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Research Article

Description of *Ceratogeusis thamiresae* new genus and species from Panama, the first Telegeusinae (Coleoptera, Elateroidea, Omethidae) with flabellate antennae

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Abstract

Ceratogeusis thamiresae Ferreira, **gen. et sp. nov.**, the first Telegeusinae with flabellate antennae, is described from Panama. The new genus and species is diagnosed and illustrated, and an updated key for the genera of Telegeusinae is given. The Telegeusinae genus *Platydrilus* López-Pérez & Zaragoza-Caballero, 2021, was discovered to be a junior homonym of *Platydrilus* Michaelsen, 1891 (Annelida, Oligochaeta, Eudrilidae), and therefore a pre-occupied name.

Key Words

Elateroidea, Neoteny, Paedomorphosis

Introduction

After receiving a loan of unidentified soft-bodied beetles from Texas A&M University Insect Collection (TAMU), I noticed a small shrunken Panamanian specimen possessing flabellate antennae. At first, I thought it was a Melyridae or a Phengodidae; however, a closer examination revealed that the specimen possessed the diagnostic characters of Telegeusinae Leng, 1920 (Elateroidea, Omethidae), including the distinct pronotum submarginally impressed, the modified maxillary palps, with terminal palpomere elongate, the anterior margin of labrum shortened and transverse, bearing a pronounced median tooth, and the shortened and apically rugose elytra, leaving more than five abdominal segments exposed.

Telegeusinae is one of the subfamilies of Omethidae, a small family of soft-bodied beetles within the superfamily Elateroidea (Kundrata et al. 2014; Cai et al. 2022; Bouchard et al. 2024). Members of this subfamily are exclusively found in the New World, with a Southern Nearctic and Neotropical distribution (Miller 2002; Roza et al. 2019; Perez-Flores and Zaragoza-Caballero 2024). Telegeusinae includes five genera, and 27 described species, most of which are found in Mexico (Roza et al. 2019; Perez-Flores and Zaragoza-Caballero 2024). Members of this group are mainly and easily recognized by their modified maxillary and labial palps, with the last palpomeres elongate, multiple times longer than the sum of preceding palpomeres, especially in the genus *Telegeusis* Horn, 1895.

Based on the examination of a recently available TAMU specimen I describe and document for the first time the extraordinary morphology of this beetle.

Material and methods

The single studied specimen is deposited at TAMU. The identification and placement of the specimen in Telegeusinae was based on previous literature on the group

(Ivie 2002; Miller 2002; Roza et al. 2019; Perez-Flores and Zaragoza-Caballero 2024) and comparison with museum's specimens (Natural History Museum London; Montana Entomology Collection, Montana State University; SDEI). The holotype was studied under a Leica® S9E, with magnification up to 50×. Prior to its study, the whole specimen was relaxed in a solution of 50% water and 50% EtOH 95% overnight. It was then placed in water for 15 minutes, followed by its inclusion in a water-based intimate lubricant, where the specimen was photographed. The dissected genitalia is permanently preserved in glycerin in a microtube placed on the pin under the specimen. After all images were taken, the specimen was glued on a card.

Morphological terminology follows Lawrence et al. (2011), and to maintain consistency with the latest described genera, the general description style of Lopez-Perez and Zaragoza-Caballero (2022). Photos of specimens were taken with a Canon 6D DSLR with an MP-E 65 mm lens, and a Mitutoyo 10X Microscope Objective (M PLAN APO) attached to a Raynox DCR 150 tube lens adapter purchased from WeMacro (https://wemacro.de/). Images were stacked using Zerene Stacker® version 1.04. Enhancements to digital images were made in Adobe Photoshop® and Adobe Lightroom® for iPad, and plate preparations were made in Adobe Illustrator® CC 2024.

Results

Taxonomy

Ceratogeusis Ferreira, gen. nov.

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Figs 1, 2

Etymology. *Ceratogeusis* gen. nov. is a combination of the word *Cerato*, which comes from the Greek kéras (κέρας), in allusion to the developed antennae of the new taxon, and a combination with the radical *geusis*, from the Telegeusinae type genus *Telegeusis*, which is derived from ancient Greek: *Tele* (ancient Greek: τῆλε, tēle) meaning elongate, and *geusis* (ancient Greek: γεῦσις), a word which is associated with the sense of taste, probably in reference to the elongate maxillary palps.

Type species. *Ceratogeusis thamiresae* gen. nov. et sp. nov.

Diagnosis. *Ceratogeusis* gen. nov. can be immediately separated from all known Telegeusinae by its distinctly flabellate antennae from antennomeres 5–10 (Figs 1, 2A) (vs. antennae filiform in *Telegeusis*, *Platydrilus*, *Pseudokarumia* and *Stenodrilus*, and serrate to subserrate in *Pseudotelegeusis*), the presence of one tentorial pit (shared with some *Pseudotelegeusis*, *Stenodrilus* and *Platydrilus* vs. two pits in *Telegeusis* and some *Pseudotelegeusis*), the labial palp 1-segmented (vs. variable, 2–3 segmented in *Telegeusis*, 2-segmented in *Stenodrilus* and *Platydrilus*, 1–2-segmented in *Pseudokarumia*; 1-segmented shared with *Pseudotelegeusis*), the maxillary palp 4-segmented (vs. 3-segmented in *Stenodrilus* and *Platydrilus*; shared 4-segmented palp in *Telegeusis* and *Pseudotelegeusis*; apparently 4-segmented in *Pseudokarumia*) and by the tibial spines smooth (vs. serrate in *Pseudokarumia*, smooth on all other genera).

Description. Color: Dark brown, legs slightly lighter than remainder of body (Fig. 1). **Body:** Elongate, parallel-sided, dorsoventrally flattened, and covered with sparse, erect setae (Figs 1, 2A), overall integument shiny. **Head:** Slightly wider than long behind eyes, vertex with a distinctly elevated carina (Figs 1, 2A, B). Antennal tubercles slightly prominent, lateralized. Antennae 11-segmented, scape, pedicel and antennomere 3 filiform, antennomere 4 expanded apically, distinctly serrate, antennomeres 5–10 flabellate, stems very short, antennomere 11 elongate, as long as branches of antennomeres 5–10 (Fig. 1), inserted anteriorly to the eyes on laterad of head. Eyes hemispherical, small, finely faceted, widely separated. Frons wider than long. Frontoclypeal suture complete, distinct. Labrum wider than long, with pronounced median tooth (Fig. 2B). Mandibles falciform. Maxillary palpi 4-segmented, multiple times shorter than antennae; last palpomere digitiform, slightly compressed, ca. 4 × longer than second (Fig. 2A, B). Labial palps 1-segmented. Tentorium with one pit, gula with two sutures (Fig. 2B). **Thorax:** Pronotum subpentagonal, submarginally impressed, with angles round; disc convex, bearing a median longitudinal impression (Fig. 1). Scutellar shield rectangular, not notched. Elytra subparallel, slightly dehiscent, apically round and densely rugose, epipleura present on basal third. Prosternum U shaped, wider than long; metaventrite posterior angles round, metadiscrimen complete. **Legs:** Pro and meso- coxae conical, metacoxae elongate. Trochanters pill-shaped, small. Femora fusiform, flattened. Tibiae elongate, bearing two apical smooth spines. Tarsal formula 5-5-5, claws simple. **Abdomen:** Composed of eight non-fused ventrites. Genitalia: aedeagus trilobate, typical elateriformia (Fig. 2C). Median lobe tapered towards apex, apically round; parameres spatulate, ventrally bearing sparsely distributed setae.

Measurements. Total Length (i.e., exposed portion of head+pronotum+tip of abdomen): 2.5 mm. Width (across humeri): 0.5 mm.

Distribution. Panama.

Ceratogeusis thamiresae Ferreira, sp. nov.

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Figs 1, 2

Holotype. PAN • San Blas Pr.; Nusagandi, el. 350 m; 27-28-V-1995; Flight Intercept Trap; Coll. A.R. Gillogly/ TAMU ENTO X1667956 [Barcode] (TAMU).

Figure 1. *Ceratogeusis thamiresae* Ferreira, sp. nov. Dorsal habitus.

Description, diagnosis and measurements. The diagnosis, description, and measurements of *Ceratogeusis thamiresae* are redundant with that of the genus.

Etymology. The new species is named after my wife, Thamires Gonçalves Silva, as a token of my gratitude for her years of support, dedication, encouragement, and friendship.

Remarks. The holotype and only known specimen of *Ceratogeusis thamiresae* new genus and species was originally glued on a small paper triangle. However, the specimen was shrunken, and a re-hydration was needed in order to enable the visualization of key characters and preparation of illustrations. While visualization of main characters was possible, a thorough description of other morphological structures (e.g., membranous wings) was not possible, given the risk it posed to further damaging the already fragile specimen.

A note on *Platydrilus* López-Pérez & Zaragoza-Caballero, 2021

During the literature survey for the update of this key, *Platydrilus* López-Pérez & Zaragoza-Caballero, 2021 was identified as a junior homonym of *Platydrilus* Michaelsen, 1891 (Annelida: Oligochaeta: Eudrilidae) (Michaelsen 1891), and therefore a pre-occupied name (Robin Kundrata, pers. comm.). The original authors of the name have been contacted, and a replacement name will be proposed in a separate communication.

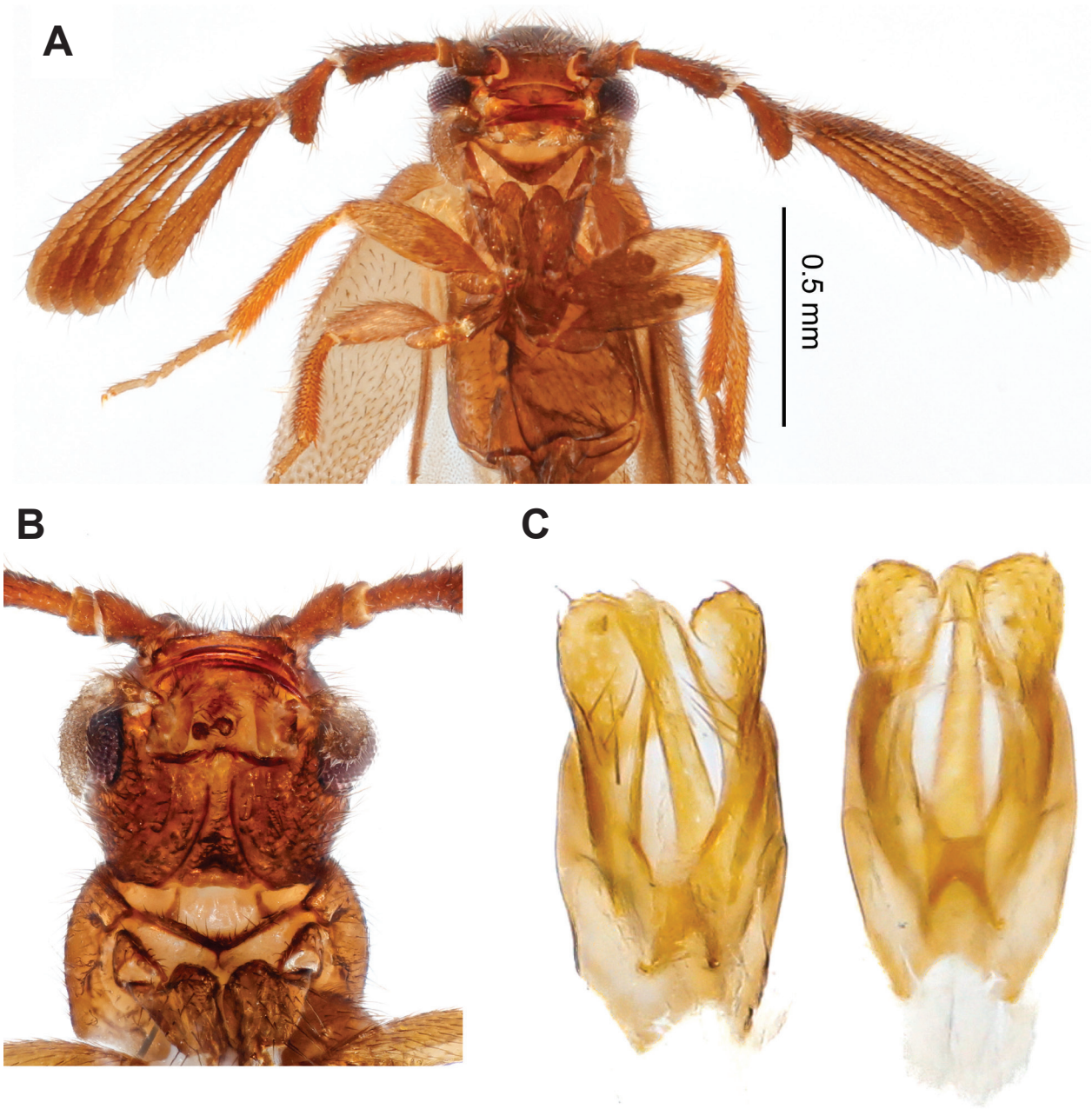

Figure 2. *Ceratogeusis thamiresae* Ferreira, sp. nov. **A.** Detail of face and antennae; **B.** Ventral view of head; **C.** Male genitalia in ventral and dorsal view, respectively.

Updated key to the genera of Telegeusinae (Adapted from Ivie 2002, Miller 2002 and López-Pérez and Zaragoza-Caballero 2021)

1	Labial palpi 2 to 3-segmented, last palpomere greatly enlarged and elongated, similar to maxillary palpi; antennae filiform	***Telegeusis***
–	Labial palpi 1 to 2-segmented, last palpomere very short, much shorter than maxillary palpi; antennae variable	**2**
2(1)	Antennae serrate, subserrate, or filiform	3
–	Antennae pectinate from antennomeres 4–10 (Fig. 1A, B)	***Ceratogeusis* gen. nov.**
3(2)	Antennae serrate or subserrate; head width behind eyes shorter than or subequal to longitudinal diameter of eye; labial palpi 1-segmented	***Pseudotelegeusis***
–	Antennae filiform; head width behind eyes greater than longitudinal diameter of eye; labial palpi 1 to 2-segmented	**4**

4(3) Labial palpi 1 to 2-segmented; mesotibial spurs serrate ***Pseudokarumia***
– Labial palpi 2-segmented; mesotibial spurs smooth **5**

5(4) Head coarsely punctate; labrum with a pronounced median tooth; last maxillary palpomere 3 times longer than labial palpomeres 1–2 combined; gula with 2 sutures; lateral lobes of aedeagus slender, twisted to apex in lateral view ***Stenodrilus***
– Head somewhat punctate; labrum with a very short median tooth; last maxillary palpomeres twice as long as labial palpomeres 1–2 combined; gula with 1 suture bifurcating at base; lateral lobes of aedeagus wide, not twisted to apex in lateral view ***Platydrilus***

Discussion

The antennae of insects play an important role in their lives, such as foraging, environment recognition, and sexual communication (Faucheux and Kundrata 2017). Insects which have flabellate and pectinate antennae have increased surface area and often a higher number of sensilla (Gao et al. 2016), including those associated with pheromone reception. Antennae morphology is quite variable across lineages of beetles known or suspected to be affected by the paedomorphosis syndrome (as is the case of all telegeusids, see below). In the case of beetles affected by the paedomorphosis syndrome, such as some Drilini, Lampyridae and Ripiphoridae, it is thought that sexual communication is probably based on pheromone signaling (De Cock and Matthysen 2005; Faucheux and Kundrata 2017; Batelka et al. 2021), where individuals heavily rely on their antennae for identifying a mate. In Elateroidea, for example, nearly all Phengodidae species (e.g., Roza et al. 2017; Coelho et al. 2024; Ferreira et al. 2024), many Neotropical Lycidae (Kazantsev 2013, 2017), and Drilini (Elateridae) (Kundrata and Sormova 2018; Kundrata and Packova 2024) have pectinate or flabellate antennae. However, the presence of simpler (i.e., filiform, serrate or moniliform) antennae also occurs in those very same families, e.g., Bocakova (2014), Kazantsev (2018), and Ferreira and Ivie (2022) for Lycidae; Roza et al. (2024) for Phengodidae; Kundrata et al. (2018), Hoffmanova and Kundrata (2022) for Elateridae, as well as Lampyridae (De Cock and Matthysen 2005; Ferreira et al. 2024b; Ferreira 2024; Hodson and Branham 2024).

Telegeusids are only known by males, and their females, which are suspected to be affected by the paedomorphosis syndrome and hypothesized to be larviform, remain unknown (Miller 2002; Ivie 2022). Their reproductive strategies as well as their communication mechanisms remain completely unknown. Even their morphology remains unexplored, and nothing is known about the ultrastructure and sensilla of telegeusids' antennae and their modified palps. Some other omethids are known to have pectinate or flabellate antennae (*Matheteus theveneti* LeConte, 1874, *Ginglymocladus* Van Dyke, 1918 and *Drilonius* Kiesenwetter, 1874), but none of these are affected by the paedomorphosis syndrome. All described telegeusid species have filiform (*Telegeusis*, *Pseudokarumia* Wittmer, 1976, *Platydrilus*, and *Stenodrilus*), moniliform (*Pseudotelegeusis jiliotupaensis* Zaragoza-Caballero, 2008) or distinctly serrate (all other described *Pseudotelegeusis* species) antennae (Ivie 2002; Miller 2002; Roza et al. 2019; Perez-Flores and Zaragoza-Caballero 2024). Although telegeusids have simple antennae, I hypothesize that their enlarged and elongated palps may have evolved in response to their need to find larviform females. In telegeusids, it appears that the simpler (filiform) the antennae, the longer the palps (e.g., *Telegeusis* spp.), while taxa with modified and slightly expanded antennae (serrate or subserrate, such as in *Pseudotelegeusis*) have comparatively shorter and smaller palps. A closer look and investigation of telegeusids' antennal and palps' ultrastructure could provide insights to this hypothesis. Particularly, if there is a correlation between a higher number of sensilla (especially those associated with pheromone's perception), and antennal and palps' modifications of telegeusids.

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