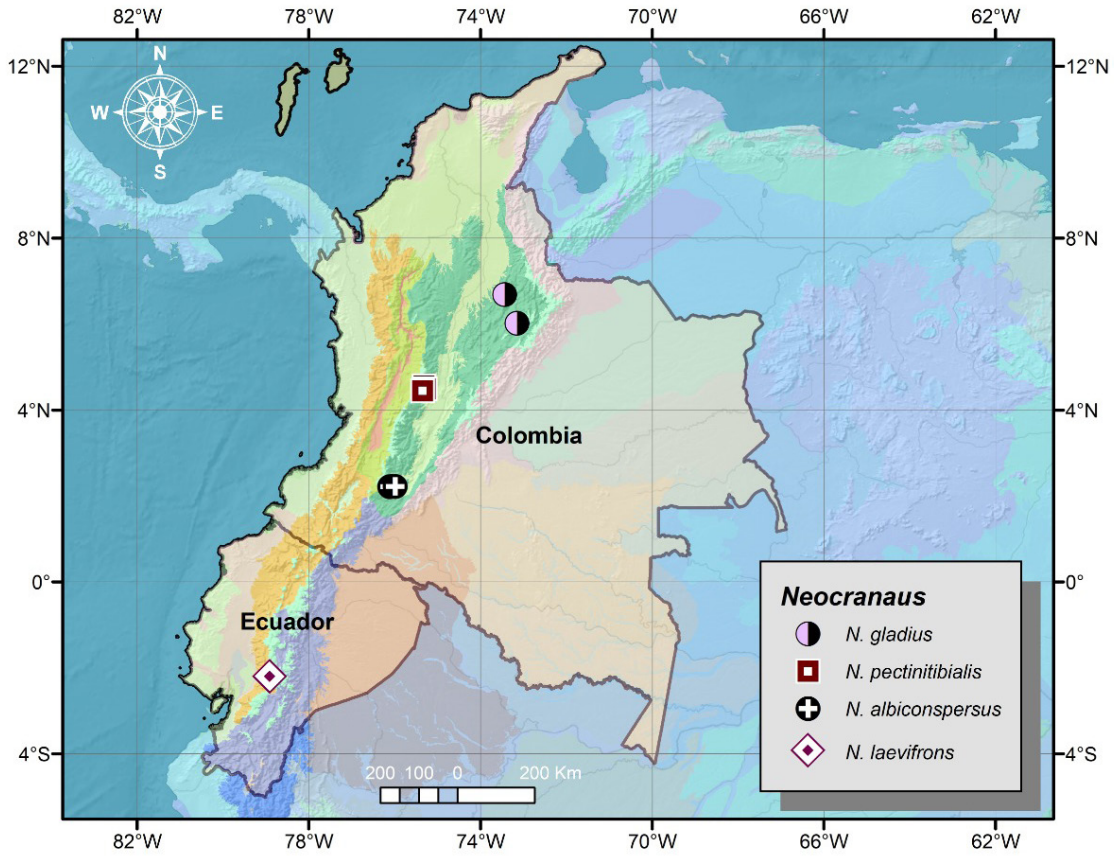


**Fig. 1.** Geographic distribution of the genus *Neocranaus* Roewer, 1913.

2.1 (1.8–3.1); leg II: tr = 1.4 (1.2–1.7), fe = 9.1 (7.6–9.7), pa = 2.1 (1.6–2.4), ti = 6.2 (5.1–6.9), mt = 7.0 (6–8.6), ta = 5.7 (6–8.6); leg III: tr = 1.9 (1.4–2.0), fe = 7.5 (5.4–7.6), pa = 2.2 (1.7–2.2), ti = 4.4 (3.5–4.5), mt = 5.9 (5.7–7.3), ta = 3.4 (3.1–3.7); leg IV: tr = 2.4 (1.4–2.4), fe = 12.3 (9.3–12.1), pa = 2.9 (2.1–3.0), ti = 6.7 (5.2–6.6), mt = 9.1 (7.7–10.4), ta = 4 (3.5–4.0).

Dorsum (Figs 2A–B, 3A–B). Dorsal scutum outline gamma pyriform with the median bulge symmetrical. Anterior margin of DS with 5 anterolateral lighter tubercles; cheliceral sockets shallow, between two short processes, medial process short. Frontal eminence low and granulated. Eyes on elliptical ocularium, located anterior on carapace; ocularium with some anterior and posterior lighter granules and

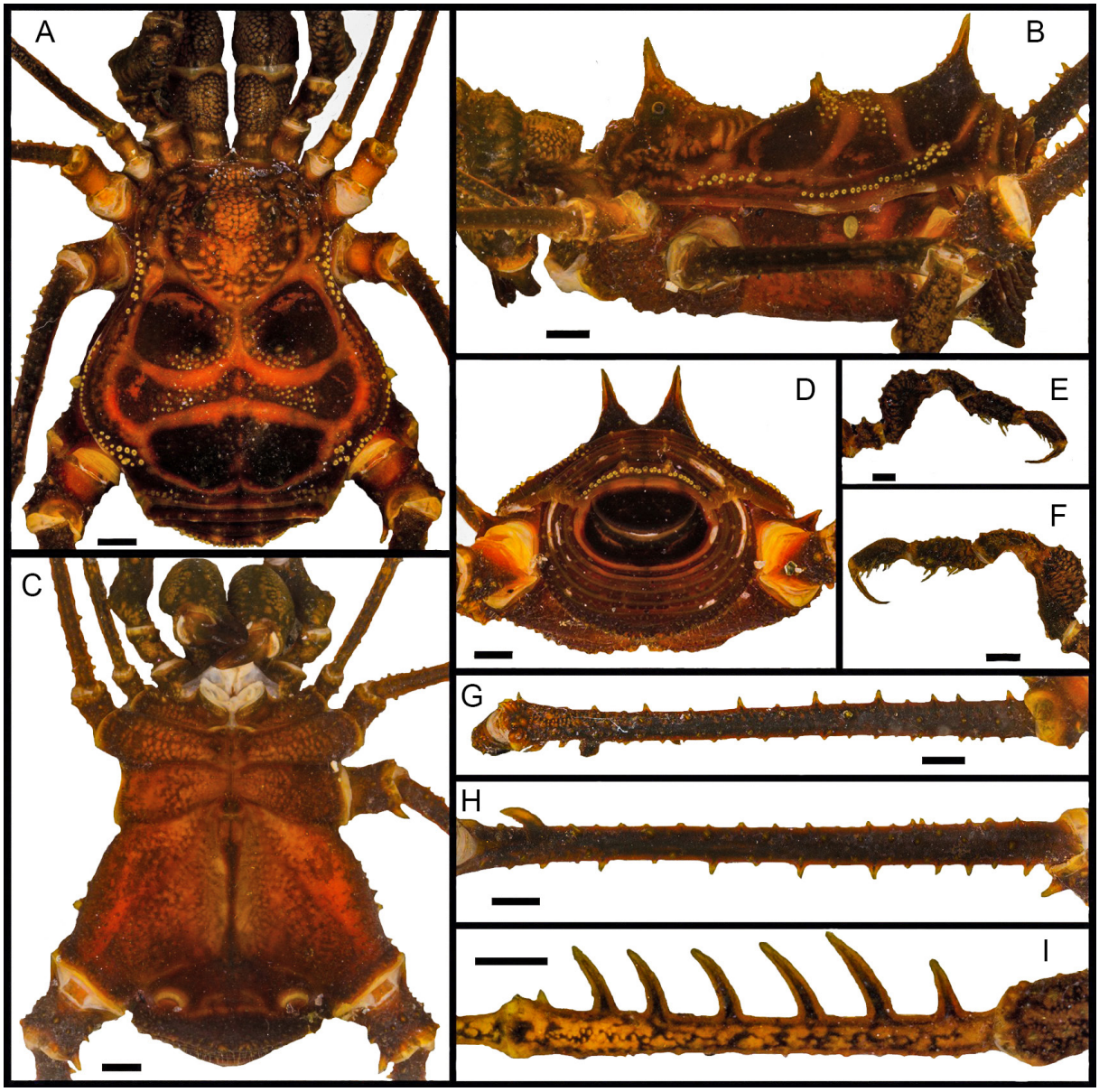


**Fig. 2.** *Neocranaus albiconspersus* Roewer, 1913, ♂ (MUSENUV-Ar 2121). **A**. Dorsal view. **B**. Lateral view. **C**. Ventral view. **D**. Posterior view. **E**. Right pedipalp, ectal view. **F**. Right pedipalp, mesal view. **G**. Right leg IV, femur in dorsal view. **H**. Right leg IV, femur in ventral view. **I**. Right leg IV, tibia in dorsal view. Scale bars = 1 mm.

paramedian pair of high spines. Lateral margin with cluster of about 13–18 yellow tubercles at the level of the coxae III, and a row of minor lighter granules between coxa IV and posterior margin and some greater tubercles at level of the area III. Mesotergum divided into three well-defined areas: I divided medially into two trapezoidal halves, with wide interior contact area, with one conspicuous and sharp tubercle on each side and some anterior granules and cluster of yellow tubercles on posteriomedial zone; II unarmed and entire, invading slightly area I in medial zone, with some yellow granules in medial zone; III with pair of paramedian sharp spines and densely tuberculated. Posterior margin almost straight with one group of about 9–12 yellow tubercles on each side and paramedian pair of small conical tubercles. Free tergites I with paramedian pair of small tubercles and row of lateral granules; II with row of sparse yellow tubercles; III with dense row of yellow rounded tubercles, both tergites with paramedian pair of large conical tubercles (II < III).

Venter (Fig. 2C–D). Coxa I with row of 7–8 conspicuous tubercles and another posterior row of granules; II–III with longitudinal rows of granules; IV densely granulated with some tubercles in prolateral face, with large conical prolateral yellow tubercle (Fig. 2B). Genital operculum with scarced granules arranged in two rows. Stigmatic area T-inverted shaped, granulate, with two posterior depressions between subparallel spiracles. Posterior margin with ventral projection. Free sternites with row of tubercles each.

Chelicerae (Figs 2A–C, 3A–C). Segment I with few small tubercles on bulla proximal face; II slightly swollen, fixed finger with irregularly toothed blade, movable finger with basal tooth and three subdistal teeth.

Pedipalps (Fig. 2E–F). Coxa short, dorsally smooth, ventrally with two mesal and blunt tubercles. Trochanter dorsally with cluster of conspicuous tubercles, one of them triangular and larger than rest,

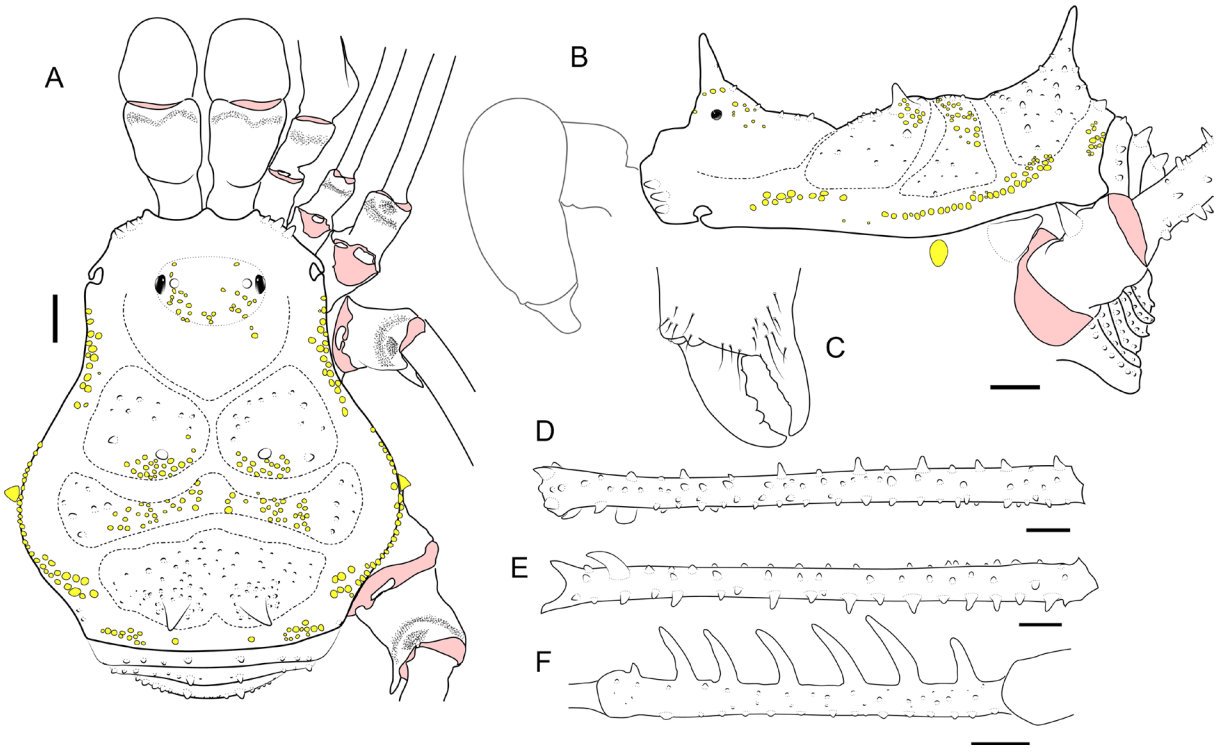


**Fig. 3.** *Neocranaus albiconspersus* Roewer, 1913, ♂ (MUSENUV-Ar 2121). **A**. Dorsal view. **B**. Lateral view. **C**. Right leg IV, femur in dorsal view. **D**. Right leg IV, femur in ventral view. **E**. Right leg IV, tibia in dorsal view. Scale bars = 1 mm.

ventrally with large and blunt tubercle. Femur dorsally curved, with dorsal keel with longitudinal row of tubercles and apical short apophysis; with ectal row of wide tubercles and without mesal row of tubercles; ventrally with two proximal tubercles, followed by gap, and row of three wide tubercles. Patella curved, dorsally tuberculated and ventrally smooth. Tibia dorsally with abundant wide tubercles, ventrally smooth; tibia mesal IiIi, ectal IiIi. Tarsus dorsally and ventrally smooth; tarsus mesal IiIIi, ectal IiIii.

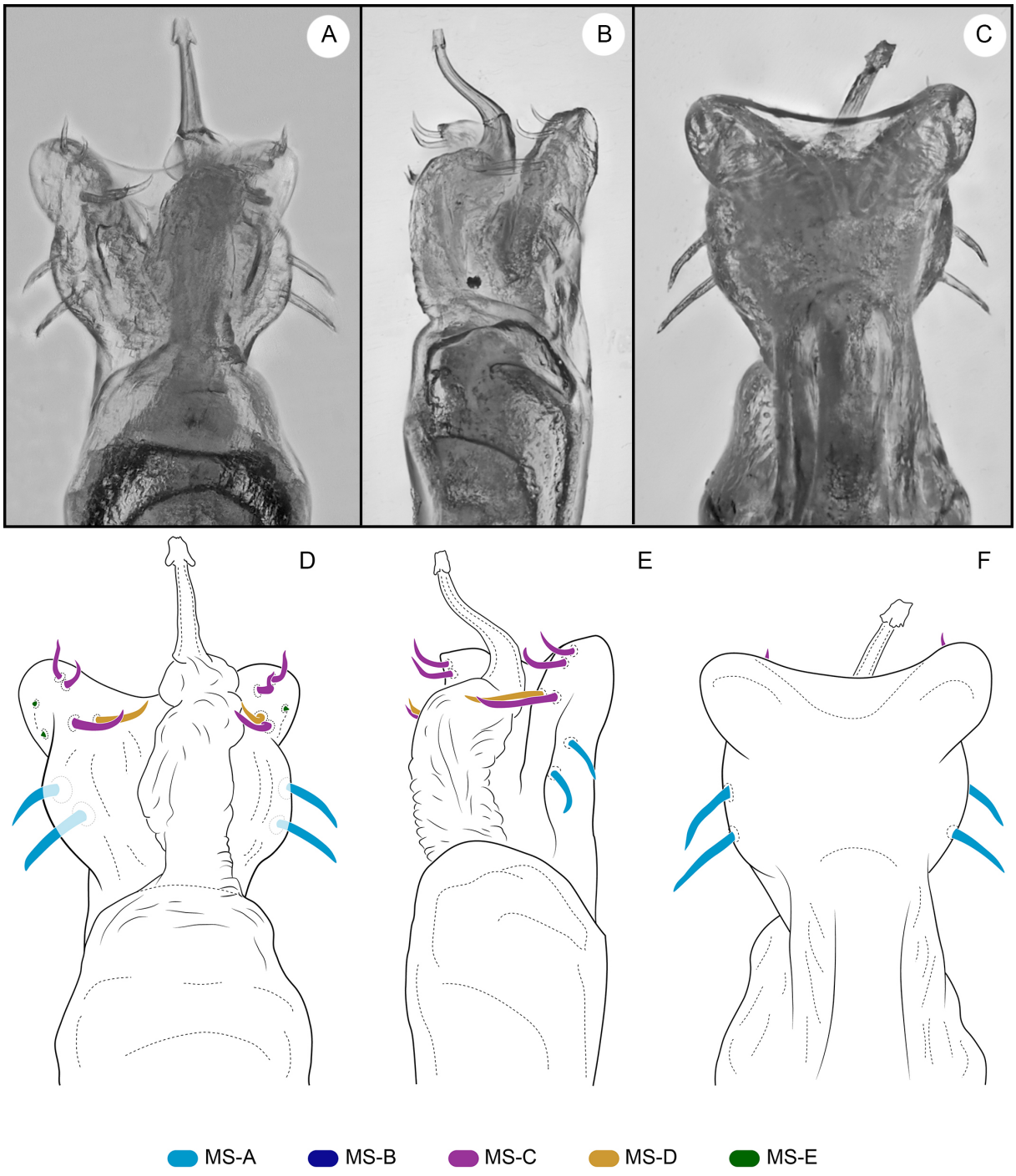


**Fig. 4.** *Neocranaus albiconspersus* Roewer, 1913, ♂ (MUSENUV-Ar 2121). Penis: apical portion in dorsal (**A, D**), ventral (**B, E**) and lateral view (**C, F**).

Legs (Figs 2G–I, 3D–F). Coxae I with three dorsal tubercles, one anterior and two posterior; II with dorsal pair of tubercles, one anterior and one posterior; III with prolateral tubercle; IV with numerous lateral tubercles, one conspicuous yellowish and one dorsodistal large tubercle. Trochanter I dorsally smooth; ventrally with four conspicuous tubercles, retrolaterally with proximal small tubercle; II dorsally smooth, ventrally with six and retrolaterally with two tubercles; III dorsally with few scattered granules, ventrally with four irregular tubercles, prolaterally with small granules, retrolaterally with two tubercles and one retrodistal large and sharp tubercle; IV with scattered dorsal tubercles, ventrally with 6 conspicuous tubercles, prolateral with small granules and on medial large and conical tubercle, retrolaterally with two mediantubercles and one retrodistal large tubercle. Femora I–II with complete rows of granules

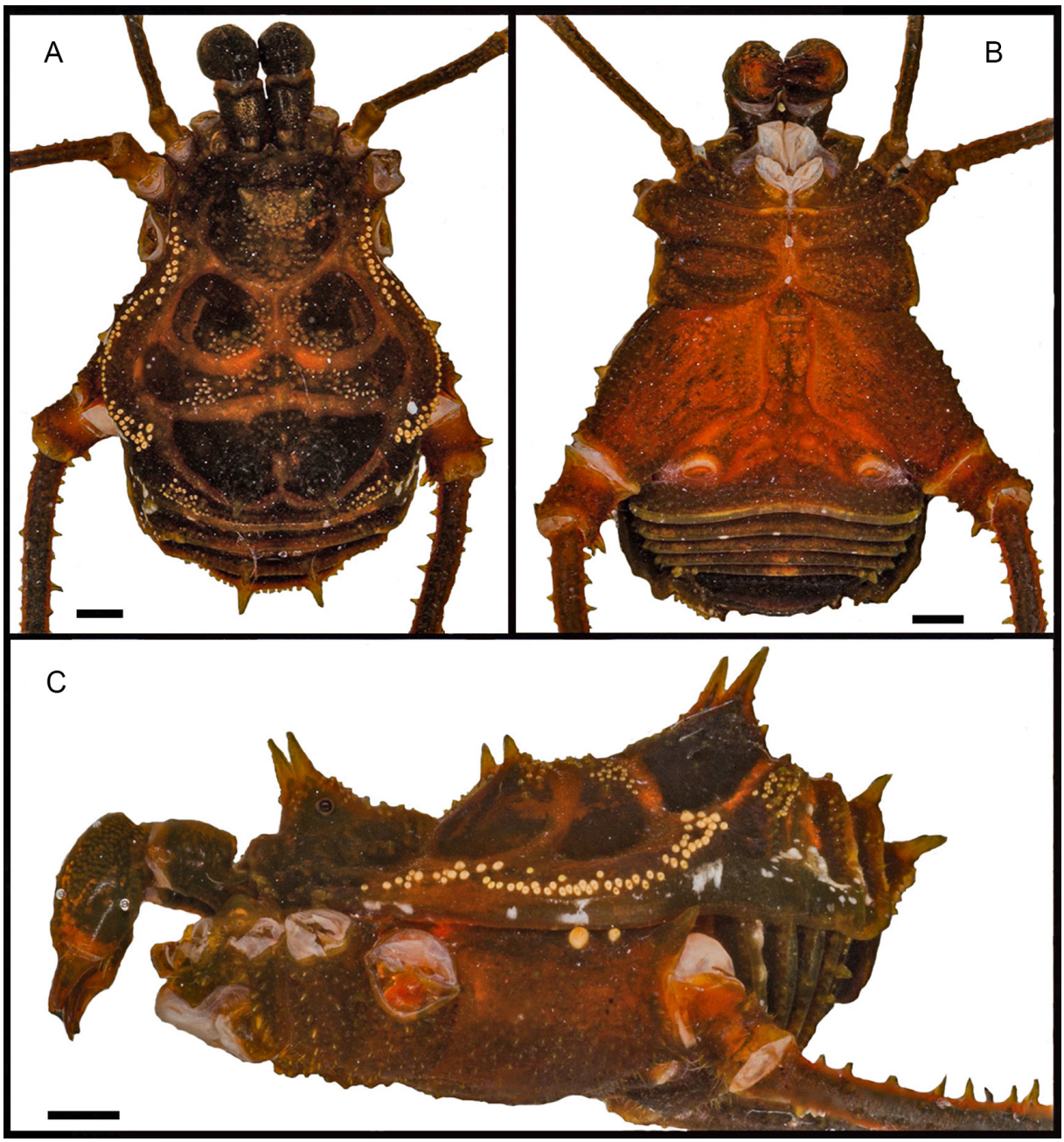


**Fig. 5.** *Neocranaus albiconspersus* Roewer, 1913, ♀ (MUSENUV-Ar 2121). **A**. Dorsal view. **B**. Lateral view. **C**. Ventral view. Scale bars = 1 mm.

(seven rows); II and IV with pro and retrodorsal distal apophyses, III only with conspicuous retrodorsal apophysis; III with complete rows of granules, one proximal retroventral and one proventral large tubercle; IV straight, with seven rows of tubercles, dorsal and retrodorsal rows with large tubercle, proventral row with one large and curved subdistal tubercle and two curved distal tubercles. Patella II–III evenly covered with low tubercles; IV covered with larger than those in III. Tibiae IV with rows of dorsal tubercles and retrolateral row of curved spines. Metatarsi I–IV smooth; calcaneus swollen. Tarsal process present. Tarsal claws III–IV subparallel, unpectinated. Tarsal segmentation: 7(3)/12(3)/6/7.

Penis (Fig. 4). VP subrectangular with rounded sides and bulged twice: at MS–A1–A2 and at ears (paired distal dorsolateral lobes of VP). Apical parabolic cleft of VP forming pair of ears widely projected laterodistal as flange. Pedestal elongate cylindrical. MS-C1–C2 apically located, MS-C3 closer to MS–D1 than to other MS-C; MS-D1 larger than MS-C1–C2 and similar in size to MS-C3. MS-A1–A2 inserted far away from MS-C, at proximal bulge of VP. MS-B absent. Stylus slightly curved, S-shaped, with small and irregular stylar caps.

Coloration (Figs 2 (in alcohol), 13A–B (in vivo)). Dorsal scutum dark yellowish brown (78) on background deep orange yellow (69); mesotergal areas brownish black (65). Chelicerae and pedipalps reticulated brownish black (65) on background dark orange yellow (72); trochanter I–IV dorsally deep reddish brown (41) and strong orange yellow (68); dorsal coxae, ventral trochanter, femora, free tergites, anal operculum and free sternites blackish red (21); coxae I–IV reticulated dark brown (59) on background deep orange (51) and strong brown (55). Yellowish tubercles on lateral and posterior margins of DS, free tergites, coxae IV and mesotergal area I vivid greenish yellow (97).

**Female** (MUSENUV-Ar 2121; individual 21)

Measurements. Variation in size found in females (n = 8) is denoted in parentheses. DSL = 8.8 (7.2–8.9); MDW = 7.1 (6.9–7.5); CL = 2.3 (2.1–2.7); CW = 4.4 (4.0–4.2); IOD = 1.3 (1.3–1.6); ChI = 1.2 (0.9–1.3); pedipalp: tr = 1.0 (0.9–1.2), fe = 2.7 (1.8–2.7), pa = 1.4 (1.0–1.4), ti = 2.0 (1.3–2.1), ta = 3.0 (2.5–3.1); leg I: tr = 1.0 (0.8–1.0), fe = 4.0 (3.1–4.0), pa = 1.3 (0.9–1.3), ti = 2.7 (2.0–3.0), mt = 4.1 (3.4–4.1), ta = 2.3 (2.1–2.5); leg II: tr = 1.1 (1.0–1.3), fe = 8.1 (7.0–8.1), pa = 1.8 (1.4–2.0), ti = 5.6 (3.5–6.6), mt = 6.2 (6.0–6-8), ta = 4.4 (4.4-5.4); leg III: tr = 1.5 (1.1–1.5), fe = 6.1 (5.1–6.1), pa = 1.9 (1.4–2.2), ti = 3.8 (3.1–3.9), mt = 4.6 (4.6–6.1), ta = 3.5 (2.9–3.5); leg IV: tr = 1.5 (1.2–1.5), fe = 8.3 (7.6–8.9), pa = 2.2 (1.8–2.2), ti = 5.3 (4.3–5.5), mt = 8.5 (8.0–8.5), ta = 3.1 (2.9–4.0).

Description. Similar to males, differing in: chelicerae not swollen (Fig. 5); DS outline slightly wider than in males, with conspicuous coda; lateral and posterior rows and groups of yellow tubercles with more tubercles; paramedian paired tubercles on free tergites larger and wider than in males; paramedia spines on mesotergal area III leaning back; stigmatic area without posteroventral projection; femur IV without prolateral distal spine; tibia IV without retrolateral row of pectinate spines.

**Distribution**

Colombia, Huila Department (Fig. 1).

***Neocranaus armatissimus*** (Mello-Leitão, 1941)

*Mitobatulina armatissima* Mello-Leitão, 1941: 170, fig. 5.

*Mitobatulina armatissima* – Soares & Soares 1949: 235.
*Neocranaus armatissimus* – Kury 2003: 95.

**Type data**

COLOMBIA • ♀ (holotype); [Putumayo], Puerto Asis; (whereabouts unknown).

**Remarks**

In the current state of knowledge of the family, the generic assignment is challenging in many cases. *Neocranaus armatissimus* is known only from the female description, and we have not been able to study the type specimen. Based on the original description, this species exhibits characteristics suggesting its placement in the genus *Neocranaus*. However, a study of the male genitalia and secondary sexual characters could confirm or refine its generic assignment. This species also appears to be related to some species currently assigned to the genus *Phareicranaus* Roewer, 1913 (*festae* group), but further analysis is needed. Some species within *Phareicranaus*, specifically those treated as the *festae* group (Pinto-da-Rocha & Kury 2003), share morphological characters with *Neocranus* + *Mitobatulina*, suggesting a potential relationship. Resolving *Mitobatulina*'s taxonomic position would require evaluating its relationships with *Phareicranaus*, *Neocranaus*, and *Nieblia* in a phylogenetic context. However, this exceeds the scope of our current project and might lead to the necessity of dismemberment of *Phareicranaus* as defined in Pinto-da-Rocha & Bonaldo (2011). The name *Nieblia* is available in the literature and could potentially be a senior synonym for *Mitobatulina*.

In light of this, we propose to kept *Mitobatulina* from synonymy with *Neocranus* until a comprehensive analysis is conducted.

**Distribution**

Colombia, Putumayo Department.

**Remarks**

Our preliminary work on the phylogenetic relationships of the genera in Cranaidae has shown that *Mitobatulina armatissima* does not belong to *Neocranaus*. Therefore, we consider not including it in the taxonomic treatment of the article. However, in the current state of knowledge of the family, it is impossible to assign this species to any valid genus. *Mitobatulina* exhibits an exomorphology distinct from *Neocranaus* as diagnosed in this study. Some species within *Phareicranaus*, specifically those treated as the *festae* group (Pinto-da-Rocha & Kury 2003), share morphological characters with *Mitobatulina*, suggesting a potential relationship between *M. arthrocentrica* and the *festae* species group. Resolving *Mitobatulina*'s taxonomic position would require evaluating its relationships with *Phareicranus*, *Neocranaus*, and *Nieblia* in a phylogenetic context. However, this exceeds the scope of our current project and might lead to the necessity of dismemberment of *Phareicranaus* as defined in Pinto-da-Rocha & Bonaldo (2011). The name *Nieblia* is available in the literature and could potentially be a senior synonym for *Mitobatulina*. In light of this, we propose removing *Mitobatulina* from synonymy with *Neocranus* and consider it as a subjective junior synonym of *Phareicranaus*.

***Neocranaus gladius*** Villarreal & Kury sp. nov.
urn:lsid:zoobank.org:act:5AE279E5-BBC8-4135-A5CB-5D76648EF54A
Figs 1, 6–8

**Diagnosis**

*Neocranaus gladius* sp. nov. differs from all other congeneric species by the shape of the outline of the dorsal scutum in dorsal view (gamma pyriform with the median bulge asymmetrical and posteriorly displaced) (Figs 6A, 7A); coxa II (at least in the males) ventrally inflated (Figs 6B–C, 7B); males with a large retrolateral spine in coxa III (Fig. 7A); paired spines on area III high, sharp and strongly divergents (Figs 6B, 7A–B) instead of short and rounded (Fig. 9B, D) or acute but almost subparallel (Fig. 2B, D). Ventral plate elongated cordiform, with trapezoid cleft which defines a pair of square ears, without subdistal constriction (the other species with known males have a subdistal constriction), MS-C distal pairs longer than MS-C basal pair and MS-D (in other species the MS-C distal pairs are smaller than basal pairs).

**Etymology**

From the Latin noun '*gladius*', meaning 'sword' of any type, but in its narrow sense, it refers to the sword of ancient Roman foot soldiers. It is used here in reference to the retrolateral tubercle of coxa III of the males in this species. Noun in apposition.

**Type material**

**Holotype**

COLOMBIA • ♂; Santander, Carmen de Chucurí, Vereda La Bodega, P.N.N. Yariguíes, camino a La Bocatoma; 6.688917° N, 73.438917° W; alt. 1704 m; 19 Mar. 2011; R. del Valle leg.; ICN-Ao-837.

**Paratypes**

COLOMBIA • 1 ♂, 1 ♀; same collection data as for holotype; ICN-Ao-ex. 837 • 1 ♂; Santander, Carmen de Chucurí, Vereda La Bodega, P.N.N. Los Yariguíes; 6.688917° N, 73.438917° W; 16 Mar. 2011; Est. Taxonomía Animal leg; ICN-Ao-855 • 1 ♂, 1 ♀; Santander, Encino, La Sierra, S.F.F. Guanentá-Alto Río Fonce; 6.021047° N, 73.151700° W; alt. 2450–2600 m; 13 Jan. 2002; S. Arias leg.; ICN-Ao-1149.

**Description**

**Male**

Measurements. DSL = 8.4; MDW = 7.5; CL = 3.8; CW = 5.0; IOD = 1.7; ChI = 1.6; pedipalp: tr = 1.3, fe = 3.4, pa = 2.0, ti = 2.3, ta = 2.4; leg IV: tr = 1.3, fe = 16.1, pa = 1.5, ti = 7.8, mt = –, ta = –.

Dorsum (Figs 6A–B, 7A–B). Dorsal scutum outline gamma pyriform, with median bulge asymmetrical and posteriorly displaced. Anterior margin of prosoma with three anterolateral short tubercles and pair of medial rounded yellow tubercles; cheliceral sockets shallow, between two very short processes, medial process short. Eyes located on elliptical ocularium, located slightly anterior on carapace, very granulated and with two rounded spines. Lateral margin with row of granules and with group of posterolateral rounded yellow tubercles on each side. Mesotergum divided into three areas: I medially divided by suture into two trapezoidal halves, each with one large tubercle surrounded by granules; II unarmed and entire, with some disperse granules and transverse row of small yellow granules, invading slightly medial portion of area I; III with paramedian pair of high and stout spines with base densely granulated. Posterior margin substraight, with row of small tubercles. Free tergites I–III with row of tubercles each, and III with paramedian pair of large acuminated tubercles.

Venter (Fig. 6C–D). Coxa I granulose, with row of 8–9 conspicuous tubercles; II much expanded, II–III with 4 median rows of granules; IV densely granulated in ventral surface, with some tubercles in prolateral face. Stigmatic area granulated (Fig. 6C), T-inverted shaped, stigmata ovoid, subparallel, with large tubercles on posterior margin and triangular ventral projection. Free sternites with row of minute granules. Free sternites I with lateral yellow tubercles, rest of sternite with lateral large tubercles and row of minute granules.

Chelicerae (Figs 6A, 7A). Segment I with few small tubercles on bulla proximal face; II slightly swollen.

Pedipalps (Fig. 6E). Coxa short, dorsally with 1–2 small tubercles. Trochanter with some dorsal small tubercles, and one large tubercle on ventral side. Femur stout and slightly curved, dorsally with row of tubercles and apical apophysis; ectal row of tubercles; ventrally with two proximal tubercles, small gap and row of four spaced tubercles. Patella slightly swollen distally, with dorsomedial depression; dorsally tuberculated, ventrally smooth. Tibia dorsally with abundant tubercles, ventrally smooth; tibia ectal iiIiIii. Tarsus dorsally tuberculated and ventrally smooth; tarsus ectal IiiIiIi.

Legs (Figs 6F–G, 7C–D). Coxae I–II with dorsal pair of tubercles; III with prolateral tubercle; IV with sparse prolateral small tubercles, one large prolateral distinctive and one apical larger and sharp tubercle. Trochanter I dorsally smooth; II dorsally tuberculated, and with two retrolateral conspicuous tubercles; III with dorsal irregular tubercles and granules, one prolateral tubercle, one retrolateral medial large tubercles and one large spine; IV with sparse prolateral, dorsal and retrolateral tubercles, one dorsal tubercle larger than others. Femora I–II with complete rows of granules; II–IV each with dorsoapical apophysis; III with complete rows of granules, and proximal retrolateral large tubercle; IV straight, with complete rows of tubercles, retrodorsal row with large tubercles on proximal and distal portions, with one large and curved prolateral distal tubercle. Patella I granulated; II–III evenly covered with low

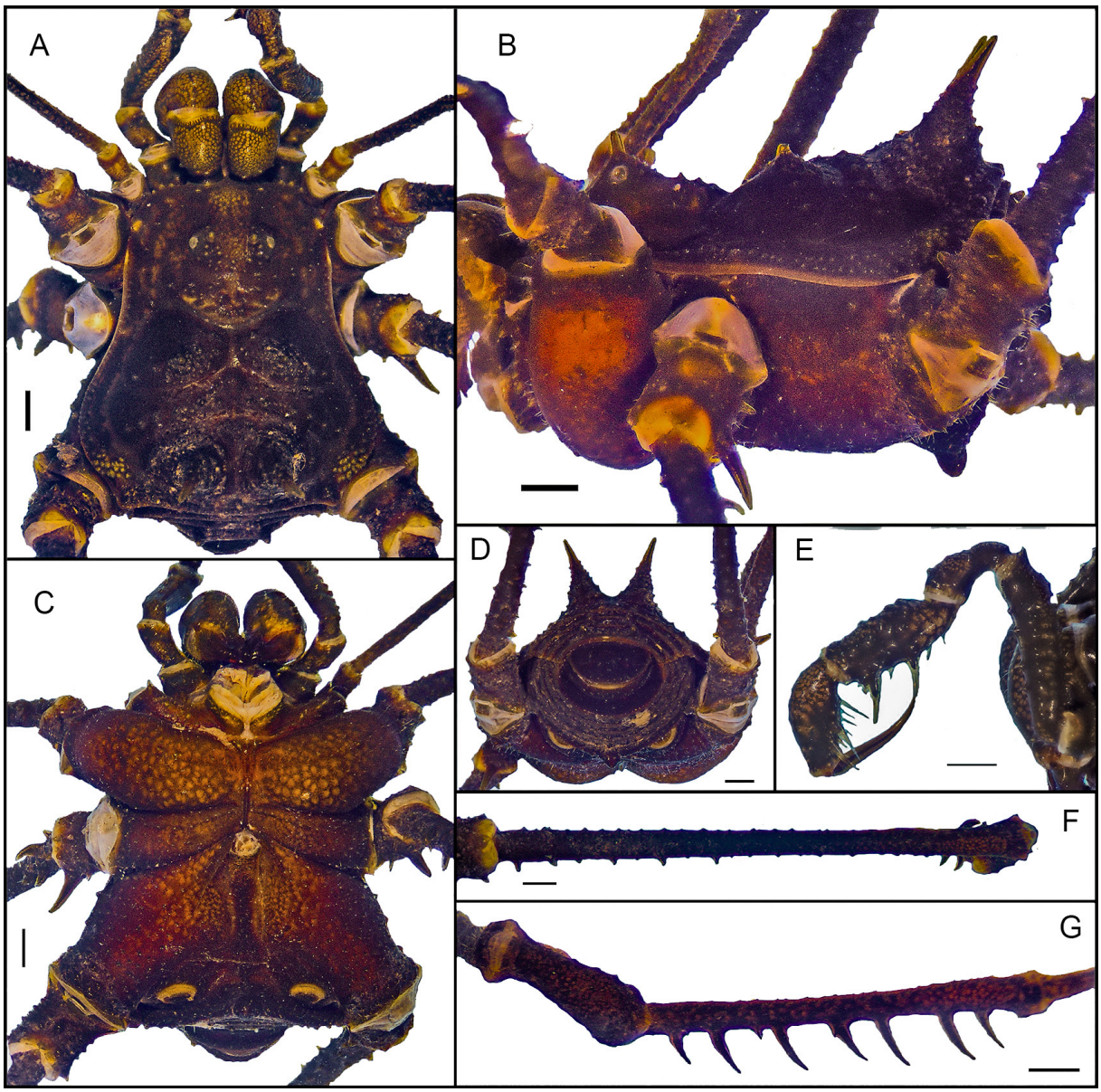


**Fig. 6.** *Neocranaus gladius* Villarreal & Kury sp. nov., holotype, ♂ (ICN-Ao-837). **A**. Dorsal view. **B**. Lateral view. **C**. Ventral view. **D**. Posterior view. **E**. Left pedipalp, ectal view. **F**. Right leg IV, femur in dorsal view. **G**. Right leg IV, tibia in dorsal view. Scale bars = 1 mm.

tubercles; IV covered with larger than those in III. Tibiae IV with rows of tubercles and retrolateral row of curved spines.

Penis (Fig. 8). Apical portion of truncus sinuous, with subdistal break (undergoing change in direction). Ventral plate elongate cordiform, with trapezoid cleft which defines pair of square ears. MS-A1-A2 situated close to MS-C1-C2 on distal half of VP. MS-D1 as large as MS-C3 being closer to MS-D1 than to other MS-C. MS-B absent. Pedestal very short, sprawled. Stylus slightly curved, S-shaped, with small and irregular stylar caps.

Coloration (in alcohol) (Fig. 6). Dorsal scutum and anal operculum brownish black (65), prosoma dark brown (59) reticulated on dark orange yellow (72). Free tergites, coxae and trochanters brownish black (65). Trochanters III–IV dorsal with distal spots vivid yellow (82). Chelicerae reticulated dark yellowish brown (78) on background vivid yellow (82). Coxae I–III and medial zone of IV ventrally reticulated deep yellowish brown (75) on background strong yellow (84); lateral and posterior zone of IV and stigmatic area deep brown (56). Pedipalp reticulated dark olive brown (96) on background moderate olive brown (95).

**Female**

Unknown.

**Distribution**

Colombia, Santander Department (Fig. 1).

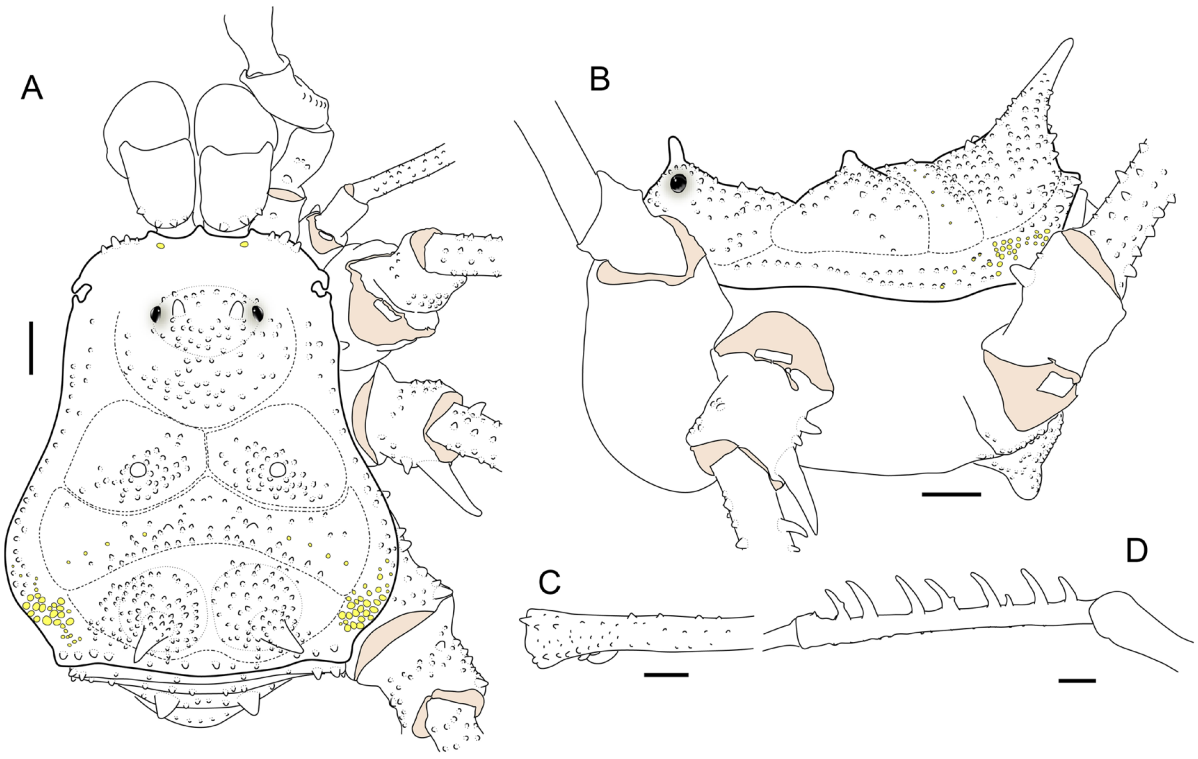


**Fig. 7.** *Neocranaus gladius* Villarreal & Kury sp. nov., holotype, ♂ (ICN-Ao-837). **A**. Dorsal view. **B**. Lateral view. **C**. Right leg IV, femur distal portion in dorsal view. **D**. Right leg IV, tibia in dorsal view. Scale bars = 1 mm.

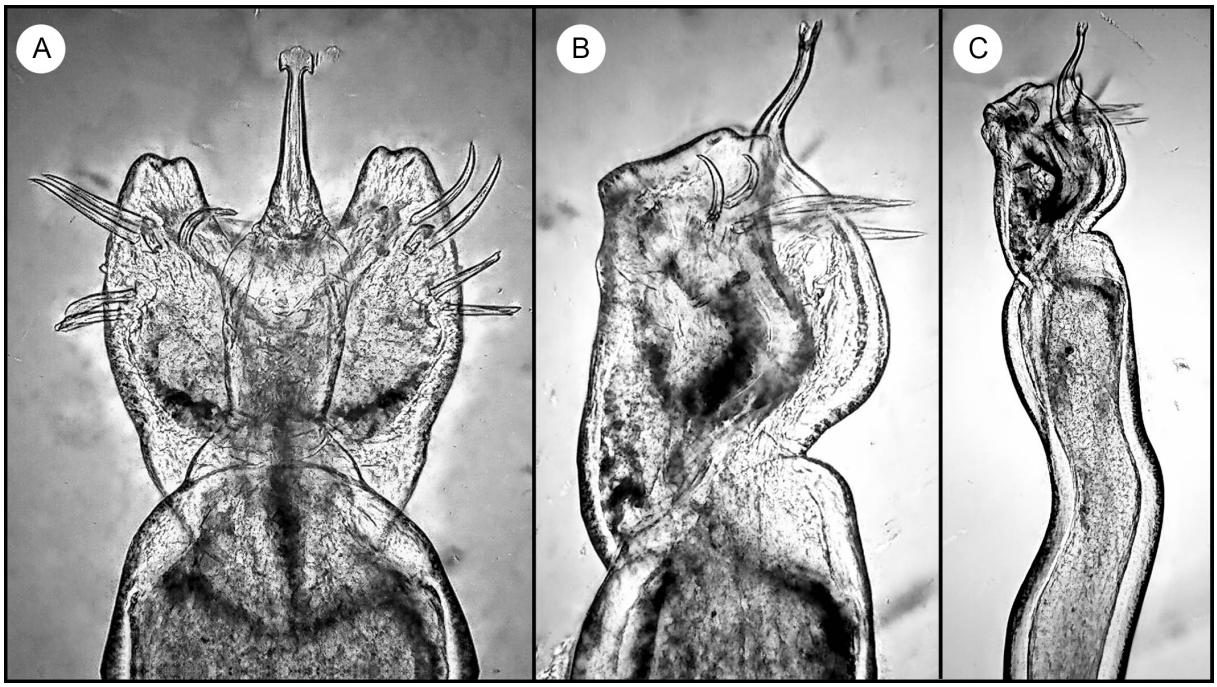


**Fig. 8.** *Neocranaus gladius* Villarreal & Kury sp. nov., holotype, ♂ (ICN-Ao-837). Penis: apical portion in dorsal (**A**), lateral (**B**) and lateral panoramic view (**C**).

***Neocranaus laevifrons*** (Roewer, 1917) comb. nov.
Fig. 1

*Holocranaus laevifrons* Roewer, 1917: 148, fig. 40.

*Holocranaus laevifrons* – Roewer 1923: 557, fig. 696; 1932: 292. — Soares & Soares 1948: 602.

**Type data**

ECUADOR • ♀, holotype; [Chimborazo], Sibambe; SMF RI 1337 (not examined).

**Distribution**

Ecuador, Chimborazo Province (Fig. 1).

***Neocranaus pectinitibialis*** (Roewer, 1915) comb. nov.
Figs 1, 9–12

*Tolimaius pectinitibialis* Roewer, 1915: 125, figs 12–13.

*Tolimaius pectinitibialis* – Roewer 1923: 558, fig. 698.
*Holocranaus pectinitibialis* – Soares & Soares 1948: 603. — Kury 2003: 93.

**Type data**

COLOMBIA • 1 ♂, 1 ♀ (syntypes); Cañón del Mt Tolima; alt. 1700 m [not located]; ERPC • 1 ♂, 1 ♀ (syntypes); Páramo de Tolima; alt. 4600 m [not located]; SMF.

**Material examined**

COLOMBIA • 2 ♀♀; Tolima, Termales, Tapias, piedemonte del Volcán-Machín; 11 Nov. 2020; L. Martínez and E. Betancur leg.; IAvH-I-3798 • 1 ♂, 1 ♀; Tolima, Juntas; 4.561725° N, 75.321106° W; 9 Jul. 2019; J. González, L. García, L. Cardozo and L. Martínez leg.; MUSENUV-Ar 2123 • 1 ♂, 3 ♀♀; same collection data as for preceding; MUSENUV-Ar 2124.

**Redescription**

**Male** (MUSENUV-Ar 2123)

Measurements. Variation in size found in males (n = 2) is denoted in parentheses. DSL = 9 (9.0–9.9); MDW = 7.4 (7.4–7.6); CL = 3.6 (3.2–3.6); CW = 5.5 (5.4–5.5); IOD = 2.3 (2.2–2.3); ChI = 2.4 (1.9–2.4); pedipalp: tr = 1.2 (1.2–1.3), fe = 3.2 (3.2–3.4), pa = 1.5 (1.5–1.6), ti = 2.5 (2,5), ta = 3.5 (3.5–3.6); leg I: tr = 1.1 (0.9–1.1), fe = 4.5 (4,5), pa = 1.5 (1.2–1.5), ti = 3.3 (3.0–3.3), mt = 5.0 (5.0–5.5), ta = 2.4 (2.4–2.5); leg II: tr = 1.6 (1.6–1.9), fe = 9.0 (9.0–9.8), pa = 2.1 (2.1), ti = 6.6 (6.0–6.6), mt = 8.3 (8.3–8.5), ta = 6.0 (6.0–6.4); leg III: tr = 1.7 (1.7–1.9), fe = 7.1 (6.8–7.1), pa = 2.2 (2,2), ti = 4.2 (4.2–4.6), mt = 6.5 (6.5–6.9), ta = 3.2 (3.2–3.5); leg IV: tr = 2.2 (1.9–2.2), fe = 12.0 (12.0–12.1), pa = 2.8 (2.8–2.9), ti = 6.9 (6.7–6.9), mt = 9.5 (9.5–10.3), ta = 4.0 (4.0–4.6).

Dorsum (Figs 9A–B, D, 10A–B). Dorsal scutum outline gamma pyriform. Anterior margin of DS with four anterolateral lighter tubercles; cheliceral sockets shallow, between two short processes, medial process median. Frontal eminence low and granulated. Eyes on elliptical ocularium, located anteriorly on carapace, and slightly posteriorly to ozopores; ocularium with some lighter granules and paramedian pair of short spines Lateral margin with cluster of about 14–19 yellow tubercles at level of coxae III, and row of minute lighter granule between coxa IV and posterior margin, with some greater tubercles at level of groove III. Mesotergum divided into three areas: I divided medially into two broadly joined trapezoidal halves, with one conspicuous tubercle on each side and some anterior granules and cluster of lighter tubercles on posterior zone; II unarmed and entire, with only three transversal rows of few granules, invading slightly area I in medial zone; III with pair of paramedian low rounded spines and densely tuberculate. Posterior margin substraight, with one group of yellow tubercles on each side and paramedian pair of small conical tubercles. Free tergites I with paramedian pair of small tubercles and lateral group of granules; II–III with row of yellow tubercles, and paramedian pair of large conical tubercles (II < III).

Venter (Figs 9B–D, 10B). Coxa I with anterior row of seven tubercles, medial row with nine tubercles and posterior row of granules; II–III with longitudinal rows of granules; IV densely granulated with some tubercles in prolateral face, with large conical prolateral yellow tubercle (Figs 9B, 10B). Genital operculum finely granulated. Stigmatic area (Fig. 9B–C). T-inverted shaped, granulate, with two posterior depressions between parallel spiracles. Posterior margin ventrally projected. Free sternites I with lateral yellow tubercles, rest each with lateral large tubercles and row of minute granules.

Chelicerae (Figs 9A–B, 10A–C). Segment I with four anterior and ectal small tubercles on bulla; II swollen with some frontal granules, fixed finger with irregularly toothed blade, movable finger with basal tooth and one medial tooth.

Pedipalps (Fig. 9A, F). Coxa dorsally smooth; ventrally with one mesal blunt tubercle. Trochanter with three dorsal tubercles, and one blunt tubercle on ventral side. Femur straight, with distal portion curved and thickened; dorsally with rows of tubercles and apical apophysis; ectal and mesal row of tubercles; ventrally with proximal group of tubercles, followed by gap, and row of about seven triangular tubercles. Patella swollen distally, with dorsal depression and dorsally tuberculate, ventrally smooth. Tibia dorsally with abundant wide tubercles, ventrally smooth; tibia mesal IiIi, ectal IiIi. Tarsus dorsally and ventrally smooth; tarsus mesal IIi, ectal IiI.

Legs (Figs 9G–I, 10D–H). Coxae I with dorsoanterior and one retrolateral tubercle; II with prolateral tubercle; III with posterolateral tubercle; IV with numerous lateral blunt tubercles, one conspicuous yellowish and one dorsodistal large tubercle. Trochanter I dorsally smooth and one retrolateral distal granule; II with one dorsal tubercle, two retrolateral small tubercles and one retrodistal distinctive granule; III with one prodistal and two retrolateral tubercles; sparse dorsal granules, one prodistal large tubercle, two prolateral, and with some retrodistal granules. Femora I–II with seven rows of granules; II with retroventral and proventral granules larger than others, with two dorsoapical apophyses; III, with distal and proximal granule larger than rest in retroventral row, retroventral and proventral granules larger than other granules of rows, with two prodorsal and retrodorsal distal tubercles; IV almost


**Fig. 9.** *Neocranaus pectinitibialis* (Roewer, 1915) comb. nov., male from Tolima (MUSENUV-Ar 2123). **A**. Dorsal view. **B**. Lateral view. **C**. Ventral view. **D**. Posterior view. **E**. Left pedipalp, ectal view. **F**. Left pedipalp, mesal view. **G**. Right leg IV, femur in dorsal view. **H**. Right leg IV, femur in ventral view. **I**. Right leg IV, patella and tibia in dorsal view. Scale bars = 1 mm.

straight, proventral row with large curved subdistal tubercle and two small distal tubercles, dorsal row with medial tubercles larger than others, retrodorsal row with conspicuous sparse tubercles. Patella I–III granulated, IV covered with low tubercles. Tibiae I–IV straight, slightly thicker distally, III with dorsal distal large tubercle; I smooth; II–III with rows of noticeable granules; IV with rows of low tubercles, and retrolateral row of curved spines. Metatarsi I–IV smooth. Tarsal process present. Tarsal claws III–IV subparallel, unpectinated. Tarsal segmentation: 7(3)/11(3)/7/7.

Penis (Fig. 11). VP subrectangular with rounded sides and bulged twice: at MS-A1–A2 and at ears. Apical trapezoid cleft of VP forming pair of ears widely projected laterodistad as flange. Pedestal elongate cylindrical. MS-C1–C3, D1 all arranged in row. MS-D1 larger than MS-C1–C3. MS-A1-A2 inserted far away from MS-C, at proximal bulge of VP. MS-B absent. Stylus slightly curved, S-shaped, with small and irregular stylar caps.

Coloration (Figs 9 (in ethanol), 13C–D (in vivo)). Description in ethanol. Dorsal scutum blackish red (21) on background dark reddish brown (44), carapace and ocularium background dark reddish orange (38). Mesotergal areas brownish black (65); chelicerae and pedipalps reticulated brownish black (65) on background strong yellowish brown (74); trochanter I–IV dorsally deep reddish brown (41) and strong orange yellow (68); coxae, ventral trochanter, femora, free tergites and free sternites blackish red (21); yellowish tubercles on the lateral and posterior margins of DS, free tergites, coxae IV and mesotergal area I brilliant greenish yellow (98).

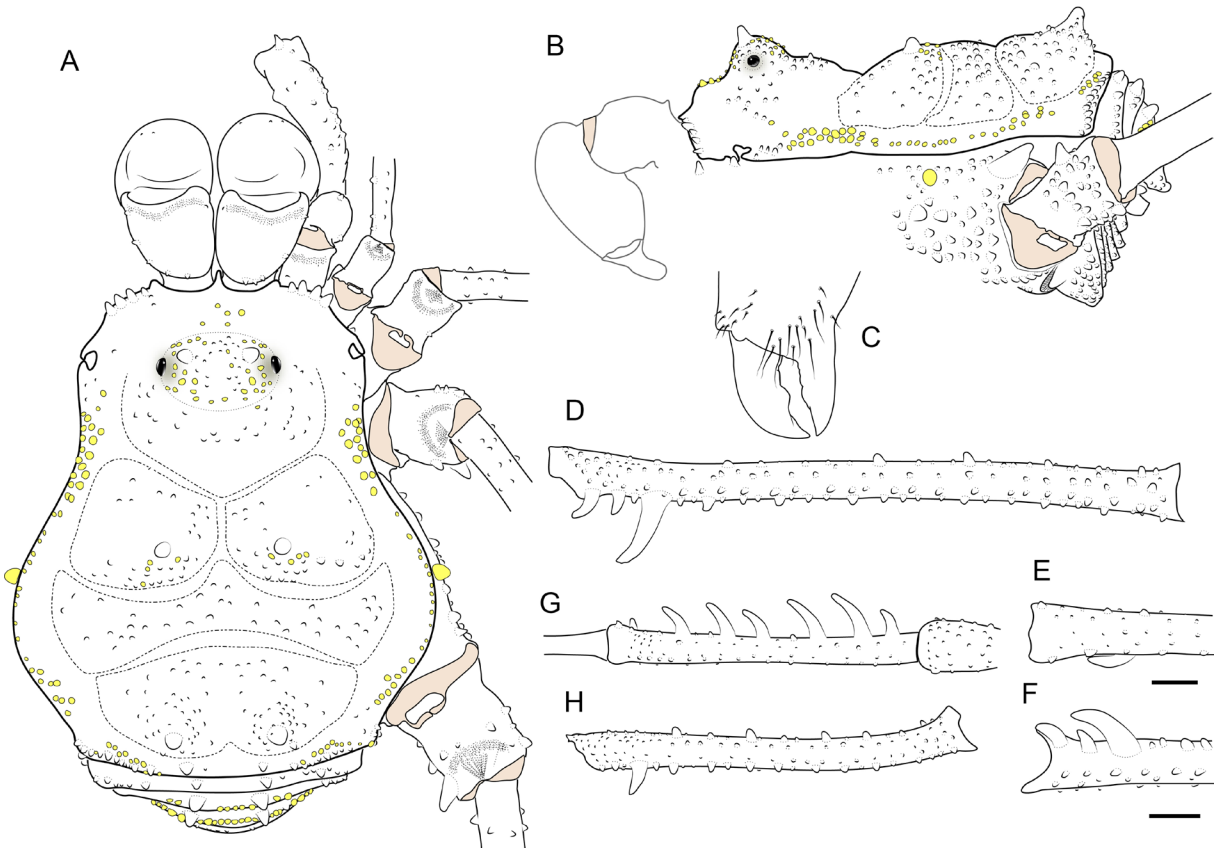


**Fig. 10.** *Neocranaus pectinitibialis* (Roewer, 1915) comb. nov. **A–E**. Male from Tolima (MUSENUV-Ar 2123). **A**. Dorsal view. **B**. Lateral view. **C**. Right leg IV, femur, prolateral view. **D**. Right leg IV, femur distal portion in dorsal view. **E**. Right leg IV, femur distal portion in ventral view. **F**. Female (Catalogue), right leg IV, tibia, prolateral view. Scale bars = 1 mm.

**Female**

Measurements. Variation in size found in females (n = 4) is denoted in parentheses. DSL = 8.8 (8.2–8.8); MDW = 7.7 (7.5–8.0); CL = 3.0 (2.9–3.2); CW = 5.0 (4.4–5.0); IOD = 1.5 (1.7–1.9); ChI = 1.5 (1.1–1.5); pedipalp: tr = 0.9 (0.8–1.0), fe = 3.0 (2.1–3.0), pa = 1.4 (0.9–1.4), ti = 1.9 (1.5–2.3), ta = 2.5 (1.9–2.5); leg I: tr = 1.1 (0.8–1.5), fe = 3.9 (3.7–4.0), pa = 1.5 (1.2–1.5), ti = 2.6 (2.6–3.0), mt = 3.8 (3.8–4.2), ta = 2.3 (2.3–2.5); leg II: tr = 1.7 (1.5–2.0), fe = 8.4 (7.8–8.4), pa = 2.2 (1.7–2.8), ti = 5.4 (5.2–5.7), mt = 7.5 (6.0–7.5), ta = 5.1 (4.2–5.5); leg III: tr = 1.4 (1.4–2.0), fe = 6.0 (5.2–6.0), pa = 2.2 (1.9–2.2), ti = 3.9 (3.5–3.9), mt = 5.6 (5.4–6.0), ta = 3.0 (2.9–3.1); leg IV: tr = 1.8 (1.5–2.0), fe = 8.9 (7.1–8.9), pa = 2.4 (1.9–2.2), ti = 6.0 (5.2–6.0), mt = 8.8 (6.8–8.8), ta = 3.1 (2.9–4.0).

Description. Similar to males (Fig. 12), differing in: chelicerae not swollen; DS outline wider than in males, with conspicuous coda; posterolateral patch of yellow tubercles with more tubercles (about 19–20); paramedian paired tubercles on free tergites larger and wider than in males; femur IV without prolateral distal spine; tibia IV without retrolateral row of pectinate spines.

**Distribution**

Colombia, Tolima Department (Fig. 1).

**Remarks**

The record from Caracas, Distrito Capital, Venezuela (Roewer 1923) must be a wrong record. As observed in other Neotropical Opiliones groups, a significant level of endemism is evident, with numerous Andean species classified as Short-Range Endemics. The record from Caracas raise doubts due to its location in a separate mountain chain, located several hundred kilometers away from the Colombian Andes and other known localities of this species. Caracas falls within a distinct biogeographic ecoregion and province, exhibiting virtually no shared faunistic elements within the Opiliones group.

### *Parental care observations in N. albiconspersus and N. pectinitibialis*

Different specimens of *N. pectinitibialis* were observed at the locality of Juntas (4.561725° N, 75.321106° W), Tolima Department and in the Merenberg Nature Reserve, Huila Department

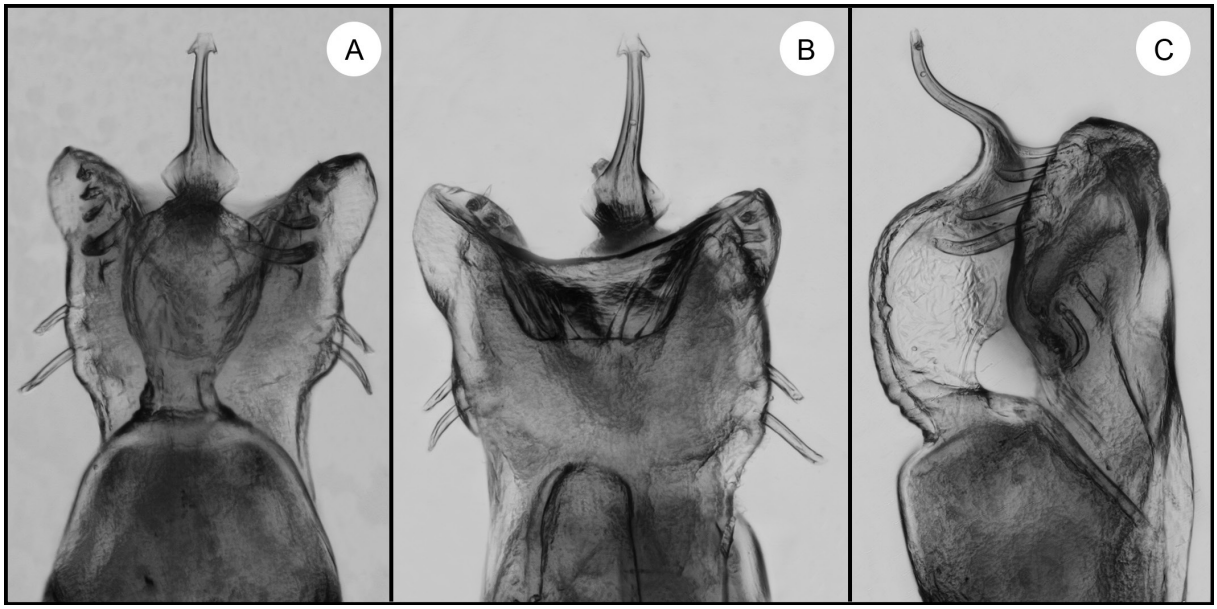


**Fig. 11.** *Neocranaus pectinitibialis* (Roewer, 1915) comb. nov. (MUSENUV-Ar 2123). Penis: apical portion in dorsal (**A**), ventral (**B**) and lateral views (**C**).

(2.2187861° N, 76.1161027° W). All individuals were found under humid crevices next to waterfalls, under rocks or in decaying wood. When individuals were found, we focused on studying feeding events or, if parental care was observed, we recorded if females or males were guarding the eggs as well as the number of eggs. Sex was determined in the field using the armature of leg IV. While recording individuals in the field, we observed three events related to parental care, in two of them, both male and female were caring for the eggs and in the third, only the female.

For *N. albiconspersus*, we observed three cases of parental care, in two of them, male and female were observed close to the eggs, and in one only the female was observed caring for the eggs. We did not

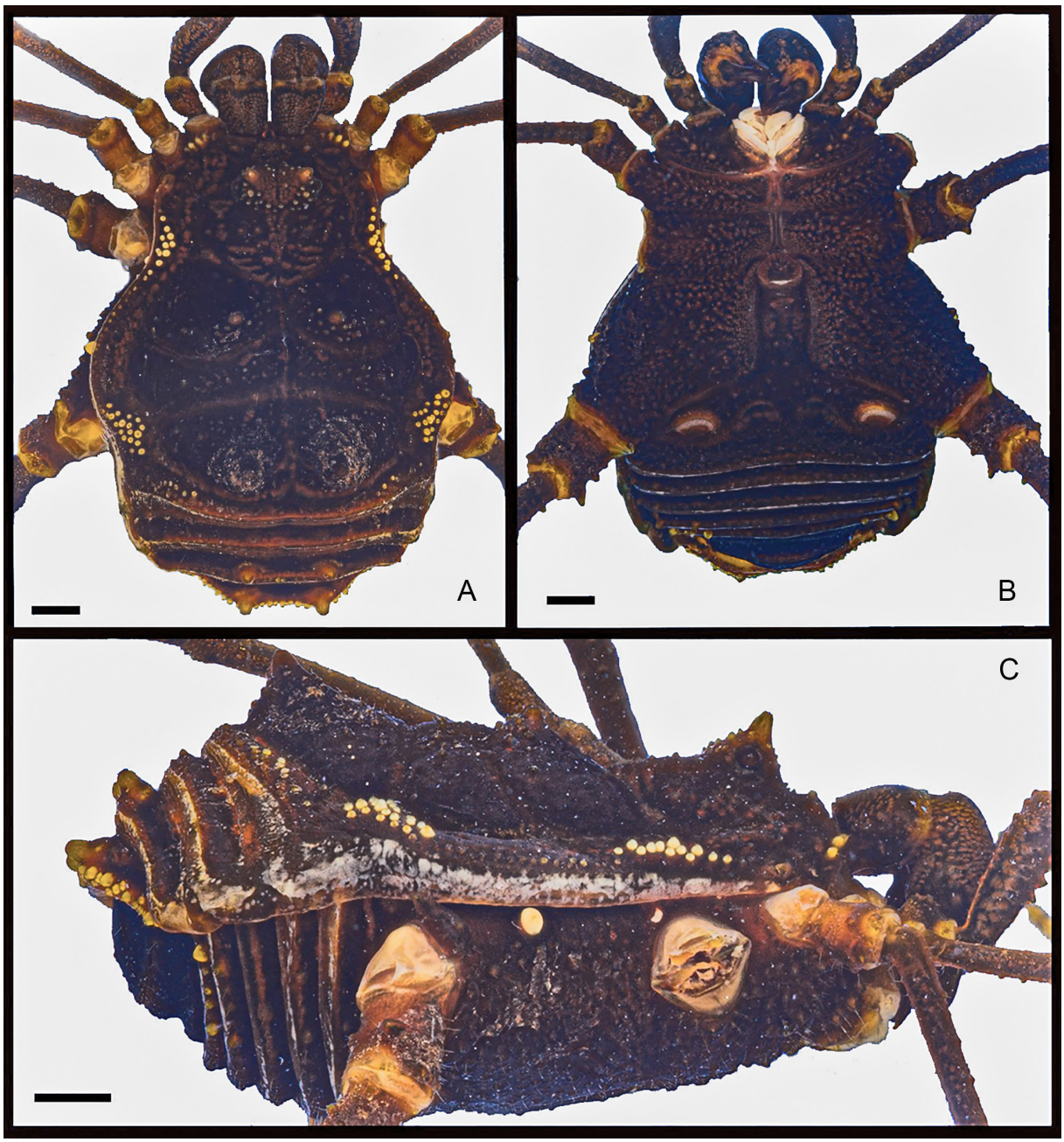


**Fig. 12.** *Neocranaus pectinitibialis* (Roewer, 1915) comb. nov. (MUSENUV-Ar 2123) female from Tolima. **A**. Dorsal view. **B**. Lateral view. **C**. Ventral view. Scale bars = 1 mm.

record feeding or any additional behavior. We also recorded predation on eggs of *N. albiconspersus* by a scolopendromorph centipede (Fig. 14C).

## Discussion

### Taxonomic remarks

While Soares & Soares (1948) did not provide a clear rationale for the synonymy of *Tolimaius* with *Holocranaus*, a more comprehensive insight emerges from Benedicto Soares' unpublished PhD thesis (Soares 1945). Within this thesis, a reasoning is presented underpinning the vast synonymization of numerous genera within what now constitutes the Gonyleptoidea. In this context, Soares (1945: 18) elucidates six distinguishing characters previously employed by Roewer to differentiate genera, collectively challenging their applicability to the taxa Cosmetidae C.L. Koch, 1839, Gonyleptidae (then encompassing the present-day Cranaidae), Phalangodidae Simon, 1879, and Stygnidae Simon, 1879. Consequently, he proposed extensive synonymies within the Cosmetidae (26 genera synonymized with another 14), Gonyleptidae (43 genera synonymized with 33: for Cranainae, 9 genera synonymized with 5), Phalangodidae (2 genera synonymized with 2) and Stygnidae (3 genera synonymized with 3). A fair share of those synonymies found their way into publications, especially the gonyleptid part, which ended up appearing in Soares & Soares' 'monographs' (1948, 1949, 1954). Goodnight & Goodnight (1953) employed a similar approach, in which they synonymized a substantial number of Cosmetidae genera into only three without providing a solid justification for their decision. It is noteworthy that a

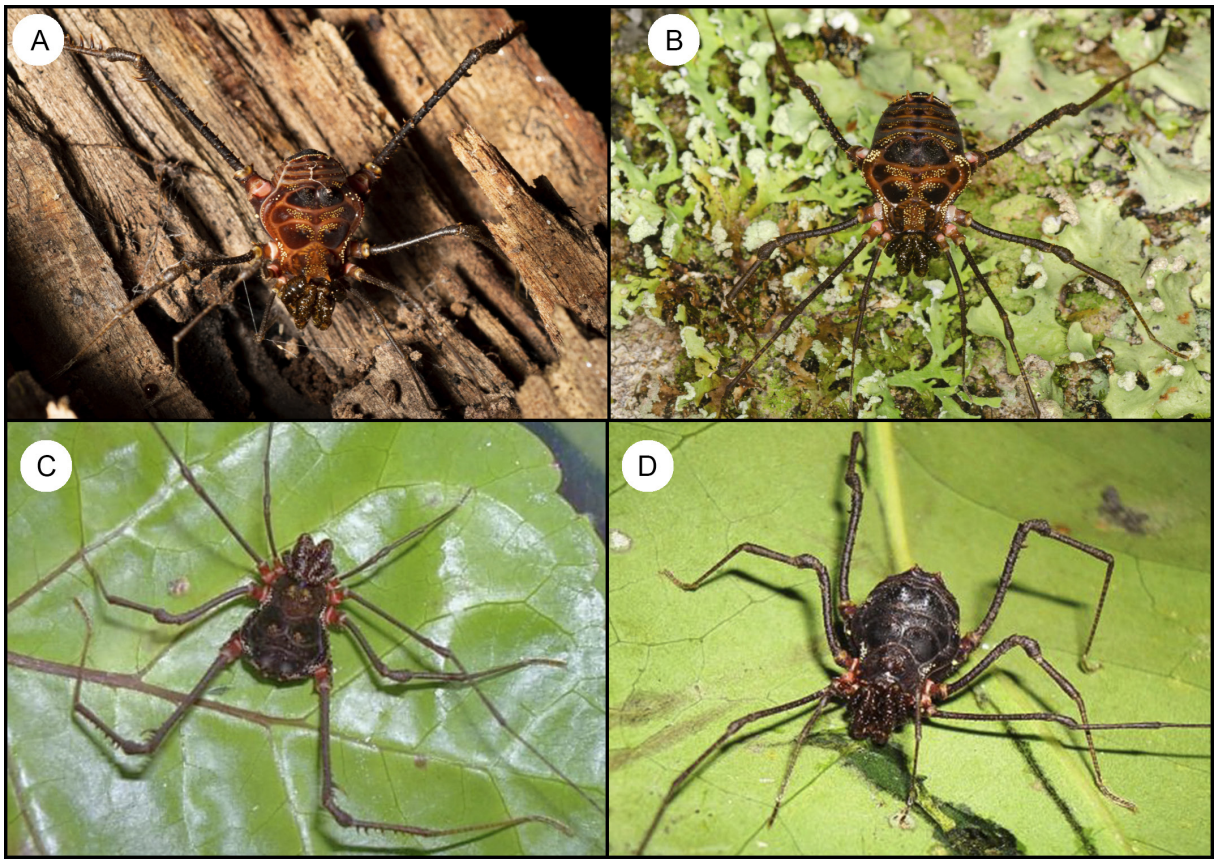


**Fig. 13. A–B**. *Neocranaus albiconspersus* Roewer, 1913, live specimens from Huila. **A**. Male. **B**. Female. **C–D**. *Neocranaus pectinitibialis* (Roewer, 1915) comb. nov., live specimens from Tolima. **C**. Male. **D**. Female. Pictures: A–B: Julio César González-Gómez; C–D: Luis F. García.

majority of these comprehensive synonymies, which lacked a substantial foundation, were subsequently discredited by multiple authors (e.g., Kury 2003; DaSilva & Gnaspini 2010; Kury & García 2016; Kury & Medrano 2018; Carvalho & Kury 2021).

The rationale underlying the synonymies proposed by the Soares and Goodnights exhibited certain logical fallacies, primarily stemming from their reliance on hypothetical conceptual distinctions of genera, as defined by Roewer. Moreover, the attempt to consolidate 64 distinct genera into a mere 3 in Cosmetidae can be characterized as an oversimplification, ignoring the underlying complexity and diversity of the taxa and overlooking the amalgamation of disparate elements within the resultant genera.

The diagnoses of *Holocranaus* vs *Tolimaius* using the superficial Roewerian system (e.g., Roewer 1923) can be differentiated only by the armature of the free tergite II (a pair of spines in *Holocranaus*, and a pair of tubercles in *Tolimaius*).

Soares "rule number 1" reads (Soares 1945: 18): genera should be no longer separated by the distinction between tubercle and spine. Therefore, following Soares' logic, it seems perfectly fine to merge both genera. The problem with both the Soares and Goodnights is their reliance on flawed Roewerian logic.

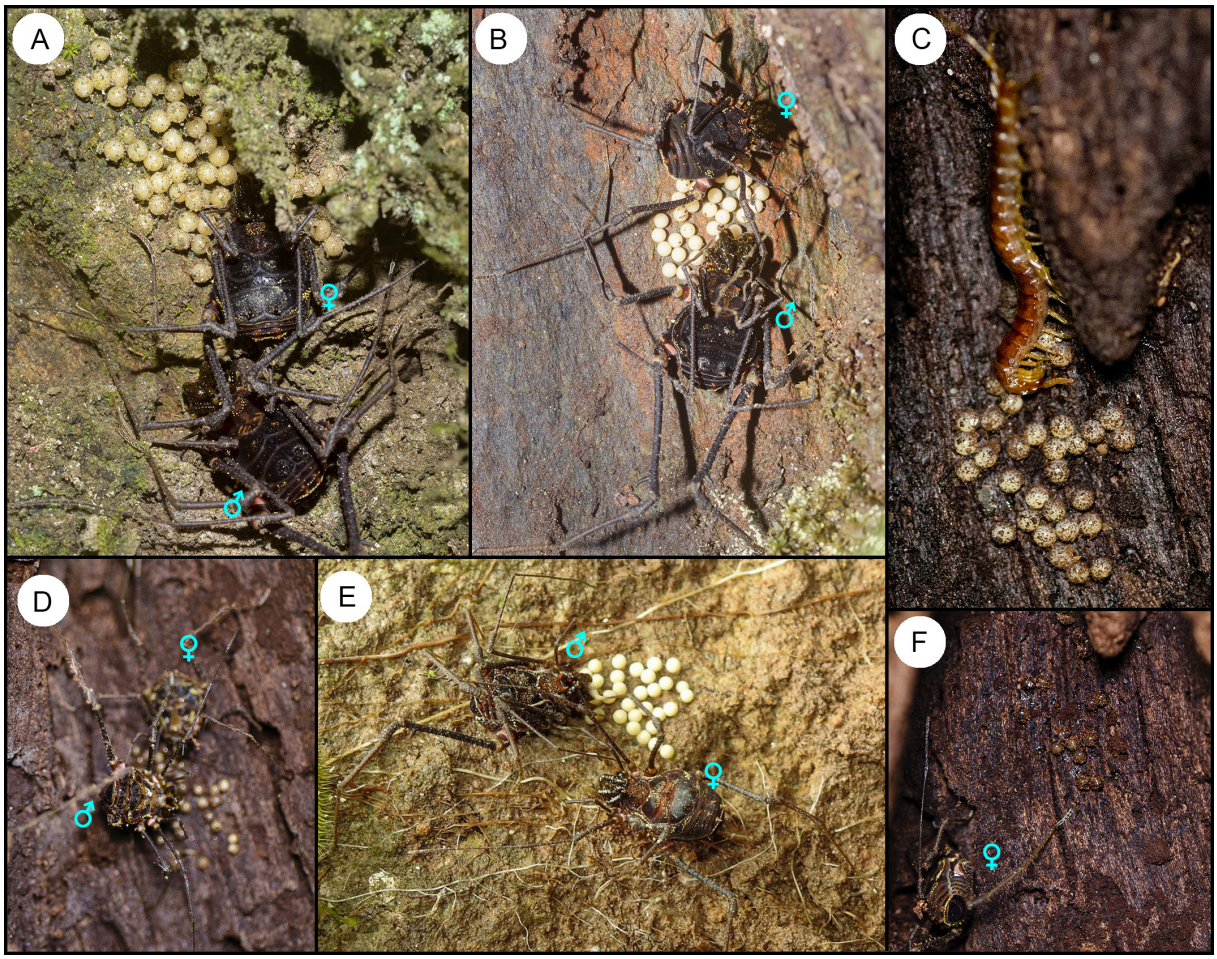


**Fig. 14. A–B**. *Neocranaus pectinitibialis* (Roewer, 1915) comb. nov., live male and female from Tolima, guarding eggs. **C–F**. *Neocranaus albiconspersus* Roewer, 1913 live specimens from Huila. **C**. Centipede predating on eggs of *Neocranaus* Roewer, 1913. **D–E**. Male and female, guarding eggs. **F**. Female guarding eggs. Pictures: Julio César González-Gómez.

This approach relies on a superficial and limited set of uninformative characters based on dorsal armature of the scutum and tarsal morphology. It can be summarized as follows: (1) few characters are arbitrarily chosen for all taxa within a broader higher-level taxon and given a specific rank value; (2) these characters are easily observable but may not be clear-cut and can be scored differently by the same author (e.g., Kury 1990); (3) other potentially relevant characters are ignored when making taxonomic decisions, even though they may be reported and integrated into species descriptions; (4) instead of extracting meaningful characters from the species, a pre-constructed grid is used to accommodate new genera virtually. This flawed approach hinders accurate and informative taxonomic decisions.

There are only a few lineages of Cranaidae for which male genital morphology is illustrated and described. This way, we could transfer some spurious species from the genus *Holocranaus*, which, currently, is an assemblage of species loosely knit in the 1920s by the use of limited Roewerian meristic features, and which could hardly resist a closer scrutiny.

*Macuchicola arthrocentrica* (Mello-Leitão, 1943) and *Nieblia festae* Roewer, 1925 (currently in *Phareicranaus*), both coming from Ecuadorian Andes, additionally share with *Neocranaus* some external morphological characteristics such as the type of ornamentation of the femur and tibia IV and the presence of ventroposterior ornamentation of the stigmatic area.

It seems that *Macuchicola*, *Neocranaus*, *Nieblia* and *Bucayana* are more closely related to each other than to the 'real' *Phareicranaus*, although a detailed phylogenetic analysis including all species of these genera is not yet available.

**Parental care**

Although our observations regarding parental care are only preliminary, the fact that both males and females have been observed repeatedly next to the eggs is a suggestion of possible biparental care. Although male proximity to eggs has been related to predation in some harvestman species (Machado *et al.* 2004), we did not record any aggressive behavior from females towards males or between males in our observations. In addition, biparental care has been previously recorded in some harvestman species, including some cranaids (e.g., Hunter *et al.* 2007). For example, although less frequently than the records made on this study, biparental care was also reported in the species *Phareicranaus calcarifer* (Simon, 1879) in a similar way as the records in our study, where adults of both sexes were observed next to the eggs and nymphs, guarding them (Hunter *et al.* 2007). Some other records of biparental care have been reported in other families like Stygnidae (Villarreal & Machado 2011) and Gonyleptidae (Machado & Oliveira 1998). Records of parental care in harvestman of the family Cranaidae are scarce when compared to other families, and are restricted to the genera *Phareicranaus* and *Phalangodus* Gervais, 1842 (Hunter *et al.* 2007; Colmenares & Tourinho 2014; García-Hernández & Machado 2017). For the first time this is recorded for *Neocranaus*, suggesting this behavior might be present in several genera in this family, similarly as it occurs in other harvestman families such as Gonyleptidae. Although we observed females alone caring for the eggs, this behavior was less frequent than biparental care; however, given our limited observations, further studies should explore the frequency of both biparental and uniparental care in the genus *Neocranaus.*

Egg predation has been extensively recorded in harvestmen, with various arthropods such as ants, wasps, spiders, orthopterans and even harvestmen of different species having been reported as egg predators (Chelini & Machado 2012). In the case of centipedes, few observations have suggested that scolopendrid species of the genus *Otostigmus* Porat, 1876 feed upon harvestman eggs of the species *Serracutisoma proximum* (Mello-Leitão, 1922) (Gonyleptidae: Goniosomatinae) (Buzatto *et al.* 2007). To our knowledge, our observation represents the first record of a centipede feeding on cranaid eggs. Given that both harvestmen and centipedes are an important part of soil fauna, centipedes might be

common predators of harvestman eggs; however, further studies are necessary to confirm this hypothesis. Interestingly, we found that eggs which were attended to by a single female were the only ones attacked by a predator. Although we have few observations in our study about egg-guarding in *N. pectinitibialis*, our observations agree with those in previous studies, which have shown that biparental is a defensive strategy against egg predation in gonyleptid harvestmen, therefore a similar trend might occur in *N. pectinitibialis*.

Egg deposition in *N. pectinitibialis* followed a similar pattern to that seen in other cranaids such as *Phalangodus briareos* Villarreal & García, 2016 (García-Hernández & Machado 2017) in which eggs are laid directly on the substrate. However, during the caring period, we recorded unattended eggs, an observation which differs from the literature, where other female harvestmen were reported to not leave the egg-batch to feed or undertake any other activity (e.g., Gnaspini 1995; Machado & Oliveira 1998; Machado *et al.*, 2004). Interestingly, one male was observed away from the eggs, which agrees with previous studies where guarding males frequently leave their egg-batches and may be found as far as five meters from the oviposition site (Hara *et al.* 2003; Machado *et al.* 2004). Although our observations on the natural history are preliminary, they agree with previous observations regarding parental care in harvestmen, suggesting that *Neocranaus* and related cranaid species could be potentially used as a model for the study of parental care in Neotropical harvestmen (Hunter *et al.* 2007).

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## Authors' contributions

OV conceived the project, diagrammed the plates of figures, and participated strongly in the writing of the article. JCG collected the specimens, worked on the elaboration of the figures and collected the data on natural history and parental care. ABK contributed to the elaboration of the map and actively participated in the writing of the discussion, descriptive part and the interpretation of the genital structure. LFG participated in the collection and analysis of the data on natural history observations and parental

care, including description and discussion. All the authors actively participated in the writing of the paper, contributing at all levels to its completion.

## Competing interests

OVM, AK, JCG and LFG declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Availability of data and materials

The material analyzed is available in the collections referred to in Material and methods.

## Consent for publication

All authors have read and approved the submission of this manuscript to European Journal of Taxonomy.

## Ethics approval consent to participate

Not applicable

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