European Journal of Taxonomy 821: 102–149
https://doi.org/10.5852/ejt.2022.821.1801
ISSN 2118-9773
www.europeanjournaloftaxonomy.eu
2022 · Amieva Mau S. *et al.*

Research article

urn:lsid:zoobank.org:pub:5F144AEC-256A-4F0C-AFBF-DF8C5E2BE843

New syarinid pseudoscorpions from Ecuador (Pseudoscorpiones, Syarinidae: *Ideobisium* and *Ideoblothrus*)

Sofía AMIEVA MAU [1,*], Mark S. HARVEY [2] & Danilo HARMS [3]

[1,3] Zoological Museum Hamburg, Leibniz Institute for the Analysis of Biodiversity Change (LIB), Martin-Luther-King-Platz 3, 20146 Hamburg, Germany.
[1] Universität Hamburg, Fachbereich Biologie, Ohnhorststraße 18, 22609 Hamburg, Germany.
[2] Western Australian Museum, Collections & Research Centre, 49 Kew Street, Welshpool, Western Australia 6106, Australia.
[2] University of Western Australia, School of Biological Sciences, Crawley, Western Australia 6009, Australia.

[*] Corresponding author: mauamievasofia_@hotmail.com
[2] Email: mark.harvey@museum.wa.gov.au
[3] Email: danilo.harms@uni-hamburg.de

[1] urn:lsid:zoobank.org:author:E555480A-478C-4143-BD02-8427421C6DB5
[2] urn:lsid:zoobank.org:author:FF5EBAF3-86E8-4B99-BE2E-A61E44AAEC2C
[3] urn:lsid:zoobank.org:author:7BABB8FF-8CFF-4E2C-ACDE-3E5614685C55

Abstract. The pseudoscorpion (Arachnida: Pseudoscorpiones) fauna of mainland Ecuador, excluding the Galápagos Islands, is poorly known, with only 41 described species in 9 families. The family Syarinidae has a pantropical distribution and presently comprises ca 120 species in 17 valid genera that are found in leaf litter and subterranean habitats, mostly in tropical and subtropical climates. Four syarinid species have been recorded from Ecuador, including the Galápagos, in two widespread genera, *Ideobisium* and *Ideoblothrus*, but field collections suggest that these pseudoscorpions are common and abundant in all forest systems across the country. Here, we review field collections of syarinids from mainland Ecuador and describe five new species in these genera: *Ideobisium kichwa* sp. nov. (Napo Province, Colonso Chalupas Natural Reserve), *I. sonqo* sp. nov. (Napo Province, Colonso Chalupas Natural Reserve), *I. susanae* sp. nov. (Napo Province, Jatun Sacha Natural Reserve), *Ideoblothrus nadineae* sp. nov. (Napo Province, Colonso Chalupas Natural Reserve) and *I. safinai* sp. nov. (Pichincha Province, Otongachi Natural Reserve) based on morphology. These species seem to have narrow distributions and we therefore restrict the ranges of two species previously recorded from Ecuador (*Ideobisium crassimanum* Balzan, 1892 and *Ideoblothrus costaricensis* (Beier, 1931)) to their countries of origin, which is Costa Rica and Venezuela, respectively.

Keywords. Arachnida, biodiversity, false scorpions, new species, taxonomy.

Amieva Mau S., Harvey M.S. & Harms D. 2022. New syarinid pseudoscorpions from Ecuador (Pseudoscorpiones, Syarinidae: *Ideobisium* and *Ideoblothrus*). *European Journal of Taxonomy* 821: 102–149.
https://doi.org/10.5852/ejt.2022.821.1801

Introduction

Pseudoscorpions are small (ca 1–10 mm in body length) arachnids that superficially resemble scorpions but lack the telson and the sting. The order comprises ca 4000 named species spread across 26 recent families that are found in all terrestrial habitats, although diversity is highest in the tropical regions of the world (Harvey 2007; Benavides *et al.* 2019; WAC 2021). One of the most diverse superfamilies is the Neobisioidea Chamberlin, 1930, which comprises soil-, cave- and leaf-litter dwelling pseudoscorpions with venom glands in both or only one of the chelal fingers. Seven neobisioid families are recognized, including the Syarinidae Chamberlin, 1930. Syarinids are diverse with 119 described species in 18 genera that generally occur in tropical regions of the world, although there are also records from Mediterranean biomes (Mahnert 1990; Zaragoza 2010; Gardini 2015) and even some cave relicts in temperate habitats (e.g., Reboleira *et al.* 2012). They are often small pseudoscorpions (<5 mm) that live in moist leaf-litter and subterranean habitats such as caves, and they have recently received some conservation relevance because at least some species seem to have very small distribution ranges (see e.g., Harvey & Edward 2007). Morphologically, syarinids differ from other pseudoscorpions by having a lanceolate trichobothrium *t* on the movable pedipalpal finger in several (but not all) genera, pleural membranes that are granulate towards the carapace rather than striate as in most pseudoscorpions, and a venom apparatus only in the fixed pedipalpal finger (Muchmore 1982; Harvey 1992; Zaragoza 2010). A recent transcriptomic study of the family relationships in the order has suggested Mesozoic origins of this family between 225 Mya (Late Triassic) and 70 Mya (Late Cretaceous), but there is no fossil record for the family (Harms & Dunlop 2017; Geißler *et al.* 2021; Schwarze *et al.* 2021), and nothing is known about diversification patterns over time although bipolar distributions between related genera (e.g., *Anysrius* Harvey, 1998 with two species from Tasmania and *Syarinus* with five species from Europe and North America) suggest continental vicariance as a driver of global diversification (Harvey 1998).

The classification of Syarinidae is still in flux, but four subfamilies are presently distinguished, namely Arcanobisiinae Zaragoza, 2010, Chitrellinae Beier, 1932, Ideobisiinae Banks, 1895 and Syarininae Chamberlin, 1930 (Harvey 2013). These have partly distinct distributions: Syarininae occurs in North America, Europe (*Syarinus* Chamberlin, 1925) and Tasmania (*Anysrius* Harvey, 1998); Arcanobisiinae (*Arcanobisium* Zaragoza, 2010) is endemic to Spain; Chitrellinae occurs in North America and Europe; and Ideobisiinae are largely cosmotropical.

The Ecuadorian pseudoscorpion fauna is poorly known and there has never been a detailed study on these arachnids in the country, with most descriptions being several decades old and conducted on samples that were collected rather randomly across the country. A total of 41 described species in 9 families are known (Harvey 2013) from mainland Ecuador, which is rather low (Harvey 2007) given that the country lies within a global biodiversity hotspot. Only three species of Syarinidae have been recorded from the mainland (Muchmore 1982), with two additional species from the Galápagos Islands (Mahnert 2014). These species are assigned to the two genera *Ideobisium* Balzan, 1892 and *Ideoblothrus*, 1892, which also occur widely in many tropical regions of the world, including the Americas. Taxonomically, *Ideoblothrus* was initially described as a subgenus of *Ideobisium* (Balzan 1892) but was elevated to generic status by Muchmore (1982), who reviewed the fauna and reclassified *Ideobisium* to include generally small and robust species with a square carapace, a low and rounded epistome, a smooth body surface, four distinct eyes, and two setae on the apex of the palpal coxa, whereas *Ideoblothrus* lacks eyes, has longitudinally striate abdominal pleural membranes (granulated anteriorly, becoming granulo-striate posteriorly in *Ideobisium*), pedipalpal segments that are often granulate, and pedal arolia that are as long as or longer than the claws (pedal arolia shorter than the claws in *Ideobisium*). It is beyond the present study to test these generic concepts, which are likely tentative, but we note that two of the three syarinid species previously recorded from Ecuador have their type localities outside the country and the Ecuadorian records are merely literature records without detailed descriptions or illustrations. These

species are *Ideobisium crassimanum* Balzan, 1892 and *Ideoblothrus costaricensis* (Beier, 1931) (Beier 1977; Muchmore 1982; Harvey 2013). The sole endemic Ecuadorean syarinid is *Ideobisium ecuadorense* Muchmore, 1982, which was collected near Cueva de los Tayos within the Morona-Santiago province of Ecuador.

To further document the pseudoscorpion fauna of Ecuador, we report on some recently collected specimens from mainland Ecuador and target syarinid pseudoscorpions for taxonomic study. We describe five new syarinid species from the Napo and Pichincha regions of Ecuador which are readily assigned to *Ideoblothrus* and *Ideobisium*, and discuss the possible misidentifications of previously recorded syarinid pseudoscorpions in the country. We also comment on possible range sizes and endemism, although a more integrated approach using molecular and morphological techniques will be necessary to fully appreciate the diversity and distribution of what appears to be a largely cryptic fauna.

Materials and methods

All specimens for this study were collected in Ecuador by Elicio E. Tapia and Nadine Dupérré between 2013 and 2020 (Figs 1–2) using pitfall trapping and hand collections. The specimens were kept in 75% ethanol and separated into small vials for detailed examination. Specimen examinations were made using a Leica M125C stereomicroscope. Measurements (in millimeters) were taken with a Leica

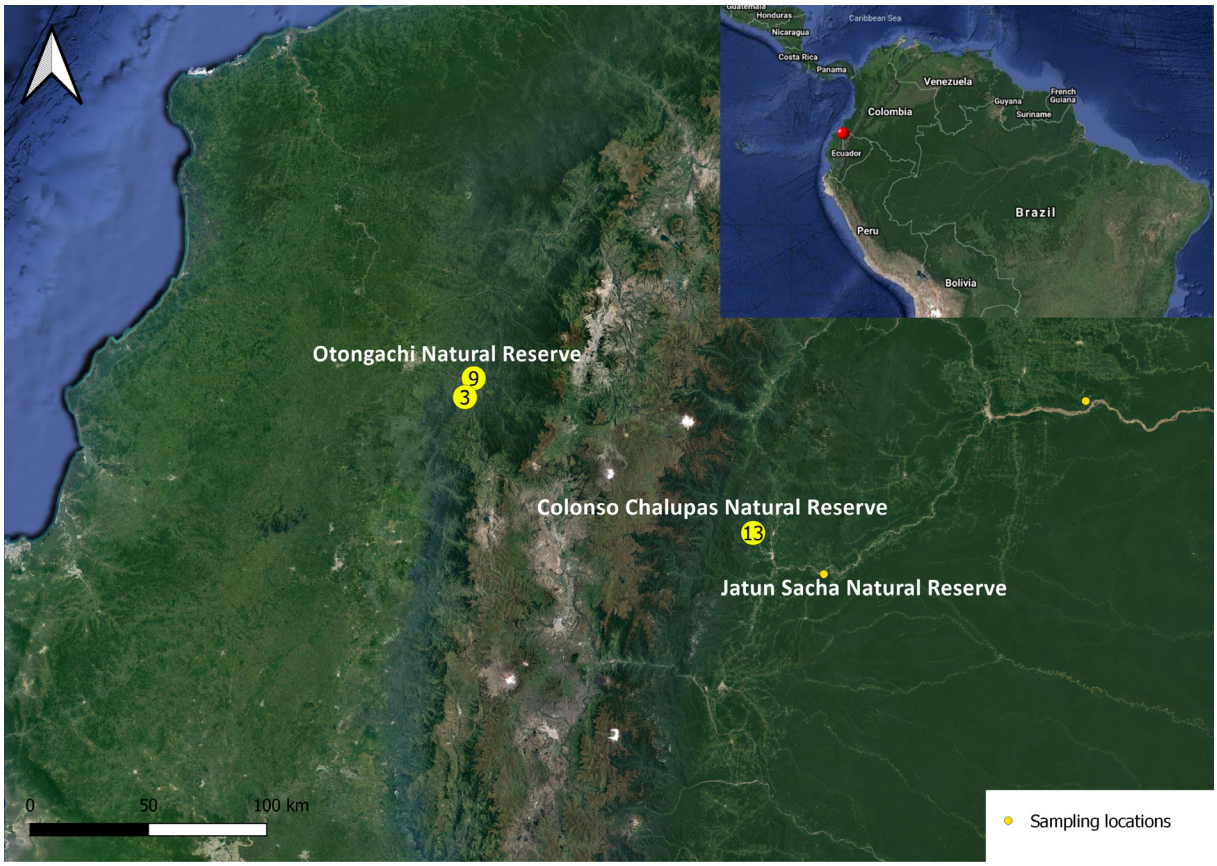

Fig. 1. Map indicating all sampling locations in Ecuador where specimens were collected. The numbers indicate overlapping locations.

DMC4500 digital camera attached to a Leica M205A stereo microscope, using the Leica Application Suite X software, ver. 3.0.1.

Digital images were taken with a Canon EOS 7D camera attached to microscope objectives in an installation on a P-51 CamLift-System controlled by P-51 Camlift Controller ver. 2.8.0.0 and by Capture One ver. 9.3. Scanning electron micrographs were taken with a Hitachi TM4000Plus scanning electron micrograph (SEM) system. Digital drawings were made using a GAOMON S620 graphic tablet and edited with Autodesk Sketchbook ver. 8.7. The distribution map was created using QGIS ver. 3.12.1 (https://www.qgis.org). Images, drawings and maps were edited with Adobe Photoshop ver. 13.0.1 x64, Inkscape ver. 1.0 and Autodesk Sketchbook ver. 8.7. Holotypes and allotypes from this study are deposited at the Museum of Invertebrates, Pontificia Universidad Católica del Ecuador, Quito (QCAZ) and paratypes are deposited at the Zoological Museum Hamburg (ZMH). Only species recorded from Ecuador's neighbouring countries, Colombia, Peru and Brazil, are compared with the new species in the corresponding diagnoses. The morphological nomenclature follows Chamberlin (1931), with the exception of the nomenclature of the chelicera (Judson 2007). Trichobothria nomenclature/terminology follows Harvey (1992). Abbreviations used in the taxonomic sections are as follows:

Fe = femur
Me = metatarsus
Pa = patella
Ta = tarsus
Ti = tibia

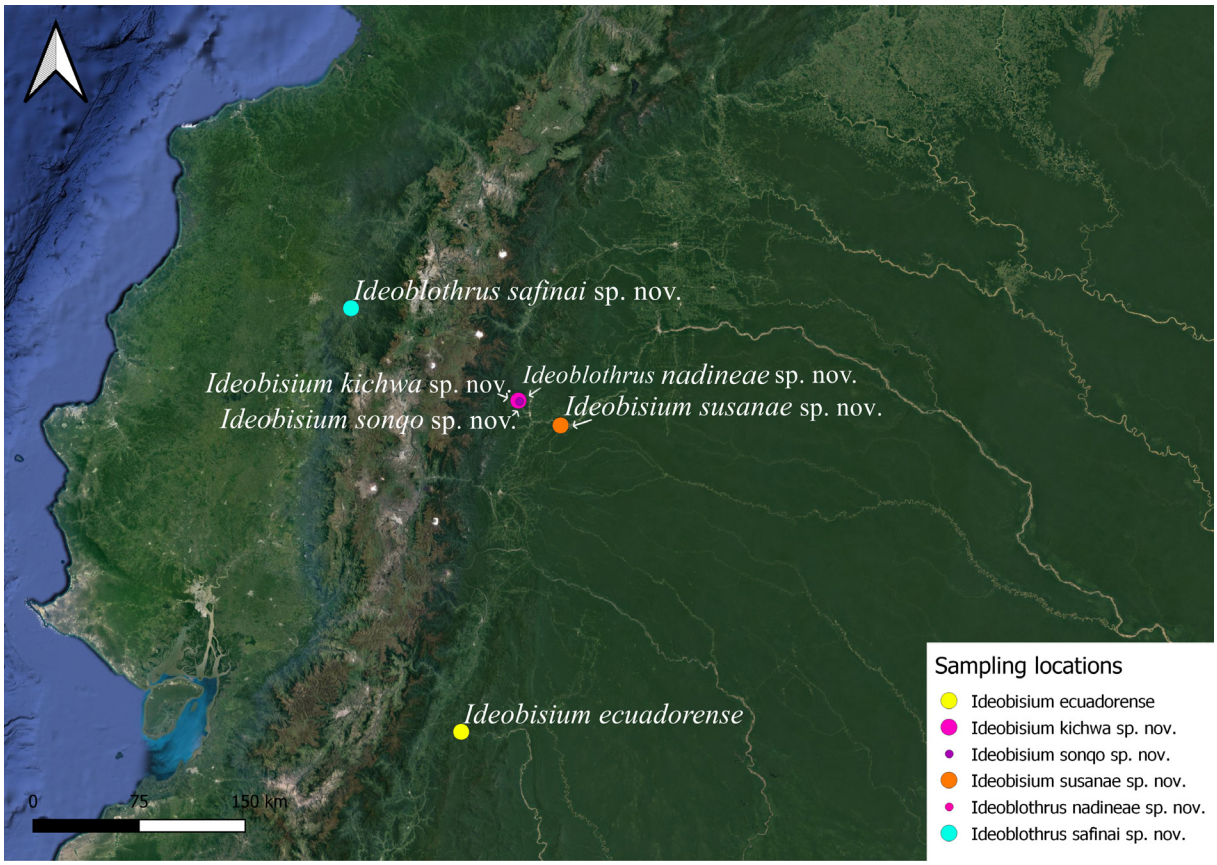

Fig. 2. Map indicating all sampling locations in Ecuador used for this study. The locations for the newly described species are shown, as well as the type locality of *Ideobisium ecuadorense* Muchmore, 1982.

Results

Class Arachnida Cuvier, 1812
Order Pseudoscorpiones de Geer, 1778
Family Syarinidae Chamberlin, 1930

Genus ***Ideobisium*** Balzan, 1892

Type species

Ideobisium crassimanum Balzan, 1892, by subsequent designation in Chamberlin (1930).

Ideobisium kichwa sp. nov.
urn:lsid:zoobank.org:act:52558090-54CC-4788-81CF-A4ECAC101421
Figs 3–8

Diagnosis

Ideobisium kichwa sp. nov. differs from *I. crassimanum* by the length of the chela (without pedicel) (♀ *I. crassimanum* 0.93 mm, ♀ *I. kichwa* sp. nov. 0.80–0.85 mm). It differs from *I. ecuadorense* in dimensions of the palpal femur (♂ *I. kichwa* sp. nov. 2.56–2.59, ♂ *I. ecuadorense* 2.89 times as long as broad), and in the number of teeth on the cheliceral fixed finger (♂ *I. kichwa* sp. nov. fixed finger 5, movable finger with 6–8, ♂ *I. ecuadorense* with 14–15 and 11–12, respectively). It differs from *I. peckorum* Muchmore, 1982 in the dimensions of the chelal hand (♂ *I. kichwa* sp. nov. chelal hand 1.26–1.29, ♂ *I. peckorum* 1.44–1.55 times as long as broad) and a longer movable chelal finger (♂ *I. kichwa* sp. nov. 0.95–1.00, ♂ *I. peckorum* 0.81–0.87 times as long as hand). It differs from *I. schusteri* Mahnert, 1985 from Brazil in the carapace size (♂ *I. kichwa* sp. nov. length/width 0.39–0.42/0.31–0.34 mm, ♂ *I. schusteri* 0.49–0.59/0.43–0.57 mm). It differs from *I. susanae* sp. nov. in the position of trichobothrium *esb*, which is midway between e*b* and *isb* in *I. susanae* sp. nov. and closer to *eb* than *isb* in *I. ecuadorense*, *I. sonqo* sp. nov. and I. *kichwa* sp. nov.

Etymology

This species is named in honour of the Kichwa indigenous people of Ecuador. The name is to be treated as a noun in apposition.

Material examined

Holotype

ECUADOR • ♀; Napo Province, Tena, Colonso Chalupas Natural Reserve; 00°54′32.904″ S, 77°53′9.168″ W; alt. 1048 m; 9–15 Mar. 2020; pitfall traps; N. Dupérré, E.E. Tapia and A.A. Tapia leg.; QCAZ.

Allotype

ECUADOR • ♂; same collection data as for holotype; QCAZ.

Paratypes

ECUADOR • 1 ♂; same collection data as for holotype; ZMH A0003685 • 2 ♀♀; same collection data as for holotype; ZMH A0003686, ZMH A0003687.

Description

Female, adult (holotype; Fig. 3A–C)

Colour. Prosoma and pedipalps dark brown, opisthosoma light brown, femora and patella of pedipalps with a pattern of light brown circles. Body length 1.90 mm.

Pedipalp (Figs 5E–F, 8A–C). Setae on prolateral margin long and acicular; trochanter 1.50, femur 2.53, patella 1.82, chela (with pedicel) 2.42, chela (without pedicel) 2.22, hand 1.25 and movable finger 4.10 times as long as broad. Patella with one lyrifissure situated dorsally near pedicel. Chela scarcely granulated at base; fixed chelal finger with 8 trichobothria, movable finger with 4 trichobothria: *eb* situated near base of chela, *esb* situated medially on retrolateral face of hand, *isb* next to base of finger, distance between *isb* and *est* greater than between *est* and *et*, *et* situated near tip of fixed finger, *est* situated between *et* and *isb*; trichobothrium *b* situated basally on movable finger, *sb*, *st* and *t* situated medially, close to each other; trichobothrium *t* short and lanceolate. Venom apparatus present only in fixed finger, venom duct short. All teeth rounded and juxtadentate, 28 teeth on fixed finger, 38 on movable finger.

Cephalothorax (Figs 5A–B, 7C–D). Carapace 1.24 times as long as broad, rectangular in shape; 2 corneate eyes on each side, anterior eyes prominent and with a lens, posterior eyes reduced to a dark cuticular patch; epistome rounded; 24 setae arranged 4:4:4:6:6, without furrows; four small lyrifissures, one behind each eye and two near posterior margin, one on each side; chaetotaxy of leg

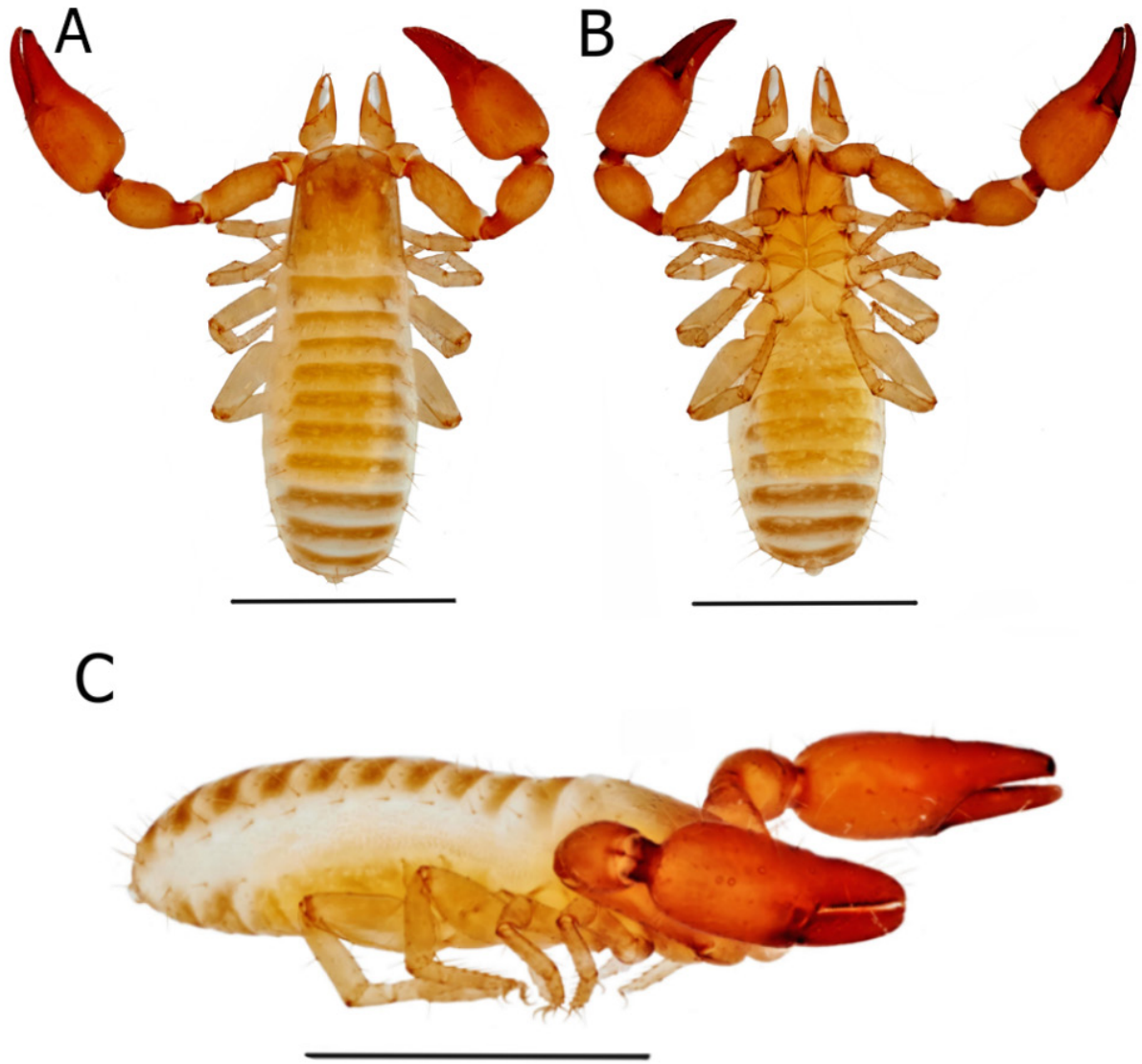

Fig. 3. *Ideobisium kichwa* sp. nov., holotype, ♀ (QCAZ). **A**. Habitus in dorsal view. **B**. Habitus in ventral view. **C**. Habitus in lateral view. Scale bars = 1 mm.

coxae I–IV: 8:8:8:8; pedipalpal coxa with 8 setae and 2 apical setae. Posterior section of coxae II slightly overlapping anterior section of coxae III.

Chelicera (Figs 5C–D, 7E–G). Smooth; 1 dorsal lyrifissure between *ls* and *is*; 5 setae on hand, 1 seta on movable finger, setae *is*, *ls*, and *sbs* longer than *bs* and *eb*, *gs* situated subdistally on movable finger; fixed finger with 5, movable finger with 10 distinct teeth; rallum with 7 dentate blades; serrula exterior with 25 blades; serrula interior with 9 blades; galea long and slightly curved, extending past tip of finger, without rami.

Abdomen (Fig. 6A–C). Tergites and sternites undivided, tergal chaetotaxy 6:6:7:8:8:8:8:7:7:6:6:2; sternal chaetotaxy 10:10:7:9:8:8:8:8:6:4:2; pleural membrane granulate anteriorly near cephalothorax, granulo-striate posteriorly; without setae.

Genitalia (Fig. 8E). Setae arranged linearly in two rows 2:6 on sternite 2 and 8 setae arranged linearly on sternite 3 below opening.

Legs (Fig. 7A–B). All legs with tarsus longer than metatarsus; scarcely granulate; femur + patella of leg IV 2.47 times as long as broad; legs III and IV with articulation between femur and patella segments slightly oblique; tibiae III and IV and metatarsi III and IV with tactile setae; tarsi of legs III and IV with tactile setae sub-basally; arolium shorter than claws, distally broadened and undivided; claws simple and not serrate.

Male, adult (allotype; Fig. 4A–C)
Same as holotype, except body length 1.84 mm.

Pedipalp. Same as in holotype except trochanter 1.79, femur 2.59, patella 1.71, chela (with pedicel) 2.61, chela (without pedicel) 2.39, hand 1.29 and movable finger 4.44 times as long as broad; 39 distinct teeth on movable finger.

Cephalothorax. Same as in holotype except carapace 1.27 times as long as broad; chaetotaxy of leg coxae I–IV: 8:8:7:8.

Chelicera. Movable finger with 8 distinct teeth.

Abdomen. Tergal chaetotaxy 6:6:6:7:8:8:8:8:7:7:6:2; sternal chaetotaxy 10:9:10:9:7:7:8:6:4:2.

Genitalia (Fig. 8D). Setae arranged linearly around small rounded ejaculatory opening; 2:4 setae above and 2:2:8 setae arranged linearly under ejaculatory opening.

Variation of female paratypes, adults (n = 2)
Same as holotype except body length 2.08–2.25 mm.

Pedipalp. Trochanter 1.50–1.69, femur 2.53–2.72, patella 1.88–2.05, chela (with pedicel) 2.33–2.54, chela (without pedicel) 2.15–2.30, hand 1.15–1.24 and movable finger 4.00–4.20 times as long as broad; 30 juxtadentate teeth on fixed finger.

Cephalothorax. Same as in holotype except carapace 1.17 times as long as broad. Chelicera. Same as in holotype except movable finger with 7 distinct teeth (n = 1).

Variation of male paratype, adult (n = 1)
Same as allotype, except body length 1.43 mm.

Pedipalp. Same as in allotype, except trochanter 1.71, femur 2.56, patella 1.85, chela (with pedicel) 2.77, chela (without pedicel) 2.53, hand 1.26 and movable finger 4.63 times as long as broad; 31 juxtadentate teeth on fixed finger, 36 on movable finger.

Cephalothorax. Carapace 1.32 times as long as broad; chaetotaxy of leg coxae I–IV: 7:8:7:8.

Chelicera. Movable finger with 6 distinct teeth.

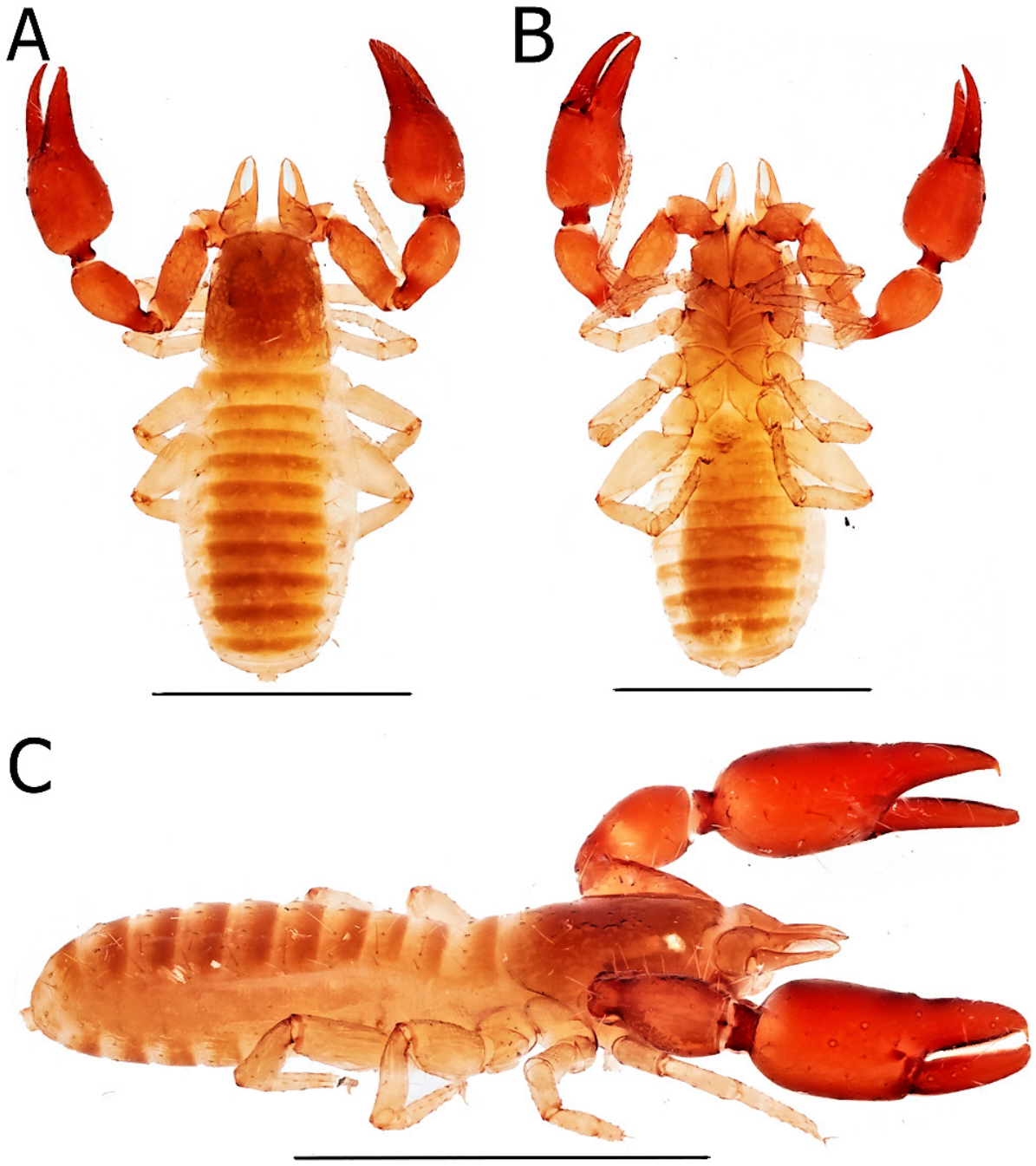

Fig. 4. *Ideobisium kichwa* sp. nov., allotype, ♂ (QCAZ). **A**. Habitus in dorsal view. **B**. Habitus in ventral view. **C**. Habitus in lateral view. Scale bars = 1 mm.

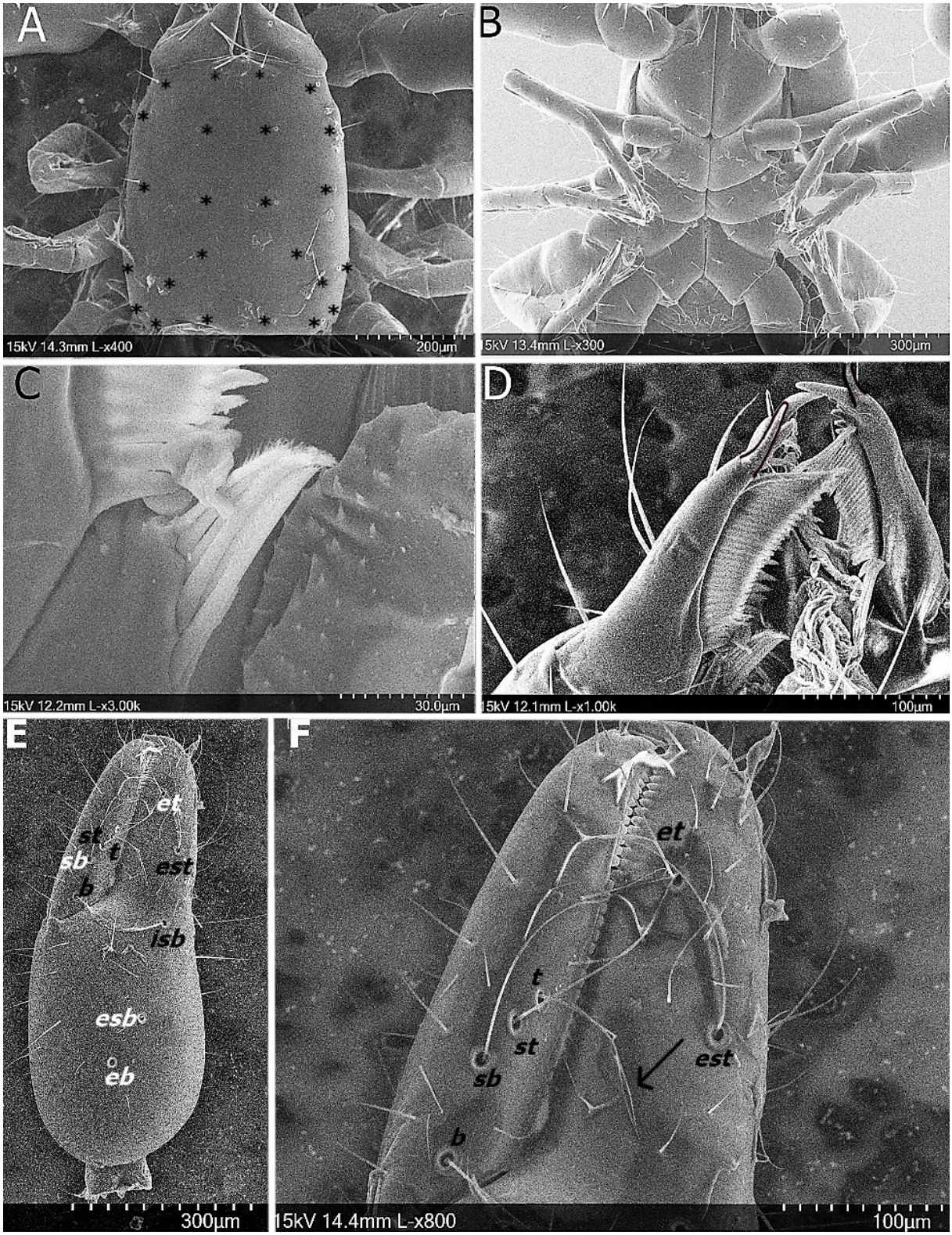

Fig. 5. Scanning electron micrographs of *Ideobisium kichwa* sp. nov., paratypes. **A**. Carapace with asterisks next to setae. **B**. Coxa. **C**. Rallum. **D**. Chelicera in ventral view with traced galea. **E**. Chela in retrolateral view showing trichobothria. **F**. Close-up view of E showing lanceolate trichobothrium *t* (arrow). A–B: ♂ (ZMH A0003685); C–D: ♀ (ZMH A0003687); E–F: ♂ (ZMH A0003685).

Abdomen. Tergal chaetotaxy 6:6:6:6:8:7:8:8:7:7:6:2; sternal chaetotaxy 10:8:7:8:7:8:8:6:4:2.

Genitalia. Same as in allotype, except setae arranged 2:5:2:2:8.

Female dimensions (mm, length/width of holotype followed by range of paratypes in parentheses) Body length 1.90 mm (2.08–2.25 mm). Pedipalps: trochanter 0.24/0.16 (0.24–0.25/0.16–0.18), femur 0.43/0.17 (0.48–0.49/0.18–0.19), patella 0.40/0.22 (0.45/0.22–0.24), chela (without pedicel) 0.80/0.36 (0.84–0.85/0.37–0.39), chela (with pedicel) 0.87/0.36 (0.91–0.94/0.37–0.39), hand length 0.45 (0.46–

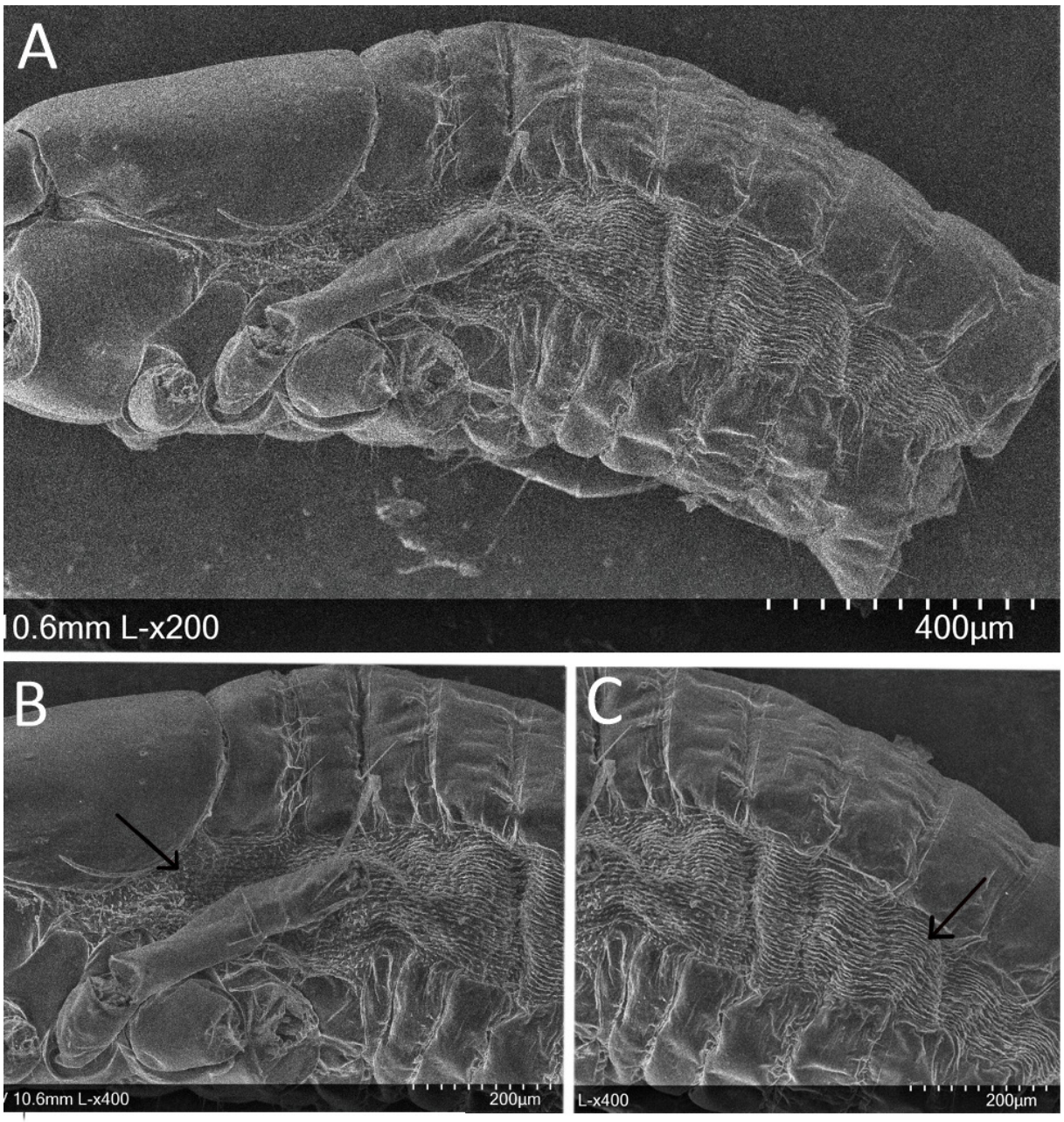

Fig. 6. Scanning electron micrographs of *Ideobisium kichwa* sp. nov., ♀, paratype (ZMH A0003686). **A**. Pleural membrane. **B**. Close-up of the anterior pleural membrane, showing a granulate structure becoming granulo-striate posteriorly; granulate structure indicated with an arrow. **C**. Close-up of the posterior pleural membrane, showing a granulo-striate structure (arrow).

0.47), movable finger length 0.41 (0.40–0.42). Chelicera 0.35/0.17 (0.36–0.37/0.18), movable finger length 0.26 (0.26). Carapace 0.62/0.50 (0.61–0.62/0.52–0.53). Leg I: femur 0.18/0.07 (0.18–0.21/0.07), patella 0.19/0.08 (0.21–0.23/0.07–0.08), tibia 0.22/0.05 (0.24–0.25/0.05–0.06), metatarsus 0.10/0.04 (0.10–0.11/0.06), tarsus 0.19/0.04 (0.19–0.22/0.04–0.05). Leg IV: femur 0.20/0.19 (0.21–0.22/0.19), patella 0.27/0.19 (0.28–0.30/0.19), tibia 0.37/0.09 (0.39–0.40/0.09), metatarsus 0.12/0.06 (0.12–0.14/0.06–0.07), tarsus 0.23/0.06 (0.26/0.07).

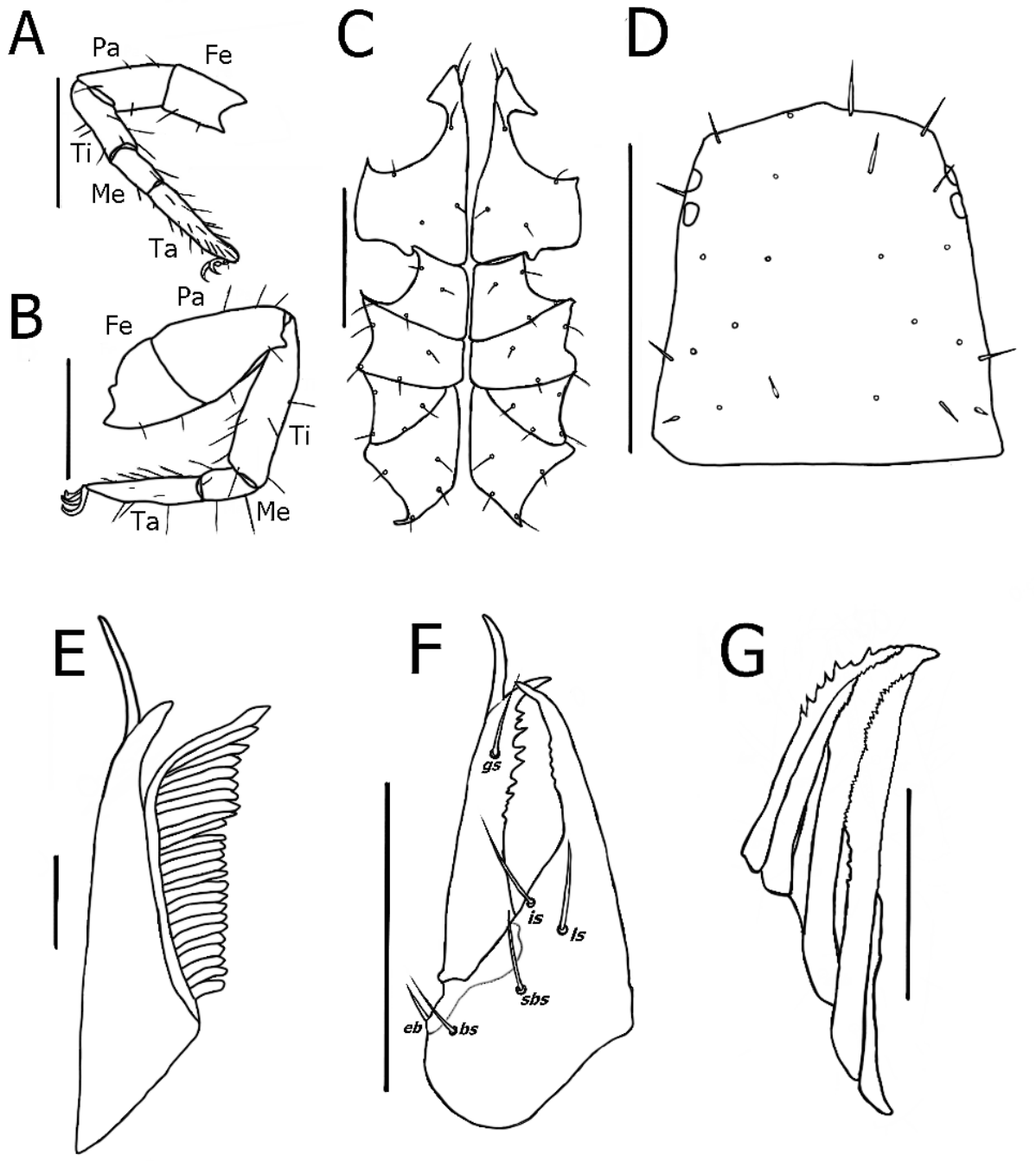

Fig. 7. *Ideobisium kichwa* sp. nov., ♀♀. **A**. Leg I. **B**. Leg IV. **C**. Coxa. **D**. Carapace. **E**. Serrula exterior. **F**. Chelicera in dorsal view, showing trichobothria and galea. **G**. Rallum. A–F: holotype (QCAZ); G: paratype (ZMH A0003687). Abbreviations: Fe = femur; Me = metatarsus; Pa = patella; Ta = tarsus; Ti = tibia. Scale bars: A–C, F = 0.25 mm; D = 0.50 mm; E = 50 µm; G = 30 µm.

Male dimensions (mm, length/width of allotype followed by paratype in parentheses)
Body length 1.84 mm (1.43 mm). Pedipalps: trochanter 0.25/0.14 (0.24/0.14), femur 0.44/0.17 (0.39/0.16), patella 0.36/0.21 (0.37/0.20), chela (without pedicel) 0.74/0.31 (0.76/0.30), chela (with pedicel) 0.81/0.31 (0.83/0.30), hand length 0.40 (0.39), movable finger length 0.40 (0.37). Chelicera 0.31/0.15 (0.31/0.15), movable finger length 0.24 (0.22). Carapace 0.56/0.44 (0.51/0.41). Leg I: femur 0.17/0.07 (0.17/0.06), patella 0.16/0.06 (0.17/0.06), tibia 0.22/0.05 (0.22/0.05), metatarsus 0.10/0.05 (0.09/0.05), tarsus 0.18/0.04 (0.18/0.04). Leg IV: femur 0.19/0.17 (0.21/0.16), patella 0.26/0.17 (0.26/0.16), tibia 0.32/0.09 (0.33/0.10), metatarsus 0.10/0.07 (0.10/0.06), tarsus 0.23/0.06 (0.21/0.05).

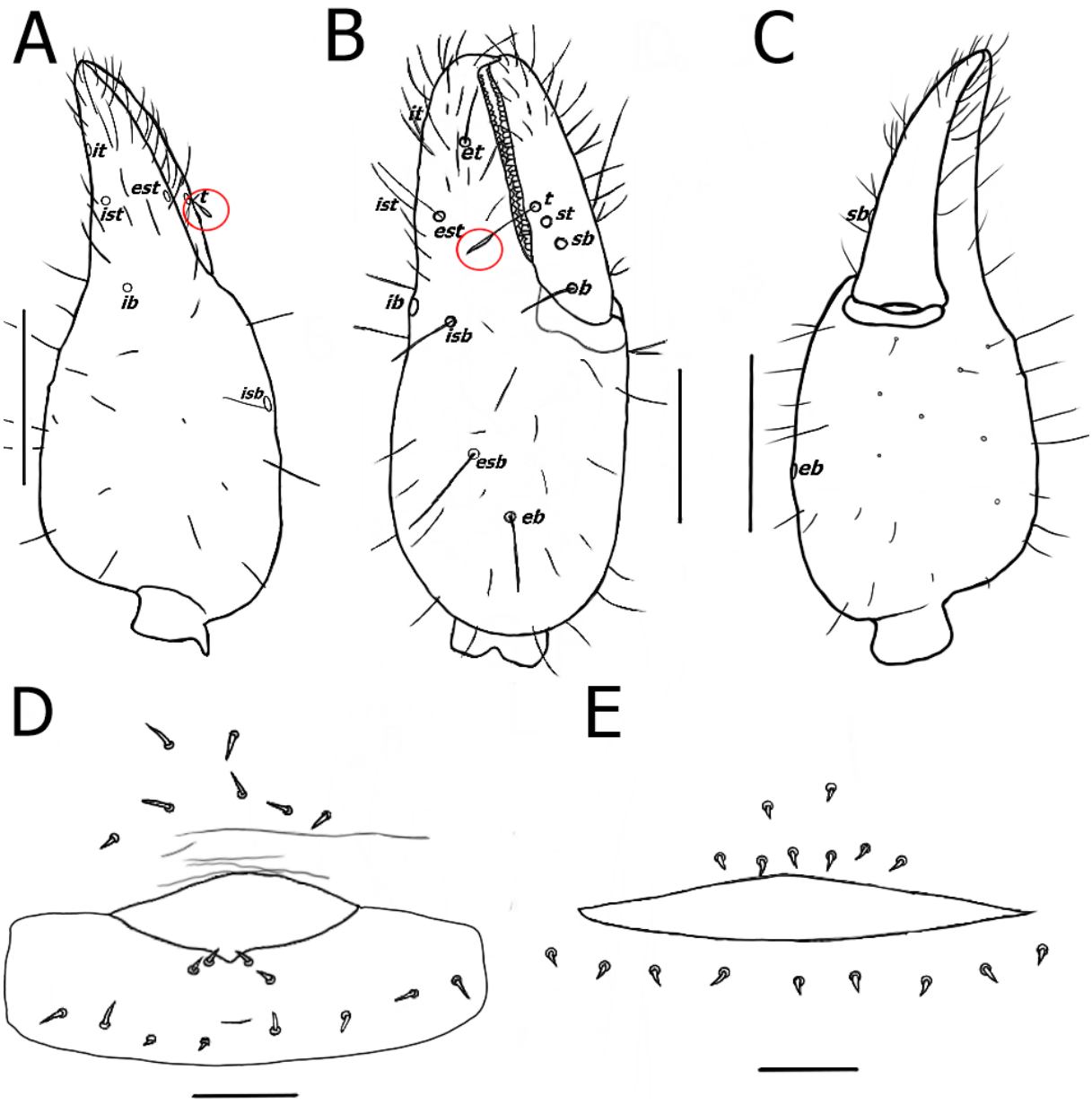

Fig. 8. *Ideobisium kichwa* sp. nov. **A**. Chela in dorsal view, showing trichobothria. **B**. Chela in retrolateral view, showing lanceolate trichobothrium *t*. **C**. Chela in ventral view. **D**. Outer genital area, showing setal arrangement. **E**. Genital area, showing setal arrangement. A–C, E: holotype, ♀ (QCAZ); D: allotype, ♂ (QCAZ). Scale bars: A–C = 25 µm; D–E = 50 µm.

Ideobisium sonqo sp. nov.
urn:lsid:zoobank.org:act:907A362A-43E1-401C-973A-7AEAFDEDD22A
Figs 9–13

Diagnosis

Ideobisium sonqo sp. nov. differs from *I. ecuadorense*, *I. kichwa* sp. nov. and *I. peckorum* in the dimensions of the pedipalp (♂ *I. sonqo* sp. nov. holotype femur 2.56, patella 1.31, chela (with pedicel) 2.55, chela (without pedicel) 2.32, hand 1.29 and movable finger 4.25 times as long as broad; ♂ *I. ecuadorense* femur 2.62–2.90, patella 1.95–2.05, chela 2.25–2.50 and hand 1.35–1.40 times as long as broad and movable finger 0.85–0.86 times as long as hand; ♂ *I. kichwa* sp. nov. hand 4.44–4.63 times as long as broad; ♂ *I. peckorum* hand 1.4–1.5 times as long as broad). It differs from *I. crassimanum* and *I. schusteri* in the dimensions of the carapace (♂ *I. sonqo* sp. nov. 1.18–1.27 times as long as broad, ♀ carapace 0.56 mm long; ♀ *I. crassimanum* 0.64 mm long; ♂ *I. schusteri* 1.1 times as long as broad). It differs from *I. susanae* sp. nov. in the dimensions of the chelicera (♂ *I. sonqo* sp. nov. cheliceral movable finger 3.60–4.40, ♂ *I. susanae* sp. nov. 3.17–3.33 times as long as broad).

Etymology

'Sonqo' is the indigenous (Kichwa) word for 'heart'. This species is named after the heart-shaped colour pattern on the carapace and honours the indigenous Kichwa culture of Ecuador. It is to be treated as a noun in apposition.

Material examined

Holotype

ECUADOR • ♂; Napo Province, Tena, Colonso Chalupas Natural Reserve; 00°54′53.6″ S, 77°52′40.598″ W; alt. 782 m; 8 Mar. 2020; E.E. Tapia, N. Dupérré and A.A. Tapia leg.; sifting litter and berlese traps; QCAZ.

Allotype

ECUADOR • ♀; same collection data as for holotype QCAZ.

Paratypes

ECUADOR • 5 ♂♂; same collection data as for holotype but 00°54′33.084″ S, 77°53′9.131″ W; 14 Mar. 2020; ZMH A0003688 to A0003692.

Description

Male, adult (holotype; Fig. 9A–C)

Colour. Prosoma and opisthosoma light brown; pedipalps dark brown, femora and patella with a pattern of lighter brown circles, body length 1.33 mm.

Pedipalp (Figs 11E, 13A–C). Setae on prolateral margin long and acicular; trochanter 1.36, femur 2.56, patella 1.31, chela (with pedicel) 2.55, chela (without pedicel) 2.32, hand 1.29 and movable finger 4.25 times as long as broad; fixed chelal finger with 8 trichobothria, movable chelal finger with 4 trichobothria: *eb* and e*sb* situated medially on retrolateral face of hand, *isb* near base of finger, distance between *isb*, *est a*nd *et* very similar, *et* situated near tip of fixed finger, *est* situated between e*t* and *isb*; trichobothrium *b* situated basally on movable finger, *sb*, *st* and *t* situated medially, close to each other; trichobothrium *t* shorter than others and lanceolate. Venom apparatus only present in fixed finger, venom duct rather short. Teeth on both fingers rounded; fixed finger with 34 small, movable finger with 37 juxtadentate teeth.

Cephalothorax (Figs 11A, C, 12C–D). Carapace 1.24 times as long as broad; rectangular in shape; 2 pairs of eyes, with corneate lens; epistome rounded; with 26 setae arranged 4:4:4:8:6; without furrows; two pairs of lyrifissures at either side of anterior margin; chaetotaxy of leg coxae I–IV 4:4:4:4:8, pedipalpal coxa with 4 setae and 2 apical setae.

Chelicera (Figs 11A–B, 12E–G). Smooth; 1 dorsal lyrifissure between *ls* and *is*; 5 setae on hand, 1 seta on movable finger, setae *is, ls* and *sbs* longer than *bs* and *es*, *gs* situated subdistally on movable finger;

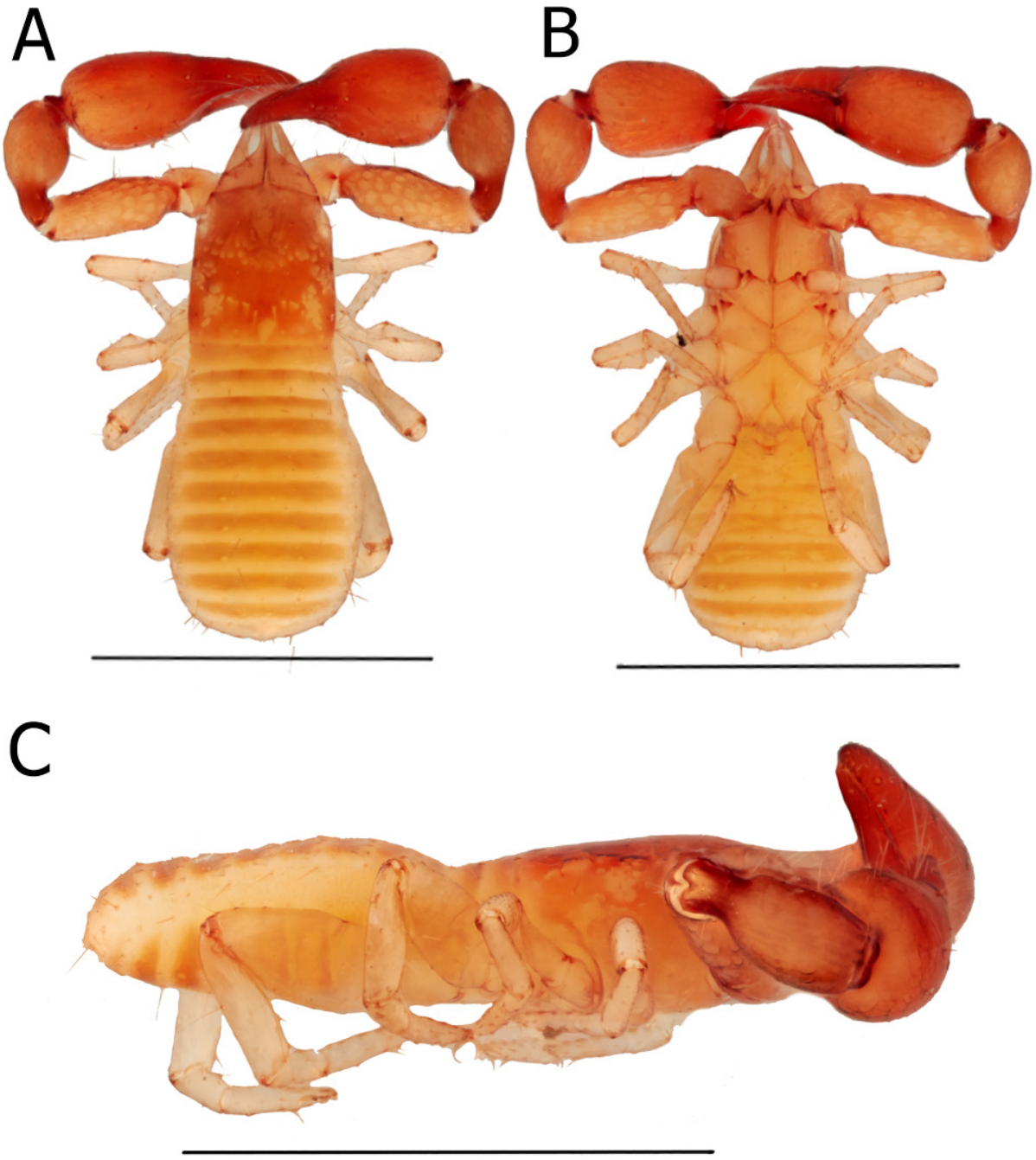

Fig. 9. *Ideobisium sonqo* sp. nov., ♂, holotype (QCAZ). **A**. Habitus in dorsal view. **B**. Habitus in ventral view. **C**. Habitus in lateral view. Scale bars = 1 mm.

fixed finger with 7–8 indistinct teeth, movable finger with ca 8 teeth; rallum with 7 dentate blades; serrula exterior with 24–25 blades; galea long and gently curved, without rami.

Abdomen (Fig. 9A–C). Tergites and sternites undivided; tergal chaetotaxy: 6:6:8:7:8:8:8:8:8:8:8:2; sternal chaetotaxy: 6:6:8:9:9:8:10:7:5:2; pleural membrane granulate anteriorly near cephalothorax, granulo-striate posteriorly; without setae.

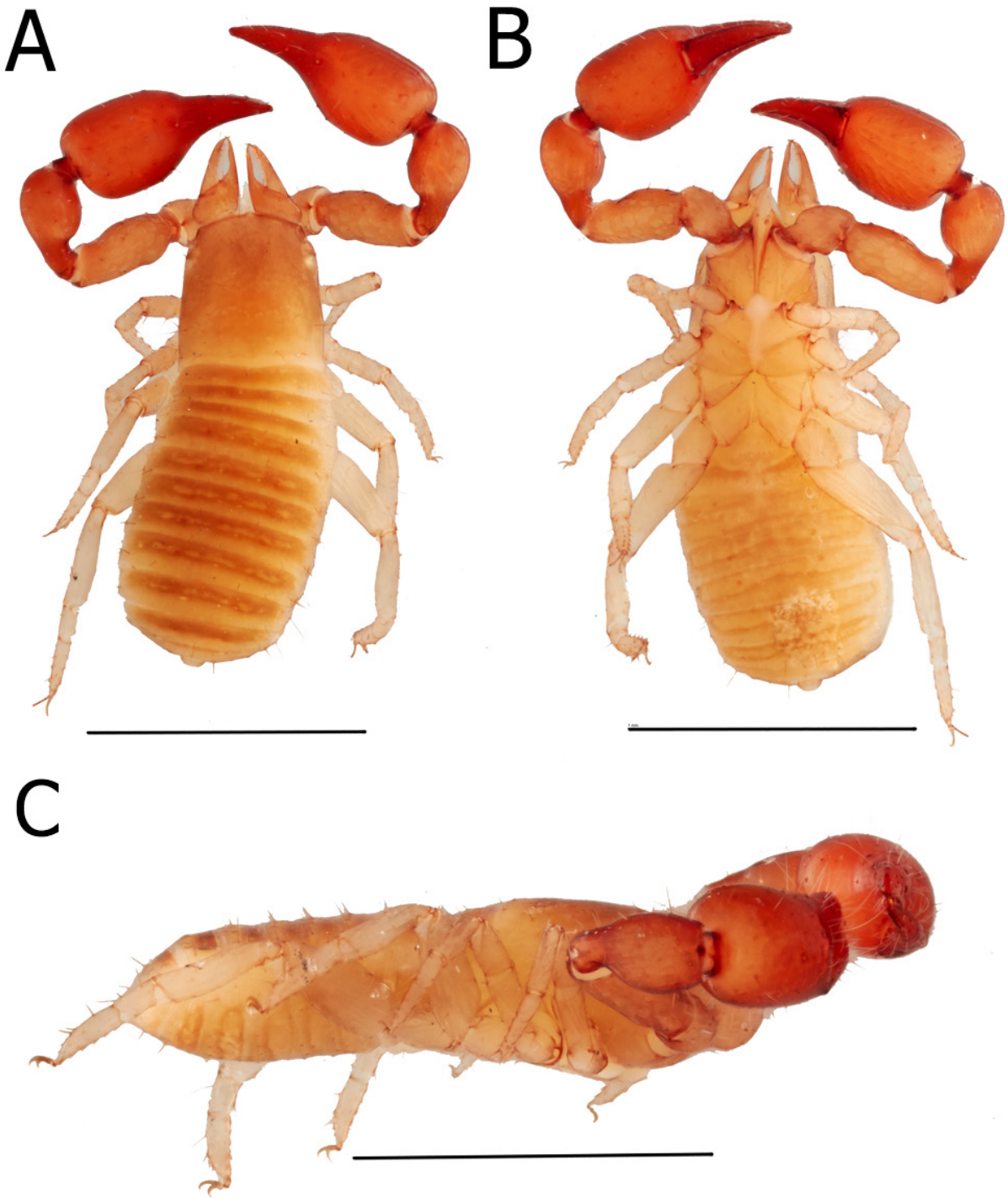

Fig. 10. *Ideobisium sonqo* sp. nov., ♀, allotype (QCAZ). **A**. Habitus in dorsal view. **B**. Habitus in ventral view. **C**. Habitus in lateral view. Scale bars = 1 mm.

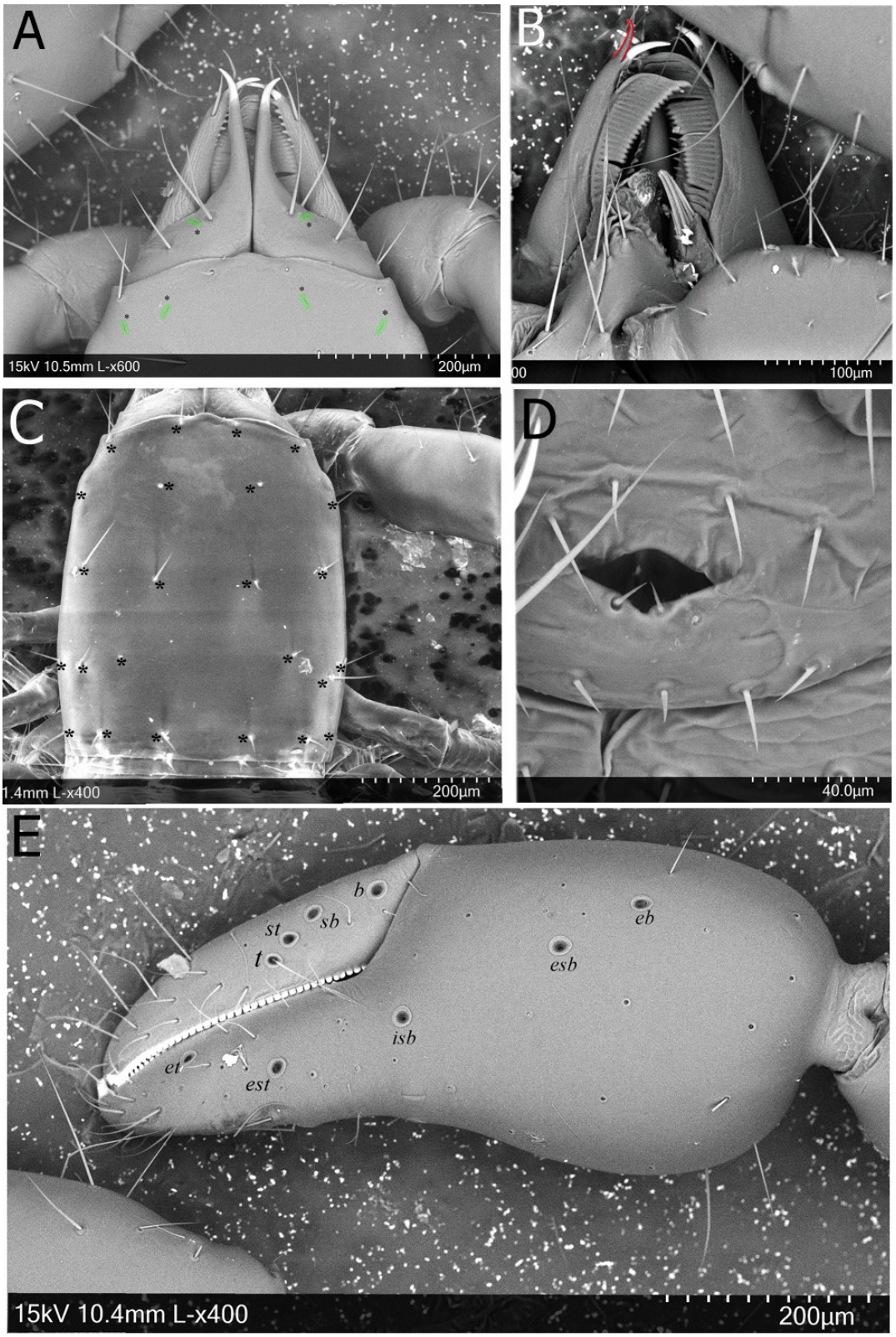

Fig. 11. Scanning electron micrographs of *Ideobisium sonqo* sp. nov. **A**. Chelicera and anterior margin of carapace in dorsal view, showing lyrifissures. **B**. Chelicera, showing galea in ventral view. **C**. Carapace with asterisks next to setae. **D**. Genital area. **E**. Chela in retrolateral view, showing trichobothria. A–C, E: paratype, ♂ (ZMH A0003690); D: paratype, ♂ (ZMH A0003692).

Genitalia (Fig. 13D). Male genitalia with a small rounded ejaculatory opening, setal arrangement ca 5 setae situated anterior to opening.

Legs (Fig. 12A–B). All legs with tarsus longer than metatarsus; femora slightly shorter than patella of leg I–II; scarcely granulate; femur + patella of leg IV 2 times as long as broad; legs III and IV with articulation between femur and patella slightly oblique; arolium shorter than claws, distally broadened and undivided; claws simple and not serrate.

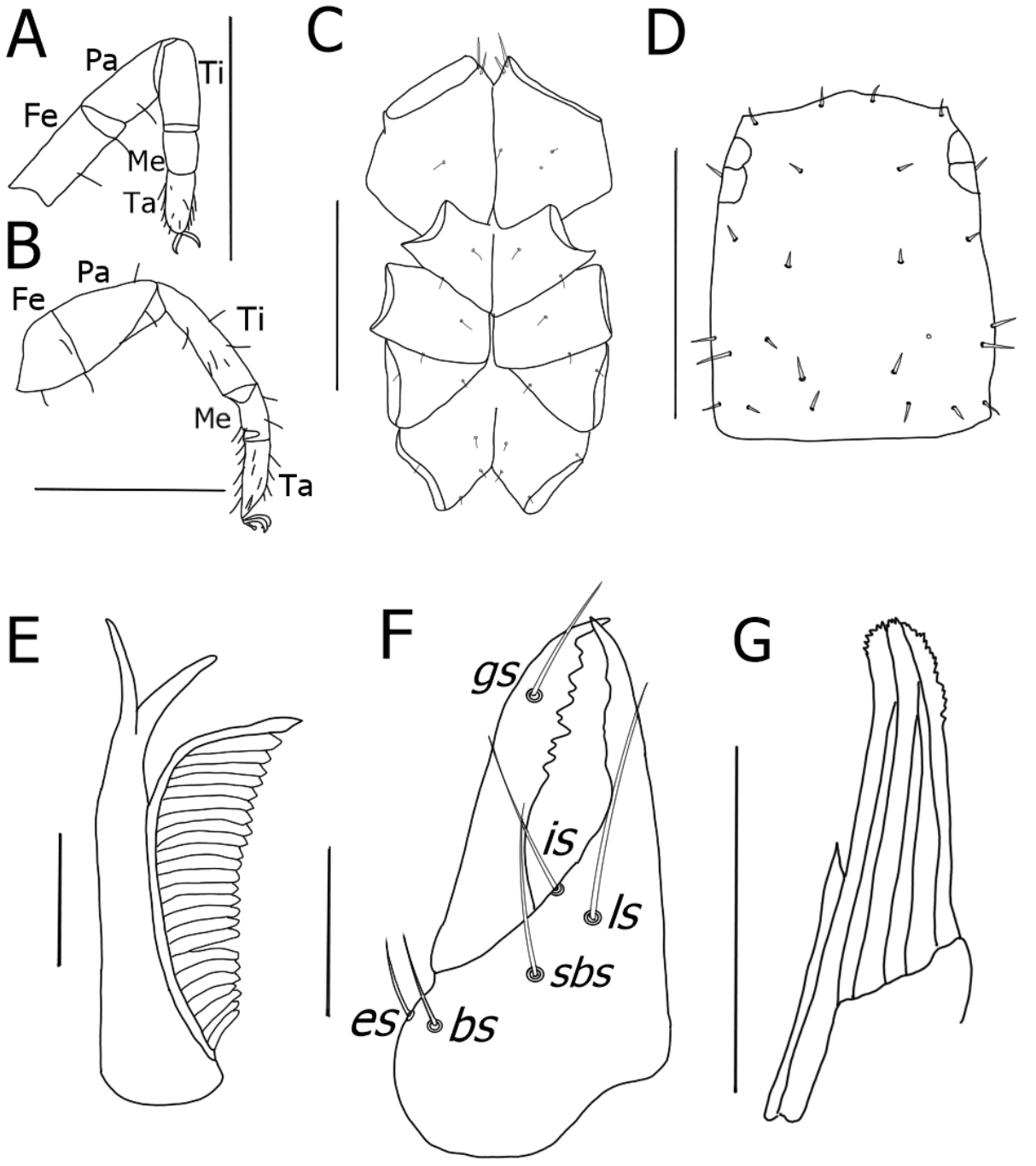

Fig. 12. *Ideobisium sonqo* sp. nov. **A**. Leg I. **B**. Leg IV. **C**. Coxa. **D**. Carapace. **E**. Serrula exterior. **F**. Chelicera in dorsal view, showing trichobothria. **G**. Rallum. A–D, F: holotype, ♂ (QCAZ); E, G: paratype, ♂ (ZMH A0003690). Abbreviations: Fe = femur; Pa = patella; Ti = tibia; Me = metatarsus; Ta = tarsus. Scale bars: A–C = 0.25 mm; D = 0.50 mm; E, G = 0.05 mm; F = 0.1 mm.

Female, adult (allotype; Fig. 10A–C)
Same as holotype except body length 1.64 mm.

Pedipalp. Trochanter 1.05, femur 2.27, patella 1.56, chela (with pedicel) 2.54, chela (without pedicel) 2.33, hand 1.27 and movable finger 3.77 times as long as broad; fixed finger with 32 teeth, movable finger with 37 teeth.

Cephalothorax. 1.06 times as long as broad, with 27 setae arranged in pattern 4:6:4:7:6; chaetotaxy of coxae of legs I–IV: 6:4:6:8, pedipalpal coxa with 6 setae.

Abdomen. Tergal chaetotaxy: 6:6:7:9:10:9:9:9:10:8:5:2; sternal chaetotaxy: 8:8:9:10:9:9:10:11:7:4:2.

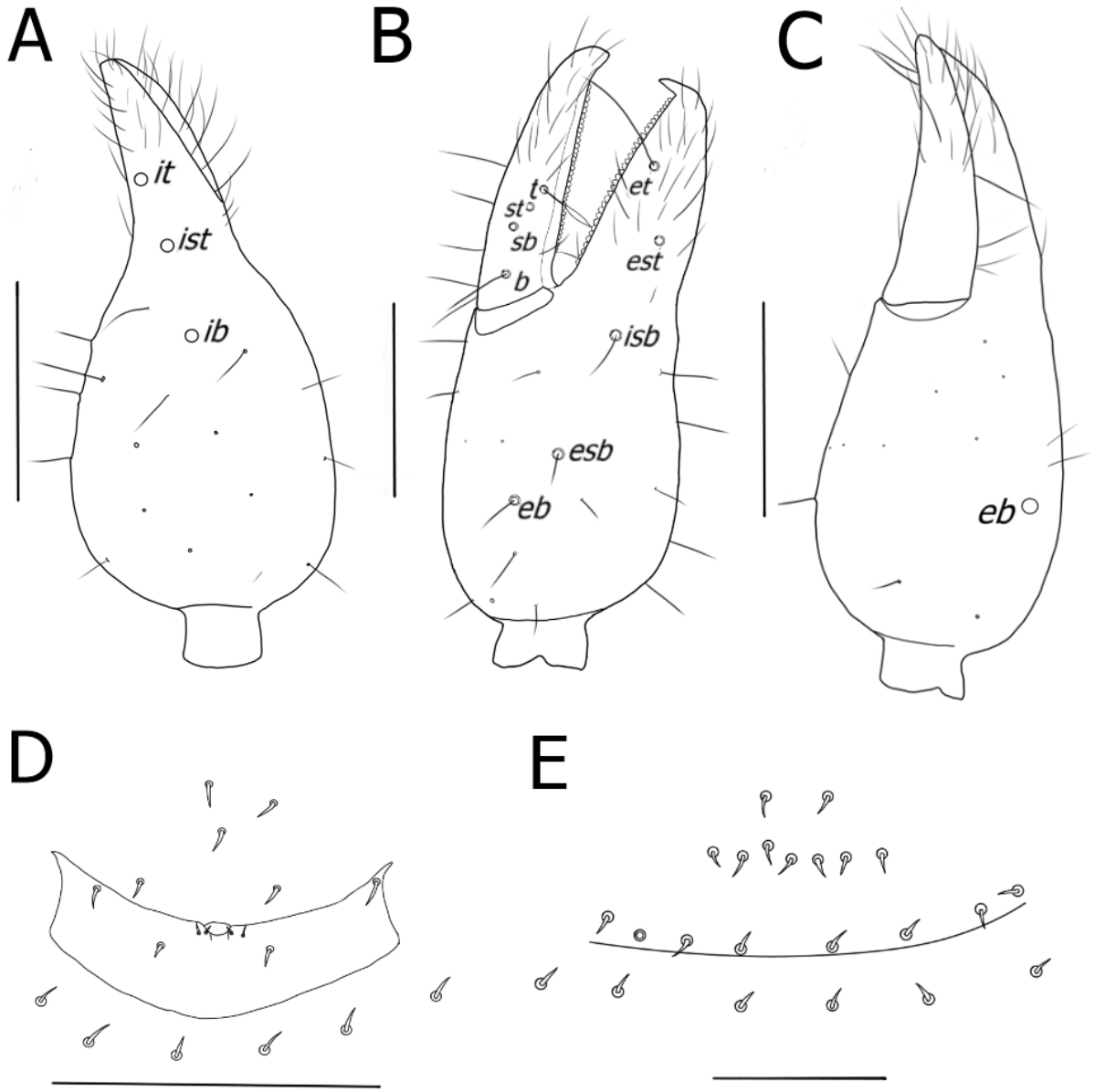

Fig. 13. *Ideobisium sonqo* sp. nov. **A**. Chela in dorsal view. **B**. Chela in retrolateral view. **C**. Chela in ventral view, showing trichobothria. **D**. Genital area. **E**. Genital area. A–D: holotype, ♂ (QCAZ); E: allotype, ♀ (QCAZ). Scale bars: A–C = 0.25 mm; D–E = 0.10 mm.

Genitalia (Fig. 13E). Female setal arrangement with four rows of setae arranged 2:7:8:6.

Variation of male paratypes (adults; n = 5)
Same as holotype except body length 1.31–1.39 mm.

Pedipalp. Trochanter 1.2–1.36, femur 2.41–2.69, patella 1.6–1.80, chela (with pedicel) 2.33–2.59, chela (without pedicel) 2.15–2.4, hand 1.29–2.55 and movable finger 3.87–4.71 times as long as broad.

Cephalothorax. 1.82–1.27 times as long as broad; carapace chaetotaxy: 24 setae arranged in pattern 4:4:4:6:6.

Female dimensions (mm, length/width of allotype)
Body length 1.64 mm. Pedipalps: trochanter 0.19/0.18, femur 0.41/0.18, patella 0.36/0.23, chela (with pedicel) 0.84/0.33, chela (without pedicel) 0.77/0.33, hand length 0.42, movable finger length 0.34. Chelicera: 0.33/0.18, movable finger length 0.22. Carapace: 0.55/0.52. Leg I: femur 0.11/0.09, patella 0.18/0.06, tibia 0.20/0.06, metatarsus 0.10/0.06, tarsus 0.17/0.05. Leg IV: femur 0.25/0.17, patella 0.23/0.17, tibia 0.31/0.09, metatarsus 0.12/0.07, tarsus 0.22/0.06.

Male dimensions (mm, length/width of holotype followed by range of five paratypes in parentheses)
Body length 1.33 mm (1.31–1.39 mm). Pedipalps: trochanter 0.19/0.14 (0.18–0.19/0.14–0.15), femur 0.41/0.16 (0.40–0.43/0.16–0.17), chela (with pedicel) 0.79/0.31 (0.70–0.79/0.27–0.33), chela (without pedicel) 0.72/0.31 (0.65–0.73/0.27–0.33), hand length 0.40 (0.39–0.44), movable finger length 0.34 (0.28–0.35). Chelicera: 0.28/0.14 (0.27–0.30/0.12–0.15), movable finger length 0.21 (0.18–0.21). Carapace 0.52/0.42 (0.51–0.56/0.42–0.45). Leg I: femur 0.10/0.07 (0.10–0.13/0.07), patella 0.18/0.06 (0.18–0.20/0.05–0.06), tibia 0.20/0.06 (0.16–0.20/0.05–0.06), metatarsus 0.90/0.05 (0.08–0.10/0.05), tarsus 0.16/0.04 (0.15–0.18/0.03–0.05). Leg IV: femur 0.16/0.20 (0.19–0.21/0.19–0.20), patella 0.22/0.19 (0.22–0.27/0.19–0.20), tibia 0.31/0.09 (0.31–0.34/0.08–0.10), metatarsus 0.12/0.05 (0.11–0.12/0.05–0.06), tarsus 0.20/0.05 (0.20–0.23/0.04–0.06).

Ideobisium susanae sp. nov.
urn:lsid:zoobank.org:act:A194CD62-D5C8-4DBF-AACD-22B66CDF70C5
Figs 14–18

Diagnosis

Ideobisium susanae sp. nov. differs from *I. crassimanum*, *I. ecuadorense*, *I. schusteri* and *I. peckorum* in carapace length (♀ *I. susanae* sp. nov. 0.48–0.50 mm, ♂ 0.46–0.48 mm, ♀ *I. crassimanum* 0.64 mm, ♂ *I. ecuadorense* 0.61 mm, ♂ *I. schusteri* 0.49–0.59 mm, ♂ *I. peckorum* 0.605 mm) and in cheliceral dimensions (♀ *I. susanae* sp. nov. 1.88–2.00, ♀ *I. crassimanum* 2.10, ♂ *I. peckorum* 2.50 times as long as broad).

Etymology

This specific epithet is a patronym for Susana Mourglier, the senior author's beloved grandmother.

Material material

Holotype
ECUADOR • ♀; Napo Province, Tena, Jatun Sacha Natural Reserve; 01°03′59.27″ S, 77°37′01.891″ W; alt. 430 m; 10–15 Mar. 2020; N. Dupérré, E.E. Tapia and A.A. Tapia leg.; sifting litter and pitfalls; QCAZ.

Allotype
ECUADOR • ♂; same collection data as for holotype; QCAZ.

Paratypes
ECUADOR • 1 ♂; same collection data as for holotype; ZMH A0003693 • 1 ♀; same collection data as for holotype; ZMH A0003694.

Description

Female, adult (holotype; Figs 14A–C)
Colour. Prosoma and pedipalps reddish brown, opisthosoma light brown, femora and patella of pedipalps with a pattern of light brown circles, body length 1.50 mm.

Pedipalp (Figs 16F, 18A–C). Setae on prolateral margin long and acicular; trochanter 1.57, femur 2.69, patella 1.76, chela (with pedicel) 2.44, chela (without pedicel) 2.25, hand 1.31 and movable finger 4.00 times as long as broad. Patella with four lyrifissures situated dorsally, one on pedicel, one near pedicel, one medially and one near anterior margin. Chela smooth; fixed chelal finger with 8 trichobothria, movable finger with 4 trichobothria: *eb* situated near base, *esb* situated median of chela, *isb* near base of finger, distance between *eb*, *esb*, and *isb* very consistent, *est* situated medially on fixed finger, *et* situated near tip of fixed finger, distance between *isb* and *est* larger than distance between *est* and *et*, *est* situated between *et* and *isb*; trichobothrium *b* situated basally on movable finger, *sb*, *st* and *t* situated medially, close to each other, *sb* below *st*, *st* below *t*; trichobothrium *t* lanceolate. Venom apparatus only present on fixed finger, venom duct short. Teeth rather rounded and juxtadentate, 29 teeth on fixed finger, 38 on movable finger.

Cephalothorax (Figs 16A, C, 17C–D). Carapace 1.06 times as long as broad, rectangular in shape, 2 corneate eyes on each side, epistome rounded; 26 setae arranged 4:6:4:6:6, without furrows; two pairs of lyrifissures, one pair consists of one lyrifissure behind each eye, second pair positioned near setae on posterior margin; chaetotaxy of leg coxae I–IV 8:9:8:8, pedipalpal coxa with 6 setae and 2 apical setae. Posterior section of coxae II slightly overlapping anterior section of coxae III.

Chelicera (Figs 16B, D, 17E–G). Smooth; one dorsal lyrifissure between *ls* and *is*; five setae on hand, one seta on movable finger, setae *is*, *ls*, *sbs* and *bs* longer than *eb*, *gs* situated subdistally on movable finger, fixed finger with 7 very small, movable finger with 9 distinct teeth, rallum with 7 blades, serrula exterior with 26 blades, serrula interior with 17 blades, galea long and slightly curved, without rami.

Abdomen. Tergites and sternites undivided; tergal chaetotaxy: 6:7:8:8:8:9:9:9:9:6:4:2; sternal chaetotaxy: 6:7:9:9:11:10:9:9:6:4:2; pleural membrane granulate anteriorly near cephalothorax, granulo-striate posteriorly; without setae.

Genitalia (Fig. 18E). Setae arranged linearly in two rows 2:6 on sternite 2 and 6 setae arranged linearly on sternite 3 below opening.

Legs (Fig. 17A–B). All legs with tarsus longer than metatarsus; scarcely granulated; femur + patella of leg IV 2.11 times as long as broad; legs III and IV with articulation between femur and patella segments slightly oblique; tibiae and metatarsi of legs III and IV with tactile setae; tarsi of legs III and IV with tactile setae sub-basally; arolium shorter than claws, distally broadened and undivided, claws simple and not serrate.

Male, adult (allotype; Fig. 15A–C)
Same as holotype except body length 1.36 mm.

Pedipalp. Trochanter 1.58, femur 2.57, patella 1.76, chela (with pedicel) 2.48, chela (without pedicel) 2.30, hand 1.26 and movable finger 4.13 times as long as broad; 28 juxtadentate teeth on fixed finger, 37 on movable finger.

Cephalothorax. Carapace 1.20 times as long as broad; 24 setae arranged 4:4:4:6:6.

Chelicera. Movable finger with 7 distinct teeth.

Abdomen. Same as holotype except tergal chaetotaxy 7:7:6:7:8:8:8:8:7:7:4:2; sternal chaetotaxy 8:8:8:8:8:9:8:9:6:4:2.

Genitalia (Fig. 18D). Small rounded ejaculatory opening; setal arrangement: two rows of setae arranged 2:2 linearly above opening, 4 setae congregated directly under opening and 10 setae congregated below.

Variation of female paratype (adult; n = 1)
Same as holotype except body length 1.34 mm.

Pedipalp. Trochanter 1.60, femur 2.75, patella 1.80, chela (with pedicel) 2.50, chela (without pedicel) 2.34, hand 1.28 and movable finger 3.90 times as long as broad.

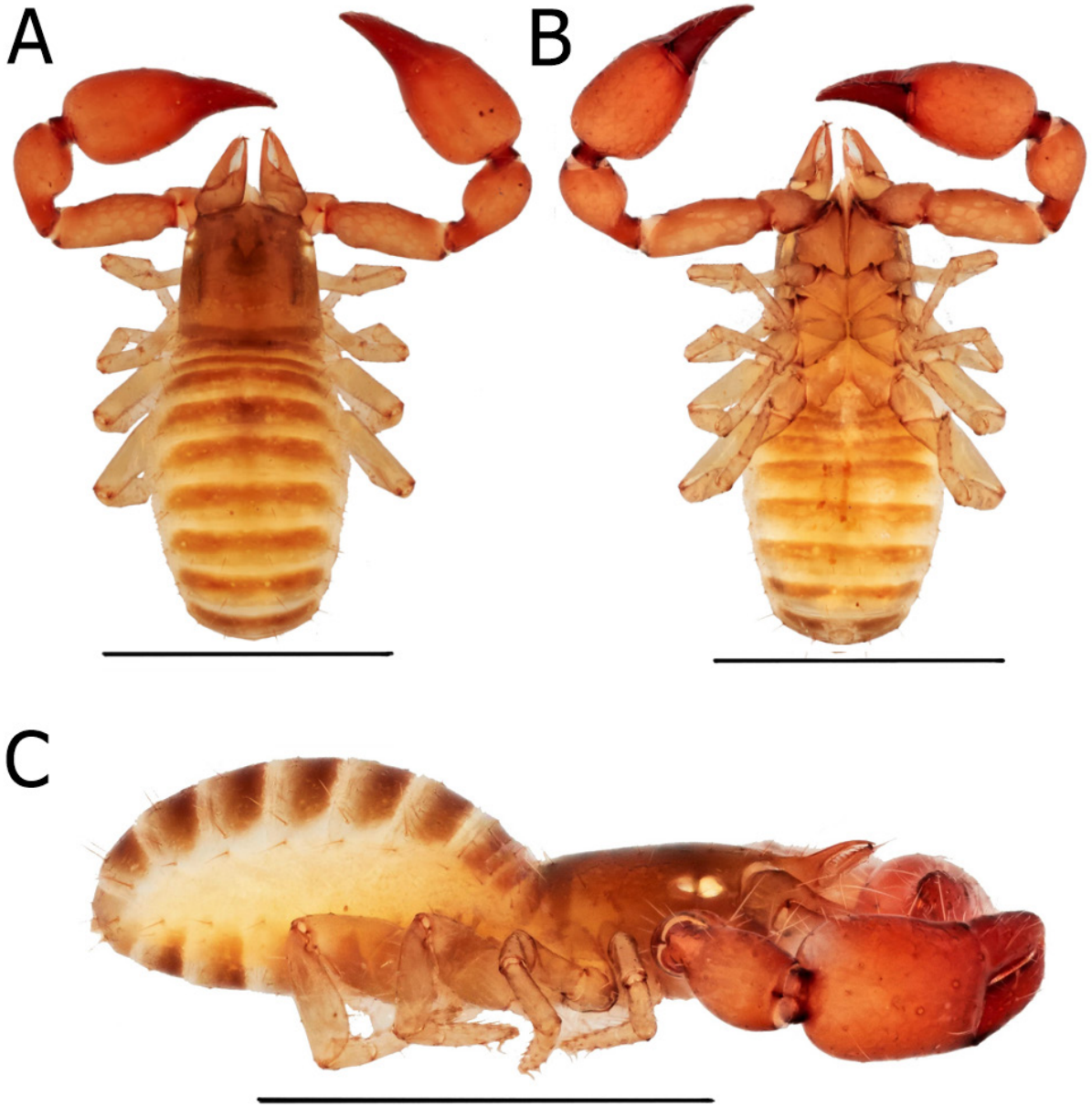

Fig. 14. *Ideobisium susanae* sp. nov., holotype, ♀ (QCAZ). **A**. Habitus in dorsal view. **B**. Habitus in ventral view. **C**. Habitus in lateral view. Scale bars = 1 mm.

Cephalothorax. Carapace 1.04 times as long as broad; 22 setae arranged 4:4:4:4:6.

Chelicera. Movable finger with 10 distinct teeth.

Abdomen. Tergal chaetotaxy 6:7:7:8:8:8:8:7:7:6:4:2; sternal chaetotaxy 6:7:8:9:11:9:9:9:6:4:2.

Variation of male paratype (adult; n = 1)
Same as allotype except body length 1.20 mm.

Pedipalp. Trochanter 1.54, femur 2.57, patella 1.78, chela (with pedicel) 2.58, chela (without pedicel) 2.38, hand 1.35 and movable finger 4.00 times as long as broad.

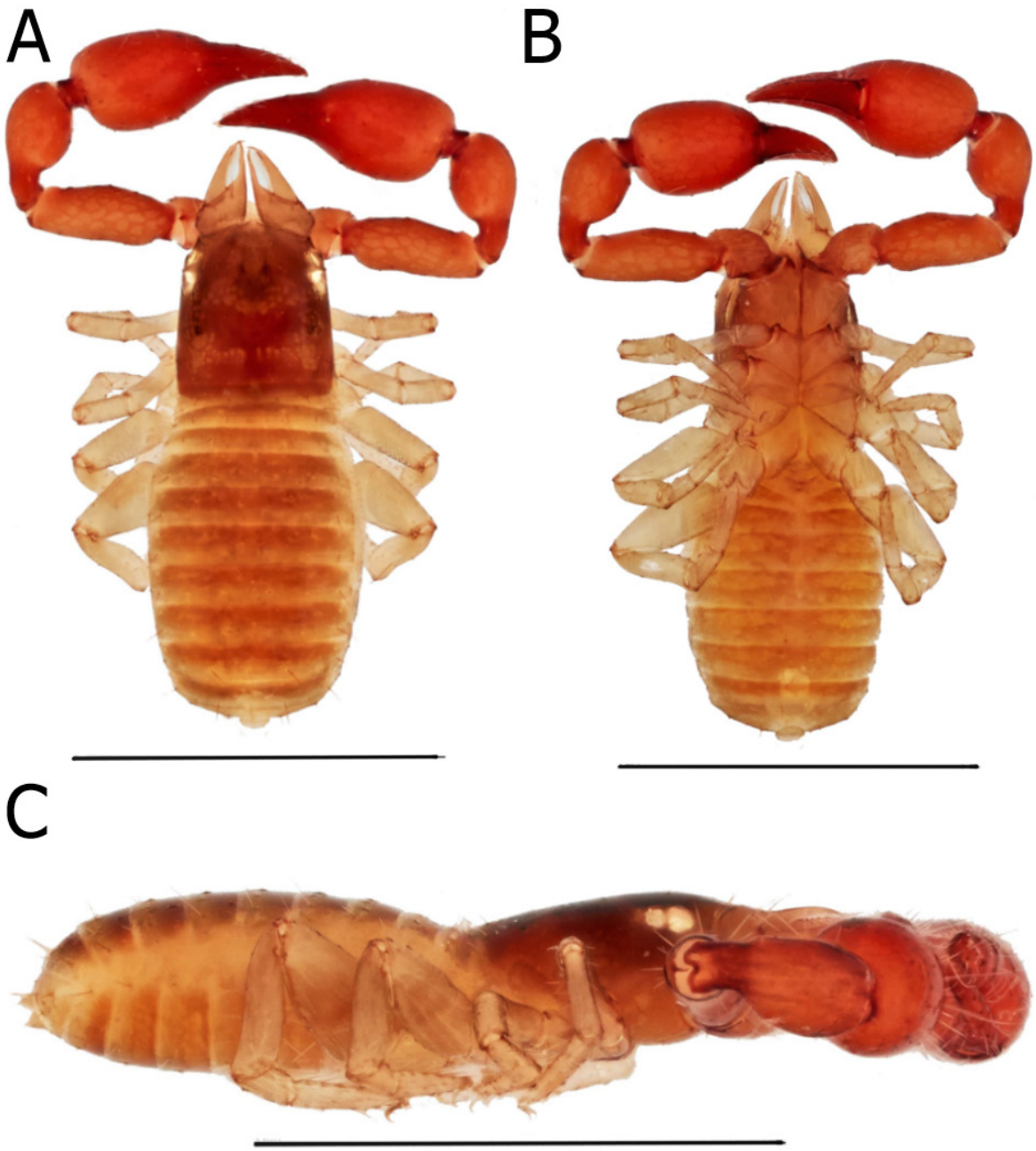

Fig. 15. *Ideobisium susanae* sp. nov., allotype, ♂ (QCAZ). **A**. Habitus in dorsal view. **B**. Habitus in ventral view. **C**. Habitus in lateral view. Scale bars = 1 mm.

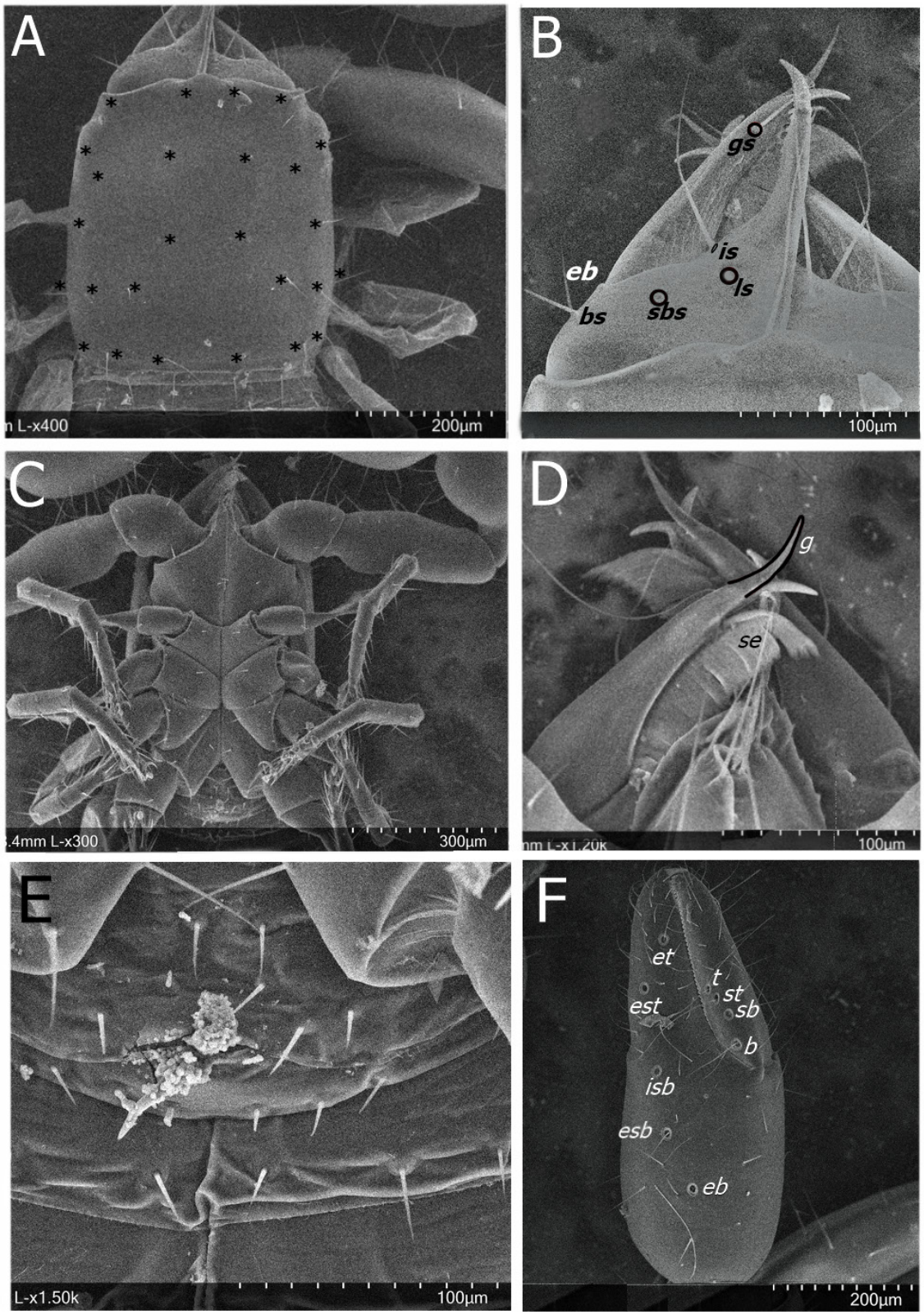

Fig. 16. Scanning electron micrographs of *Ideobisium susanae* sp. nov., paratype, ♂ (ZMH A0003693). **A**. Carapace with asterisks next to setae. **B**. Chelicera in dorsal view, showing trichobothria. **C**. Coxa. **D**. Chelicera in ventral view, showing galea and serrula exterior. **E**. Genital area. **F**. Chela in retrolateral view, showing trichobothria. Abbreviations: g = galea; se = serrula exterior.

Cephalothorax. Carapace 1.15 times as long as broad.

Chelicera. Movable finger with 9 distinct teeth.

Abdomen. Tergal chaetotaxy 8:8:8:9:8:8:9:7:6:4:2; sternal chaetotaxy 6:6:6:7:6:8:10:8:7:4:2.

Female dimensions (mm, length/width of holotype followed by paratype in parentheses)
Body length 1.50 mm (1.34 mm). Pedipalps: trochanter 0.22/0.14 (0.24/0.15), femur 0.43/0.16 (0.44/0.16), patella 0.37/0.21 (0.36/0.20), chela (without pedicel) 0.72/0.32 (0.75/0.32), chela (with

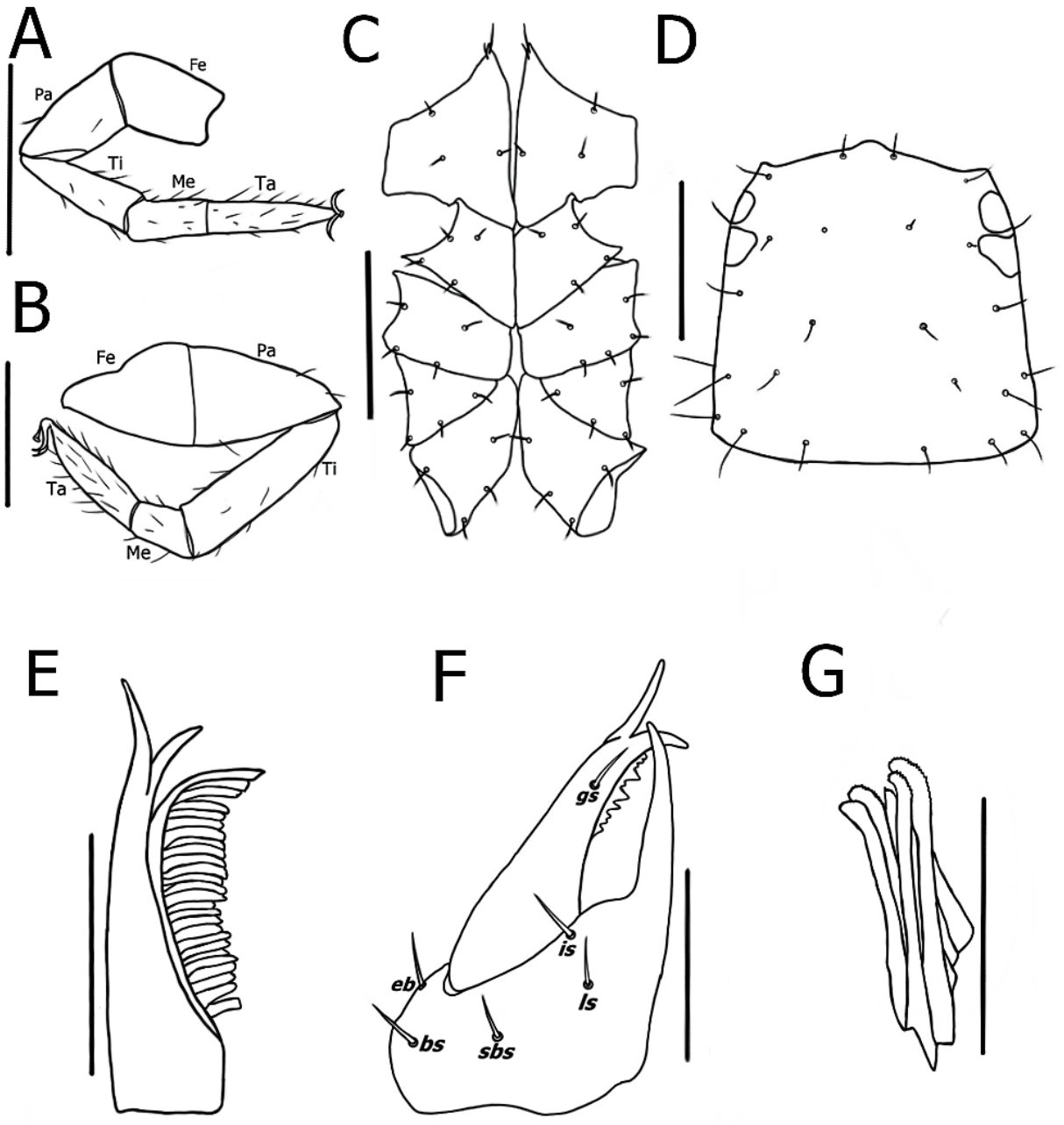

Fig. 17. *Ideobisium susanae* sp. nov. **A**. Leg I. **B**. Leg IV. **C**. Coxa. **D**. Carapace. **E**. Serrula exterior. **F**. Chelicera in dorsal view, showing trichobothria. **G**. Rallum. A–D, F: holotype, ♀ (QCAZ); E, G: paratype, ♂ (ZMH A0003693). Abbreviations: Fe = femur; Pa = patella; Ti = tibia; Me = metatarsus; Ta = tarsus. Scale bars: A–D = 0.25 mm; E = 100 µm; F = 0.125 mm; G = 40 µm.

pedicel) 0.78/0.32 (0.80/0.32), hand length 0.42 (0.41), movable finger length 0.36 (0.39). Chelicera 0.32/0.17 (0.32 /0.16), movable finger length 0.23 (0.24). Carapace 0.50/0.47 (0.48/0.46). Leg I: femur 0.17/0.05 (0.19/0.06), patella 0.16/0.06 (0.16/0.07), tibia 0.20/0.05 (0.21/0.05), metatarsus 0.09/0.04 (0.10/0.04), tarsus 0.18/0.04 (0.17/0.04). Leg IV: femur 0.17/0.15 (0.20/0.17), patella 0.24/0.15 (0.26/0.17), tibia 0.28/0.10 (0.29/0.10), metatarsus 0.12/0.06 (0.12 /0.05), tarsus 0.21/0.06 (0.21/0.04).

Male dimensions (mm, length/width of allotype followed by paratype in parentheses)
Body length 1.36 mm (1.20 mm). Pedipalps: trochanter 0.19/0.12 (0.20/0.13), femur 0.36/0.14 (0.36/0.14), patella 0.30/0.17 (0.32/0.18), chela (without pedicel) 0.62/0.27 (0.62/0.27), chela (with pedicel) 0.67/0.27 (0.67/0.26), hand length 0.34 (0.35), movable finger length 0.33 (0.32). Chelicera

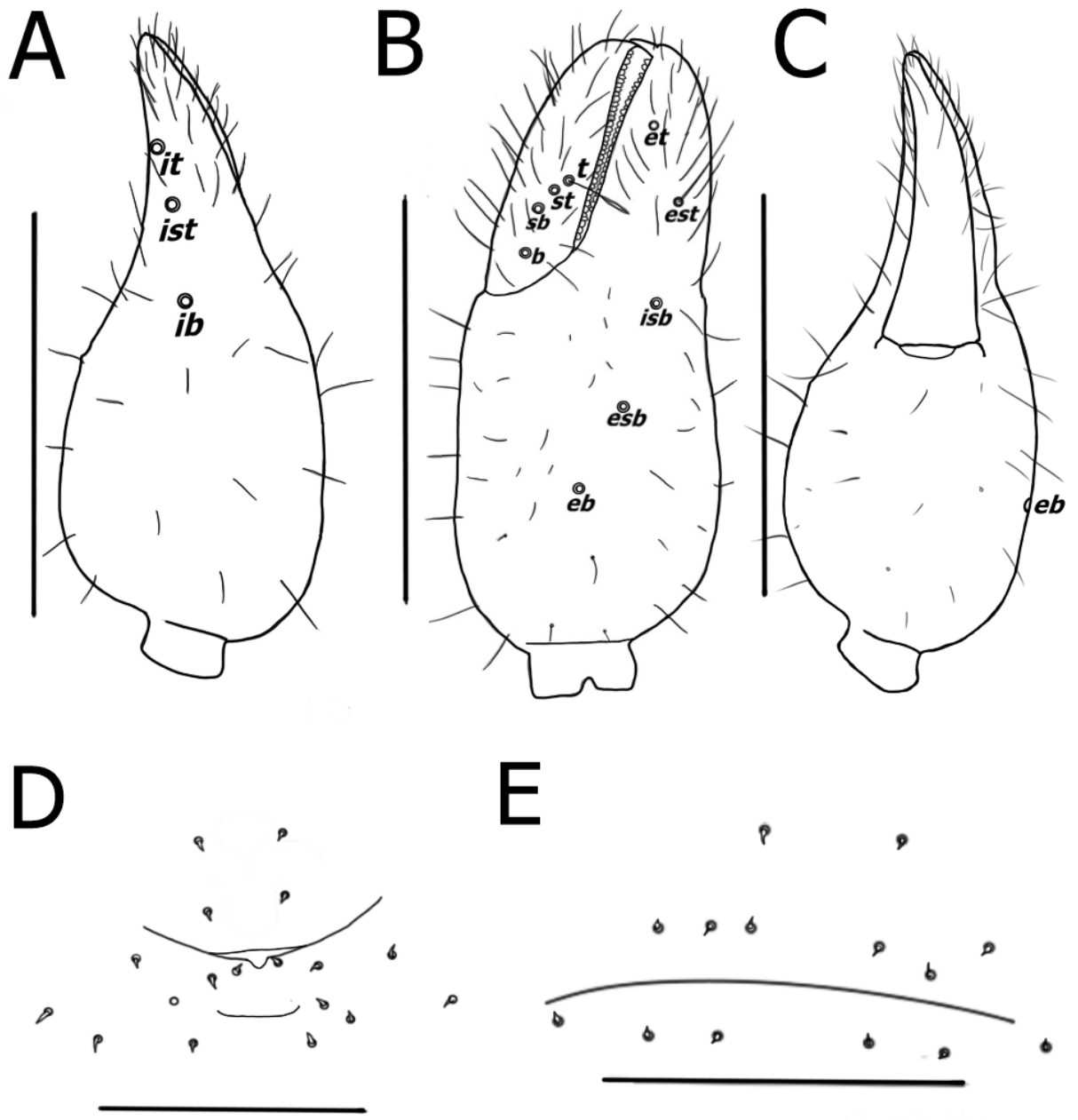

Fig. 18. *Ideobisium susanae* sp. nov. **A**. Chela in dorsal view, showing trichobothria. **B**. Chela in retrolateral view. **C**. Chela in ventral view. **D**. Outer genital area. **E**. Genital area. A–C, E: holotype, ♀ (QCAZ); D: allotype, ♂ (QCAZ). Scale bars: A–C = 0.50 mm; D = 0.20 mm; E = 0.10 mm.

0.26/0.13 (0.26/0.13), movable finger length 0.20 (0.19). Carapace 0.48/0.40 (0.46/0.40). Leg I: femur 0.18/0.06 (0.17/0.06), patella 0.16/0.06 (0.15/0.05), tibia 0.19/0.05 (0.18/0.05), metatarsus 0.08/0.04 (0.09/0.04), tarsus 0.18/0.04 (0.16/0.04). Leg IV: femur 0.19/0.14 (0.17/0.16), patella 0.24/0.14 (0.21/0.16), tibia 0.29/0.09 (0.29/0.09), metatarsus 0.13/0.05 (0.13/0.05), tarsus 0.21/0.05 (0.21/0.06).

Genus ***Ideoblothrus*** Balzan, 1892

Ideobisium (*Ideoblothrus*) Balzan, 1892: 541.

Type species

Ideobisium (*Ideoblothrus*) *similis* Balzan, 1892, by subsequent designation by Muchmore (1982).

Ideoblothrus nadineae sp. nov.

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Figs 19–24

Diagnosis

Ideoblothrus nadineae sp. nov. differs from *I. brasiliensis* (Mahnert, 1979), *I. caecus* (Mahnert, 1979), *I. colombiae* Muchmore, 1982 and *I. kochalkai* Muchmore, 1982 in carapace dimensions (♂ *I. nadineae* sp. nov. carapace 0.37–0.42 mm long, ♂ 1.16–1.29, ♀ 1.19 times as long as broad, ♂ *I. brasiliensis* 1.38, ♀ *I. caecus* 1.27 times as long as broad, ♂ *I. colombiae* 0.55 mm long, ♂ *I. kochalkai* 0.74 mm long. It differs from *I. costaricensis* in pedipalpal dimensions (♂ *I. nadineae* sp. nov. trochanter 0.16–0.18 mm long, *I. costaricensis* 0.22 mm long). It differs from *I. fenestratus* (Beier, 1955) in the absence of a deep furrow on the carapace. *Ideoblothrus nadinae* sp. nov. differs from *I. amazonicus* (Mahnert, 1979), *I. costaricensis*, *I. levipalpus* Mahnert, 1985, *I. paraensis* Mahnert, 1985 and *I. tenuis* Mahnert, 1985 in the dimensions of the chela and carapace, with *I. nadineae* sp. nov. having smaller dimensions (♂ *I. nadineae* sp. nov. chela 2.55 2.95, ♀ 2.71 times as long as broad, carapace 0.37–0.42/ 0.31–0.34 mm, chela with pedicel 0.56–0.61 mm and 0.61 mm without pedicel, *I. amazonicus* carapace 0.35–0.37/0.28–0.36 mm and chela length 0.49–0.54 mm, *I. costaricensis* chela 2.5 times as long as broad, ♀ *I. levipalpus* chela with pedicel 0.49 mm, ♂ *I. paraensis* chela length 0.58–0.66 mm, ♀ *I. tenuis* chela without pedicel 0.74–0.75 mm). It differs from *I. safinai* sp. nov. in the positions of trichobothria *eb*, *esb* and *isb*, which are closer to each other in *I. safinai* sp. nov. compared to *I. nadineae* sp. nov.

Etymology

This specific epithet is a patronym for Nadine Dupérré, collection manager at the ZMH, who collected this new species and mentored the senior author during her studies.

Material examined

Holotype

ECUADOR • ♂; Napo Province, Tena, Colonso Chalupas Natural Reserve; 00°54′33.084″ S, 77°53′9.131″ W; alt. 1044 m; 14 Mar. 2020; N. Dupérré, E.E. Tapia and A.A. Tapia leg.; sifting litter and Berlese traps; QCAZ.

Allotype

ECUADOR • ♀; same collection data as for holotype; QCAZ.

Paratypes

ECUADOR • 5 ♂♂; same collection data as for holotype; ZMH A0003695 to A0003699.

Description

Male, adult (holotype; Fig. 19A–C)

Colour. Prosoma and pedipalps reddish-brown, opisthosoma pale brown, femora and patella of pedipalps with a pattern of light brown circles. Body length 1.14 mm.

Pedipalp (Figs 21B, 22A, 24A–C). Setae on prolateral margin long and acicular; trochanter 1.64, femur 2.69, patella 2.00, chela (with pedicel) 2.81, chela (without pedicel) 2.57, hand 1.24 and movable finger 5.33 times as long as broad. Chela granulate, fixed chelal finger with 8 trichobothria, movable finger with 4 trichobothria: *eb* situated near base of movable finger chela, *esb* situated slightly above and close to *eb* on retrolateral face of hand, *isb* also near base of finger and slightly above *esb*, *eb*, *esb* and *isb* very close to each other, *est* situated medially on fixed finger, *et* situated near tip of fixed finger, distance between *isb* and *est* similar to distance between *est* and *et*, *est* situated between *et* and *isb*; trichobothrium *b* situated basally on movable finger, *sb, st* and *t* situated medially, close to each other; trichobothrium *t* lanceolate. Venom apparatus present only in fixed finger, venom duct short; all teeth rounded and juxtadentate, 29 teeth on fixed finger, 37 on movable finger.

Cephalothorax (Figs 21A, C, 23C–D). Carapace 1.25 times as long as broad, rectangular in shape, no eyes, epistome small and triangular; 26 setae arranged 4:6:4:6:6; without furrows; three pairs of lyrifissures, first pair placed near anterior margin, second pair placed sub-medially, third pair near posterior margin; chaetotaxy of leg coxae I–IV 10:10:8:10, pedipalpal coxa with 10 setae and 2 apical setae. Posterior margin of coxae II slightly overlapping anterior section of coxae III.

Chelicera (Figs 22B, 23E–G). Smooth; 2 dorsal lyrifissures, 1 between *ls* and *is* and 1 basally; 5 setae on hand, 1 on movable finger, setae *is*, *ls* and *sbs* longer than *bs* and *eb*, *gs* situated subdistally on movable finger; fixed finger with 11, movable finger with 6 teeth, rallum with 7 dentate blades; serrula exterior with 25 blades, serrula interior with 11 blades, galea rather short, not extending past tip of movable finger, straight, without rami.

Abdomen. Tergites and sternites undivided; tergal chaetotaxy: 7:7:9:9:9:9:9:9:9:7:7:2; sternal chaetotaxy: 6:9:10:10:10:10:6:6:4:4:2; pleural membrane longitudinally striate, without setae.

Genitalia (Figs 22C, 24D). Small rounded ejaculatory opening; 4 setae arranged linearly above opening, 4 setae congregated under opening and 5 setae below.

Legs (Fig. 23A–B). All legs with tarsus longer than metatarsus; not granulated; femur + patella of leg IV 2.41 times as long as broad; legs III and IV with articulation between femur and patella slightly oblique; tibiae III and IV with medial tactile setae; metatarsi III and IV with basal tactile setae; arolium as long as claws, distally broadened and undivided, claws simple and not serrate.

Female, adult (allotype; Fig. 20A–C)

Same as holotype, except body length 1.11 mm.

Pedipalp. Trochanter 1.58, femur 2.64, patella 1.67, chela (with pedicel) 2.71, chela (without pedicel) 2.54, hand 1.13 and movable finger 3.88 times as long as broad; 32 distinct teeth on movable finger.

Cephalothorax. Carapace 1.19 times as long as broad; chaetotaxy of leg coxae I–IV 10:12:8:12.

Chelicera. Fixed finger with 12, movable finger with 7 teeth.

Abdomen. Tergal chaetotaxy 7:8:9:8:8:8:9:9:8:7:7:2; sternal chaetotaxy 8:10:11:11:11:9:9:7:7:4:2.

Genitalia (Fig. 24E). 2 setae arranged linearly on sternite 2 and 8 setae linearly on sternite 3 below opening.

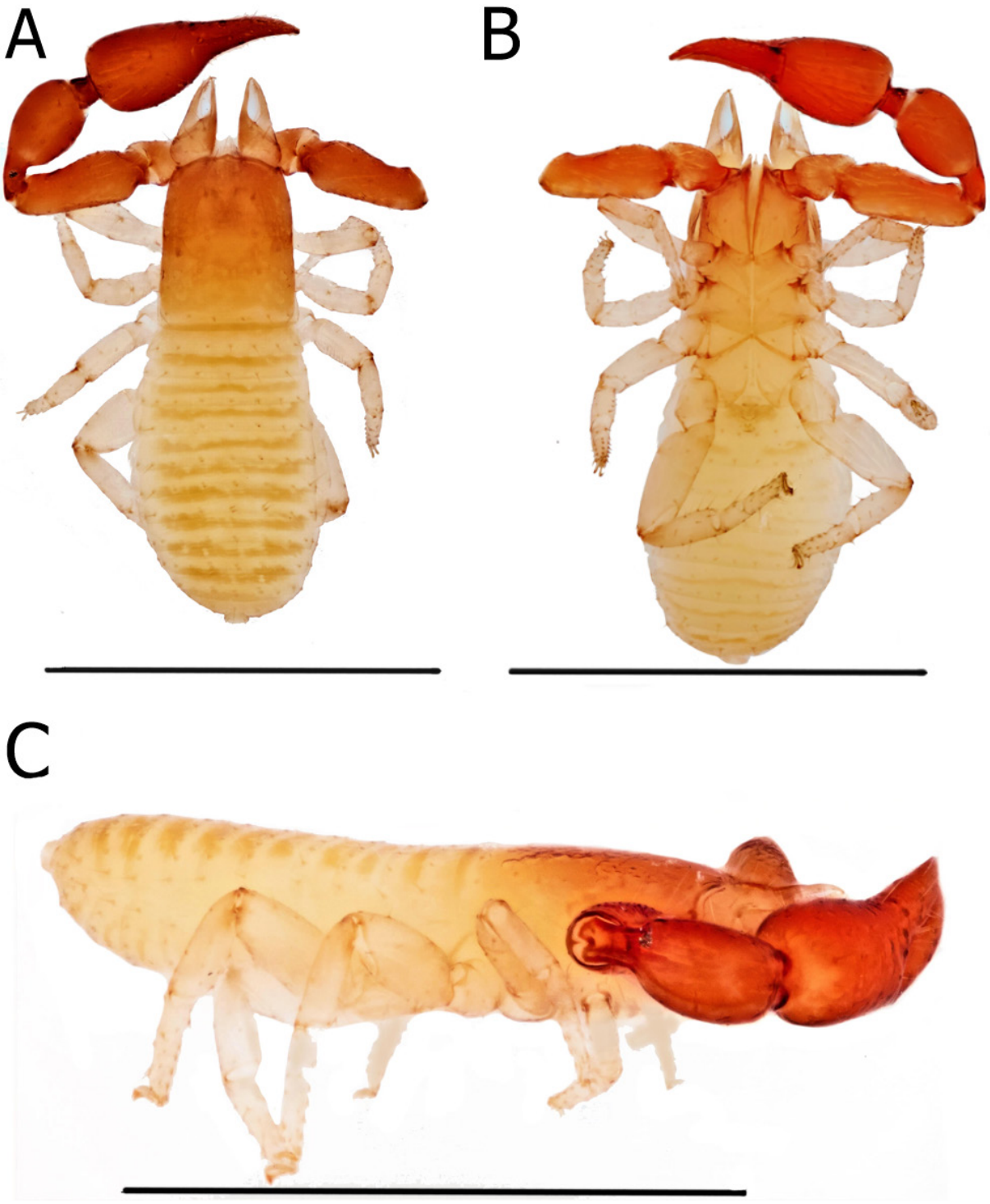

Fig. 19. *Ideoblothrus nadineae* sp. nov., holotype, ♂ (QCAZ). **A**. Habitus in dorsal view. **B**. Habitus in ventral view. **C**. Habitus in lateral view. Scale bars = 1 mm.

Variation of male paratypes (adults; n=5)
Same as holotype, except body length 1.01–1.23 mm.

Pedipalp. Trochanter 1.55–1.64, femur 2.38–2.69, patella 1.76–1.94, chela (with pedicel) 2.55–2.95, chela (without pedicel) 2.36–2.75, hand 1.14–1.29 and movable finger 4.29–5.00 times as long as broad; 27 (n=2) or 29 (n=3) juxtadentate teeth on fixed finger, 35 (n=1), 36 (n=3) or 37 (n=1) on movable finger.

Cephalothorax. Carapace 1.15–1.29 times as long as broad; one paratype with 27 setae arranged 4:6:4:6:7; variation in chaetotaxy of coxae of legs I–IV: 10:10:8:10 (ZMH A0003695), 10:10:6:8 (ZMH A0003696), 8:8:6:10 (ZMH A0003697), 10:10:8:10 (ZMH A0003698), 10:8:8:10 (ZMH A0003699); pedipalpal coxa with 8 (n=2) or 10 (n=3) setae.

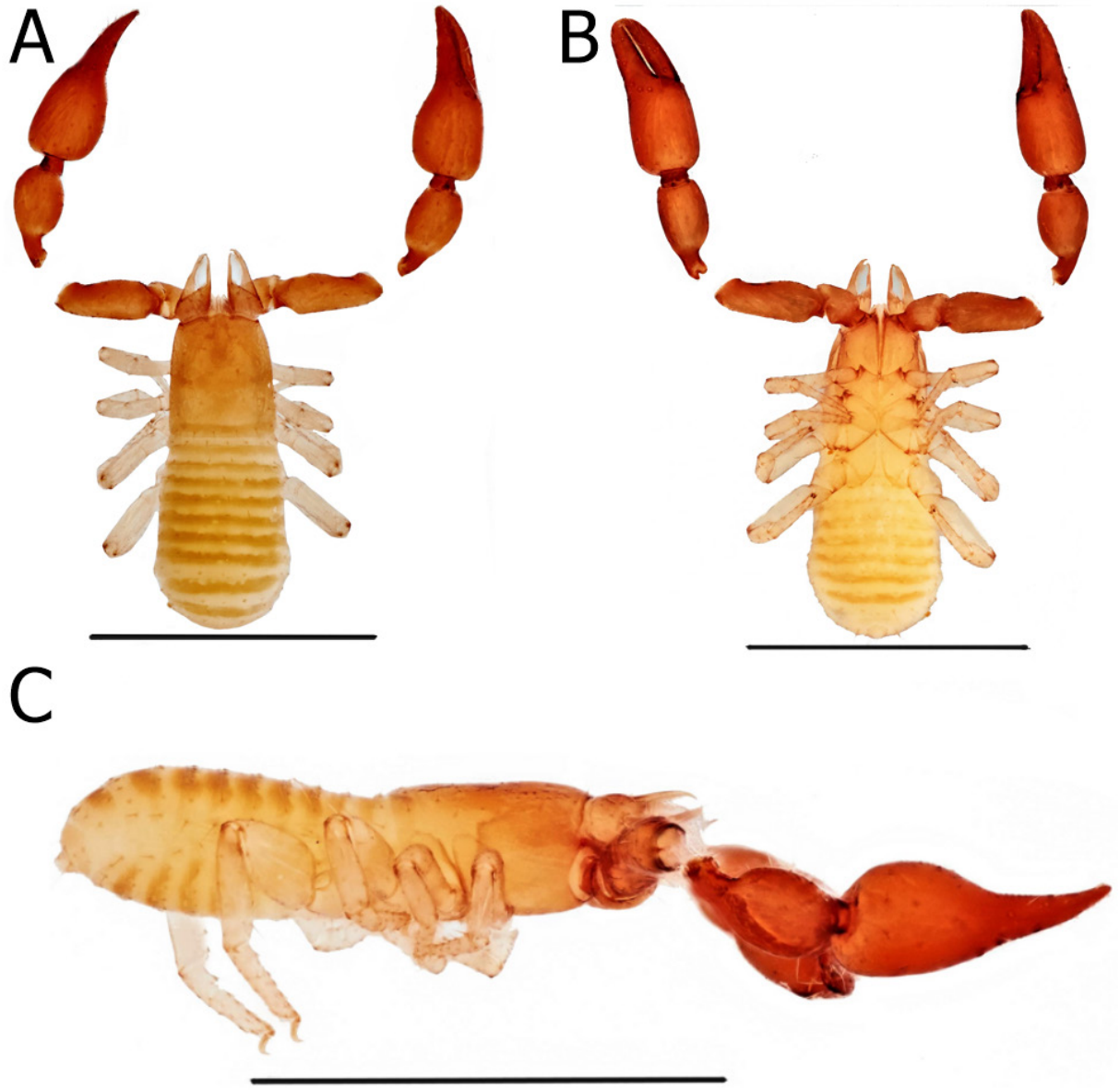

Fig. 20. *Ideoblothrus nadineae* sp. nov., allotype, ♀ (QCAZ). **A**. Habitus in dorsal view. **B**. Habitus in ventral view. **C**. Habitus in lateral view. Scale bars = 1 mm.

Chelicera. Fixed finger with 10 (n = 1) or 13 (n = 2) teeth, movable finger with 6 (n = 3) teeth.

Abdomen. Same as holotype, except variations in tergal chaetotaxy: 6:7:9:9:9:9:9:9:9:7:6:2 (ZMH A0003695), 7:6:8:9:9:9:9:9:8:6:6:2 (ZMH A0003696), 6:7:8:9:9:9:9:9:9 (ZMH A0003697), 7:8:9:9:9:9:9:9:9:7:6:2 (ZMH A0003698), 7:7:8:9:9:9:9:8:9:9:7:2 (ZMH A0003699); variations in sternal chaetotaxy: 6:10:10:11:11:10:9:7:4:4:2 (ZMH A0003695), 6:8:8:9:9:8:8:9:4:4:2 (ZMH A0003696), 6:9:10:10:10:9:8:9:7:6:2 (ZMH A0003697), 10:10:9:8:8:9:8:8:7:7:2 (ZMH A0003698), 6:9:9:9:10:10:10:8:6:4:2 (ZMH A0003699).

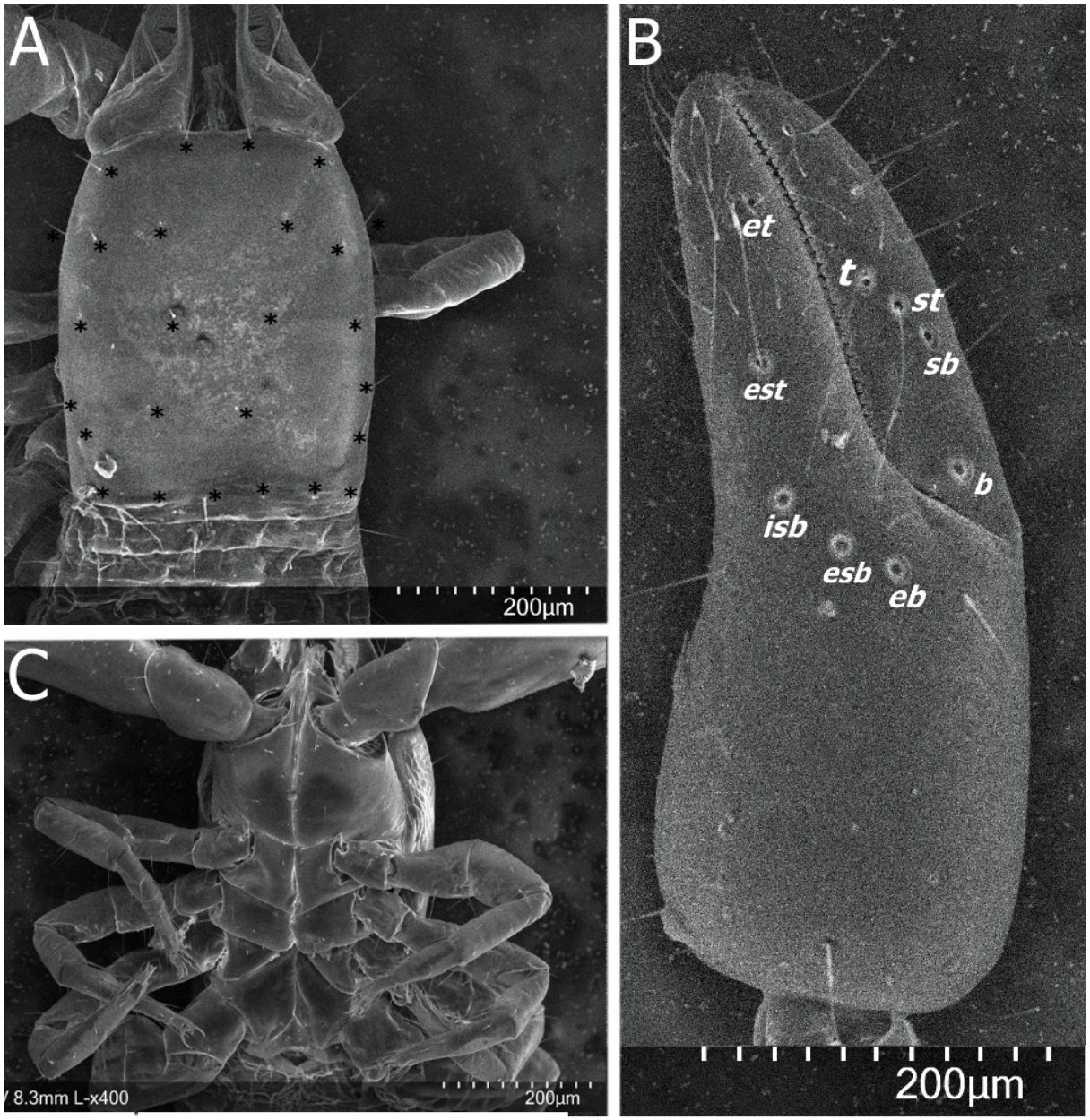

Fig. 21. Scanning electron micrographs of *Ideoblothrus nadineae* sp. nov., paratype, ♂ (ZMH A0003695). **A**. Carapace with asterisks next to setae. **B**. Chela in retrolateral view, showing trichobothria. **C**. Coxa.

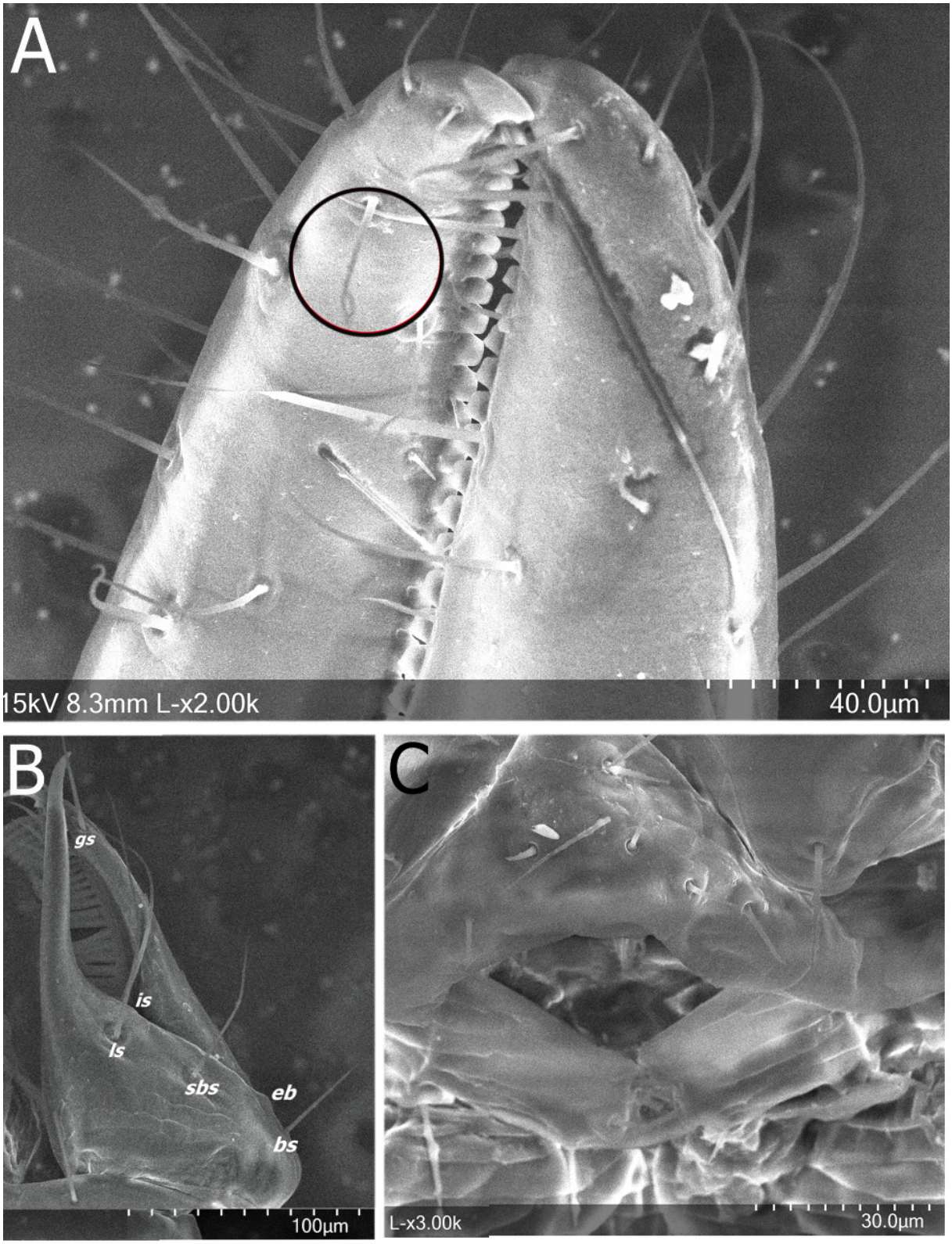

Fig. 22. Scanning electron micrographs of *Ideoblothrus nadineae* sp. nov., paratype, ♂ (ZMH A0003695). **A**. Close-up view of chela, showing lanceolate trichobothrium *t*. **B**. Chelicera in dorsal view, showing trichobothria. **C**. Genital area.

Female dimensions (mm, length/width of allotype)
Body length 1.11 mm. Pedipalps: trochanter 0.18/0.11, femur 0.37/0.14, patella 0.30/0.18, chela (without pedicel) 0.61/0.24, chela (with pedicel) 0.65/0.24, hand length 0.27, movable finger length 0.31. Chelicera 0.25/0.13, movable finger length 0.19. Carapace 0.43/0.36. Leg I: femur 0.11/0.06, patella 0.14/0.06, tibia 0.19/0.06, metatarsus 0.07/0.04, tarsus 0.14/0.03. Leg IV: femur 0.12/0.13, patella 0.21/0.13, tibia 0.27/0.13, metatarsus 0.09/0.05, tarsus 0.15/0.05.

Male dimensions (mm, length/width of holotype followed by range of five paratypes in parentheses)
Body length 1.14 mm (1.01–1.23 mm). Pedipalps: trochanter 0.18/0.11 (0.17–0.18/0.10–0.11), femur 0.35/0.13 (0.31–0.35/0.12–0.13), patella 0.32/0.16 (0.29–0.31/0.16–0.17), chela (without pedicel)

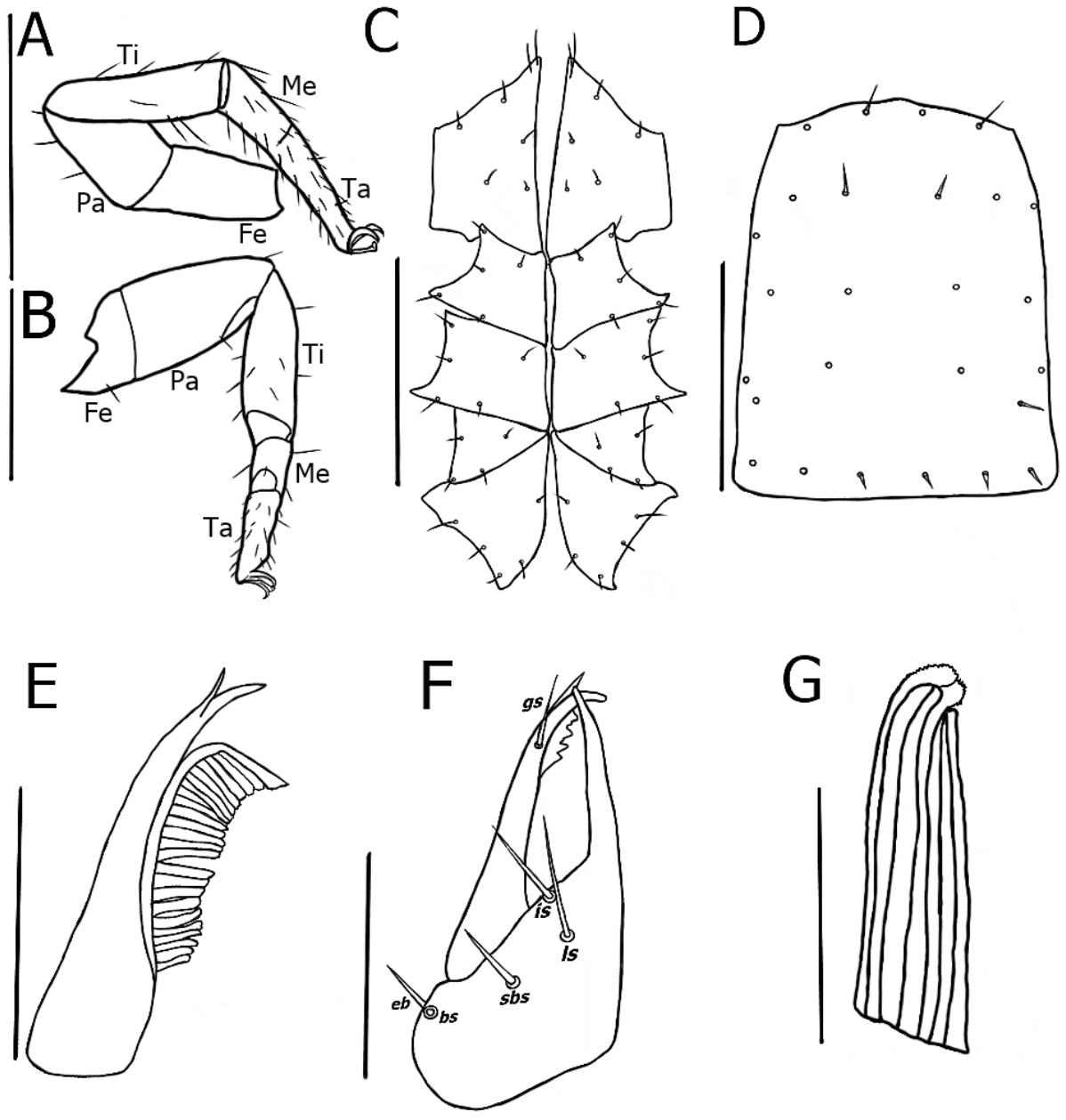

Fig. 23. *Ideoblothrus nadineae* sp. nov., holotype, ♂ (QCAZ). **A**. Leg I. **B**. Leg IV. **C**. Coxa. **D**. Carapace. **E**. Serrula exterior. **F**. Chelicera in dorsal view, showing trichobothria. **G**. Rallum. Abbreviations: Fe = femur; Pa = patella; Ti = tibia; Me = metatarsus; Ta = tarsus. Scale bars: A–D = 0.25 mm; E = 100 µm; F = 0.125 mm; G = 20 µm.

0.54/0.21 (0.52–0.56/0.20–0.22), chela (with pedicel) 0.59/0.21 (0.56–0.61/0.20–0.21), hand length 0.26 (0.24–0.27), movable finger length 0.32 (0.30). Chelicera 0.22/0.11 (0.20–0.22/0.10–0.12), movable finger length 0.18 (0.16–0.17). Carapace 0.40/0.32 (0.37–0.42/0.31–0.34). Leg I: femur 0.12/0.06 (0.11–0.12/0.05–0.07), patella 0.11/0.07 (0.12/0.06–0.07), tibia 0.17/0.04 (0.16–0.18/0.04–0.05), metatarsus 0.07/0.04 (0.08/0.04), tarsus 0.12/0.03 (0.11–0.13/0.03). Leg IV: femur 0.09/0.12 (0.09–0.12/0.10–0.12), patella 0.20/0.12 (0.19–0.20/0.10–0.12), tibia 0.22/0.07 (0.21–0.23/0.06–0.07), metatarsus 0.09/0.05 (0.07–0.09/0.04–0.05), tarsus 0.12/0.04 (0.12–0.13/0.04).

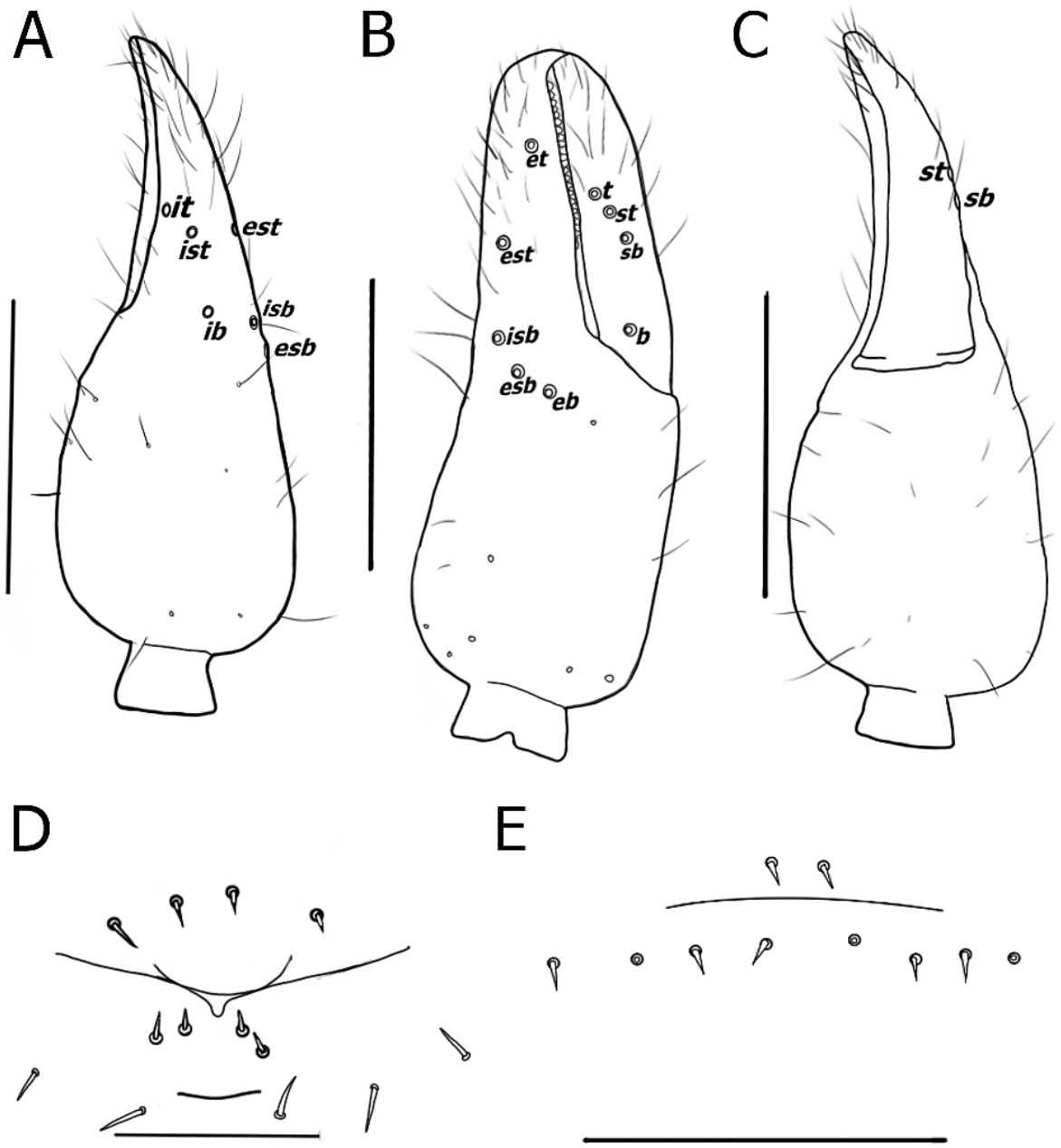

Fig. 24. *Ideoblothrus nadineae* sp. nov. **A**. Chela in dorsal view, showing trichobothria. **B**. Chela in retrolateral view. **C**. Chela in ventral view. **D**. Outer genital area. **E**. Genital area. A–D: holotype, ♂ (QCAZ); E: allotype, ♀ (QCAZ). Scale bars: A–C, E = 0.25 mm; D = 100 μm.

Ideoblothrus safinai sp. nov.

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Figs 25–30

Diagnosis

Ideoblothrus safinai sp. nov. differs from *I. amazonicus*, *I. brasiliensis*, *I. caecus*, *I. kochalkai*, *I. levipalpus*, *I. paraensis* and *I. tenuis* in the dimensions of the carapace (♀ *I. safinai* sp. nov. carapace 0.66/0.56 mm, ♂ 0.54–0.59/0.44–0.51 mm; ♀ *I. amazonicus* 0.37 mm; ♀ *I. brasiliensis* 0.36/0.26 mm; ♀ *I. caecus* 0.56 mm; ♂ *I. kochalkai* carapace length 0.74 mm; ♀ *I. levipalpus* 0.38/0.38 mm; *I. paraensis* 0.43–0.46/0.34–0.37 mm; ♀ *I. tenuis* 0.47/0.35–0.37 mm). It differs from *I. costaricensis* and *I. fenestratus* in the dimensions of the pedipalps (♂ *I. safinai* sp. nov. femur 0.43–0.52, patella 0.39–0.40, chela (without pedicel) 0.76–0.91, hand 0.38–0.47, pedicel 0.06–0.10 and movable finger 0.38–0.47 mm long, chela (with pedicel) 2.73–3.00 times as long as broad; *I. costaricensis* hand length (without pedicel) 0.31 mm; ♂ *I. fenestratus* chela (with pedicel) 2.50–2.60 times as long as broad). It differs from *I. colombiae* in the chaetotaxy of the carapace (♂ *I. safinai* sp. nov. with 30 setae arranged 2:4:6:4:6:8; ♂ *I. colombiae* with 21 setae arranged 4:4:4:4:5 or only 4 at posterior margin).

Etymology

This species is a patronym for Professor Carl Safina, an American ecologist, whom the first author admires for his academic and literary work.

Material examined

Holotype

ECUADOR • ♂; Pichincha Province, La Unión del Toachi, Otongachi Natural Reserve; 00°19′16.662″ S, 78°57′5.867″ W; alt. 900 m; Aug. 2013; E.E. Tapia and N. Dupérré leg.; sifting litter and berlese traps; QCAZ.

Allotype

ECUADOR • ♀; same collection data as for holotype; QCAZ.

Paratypes

ECUADOR • 2 ♂♂; same collection data as for holotype; ZMH A0015394, ZMH A0015395 • 2 ♂♂; same collection data as for holotype, but 25 Aug. 2013; ZMH A0015397, ZMH A0015398.

Other material

ECUADOR • 1 tritonymph; same collection data as for holotype; ZMH A0015396.

Description

Male, adult (holotype, Fig. 25A–C)

Colour. Prosoma and pedipalps dark brown, opisthosoma light brown, femora and patella of the pedipalps with a pattern of light brown circles. Body length 2.03 mm.

Pedipalp (Figs 28A, C, 30A–C). Setae on prolateral margin long and acicular; trochanter 1.67, femur 2.32, patella 1.63, chela (with pedicel) 2.73, chela (without pedicel) 2.53, hand 1.23 and movable finger 3.80 times as long as broad; patella with one lyrifissure situated dorsally on pedicel. Chela not granulated. Fixed chelal finger with 8 trichobothria, movable finger with 4 trichobothria: *eb* and *esb* situated medially on retrolateral face of hand, *isb* slightly above base of finger, distance between *isb*, *est* and *et* very similar, *et* situated near tip of fixed finger, *est* situated between *et* and *isb*; trichobothrium *b* situated basally on movable finger, *sb*, *st* and *t* situated medially, close to each other; trichobothrium *t* lanceolate. Venom apparatus present only in fixed finger, venom duct rather short. Teeth rounded and juxtadentate, 32 teeth on fixed finger, 41 on movable finger.

Cephalothorax (Figs 27A, C, 29C–D). Carapace 1.20 times as long as broad, rectangular in shape, with pointy ends at top corners; no eyes; epistome triangular; 30 setae arranged 2:4:6:4:6:8; without furrows; two pairs of lyrifissures, first pair situated near anterior margin, second pair situated near setae on posterior row; chaetotaxy of leg coxae I–IV: 12:12:8:10, pedipalpal coxa with 11 setae and 2 apical setae. Posterior section of coxae II slightly overlapping anterior section of coxae III.

Chelicera (Figs 27B, D, 29E–G). Smooth; 1 dorsal lyrifissure between *ls* and *is*; 5 setae on hand, 1 seta on movable finger, setae *is*, *ls* and *sbs* longer than *bs* and *es*, *gs* situated subdistally on movable finger; fixed finger with 8 indistinct teeth, movable finger with 10 distinct teeth; rallum with 6 dentate blades, serrula exterior with 25 blades, serrula interior with 6 blades; galea short, rather straight, not extending past tip of movable finger, without rami.

Abdomen (Fig. 27E). Tergites and sternites undivided; tergal chaetotaxy: 6:7:8:8:8:8:6:7:8:6:6:2; sternal chaetotaxy: 6:8:9:9:8:9:9:4:2:2; pleural membrane longitudinally striate, without setae.

Genitalia (Fig. 29H). Small rounded ejaculatory opening, 4 setae arranged linearly above opening, 4 setae congregated under opening and 8 setae below.

Legs (Figs 28B, 29A–B). All legs with tarsus longer than metatarsus; not granulate; femur + patella of leg IV 2.96 times as long as broad; legs III and IV with articulation between femur and patella slightly oblique; tibiae III and IV and metatarsi III and IV with tactile setae sub-basally; arolium as long as claws, distally broadened and undivided; claws simple and not serrate.

Female, adult (allotype, Fig. 26A–C)
Same as holotype, except body length 2.22 mm.

Pedipalp. Trochanter 1.68, femur 2.67, patella 1.86, chela (with pedicel) 2.84, chela (without pedicel) 2.63, hand 1.34 and movable finger 4.45 times as long as broad.

Cephalothorax. Same as holotype except carapace 1.18 times as long as broad; 25 setae arranged 4:5:4:4:2:6; chaetotaxy of leg coxae I–IV: 14:10:12:10; pedipalpal coxa with 12 setae.

Chelicera. Same as holotype.

Abdomen. Same as holotype except tergal chaetotaxy: 7:8:8:8:9:9:9:9:7:9:4:2; sternal chaetotaxy: 7:6:7:7:7:8:7:7:7:2:4:2.

Genitalia (Fig. 29I). Setae arranged linearly in two rows 5:6 on sternite 2 and 7 setae arranged linearly on sternite 3 below opening.

Legs. Same as holotype, except femora slightly longer than patella in legs I–II.

Variation of male paratypes (adults, n = 4)
Same as holotype, except body length 1.39–2.32 mm.

Pedipalp. Trochanter 1.47–1.69, femur 2.16–2.56, patella 1.60–1.81, chela (with pedicel) 2.78–3.00, chela (without pedicel) 2.53–2.63, hand 1.24–1.52 and movable finger 4.56–4.78 times as long as broad.

Cephalothorax. Carapace 1.11–1.17 times as long as broad; either 30 setae arranged 2:4:6:4:6:8 (n = 2) or 29 setae arranged 2:4:6:4:7:6 (n = 2); variation in chaetotaxy of coxae of legs I–IV: 9:10:8:12 (ZMH A0015395), 13:11:8:10 (ZMH A0015394), 13:10:8:10 (ZMH A0015398), 12:10:8:10 (ZMH A0015397); pedipalpal coxa with 12 setae.

Abdomen. Tergal chaetotaxy variation: 7:8:8:8:8:8:8:8:8:4:2 (ZMH A0015395), 7:7:9:9:9:9:9:9:9:4:2 (ZMH A0015394), 7:7:7:8:8:9:9:9:9:4:2 (ZMH A0015398), 7:7:9:9:8:9:8:9:8:6:4:2 (ZMH A0015397); sternal chaetotaxy variation: 6:9:9:10:10:8:9:9:9:4:2 (ZMH A0015395), 7:8:9:10:10:10:10:7:4:2 (ZMH A0015394), 6:8:8:7:9:9:9:9:4:2 (ZMH A0015398), 6:7:7:8:8:7:8:8:4:2 (ZMH A0015397).

Tritonymph

Same as holotype, except body length 1.57 mm.

Pedipalp (Fig. 30D–F). Trochanter 1.63, femur 2.76, patella 1.73, chela (with pedicel) 2.57, chela (without pedicel) 2.40, hand 1.25 and movable finger 4.90 times as long as broad. Fixed chelal finger with 7 trichobothria, movable with 3 trichobothria: *it* and *sb* absent, *eb* situated at base of fixed finger, *esb*, *isb* and *ib* situated on dorsal side of fixed finger, *ist* and *est* close together, *et* situated sub-distally;

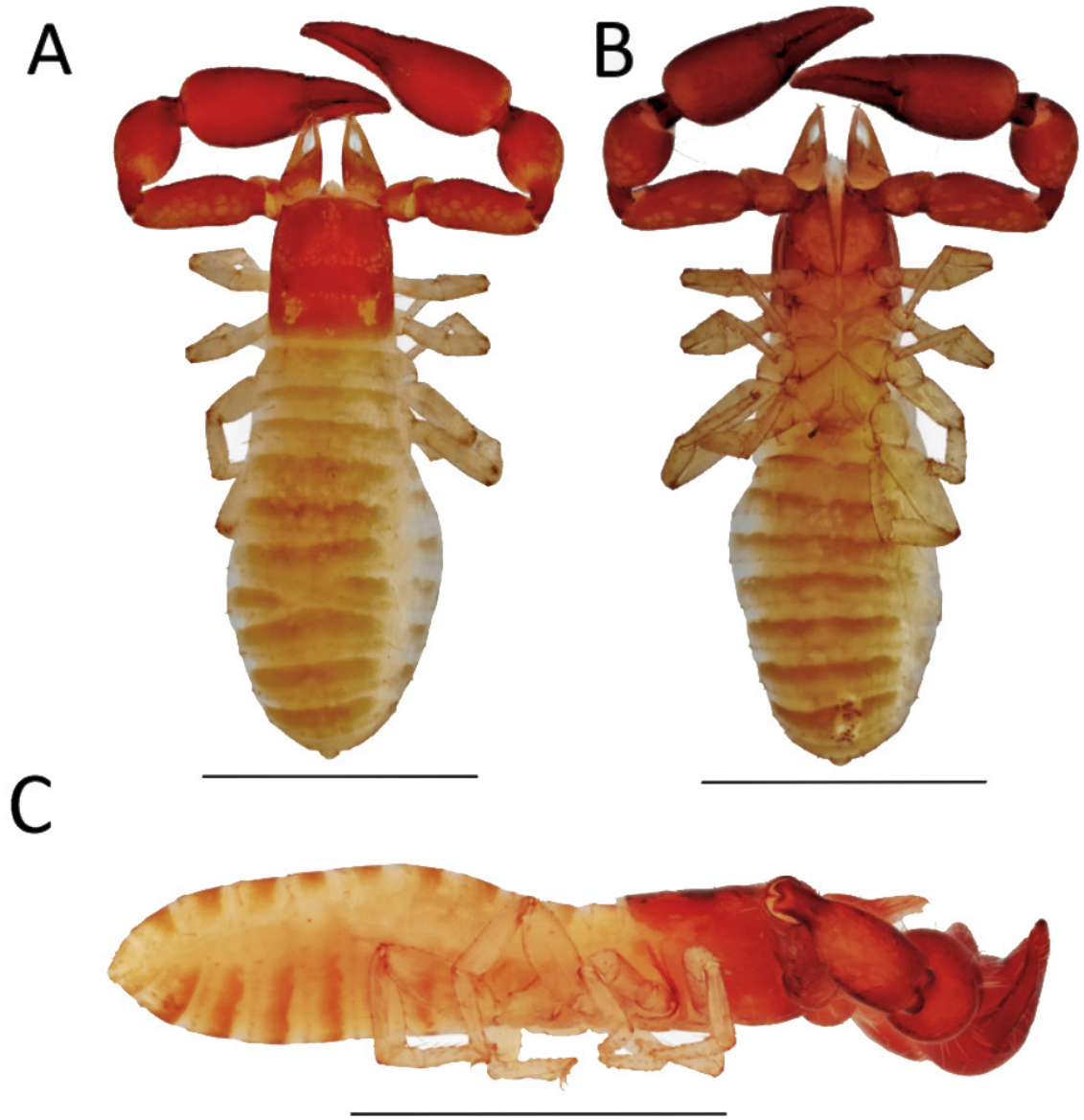

Fig. 25. *Ideoblothrus safinai* sp. nov., holotype, ♂ (QCAZ). **A**. Habitus in dorsal view. **B**. Habitus in ventral view. **C**. Habitus in lateral view. Scale bars = 1 mm.

b situated sub-basally, *st* and *t* situated medially on movable finger. Teeth rounded and juxtadentate, 37 teeth on fixed finger, no distinct teeth on movable finger.

Cephalothorax. Same as holotype except carapace 1.09 times as long as broad; 29 setae arranged 2:4:6:4:7:6; chaetotaxy of coxae of legs I–IV: 11:12:8:12, pedipalpal coxa with 14 setae.

Abdomen. Same as holotype. Tergal chaetotaxy: 7:8:9:9:9:9:9:10:9:8:4:2; sternal chaetotaxy: 6:7:8:7:9:8:10:10:8:6.

Legs. All legs with tarsus longer than metatarsus; arolium as long as claws, distally broadened and undivided; claws simple and not serrate.

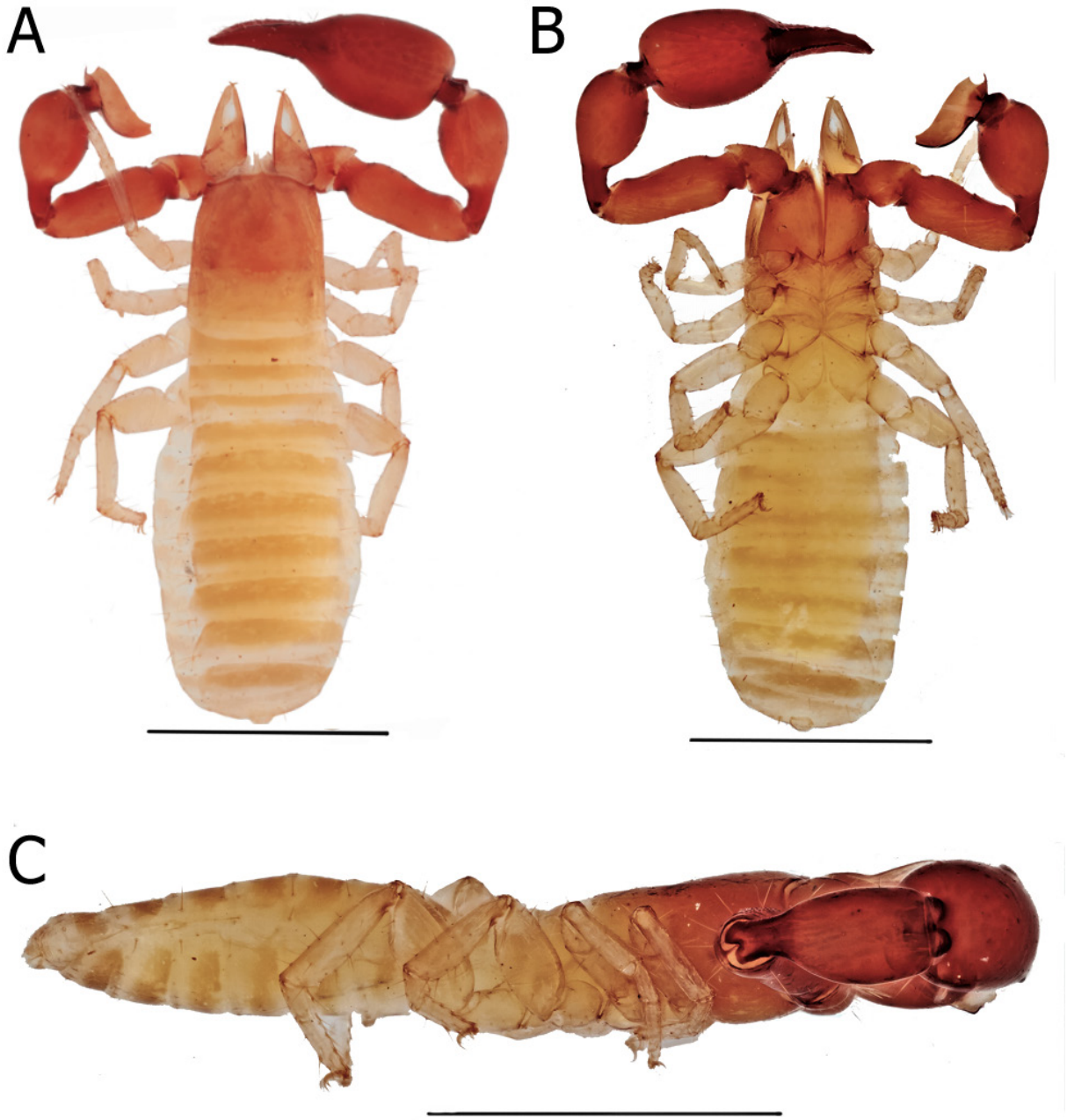

Fig. 26. *Ideoblothrus safinai* sp. nov., allotype, ♀ (QCAZ). **A**. Habitus in dorsal view. **B**. Habitus in ventral view. **C**. Habitus in lateral view. Scale bars = 1 mm.

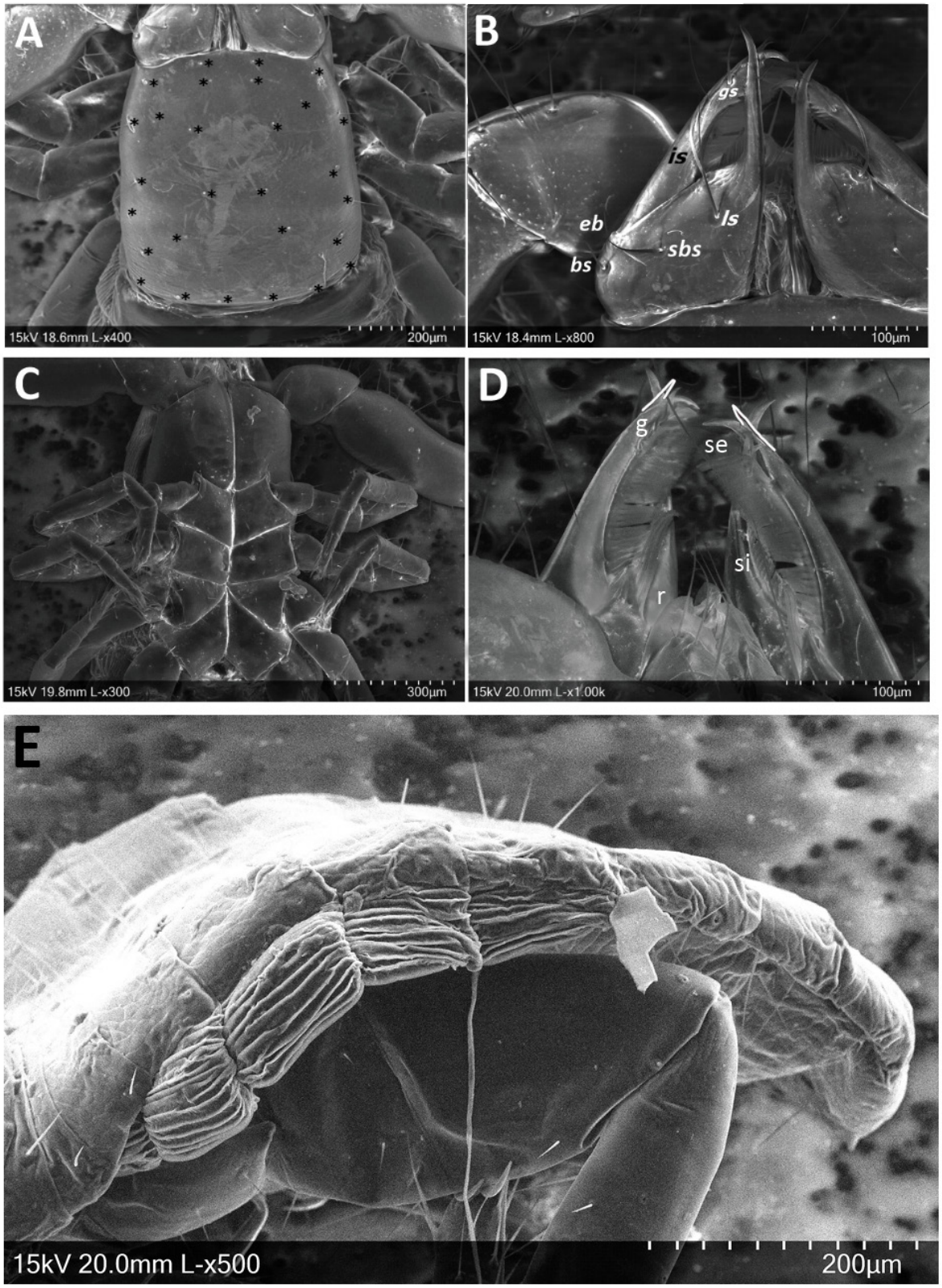

Fig. 27. Scanning electron micrographs of *Ideoblothrus safinai* sp. nov., ♂♂. **A**. Carapace with asterisks next to setae. **B**. Chelicera in dorsal view, with trichobothria. **C**. Coxa. **D**. Chelicera in ventral view. **E**. Longitudinally striate pleural membrane. A–D: paratype (ZMH A0015394); E paratype (ZMH A0015395). Abbreviations: g = galea highlighted; r = rallum; se = serrula exterior; si = serrula interior.

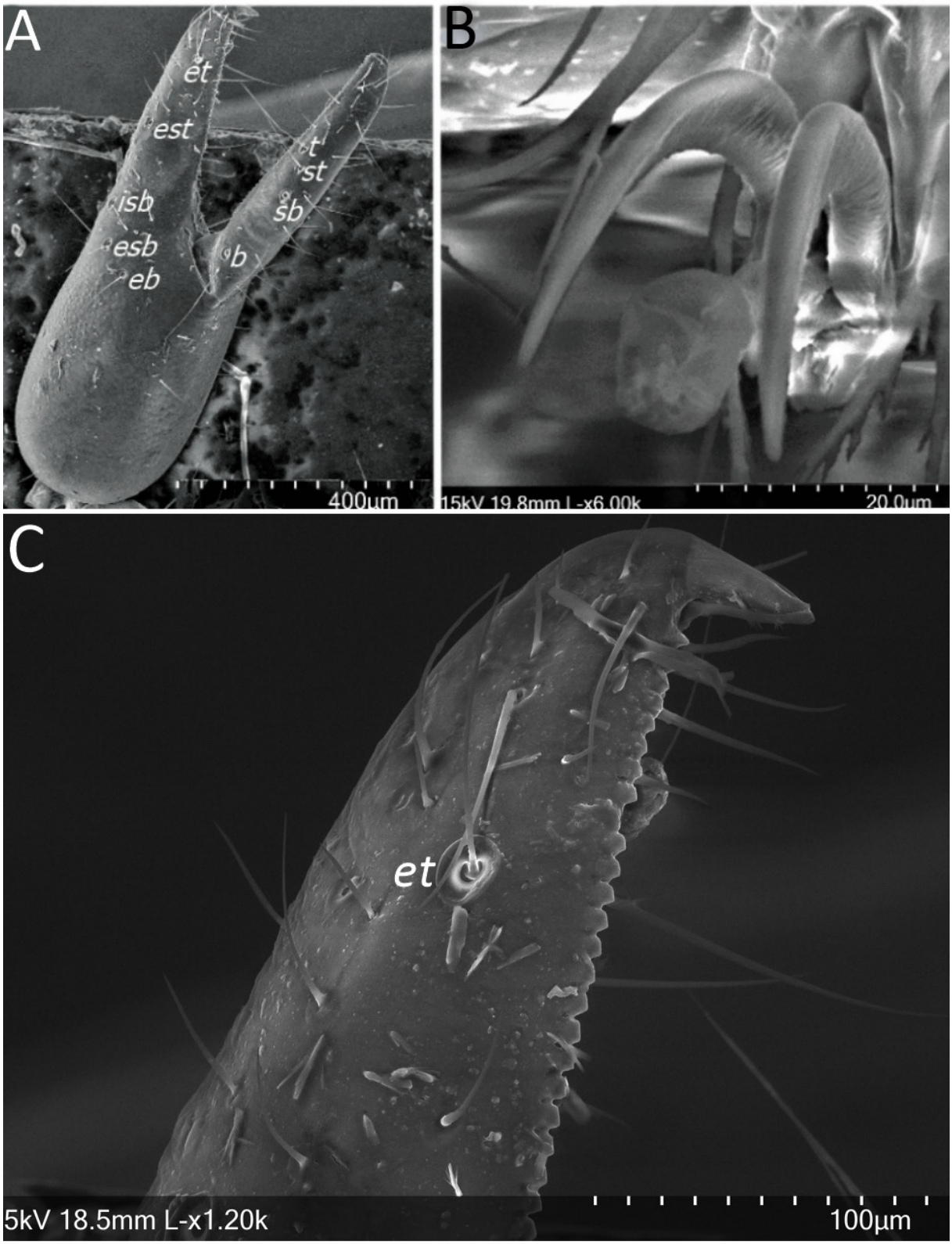

Fig. 28. Scanning electron micrographs of *Ideoblothrus safinai* sp. nov., paratype, ♂ (ZMH A0015395). **A**. Chela in retrolateral view, showing trichobothria. **B**. Claw and arolium, showing broadened end. **C**. Close-up of chelal tip of fixed finger.

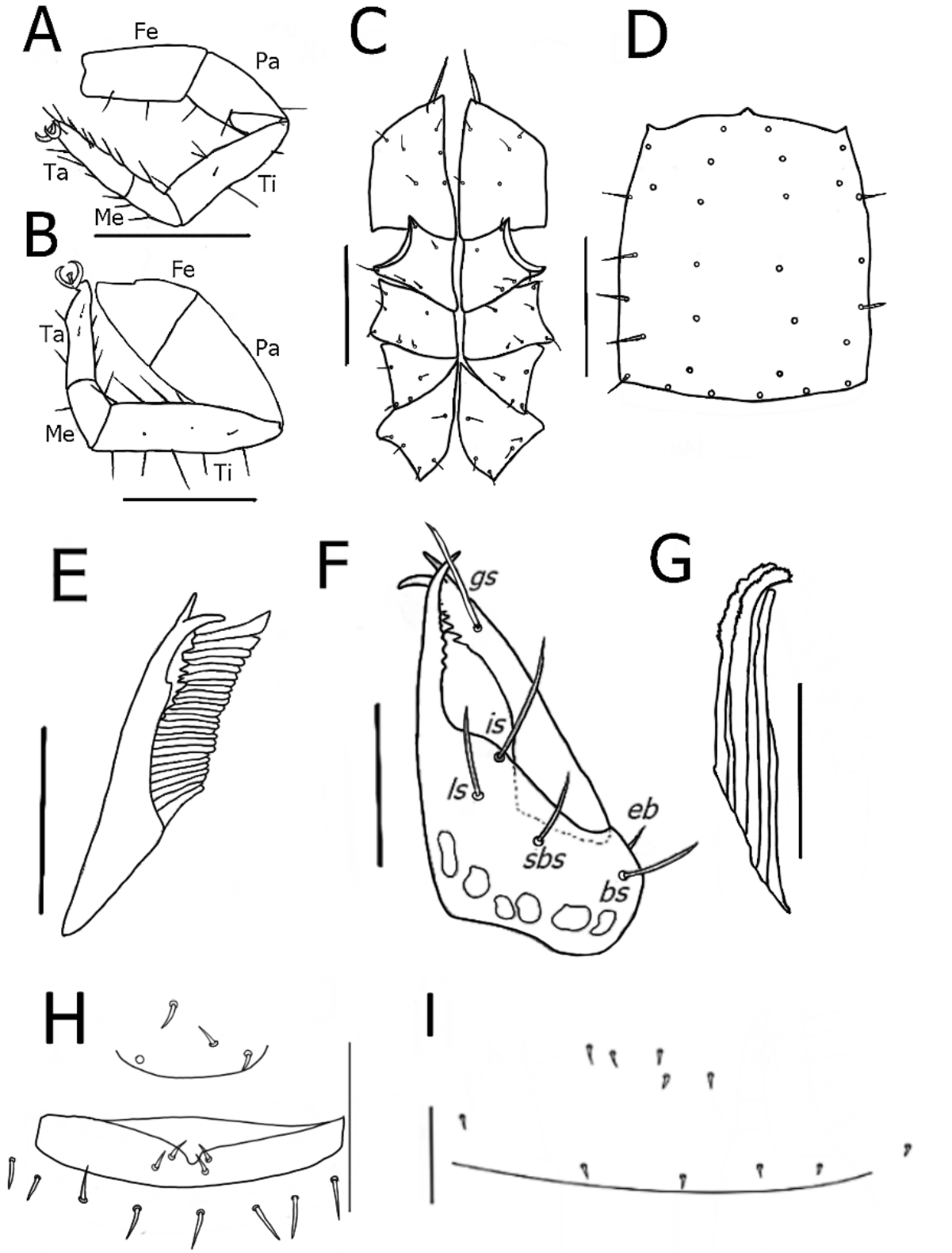

Fig. 29. *Ideoblothrus safinai* sp. nov. **A**. Leg I. **B**. Leg IV. **C**. Coxa. **D**. Carapace. **E**. Galea and serrula exterior. **F**. Chelicera, with trichobothria. **G**. Rallum. **H**. Genitalia. **I**. Genitalia. A–F, H: holotype, ♂ (QCAZ); G: paratype, ♂ (ZMH A0015394); I: allotype, ♀ (QCAZ). Abbreviations: Fe = femur; Pa = patella; Ti = tibia; Me = metatarsus; Ta = tarsus. Scale bars: A–B, E = 0.50 mm; C–D = 0.25 mm; F = 0.125 mm; G = 40 µm; H = 18 µm; I = 36 µm.

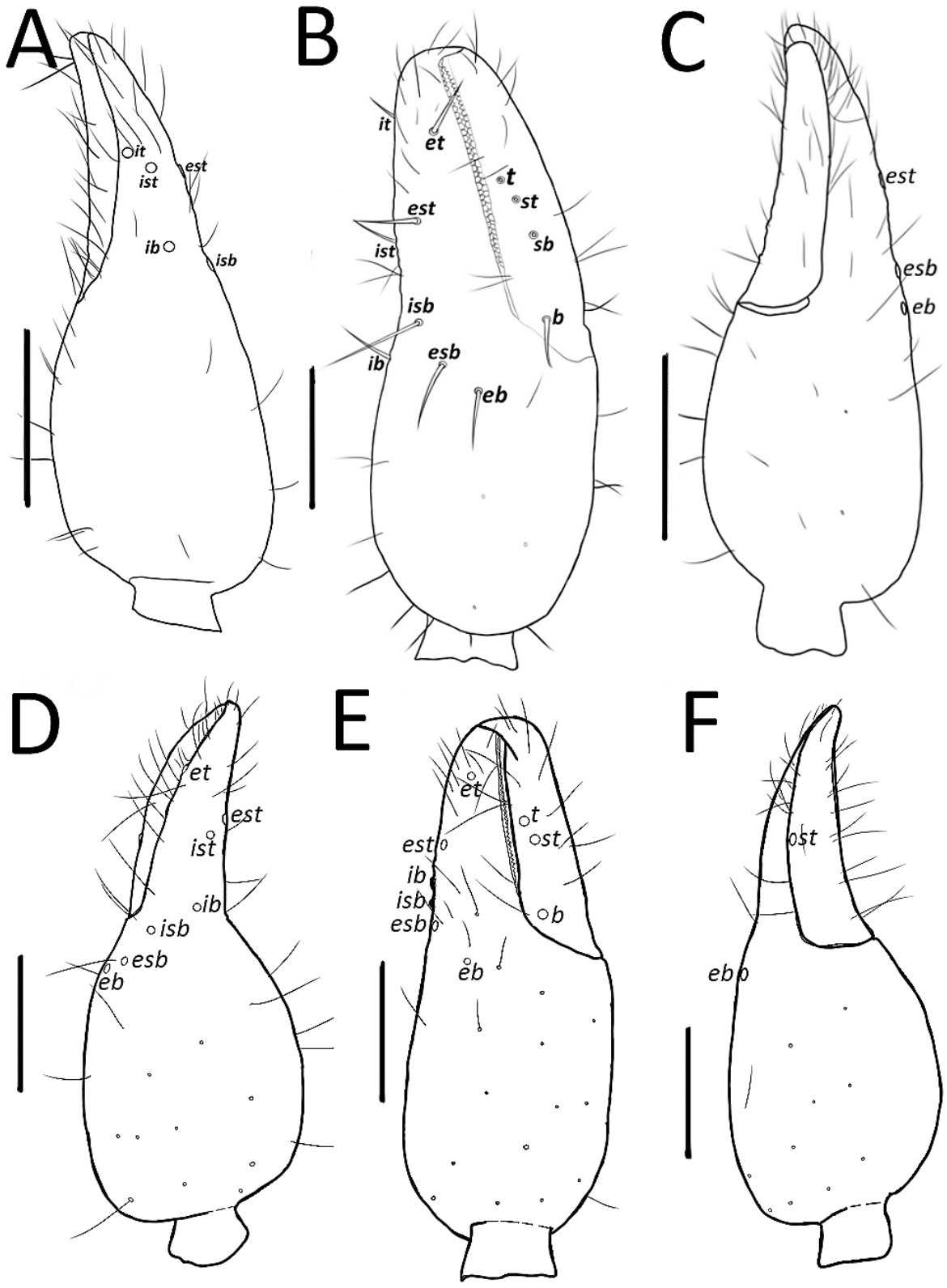

Fig. 30. *Ideoblothrus safinai* sp. nov. **A**. Chela in dorsal view, with trichobothria. **B**. Chela in retrolateral view. **C**. Chela in ventral view. **D**. Chela in dorsal view, showing position of trichobothria. **E**. Chela in retrolateral view. **F**. Chela in ventral view. A–C: holotype, ♂ (QCAZ); D–F: tritonymph (ZMH A0015396). Scale bars: 0.25 mm.

Female dimensions (mm, length/width of allotype)
Body length 2.22 mm. Pedipalps: trochanter 0.32/0.19, femur 0.56/0.21, patella 0.54/0.29, chela (with pedicel) 1.08/0.38, chela (without pedicel) 1.00/0.38, hand length 0.51, movable finger length 0.49. Chelicera: 0.36/0.19, movable finger length 0.30. Carapace: 0.66/0.56. Leg I: femur 0.22/0.11, patella 0.21/11, tibia 0.23/0.06, metatarsus 0.13/0.04, tarsus 0.19/0.04. Leg IV: femur 0.21/0.17, patella 0.25/0.17, tibia 0.33/0.07, metatarsus 0.10/0.07, tarsus 0.19/0.06.

Male dimensions (mm, length/width of holotype followed by range of four paratypes in paretheses)
Body length 2.03 mm (1.39–2.32 mm). Pedipalps: trochanter 0.25/0.15 (0.22–0.27/0.15–0.16), femur 0.44/0.19 (0.41–0.52/0.18–0.21), patella 0.39/0.24 (0.39–0.49/0.23–0.27), chela (without pedicel) 0.76/0.30 (0.79–0.91/0.29–0.36), chela (with pedicel) 0.82/0.30 (0.87–1.01/0.29–0.36), hand length 0.38 (0.38–0.47), movable finger length 0.38 (0.41–0.47). Chelicera 0.26/0.16 (0.31–0.34/0.12–0.17), movable finger length 0.25 (0.24–0.27). Carapace 0.54/0.45 (0.50–0.59/0.44–0.51). Leg I: femur 0.16/0.06 (0.15–0.19/0.04–0.10), patella 0.19/0.08 (0.19–0.21/0.07–0.09), tibia 0.25/0.05 (0.24–0.26/0.06–0.07), metatarsus 0.1/0.05 (0.09–0.11/0.04–0.06), tarsus 0.17/0.04 (0.15–0.18/0.04–0.05). Leg IV: femur 0.18/0.15 (0.15–0.26/0.15–0.17), patella 0.26/0.15 (0.24–0.26/0.15–0.17), tibia 0.34/0.09 (0.29–0.39/0.08–0.10), metatarsus 0.12/0.07 (0.09–0.12/0.06–0.07), tarsus 0.19/0.05 (0.16–0.21/0.05–0.07).

Tritonymph dimensions (mm, length/width)
Body length 1.57 mm. Pedipalps: trochanter 0.25/0.15, femur 0.44/0.19, patella 0.39/0.24, chela (without pedicel) 0.76/0.3, chela (with pedicel) 0.82/0.3, hand length 0.44, movable finger length 0.38. Chelicera: 0.26/0.16, movable finger length 0.25. Carapace 0.54/0.45. Leg I: femur 0.16/0.06, patella 0.19/0.08, tibia 0.25/0.05, metatarsus 0.1/0.05, tarsus 0.17/0.04. Leg IV: femur 0.18/0.15, patella 0.26/0.15, tibia 0.34/0.09, metatarsus 0.12/0.07, tarsus 0.19/0.05

Discussion

Morphology and diversity

The pseudoscorpion biodiversity of the Ecuadorian Amazon rainforest and adjacent Andes is poorly studied at every level, although pseudoscorpions can be abundant and diverse in these biomes, with a total of 41 species representing 9 families (WAC 2021). The addition of five new syarinids represents the first pseudoscorpion descriptions for mainland Ecuador for more than a decade (Mahnert & Schmidl 2011). In general, pseudoscorpion taxonomy in tropical South America is often poor and comprehensive studies are only available for Brazil (e.g., Mahnert 1979, 1985; Adis & Mahnert 1985; Mahnert *et al.* 1986; Adis *et al.* 1988; Morais *et al.* 1997), although there have been some recent studies on the Colombian fauna (e.g., Torres & Bedoya Roqueme 2018; Bedoya Roqueme 2019; Romero-Ortiz *et al.* 2019) but none for Peru. All of these rely exclusively on somatic morphology.

A problem we faced in our study – that will most likely apply to other genera and families in this region as well – is to identify and diagnose morphologically cryptic species. All species in this study are very similar and differ only in minute details of chaetotaxy and measurements, such as the position of trichobothria on the chela, the setation of the carapace, the leg coxae and pedipalpal coxae, and dimensions of the carapace. These differences are consistent across large series of specimens and therefore indispensable to distinguish species, yet such series are difficult to obtain, and species identification remains difficult for non-experts. A path towards documenting such difficult and diverse lineages in the future may lie in supplementing morphology with molecular genetic tools. The latter are increasingly used in pseudoscorpion taxonomy, and almost all studies using genetic markers have documented

major cryptic diversity in soil-dwelling pseudoscorpions across a wide range of families, such as the Pseudotyrannochthoniidae (Harms 2018; Harms *et al.* 2019), the Chthoniidae (e.g., Cosgrove *et al.* 2016; Ohira *et al.* 2018), the Feaellidae (Harvey *et al.* 2016), and most recently even the Neobisiidae in central Europe, where several ghost lineages have been documented in what appeared to be a comparatively well-studied fauna (Muster *et al.* 2021). Syarinids share many ecological characteristics with these taxa, such as the dependence on (often moist) soil habitats, the lack of phoresy as a means of passive dispersal, and the often small distribution ranges. Since syarinids are a common element of the tropical American soil fauna and abundant in many Ecuadorian ecosystems, we expect a major increase in species diversity once the morphological characters are supplemented with genetic data across all ecosystems of tropical South America. Genetic tools may also help to evaluate species ranges in more detail and understand biogeographical patterning. Based on morphology, many studies have pointed to small distribution ranges of tropical syarinids, including *Ideoblothrus* and other genera (e.g., Harvey & Edward 2007; Harvey & Leng 2008; Gardini 2015; Kolesnikov & Turbanov 2018) and the wide ranges presently assumed for most of the American species are unrealistic.

Ecuador is nested in a biodiversity hotspot with extreme biodiversity richness, ranking 17th in the world in biodiversity (Sierra *et al.* 2002; Brito & Borges 2015) and harbours one of the richest arachnid faunas of the Neotropics (Brito & Borges 2015). Evidence for local endemism in almost all lineages of spiders and extreme levels of richness across Ecuadorian biomes is becoming increasingly evident as taxonomic knowledge progresses (e.g., Dupérré 2015; Dupérré & Tapia 2017, 2018, 2020; Dupérré *et al.* 2021) and other arachnids will undoubtedly follow this pattern.

The status of other Ecuadorian syarinids

This study provides evidence for several cryptic species but also small distribution ranges in syarinid pseudoscorpions. It is therefore relevant that the type localities of two syarinids previously recorded from Ecuador (Beier 1977; Baert *et al.* 1995), *Ideobisium crassimanum* and *Ideoblothrus costaricensis*, both lie outside the country, sometimes several thousand kilometers away (Table 2). Considering the ecology of syarinids as known to date and the cryptic nature of the species, these historical records likely represent misidentifications and we restrict the ranges of these species to their respective type localities, which are Caracas, Venezuela (*I. crassimanum*) and Tuis, Cartago, Costa Rica (*I. costaricensis*). The type locality of *Ideobisium ecuadorense* is the only previously recorded species with the locus typicus being in Ecuador (near Los Tayos Cave, ca 03°03′07.5″ S, 78°12′19.3″ W; map on Fig. 2). This is the sixth syarinid species from Ecuador to date and it is important to note that the two type specimens were not collected within caves but rather in leaf litter near them; this strengthens the argument that syarinids are common and abundant in rainforest litter systems across the country.

Finally, we might point out that all the species described here can be assigned unequivocally to *Ideobisium* or *Ideoblothrus* as defined by Muchmore (1982), although these concepts are clearly tentative given that, e.g., species of *Ideoblothrus* are known from distant localities ranging from the Americas to tropical Africa, Australia and even Micronesia (Harvey 2013). The type locality of the type species of *Ideobisium*, *I. crassimanum*, is in Venezuela (Table 2), and it is possible that the genus will be restricted in future studies to species from central America and tropical South America.

Only two additional syarinid genera have been recorded from the Neotropics, both from the Amazonian and Brazil: *Nannobisium* Beier, 1931 and *Microblothrus* Mahnert, 1985 (Table 1). *Nannobisium* otherwise occurs in Jamaica and western Africa (Mahnert 1979), a pattern that might well reflect continental vicariance, and *Microblothrus* is a monotypic genus from Manaus (Mahnert 1985). Both genera have not been recorded from Ecuador, but might be discovered in the future.

Table 1. Syarinid species from Ecuador and neighbouring countries Brazil, Colombia and Peru, based on Harvey (2013).

Country	Genus	Species	Type locality	Coordinates
Brazil	*Ideobisium*	*Ideobisium schusteri* Mahnert, 1985	Rio Taruma-Mirim, Amazonas	3°02′ S, 60°09′ W
	Ideoblothrus	*Ideoblothrus amazonicus* (Mahnert, 1979)	Rio Demini, Amazonas	0°37′ S, 62°56′ W
	Ideoblothrus	*Ideoblothrus brasiliensis* (Mahnert, 1979)	Belém do Pará	1°27′ S, 48°29′ W
	Ideoblothrus	*Ideoblothrus caecus* (Mahnert, 1979)	Santarém, Pará	2°27′ S, 54°43′ W
	Ideoblothrus	*Ideoblothrus levipalpus* Mahnert, 1985	S Bank of the Rio Negro, 1km above Manaus, Amazonas	3°07′ S, 60°11′ W
	Ideoblothrus	*Ideoblothrus paraensis* Mahnert, 1985	Paricatuba, Benevides, Pará	1°22′ S, 48°5′ W
	Ideoblothrus	*Ideoblothrus tenuis* Mahnert, 1985	Reserva Florestal Adolpho Ducke, 26 km N of Manaus, on Manaus-Itacoatiara Highway, Amazonas	2°57′ S, 59°55′ W
	Microblothrus	*Microblothrus tridens* Mahnert, 1985	Reserva Florestal Adolpho Ducke, 26 km N of Manaus, on Manaus-Itacoatiara Highway, Amazonas	2°57′ S, 59°55′ W
	Nannobisium	*Nannobisium beieri* Mahnert, 1979	Santarém, Pará	2°27′ S, 54°43′ W
Colombia	*Ideobisium*	*Ideobisium peckorum* Muchmore, 1982	7 km N of Leticia, Amazonas	4°09′ S, 69°55′ W
	Ideoblothrus	*Ideoblothrus colombiae* Muchmore, 1982	Between San Pedro and San Javier, Sierra Nevada de Santa Marta, Magdalena	10°55′ N, 73°48′ W
	Ideoblothrus	*Ideoblothrus kochalkai* Muchmore, 1982	Casa Antonio, Cuchilla Cebolleta, Sierra Nevada de Santa Marta, Magdalena	10°55′ N, 73°55′ W
	Ideoblothrus	*Ideoblothrus peckorum* Muchmore, 1982	7 km N of Leticia, Amazonas	4°09′ S, 69°55′ W
Costa Rica	*Ideoblothrus*	*Ideoblothrus costaricensis* (Beier, 1931)	Tuis, Cartago	9°51′ N, 83°35′ W
Ecuador	*Ideobisium*	*Ideobisium ecuadorense* Muchmore, 1982	Los Tayos Cave, Cordillera del Condor	3°01′ S, 78°15′ W
	Ideobisium	*Ideobisium kichwa* sp. nov.	Tena, Colonso Chalupas Natural Reserve	0°54′32.904″ S, 77°53′9.168″ W
	Ideobisium	*Ideobisium sonqo* sp. nov.	Napo Province, Tena, Colonso Chalupas Natural Reserve	0°54′53.6″ S, 77°52′40.598″ W
	Ideobisium	*Ideobisium susanae* sp. nov.	Tena, Jatun Sacha Natural Reserve	1°3′59.27″ S, 77°37′1.891″ W
	Ideoblothrus	*Ideoblothrus nadineae* sp. nov.	Tena, Colonso Chalupas Natural Reserve	0°54′33.084″ S, 77°53′9.131″ W
	Ideoblothrus	*Ideoblothrus safinai* sp. nov.	Otongachi Natural Reserve, Pichincha	0°19′16.662″ S, 78°57′5.867″ W
Peru	*Ideoblothrus*	*Ideoblothrus fenestratus* (Beier, 1955)	Sivia, Ayacucho	12°30′ S, 73°51′ W
Venezuela	*Ideobisium*	*Ideobisium crassimanum* Balzan, 1892	Caracas	10°30′ N, 66°55′ W

Table 2. Previously recorded species of *Ideobisium* Balzan, 1892 and *Ideoblothrus* Balzan, 1892 in Ecuador, their type localities and sampling locations.

Species	Type locality	Records in Ecuador	Linear distance type locality – Tena and Otongachi Natural Reserve (ONR), Ecuador	Literature
Ideobisium crassimanum Balzan, 1892	Caracas, Venezuela, 10°30′ N, 66°55′ W	Ecuador continental, Oriente, tropical forest in Archidona, alt. 750 m, humus	ca 1750 km (Tena), 1800 km (ONR)	(Balzan 1892; Beier 1977; Harvey 2013)
Ideobisium ecuadorense Muchmore, 1982	Los Tayos Cave, Cordillera del Condor, Ecuador, 3°01′ S, 78°15′ W	Los Tayos Cave, Cordillera del Condor	ca 230 km (Tena), 316 km (ONR)	(Muchmore 1982)
Ideoblothrus costaricensis (Beier, 1931)	Tuis, Cartago, Costa Rica, 9°51′ N, 83°35′ W	Ecuador continental, Oriente, tropical forest in Archidona, alt. 750 m, humus; tropical forest in Pugo, alt. 800 m	ca 1360 km (Tena), 1230 km (ONR)	(Beier 1931, 1977; Harvey 2013)

Acknowledgements

SAM thanks BIO-GEEC (German-Ecuadorian Biodiversity Consortium), funded by the German Academic Exchange Service (DAAD), for supporting this research through a travel and summer school grant, and Nadine Dupérré and Elicio E. Tapia (LIB Hamburg) for the collection of the samples and technical support. DH acknowledges the DAAD for fostering international exchange within the framework of the BIO-GEEC Project, and Anja Munzig and Ilona Daun (both DAAD) for their excellent administrative support. We also thank Dietmar Quandt (University of Bonn) for leading this project with the last author. All specimens in this paper were collected with permits from the Ministerio del Ambiente de Ecuador (MAE) that were issued for the BIO-GEEC Project. The authors declare no conflict of interests.

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Manuscript received: 10 November 2021
Manuscript accepted: 31 March 2022
Published on: 31 May 2022
Topic editor: Tony Robillard
Section editor: Rudy Jocqué
Desk editor: Danny Eibye-Jacobsen