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Description of two new species of *Claustropyga* Hippa, Vilkamaa & Mohrig (Diptera, Sciaridae) from the northern Palaearctic

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Abstract

Claustropyga alveata **sp. n**. and *C. caetrata* **sp. n.** from the northernmost Palaearctic are described and illustrated. *Claustropyga alveata* **sp. n.** has a highly modified tegmen and unusual gonocoxal apodemes, and *C. caetrata* **sp. n.** has an uncommonly shaped apical tooth of the gonostylus. The newly described species raise the number of known species of *Claustropyga* to twenty-seven.

Key words: biodiversity, Palaearctic, identification, morphology, taxonomy

Introduction

The Holarctic genus *Claustropyga* Hippa, Vilkamaa & Mohrig, 2003, (type species *Corynoptera clausa* Tuomikoski, 1960) originally included 17 species; some newly described and some previously classified in *Corynoptera* Winnertz. Subsequently, a further 10 species have been described by Hippa & Vilkamaa (2007, 2016), Mohrig & Kauschke (2017) and Rudzinski & Ševčík (2019). *Claustropyga* is characterized by the long intergonocoxal area (which in most species is produced into a wide lobe), by the highly modified tegmen of the male hypopygium, by the medially often strongly impressed gonostylus with usually strong megasetae with distinct basal bodies and by the gonostylus apparently lacking the basomedial sclerotized structures as described by Hippa & Vilkamaa (1994) and Hippa *et al*. (2003). Furthermore, a short maxillary palpus, which in some species is 2-segmented, is typical in *Claustropyga.*

In the maximum-likelihood phylogenetic analysis based on four gene fragments (28S, 18S, 16S and COI) by Vilkamaa *et al.* (2023), *Claustropyga* appeared as the sister group of *Spinopygina* Vilkamaa, Burdíková & Ševčík, 2023.

Claustropyga refrigerata (Lengersdorf, 1930) appeared as the sister group of all other species of *Claustropyga* in the morphological cladistic analysis by Hippa *et al*. (2003), but in the molecular analyses of Arthofer *et al.* (2021) and Vilkamaa *et al.* (2023), that species nested not with the other species of *Claustropyga* but with *Bradysia* Winnertz. Like most taxa of Sciaridae, and unlike *Claustropyga*, the gonostylus of *C. refrigerata* has well-developed basomedial sclerotized structures, and therefore the species can be excluded from *Claustropyga* even on morphological grounds. Mohrig *et al*. (2013) synonymized *Claustropyga elizabethae* Hippa, Vilkamaa & Mohrig, 2003 with *C. acanthostylata* Tuomikoski, 1960.

Material and methods

The material studied became available from Anatoliy Barkalov (Russia), the Tromsø University Museum, Tromsø, Norway (TMU) and from the Finnish Museum of Natural History (MZH). The type specimens will be deposited in MZH and TMU.

The specimens were mounted on microscope slides in Euparal, after having been dehydrated in absolute ethanol. Terminology and measurement methods follow Hippa & Vilkamaa (1994) and Hippa *et. al.* (2003). Only males were studied; females of the species are unknown.

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The digital photographs of the slide-mounted specimens were taken with a Leica MC170 HD camera mounted on a Leica DM 4000 B LED research microscope, and the pencil drawings were made with the aid of a Leitz Diaplan microscope equipped with a drawing tube and finalized in indian ink. The figures were processed with Photoshop version CS5, CorelDraw2017 and CorelPhotopaint2017.

New species of *Claustropyga*

Claustropyga alveata sp. n.

Figs 1–3, 4 A

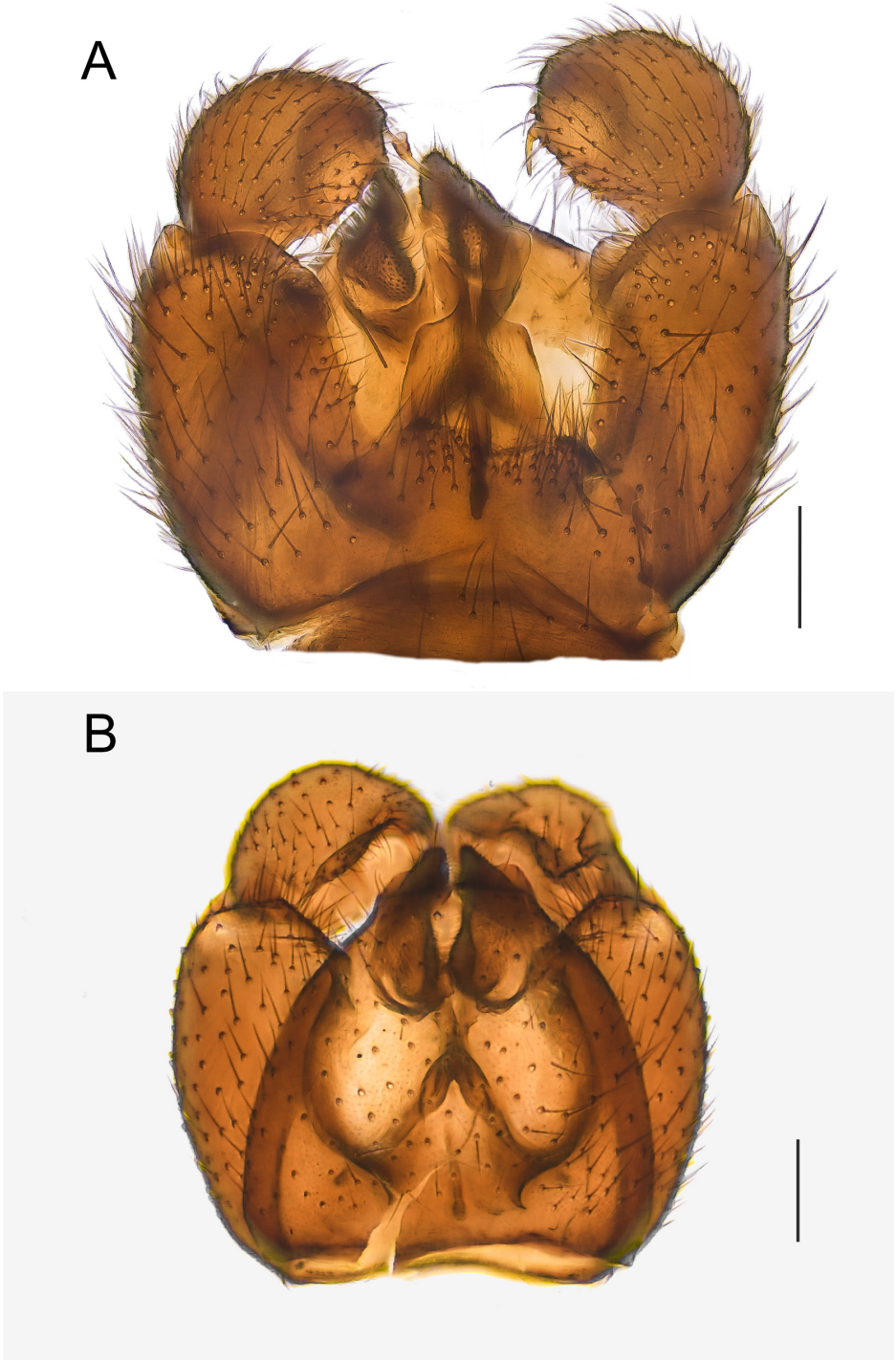

FIGURE 1. *Claustropyga alveata* **sp. n.** (A holotype, B paratype). **A.** Hypopygium, ventral. **B.** Hypopygium, dorsal. Scale 0.1 mm.

Holotype male. FINLAND, Le (Lapponia enontekiensis), Enontekiö, Annjaloanji (Grid 76860:2806), 11–15. VII.2007, 1 male, R. Jussila (MZH). *Paratype*. NORWAY, FN Båtsfjord, Komagdalen, Bajit, Suovka, Malaise trap, 14.VII–21.VIII.2009, T.E. Barstad, 1 male (Sample ID: TSZD-JKJ-103800; TMU).

Male. **Head**. Face and antenna concolorous brown, maxillary palpus pale brown. Eye bridge 2 facets wide. Face with 6 scattered strong setae. Clypeus with 1 seta. Maxillary palpus with 3 segments; 1st segment longer than 2nd segment, 3rd segment shortest; 1st segment with 1 sharp seta, with a large dorsal patch of sensilla. Body of 4th antennal flagellomere 1.65x as long as wide, the neck shorter than wide, the longest setae as long as the width of flagellomere. **Thorax**. Brown, setae dark. Scutum with some long and strong laterals and long dorsocentrals. Scutellum with 2–6 long and strong setae and with some short setae. Anterior pronotum with 1–5 setae. Proepisternum with 3–4 setae. **Wing.** Length 2.1 mm. Width/length 0.45. R_1/R 0.65–0.95. stM longer or shorter than fork of M. bM longer than r-m. bM non-setose, r-m non-setose or with 3 dorsal setae. Halter pale brown. **Legs**. Fore coxa yellow, mid- and hind coxae pale brown, coxal setae dark. Fore tibial organ with indistinct patch of few strong setae. Fore tibial spur slightly longer than tibial width. **Abdomen**. Pale brown, setae long and strong. **Hypopygium** (Fig. 1). Pale brown, as abdomen. Tergite IX long and wide, nearly covering cerci dorsally. Intergonocoxal area lobe-like produced with roundish medial notch; gonocoxa much longer than gonostylus, with moderately long setosity; with apicoventral elongated seta rather short, gonocoxal apodemes strongly sclerotized, with hook-formed basal extensions; extended caudad forming a V-shaped structure with its closed end pointing caudad (Fig. 3 C). Gonostylus (Figs 2 A, 4 A) roundish, with short setosity; strongly excavated medially; with straight dorsomedial margin, excavation with central ridge on which 1 megaseta very close to apical tooth and 1 megaseta at middle position; with 1 subapical megaseta at ventral margin; with small pyramidal apical tooth. Tegmen (Figs 1 A, 3 A, B) long, constricted subapically, weakly sclerotized laterally; apical part unsclerotized; with divergent ventromedial sclerotizations extended from middle to apical part; with strongly sclerotized V-formed apodeme; with small area of tiny needle-like aedeagal teeth. Aedeagal apodeme strong.

FIGURE 2. *Claustropyga alveata* **sp. n.** (holotype). **A.** Gonostylus, dorsal. **B.** Apical part of fore tibia, prolateral. Scale for A 0.1 mm, for B 0.05 mm.

Female. Unknown.

DNA. Barcode COI, BIN BOLD ADL3758. Deposited in The Barcode of Life Data System (BOLD) (Rathasingham & Hebert 2007)

Discussion. *Claustopyga alveata* **sp. n**. has unusual, strongly sclerotized, vertically superimposed structures on the medial part of the hypopygium (Fig. 3 A–C); dorsally the V-shaped gonocoxal apodeme is extended caudally, ventral to this the apodeme of the tegmen is also V-shaped, and at the ventralmost position, two rod-like medial sclerotizations of the tegmen extend from the basal part to the apical part of the tegmen. Whether these ventral rods are united into the apodeme of tegmen, is not detectable in the preparations. Usually in Sciaridae, the apodeme of tegmen, mediad of the usually strongly sclerotized lateral parts (which are usually called ‘apodemes

of tegmen'), is a transverse or apically smoothly curved variably sclerotized bridge. In general, the basal part of the gonocoxal apodeme consists of a transverse 'bridge' uniting the left and right apodemes, with simple longer or shorter proximally orientated rods, not the hook-like structures present in *Claustropyga alveata.* The combination of sclerotized structures in the hypopygium of this species is unique among Sciaridae.

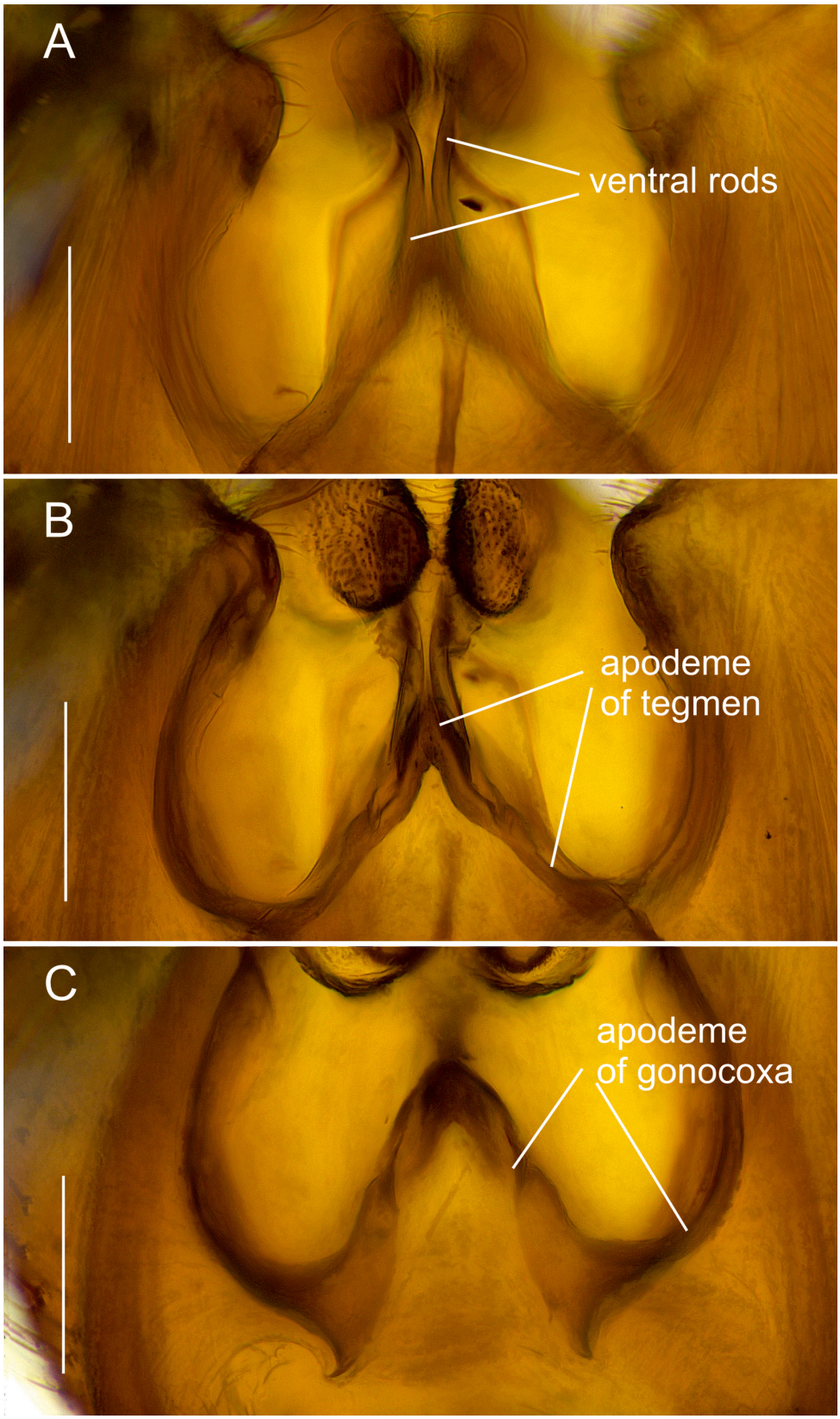

FIGURE 3. *Claustropyga alveata* **sp. n.** (paratype). Medial structures of hypopygium, ventral. **A.** Focus on ventral portion of tegmen. **B.** Focus on dorsal portion of tegmen. **C.** Focus on apodeme of gonocoxa. Scale 0.1 mm.

By its subapically constricted tegmen, *Claustopyga alveata* resembles only *C. stupenda* Hippa & Vilkamaa, 2016, but the latter has two very long basal megasetae on its gonostylus instead of one short one and lacks the characteristic medial sclerotizations of *C. alveata* in its hypopygium. Moreover, the gonostylus of *C. alveata* is much smaller. In its small, globular gonostylus with a very small apical tooth, *Claustropyga alveata* differs from all other species of the genus. *Claustropyga alveata* has a long and unusually wide tergite IX, in dorsal aspect nearly covering the cerci (Fig. 1 B). The length of tergite IX is variable amongst Sciaridae genera and amongst species of *Claustropyga*, with *C. caetrata* sp. n, *C. abblanda* (Freeman, 1983), *C. clavulata* Hippa & Vilkamaa, 2016, C. *subcorticis* (Mohrig & Krivosheina, 1985) and *C. tumida* Hippa, Vilkamaa & Mohrig, 2003 having a long tergite IX.

Etymology. The name is a Latin adjective, *alveata*, hollowed, referring to the roundish, deeply excavated gonostylus.

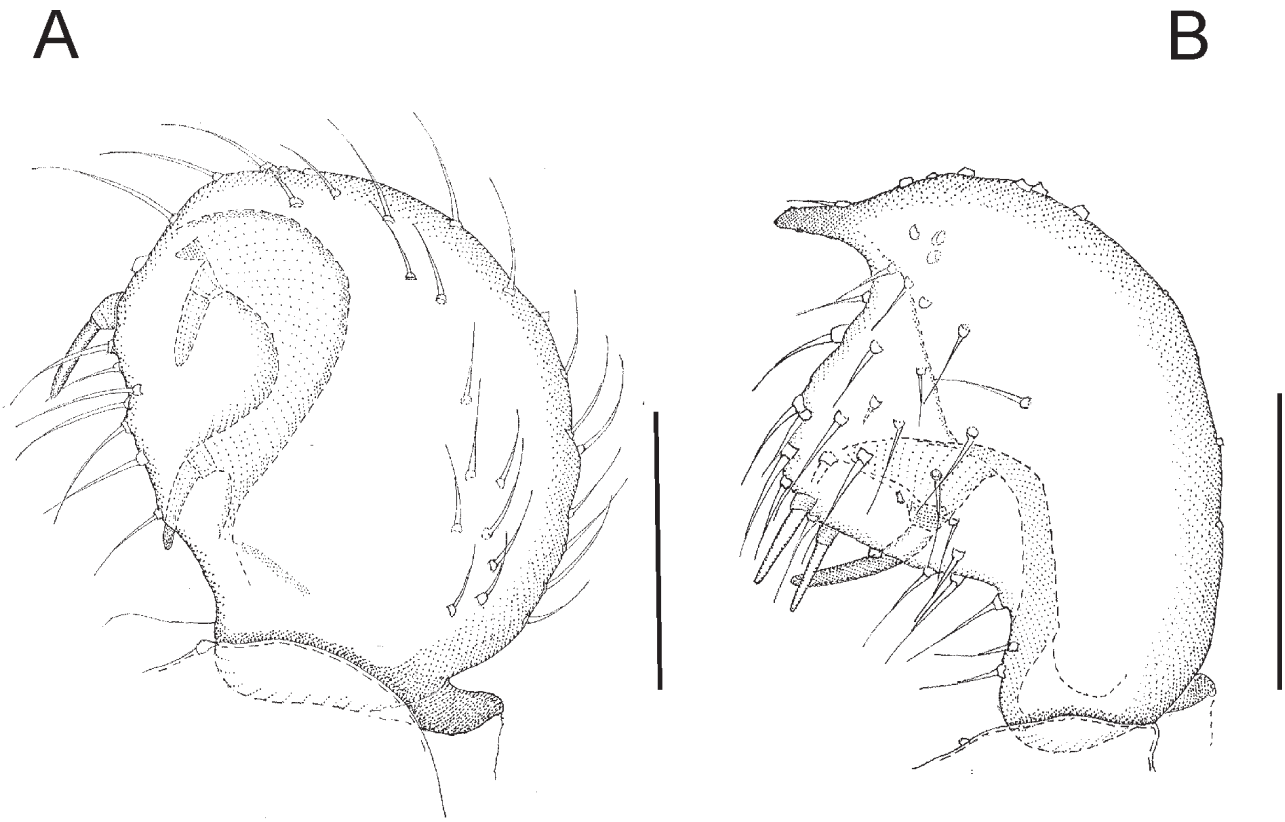

FIGURE 4. Gonostylus, ventral. **A.** *Claustropyga alveata* **sp. n.** (holotype). **B.** *C. caetrata* (holotype). Scale 0.1 mm.

Claustropyga caetrata **sp. n.**
Figs 4 B, 5–6

Material studied. Holotype male. RUSSIA, Yamalo-Nenets Autonomous Okrug, on the river Longotegan, 67º32' N, 66º72' E, Malaise trap, 2–28.VII.2015, A. Barkalov (MZH). *Paratype*. Same data as holotype, 1 male (MZH).

Male. **Head**. Face and antenna concolorous brown, maxillary palpus pale brown. Eye bridge 2 facets wide. Face with 2–5 scattered strong setae. Clypeus non-setose. Maxillary palpus with 2 segments; 1st segment longer than 2nd segment; 1st segment with 2 sharp setae, with a large indistinct dorsal patch of sensilla. Body of 4th antennal flagellomere 1.45–1.50x as long as wide, the neck slightly shorter than wide, the longest setae as long as the width of flagellomere. **Thorax**. Brown, setae dark. Scutum with some long and strong laterals and long dorsocentrals. Scutellum with 4 long and strong setae and with some short setae. Anterior pronotum with 2 setae. Proepisternum with 5 setae. **Wing.** Length 1.7 mm. Width/length 0.45. Anal lobe small. R_1/R 0.70. c/w 0.65–0.85. r-m and bM equally long or r-m slightly longer. Fork of M longer than stM. r-m and bM non-setose. Halter pale brown. **Legs**. Fore coxa yellow, mid- and hind coxae pale brown, coxal setae dark. Fore tibial organ with indistinct patch of few

strong setae. Fore tibial spur slightly longer than the tibial width. **Abdomen**. Pale brown, setae dark, long and strong. **Hypopygium** (Fig. 5). Pale brown, as abdomen. Tergite IX long. Intergonocoxal area lobe-like produced, with shallow notch; gonocoxa nearly as long as gonostylus, wide, with short medial setosity, with membraneous area non-setose; with short apicoventral elongated seta. Gonostylus (Figs 4 B, 5 C) wide, shortly setose, with prominent ventromedial lobe with long and sharp setae; strongly excavated; with straight dorsomedial margin; with short apical tooth with some sharp cusps (Fig. 6 A); with 1 megaseta at medial margin of gonostylar lobe (holotype with 2 in one gonostylus), 1 megaseta in medial excavation arising from large basal body. Tegmen (Figs 5 A, 6 B). wide basally with distinct basolateral shoulders, strongly narrowed at middle; slightly sclerotized laterally and apically, with a small area of minute aedeagal teeth. Aedeagal apodeme moderate.

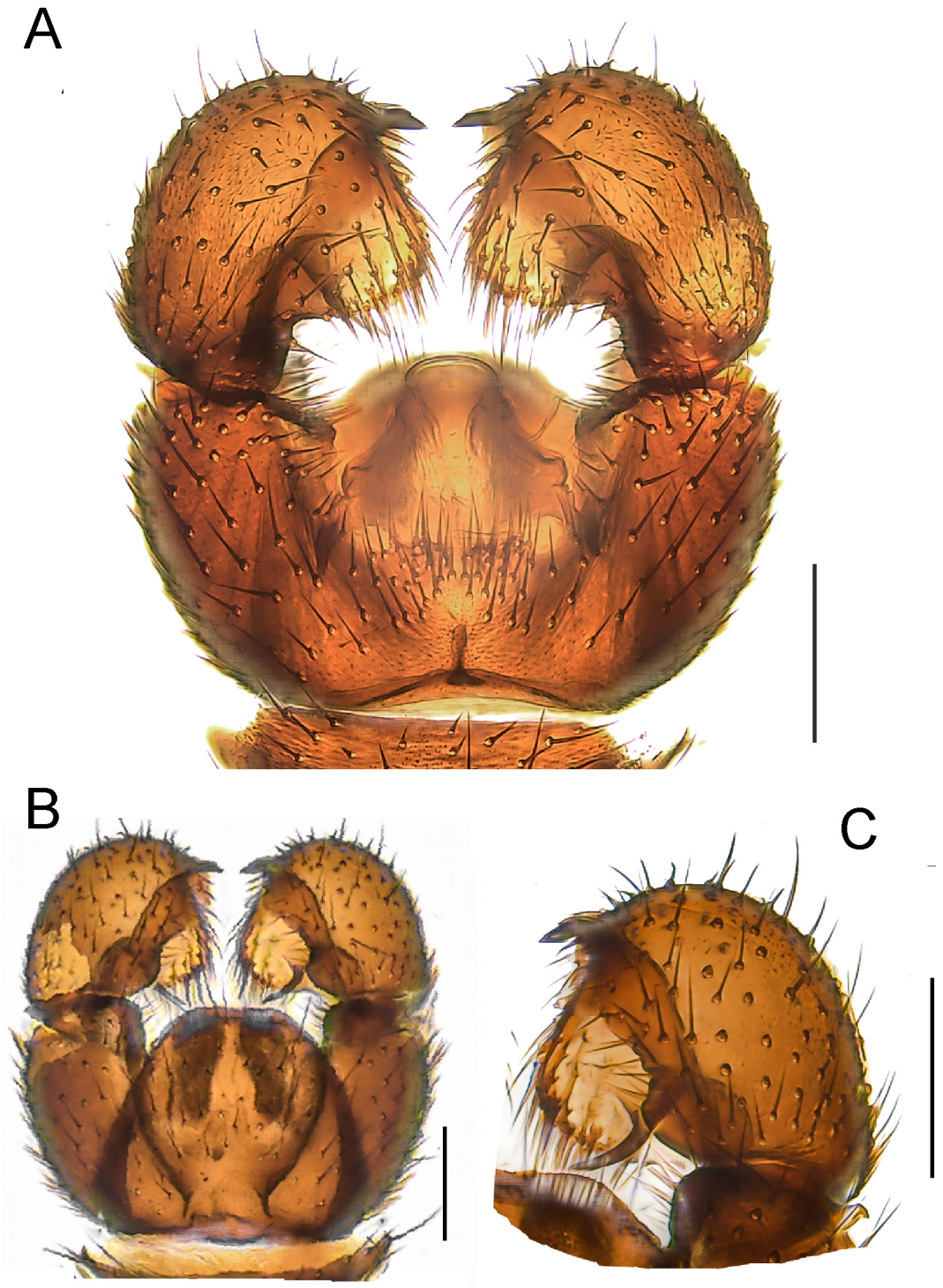

FIGURE 5. *Claustropyga caetrata* **sp. n.** (holotype). **A.** Hypopygium, ventral. **B.** Hypopygium, dorsal. **C.** Gonostylus, dorsal. Scale 0.1 mm.

DNA. Unknown.

Female. Unknown.

Discussion. The holotype and paratype of *Claustropyga caetrata* **sp. n.** differ slightly in the exact form of the tegmen and of the intergonocoxal lobe (Figs 5 A, 6 B) but the specimens are considered conspecific. *Claustropyga caetrata* resembles *C. corticis* (Mohrig & Antonowa, 1978) in having a large medial lobe in the gonostylus. It differs in having only two or three gonostylar megasetae instead of five and in having distinct lateral shoulders in the tegmen instead of smoothly curved sides. *Claustropyga caetrata* differs from all other known species of the genus in having sharp teeth-like cusps in the apical tooth of the gonostylus.

FIGURE 6. *Claustropyga caetrata* **sp. n.** (paratype). **A.** Apical part of gonostylus, ventral. **B.** Tegmen, ventral. Scale 0.05 mm.

Etymology. The name is a Latin adjective, *caetrata*, armed with a small shield, referring to the wide ventral lobe of the male gonostylus.

Acknowledgments

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