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A new species of *Leptorhyparus* Howden, 2003 (Coleoptera: Scarabaeidae: Aphodiinae: Rhyparini) in amber from the Dominican Republic, with comments on extant species

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A new species of *Leptorhyparus* Howden, 2003 (Coleoptera: Scarabaeidae: Aphodiinae: Rhyparini) in amber from the Dominican Republic, with comments on extant species

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Abstract. A **new species** of *Leptorhyparus* Howden, 2003 (Coleoptera: Scarabaeidae: Aphodiinae: Rhyparini) is described, *Leptorhyparus quadricornis* Skelley, in amber from the Dominican Republic. Extant species of *Leptorhyparus* are reviewed, with additional collection data and diagnostic characters presented.

Key words. Caribbean, West Indies, *Rhyparus*, fossil.

Resumen. Se describe una **nueva especie** en el género *Leptorhyparus* Howden, 2003 (Coleoptera: Scarabaeidae: Aphodiinae: Rhyparini), *Leptorhyparus quadricornis* Skelley, en ámbar de la República Dominicana. Se revisan las especies vivientes del género *Leptorhyparus*, agregándose datos de colección y caracteres diagnósticos.

Parabras clave. Mar Caribe, las Antillas, *Rhyparus*, fósil.

ZooBank registration. urn:lsid:zoobank.org:pub:0D2107D1-BD4D-426C-ABCF-C4CC3EEA060F

Introduction

Species of *Rhyparus* Westwood, 1845 are found worldwide with over 70 species (Cartwright and Woodruff 1969; Cartwright and Chalumeau 1978; Mencl and Rakovič 2013; Mencl et al. 2013; Minkina 2019; Mora-Aguilar and Delgado 2019; Anichtchenko et al. 2021). An amber fossil species of "*Rhyparus*" from the Dominican Republic is illustrated in Wu (1996) and listed by others (Poinar and Poinar 1999; Krell 2007) that is clearly unlike any currently described species of *Rhyparus*. However, the body shape, broad costae, and elytral tuft of setae clearly place it closer to *Lioglyptoxenus* Pittino, 2006 and *Leptorhyparus* Howden, 2003. Recently, specimens in amber became available allowing for a formal description and evaluation of its generic placement, with the realization it belongs in *Leptorhyparus*. Minkina (2020) recently described two extant species of *Leptorhyparus*. Here, I take the opportunity to describe the amber fossil species, report additional records for extant species of *Leptorhyparus*, and supplement the generic and species diagnoses.

Materials and Methods

Material studied are deposited in:

CEMT Setor de Entomologia da Coleção Zoológica, Universidade Federal de Mato Grosso, Cuiabá, MT, Brazil [F. Vaz-de-Mello]
CMNC Canadian Museum of Nature, Ottawa, Canada [F. Genier, A. Smith]
CSCA California State Collection of Arthropods, Sacramento, CA, USA [A. Tishechkin, J. Kishmirian-Airoso]
FSCA Florida State Collection of Arthropods, Gainesville, FL, USA
SEMC Snow Entomological Museum, University of Kansas, Lawrence, KS, USA [Z. Falin]

Photographs of specimens in the FSCA were taken using a Syncroscopy Auto-Montage system with a JVC 3-CCD, KY-F75U digital camera through a Leica Z16 APO lens. The amber holotype of *L. quadricornis*, new species, was submerged in mineral oil to remove optical distortion caused by the rounded surfaces. A layer of glass beads in the bottom of the mineral oil pool allowed the piece to be positioned at different angles to get the optimum views of the specimen. Photographs of the paratype of *L. quadricornis*, new species, in amber were taken by Vinícius Costa-Silva (CEMT) with a stereomicroscope Leica m205c and image capture system MC190 HD. Terminology for dorsal carinae follows Krikken and Huijbregts (1987) and Howden (2003).

Leptorhyparus Howden

Leptorhyparus Howden 2003: 397. Type species: *Leptorhyparus gilli* Howden 2003: 400, by original designation.

Diagnosis. *Leptorhyparus* is easily distinguished from other rhyparine genera in the New World by its small size (length < 3.5 mm); the erect tuft of setae at the caudal apex of the discomedian costa; elytra with caudal bulb and trichome deeply divided dorsally; and apical half of pygidium with two complete parallel (not Y-shaped) carinae (Fig. 4–5). Other characters include nearly parallel-sided body; pronotum with lateral margin lobed at anterior angle; pronotum and elytra with costae broadly convex (not distinctly carinate), wide (Fig. 1–3); and intervals equal in width or narrower than costae.

Comment. Worldwide, *Leptorhyparus* is most similar to *Lioglyptoxenus* Pittino in most features mentioned above. They differ in ways stated in Pittino's (2006) key to world genera, primarily by body size, pronotal shape, and distribution. *Lioglyptoxenus* is larger, length > 3.9 mm, lacks lobes on the pronotal lateral margin, and is found in Asia. *Leptorhyparus* is unique among the world's rhyparines with the caudal bulb and trichome of the elytra split onto inner and outer lobes, and the pygidium with two nearly parallel carina the entire length. Other genera have bulbs lacking to entire, and the carina on the pygidium is absent, single, or Y-shaped.

Minkina (2020) recently reviewed *Leptorhyparus* describing two new species and presented a key to species. It is unfortunate there were only two unique specimens available for that study. The species are valid, but some of the key characters are variable within the series available. Minkina (2020) commented that variations in these characters could be related to body size or other variables. Some are discussed below.

Species Accounts

Leptorhyparus brasiliensis Minkina, 2020

Figures 1, 4, 6–8 (see also Minkina 2020)

Leptorhyparus brasiliensis Minkina 2020: 34.

Diagnosis. *Leptorhyparus brasiliensis* is readily distinguished from the other members of the genus by the smaller body (length 1.98–2.60 mm); head lacking distinct tufts of setae; sides of clypeus distinctly sinuate before genae; pronotum having a long groove in the interval on the outside margin of the costa that reaches the anterior fovea, distinctly separating the paramedian and discolateral costae (Fig. 1); pronotum having a small anterior lobe of the discolateral costa; elytra with postdiscal bulbs reduced; elytra with caudal bulbs small and not distinctly visible in ventral view (Fig. 4); median impression of metaventrite widening posteriorly; epipharynx transverse with deeply emarginate anterior margin (Fig. 6); male genitalia with phallobase tubular (Fig. 7–8); parameres ⅓ length of phallobase, symmetrical broadly rounded in caudal view; and it occurs widely in South America east of the Andes.

Variation. Howden (2003) noted some variation in *L. gilli*, and similar, subtle variation is seen in the small series available for *L. brasiliensis*. Variation was seen in the size and distinctness of dorsal and ventral punctation. Some of this apparent variability is related to the amount of encrustation over the structure. Although not all were dissected, it appears the Brazilian specimens are all female, while the French Guiana specimens are all male. The Brazilian specimens are slightly larger than those from French Guiana.

Material examined. (7) Label data: **BRAZIL: Rondônia**: 62 km SW Ariquemes, near Fazenda Rancho Grande, 27-IV-1992, U. Schmitz, black light trap (1 FSCA); same locality, 3–15-XII-1996, J. E. Eger, black light trap (1

Figures 1–8. *Leptorhyparus* characters. **1–3)** Head and pronotum. **1)** *L. brasiliensis*. **2)** *L. gilli*. **3)** *L. peruanus*. **4–5)** Elytra and pygidium, caudal view. **4)** *L. brasiliensis*, **5)** *L. peruanus*. **6–8**) Body parts of *L. brasiliensis*, from French Guiana. **6)** Epipharynx. **7)** Male genitalia, caudal view. **8)** Male genitalia, lateral view.

CEMT); same locality, 4–16-XI-1997, J. E. Eger, black light trap (1 FSCA). **ECUADOR**: **Orellana**: Yasuni Research Station, 0.6745°S, 76.397°W, Sante trap, 2m, lower jar, 12–16-VII-2008, LASAM Team (1 CSCA). **FRENCH GUIANA: Kaw**: Camp Amazone, Kaw Mtn., 6–10-III-2016, 307m, J. B. Heppner (1 CMNC; 3 FSCA).

Leptorhyparus gilli Howden

Figure 2 (see also Howden 2003)

Leptorhyparus gilli Howden 2003: 400–401, fig. 4–7.

Diagnosis. *Leptorhyparus gilli* is readily distinguished from the other members of the genus by small body (length 2.3–2.6 mm); head lacking distinct tufts of setae; sides of clypeus straight to genae; pronotum having a shortened groove in the posterior interval between the paramedian and discolateral costae that does not reach the anterior fovea, the area between the groove and fovea not raised allowing these costae to appear separated (Fig. 2); pronotum having a small anterior lobe of the discolateral costa; elytra with postdiscal bulbs reduced; elytra with caudal bulbs smaller and not distinctly visible from ventral view; median impression of metaventrite a narrow line entire length; and it occurs in southern Central America.

Variation. As Howden (2003) discussed for *L. gilli* and Minkina (2020) suspected for *L. brasiliensis* and *L. peruanus*, there are variation in details related to the development of the paramedian and discolateral costae of the pronotum, along with the area between them, puncture rows with punctures varying in size and distance, elytral intervals appearing flat or convex depending on the individual, and general size and distinctness of dorsal and ventral punctation. Some of the differences are actual variation between individuals. In others it appears to relate to the visual quality of the structures relating to dirt remnants or angle of lighting. Caution needs to be taken to recognize species differences that hold for series of specimens and not individuals. New species descriptions based on subtle differences of singletons should be avoided.

Material examined. (20) Holotype and 3 Panamanian paratypes in the CMNC plus the following: **COSTA RICA: Heredia**: Estación Biológica LaSelva, 10°26′N, 84°01′W, flight intercept trap #5, 8-VII-2005, M. Ferro (1 CSCA); **Puntarenas:** Estación Biológica Las Cruces, 1330 m, 08°47.14′N, 82°57.58′W, 30-V-2004, J. S. Ashe, Z. Falin, I. Hinojosa, at uv light, CR1AFH04 058, (2 FSCA: barcode KUNHM-ENT SM060993, SM0609981); 5 km SW Estación Biológica Las Cruces, 1400 m, 8°47′13″N, 82°59′13″W, 22-VI-1998, R.S. Anderson, wet cloud forest litter (3 CMNC). **NICARAGUA: Jinotega:** Parque Nacional Cero Saslaya, 13.77165 −85.01184, ±150 m 1110 m, 12-V-2011, ex sifted leaf litter, ridgetop cloud forest, LLAMA11 Wa-D-03-1-all (1 SEMC: barcode KUNHM-ENT SEMC1113155). **PANAMA: Chiriqui:** Fortuna, 1050 m, 8°45′N 082°15′W, 19-IX-1978, H. Wolda, Lt. trap (2 FSCA); Fortuna, 28-VIII-1977, H. Wolda (1 CEMT, 4 FSCA); **Cocle:** Rio Indo Lodge, N. El Valle, 08°39′46.7″N, 80°07′07.9″W, 575 m, 18–20-VIII-2012, J. Heppner (1 FSCA); **Veraguas:** Santa Fe, Alto Piedra, 850 m, 16–18-VI-2011, J. B. Heppner (1 FSCA).

Comments. There is some variation in the distance between the end of the pronotal groove and the anterior foveae. Lighting must be correct to fully illuminate these structures. Sometimes the interval is more depressed making it appear as if the groove is longer. However, the groove at the bottom of this depressed interval is deep, sharply defined and always well separated from the fovea.

Leptorhyparus peruanus Minkina, 2020

Figure 3, 5 (see also Minkina 2020)

Leptorhyparus peruanus Minkina 2020: 36.

Diagnosis. *Leptorhyparus peruanus* is readily distinguished from the other members of the genus by its larger body (length 3.2–3.4 mm); head lacking distinct tufts of setae; pronotum having a short groove in the interval between the paramedian and discolateral costae that does not reach the anterior fovea, the area between groove and fovea raised allowing these costa to appear connected (Fig. 3); pronotum with enlarged anterior lobe of the discolateral costa (Fig. 3); elytra with postdiscal bulb normally developed (Fig. 5); elytra with caudal bulb large and distinctly visible from ventral view; and it occurs in Peru.

Material examined. (1) Label data: **PERU**: Junin, Prov. Satipo, 11 km NE Puerto Ocopa, Los Olivos, 1200 m, 11°3.00′S, 74°15.52′W, 30–31 March 2009, A.V. Petrov, window trap (1 CSCA).

Leptorhyparus quadricornis Skelley, new species

Figures 9–17

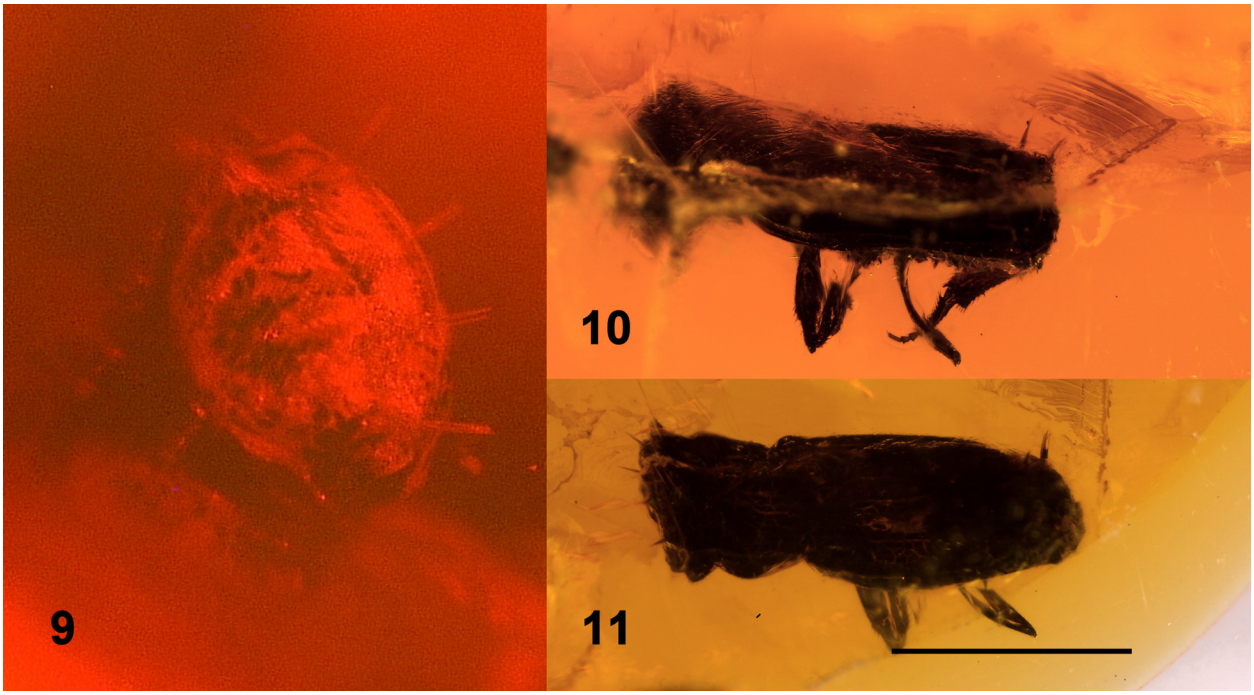
Diagnosis. *Leptorhyparus quadricornis* is readily distinguished from all other Rhyparini by the small size and head with four distinct pencil-like tufts of setae. It is a fossil in amber from the Dominican Republic.

Description. Holotype length 2.1 mm. Body apparently dark brown or entirely black; shape elongate, parallel-sided (Fig. 12). **Head.** Head with distinct punctures (Fig. 9). Clypeus with angulate tooth on each side of slightly concave median third of margin (Fig. 16); edge with narrow elevated bead; centroclypeal disc with 2 low costae. Frons with 4 weak costae, each with a pencil-like tuft of setae. **Pronotum.** Pronotum rectangular; costae low, broad, convex (Fig. 13, 15), weak near anterior margin, almost reaching posterior margin; lateral margin strongly sinuate, anterior and intermediate lobes small. **Elytron.** Elytron almost twice as long as head and pronotum combined; sides almost parallel for ⅘ of length; all costae low, broad, convex (Fig. 13, 15); discomedian costa with distinct pencil-like erect setal tuft at caudal apex; caudal bulb divided into inner and outer lobes (Fig. 13–15). **Venter.** Metaventrite appears flattened either side of midline. **Abdomen.** Abdomen with length of apical ventrite equal to preceding three combined; all ventrites smooth. **Legs.** Meso- and metafemur elongate-oval, not clavate (Fig. 17). Meso- and metatibia gradually triangularly widening to truncate apex, slightly flattened. Metatibia with small but distinct spine on inner margin. Meso- and metatarsi elongate, first tarsomere as long as next 3 combined, claws minute.

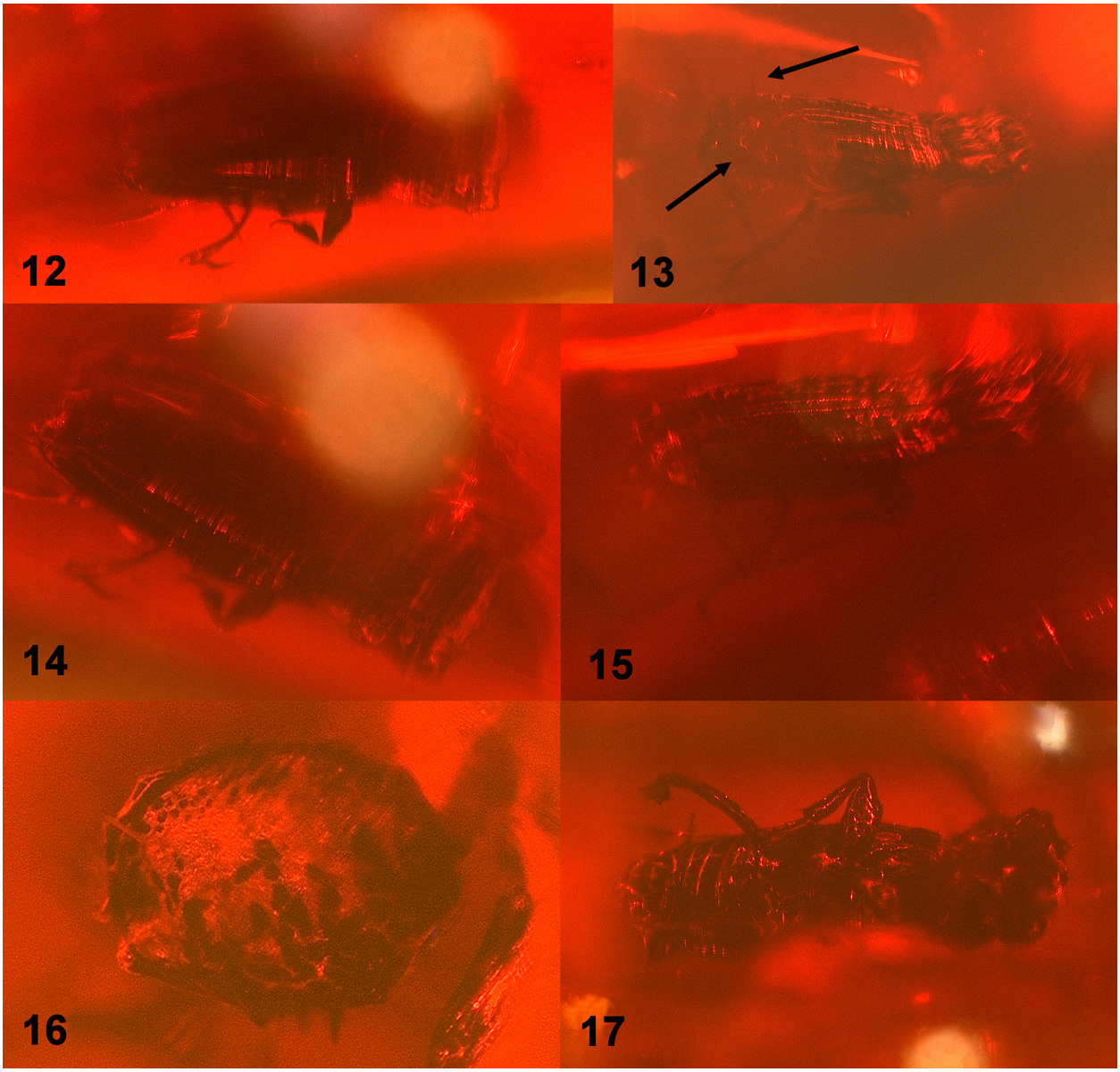
Material examined. Holotype (FSCA; Fig. 9, 12–17) is in dark opaque amber with many cracks and irregularities. A paratype (CEMT; Fig. 10–11) is in transparent amber, but details are not readily visible due to cracks and irregularities in the amber. Wu (1996) did not state where the specimen imaged in the book was deposited, it was not available for study. The image in Wu (1996: 187, fig. F-459) was consulted.

Etymology. The species epithet is a masculine adjective in the nominative singular meaning four-horned.

Comments. The available specimens are poorly visible in the amber, with only some structures visible. Enough are visible to identify them as this species. In all cases, visible setal tufts on the head are unlike any known species of Rhyparini. Placement in *Leptorhyparus* is based on the small body size, elytral tuft of setae on apex of



Figures 9–11. *Leptorhyparus quadricornis*. **9)** Head of holotype. **10–11)** Lateral and dorsal view of *L. quadricornis*, paratype CEMT, line = 1.0 mm. Photos in Figures 10–11 by Vinícius Costa-Silva (CEMT).



Figures 12–17. *Leptorhyparus quadricornis*, holotype. **12)** Dorsal view. **13)** Oblique dorso-posterior view, arrows point to setal tuft on apex of dorsomedian costa and bilobed caudal bulb. **14)** Oblique dorso-anterior view. **15)** Oblique dorso-posterior view. **16)** Head, anterior view. **17)** Ventral view.

discomedian costa, smoothly elongate body shape, small pronotal anterior lateral lobes, low costae, and apparently divided caudal bulb of elytra. The holotype is in a small piece of dark amber that has many cracks and layers preventing easy visibility. However, there were a couple narrow 'windows' of clarity that allowed some photography. With digital enhancement, the images presented here allowed for the description above. A better specimen or use of high-tech Micro CT imaging systems may allow a better description to be made someday. Naming it now documents the species for future studies.

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