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Five new species of *Phyllophaga* (Coleoptera: Melolonthidae) of northwestern Mexico

Miguel Ángel Morón[1], Gabriel A. Lugo-García[2], and Agustín Aragón-García[3]*

Abstract

Five new species of *Phyllophaga* of northwestern Mexico are described: *P.* (*Listrochelus*) *balacachiana* **sp. nov.** from tropical thorny forests of northern Sinaloa and southern Sonora; *P.* (*Listrochelus*) *tascatensis* **sp. nov.** from pine and oak forests of northern Sinaloa and southwestern Chihuahua; *P.* (*Listrochelus*) *choixiana* **sp. nov.** from tropical deciduous forest of northern Sinaloa; *P.* (*Listrochelus*) *reyesolivasi* **sp. nov.** from pine and oak forest of southwestern Chihuahua; and *P.* (*Phyllophaga*) *collaroides* **sp. nov.** from pine and oak forests of northern Sinaloa and southwestern Chihuahua. Illustrations of diagnostic characters and comments on the differences from similar species are included.

Key Words: May beetle; taxonomy; pine–oak forest; tropical forest

Resumen

Se describen cinco especies nuevas de *Phyllophaga* del noroeste de México: *P.* (*Listrochelus*) *balacachiana* **sp. nov.** colectada en bosque tropical espinoso del norte de Sinaloa y sur de Sonora; *P.* (*Listrochelus*) *tascatensis* **sp. nov.** obtenida en bosque de pino y encino del norte de Sinaloa y suroeste de Chihuahua; *P.* (*Listrochelus*) *choixiana* **sp. nov.** encontrada en bosque tropical caducifolio del norte de Sinaloa; *P.* (*Listrochelus*) *reyesolivasi* **sp. nov.** colectada en bosque de pino y encino del suroeste de Chihuahua; y *P.* (*Phyllophaga*) *collaroides* **sp. nov**. obtenida en bosque de pino y encino del norte de Sinaloa y suroeste de Chihuahua. Se incluyen ilustraciones de los caracteres diagnósticos y comentarios sobre las diferencias con las especies afines.

Palabras Clave: mayates; taxonomía; bosques pino–encino; bosques tropicales

Recent collecting efforts by the second author in poorly studied areas along the adjoining borders of the Mexican states of Sinaloa, Chihuahua, and Sonora provided important samples of Scarabaeoidea useful to increase our understanding of the faunistic composition of the group across the Sierra Madre Occidental and its Pacific slopes (Lugo-García et al. 2011, 2013). Included in the samples were some undescribed species of *Phyllophaga* (Coleoptera: Melolonthidae), which externally appear similar to some species occurring from New Mexico and Arizona to Chihuahua and Sonora, and which belong to species groups defined by Saylor (1940) and Morón (1986). These new species are separated easily on the basis of male genital characters. In this paper, we describe 4 new species of *Phyllophaga* (*Listrochelus*) and 1 species of *Phyllophaga* (*s.str.*).

Materials and Methods

The characters and terms used in the descriptions are those of Saylor (1940, 1942), Sanderson (1958), Morón (1986, 2004), and Woodruff & Beck (1989). Drawings were made with the aid of a digital microscope imager attached to a Celestron 44206 stereomicroscope, using magnifications of 10.5 to 67.5×. Measurements were obtained with an electronic vernier or ocular micrometer. Photographs were made with a Nikon D5200 camera equipped with an AF-S DX Micro Nikkor 40 mm f/2.8G lens. Specimens were deposited in the following collections: Centro de Agroecología, Instituto de Ciencias, Benemérita Universidad Autónoma de Puebla (CenAgro), Instituto de Ecología, Xalapa, Mexico (IEXA); M. A. Morón, Xalapa (MXAL); Escuela Superior de Agricultura del Valle del Fuerte, Universidad Autónoma de Sinaloa (UAS).

Results

Phyllophaga (*Listrochelus*) *balacachiana* **sp. nov.** (Figs. 1 and 2, 5–10)

MALE HOLOTYPE

Body length 15.4 mm; humeral width 5.3 mm. Head reddish yellow, body and legs testaceous light yellowish (Figs. 1–2). Clypeus wider than long (2.5:1.0), anterior border slightly curved, with margin clearly elevated, surface slightly convex at center, covered with punctures, glabrous. Frons wider than long (2.4:1.0), slightly concave, with irregularly distributed punctures, glabrous, 3.2× wider than each eye's dorsal diameter. Canthus with 10 setae. Vertex with a transverse carinate ridge. Occipital area without punctures. Antenna 10-segmented; with club 1.1× longer than preceding 6 segments combined.

Pronotum wider than long (1.6:1.0) and 2.4× wider than frons, but only 1.5× wider than head including eyes. Pronotal disc with shallow, small punctures regularly separated and distributed on disc, but less dense near posterior half of midline; lateral margins obtusely

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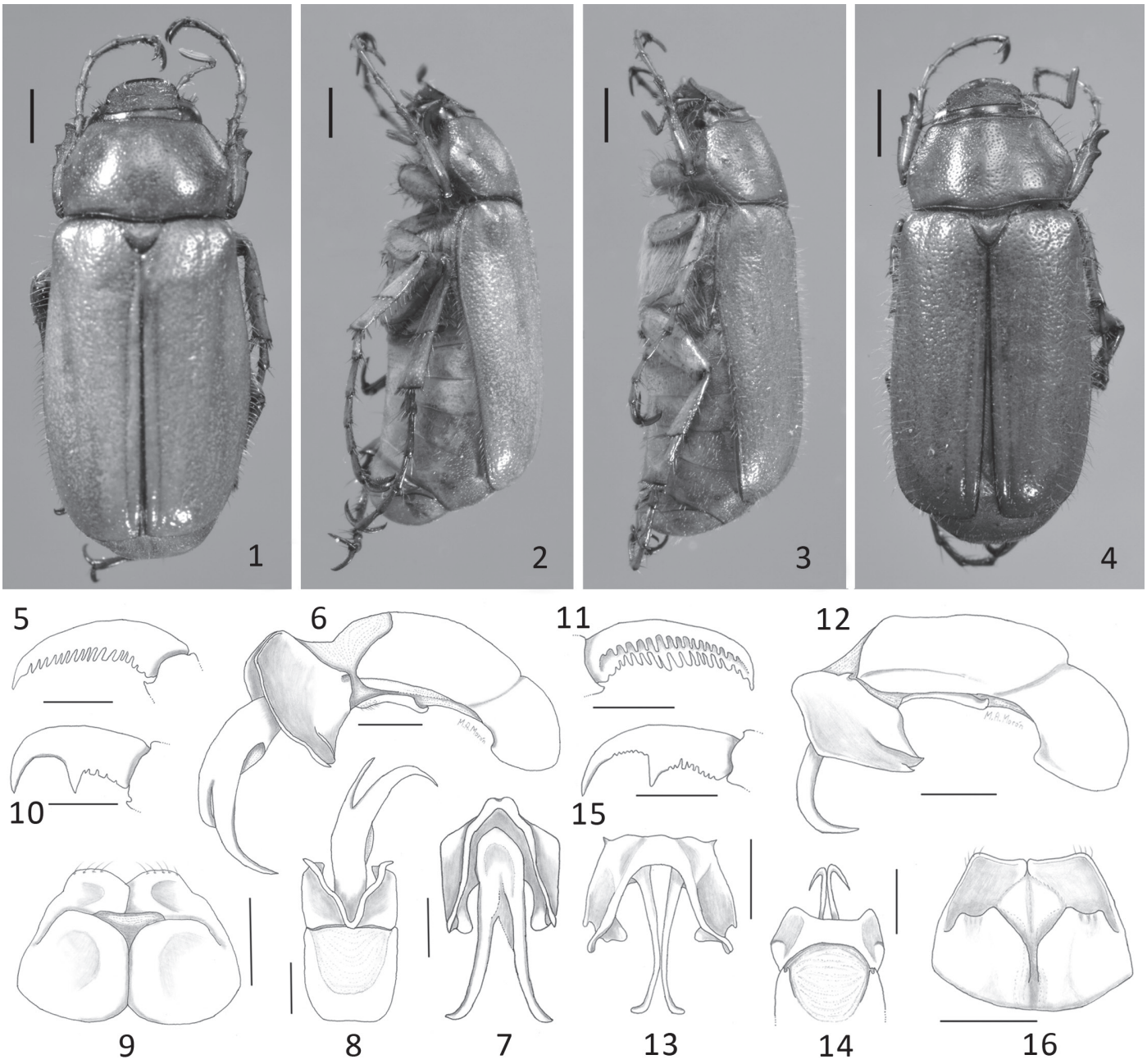

Figs. 1–16. Habitus and morphological characters of *Phyllophaga balacachiana*, **new species** and *Phyllophaga tascatensis*, **new species**. **1–4.** Habitus of males: 1–2. *P. balacachiana*, **new species**, 1. dorsal view, 2. lateral view; 3–4. *P. tascatensis*, **new species**, 3. lateral view, 4. dorsal view; scale bar = 2 mm. **5–10.** *Phyllophaga balacachiana*, **new species**: 5. male tarsal claw; 6–8. male genital capsule: 6. lateral view, 7. distal view, 8. dorsal view; 9. female genital plates, ventral view; 10. female tarsal claw; scale bar = 1 mm, except in Figs. 5 and 10 = 0.5 mm. **11–16.** *Phyllophaga tascatensis*, **new species**: 11. male tarsal claw; 12–14. male genital capsule: 12. lateral view, 13. distal view, 14. dorsal view; 15. female tarsal claw; 16. female genital plates, ventral view; scale bar = 1 mm, except in Figs. 11 and 15 = 0.5 mm.

angled, widest just behind middle, lateral marginal bead irregularly crenulate, with long, slender setae; anterior marginal bead without setae; anterior angles obtuse, not prominent; posterior angles widely obtuse, rounded. Scutellum 1.1× wider than long, with 12 shallow, minute, round punctures. Elytron 3.0× longer than wide, with shallow, rugose, round punctures along the striae and weakly rugo-punctate interstriae, with scattered minute setae on disc, the only regular line of erect setae occurs along external border. Pterosternum with long, abundant light yellow setae. Protibia shorter than protarsus (1.0:1.5). Metatibia shorter than metatarsus (1.0:1.2). Tarsal claws regularly bi-pectinate (Fig. 5).

Propygidium completely dull, regularly punctate, with scattered short setae. Pygidium strongly convex (Fig. 2), prominent, glossy, with sparse, round, shallow setiferous punctures mainly at sides; apical margin with 9 medium-size setae. Fifth abdominal sternite slightly convex, weakly furrowed on midline; anal plate short, weakly furrowed on midline, with 20 short setae, posterior margin entire at middle. Parameres large, wide, fused dorsally (Figs. 7–8), clearly dentate before apex, lateral border weakly carinate; tectum large, uniformly convex, with 2 basal rounded prominences; aedeagus much longer, sclerotized support curved downward and widely bifurcate apically (Figs. 6–8). Length of genital capsule from the apex of parameres to the border of basal piece 5.8 mm.

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FEMALE ALLOTYPE

Similar to male, except: Body length 15.2 mm. Humeral width 5.9 mm. Antennal club nearly as long as preceding 5 segments combined (1.1:1.0). Anterior border of clypeus nearly straight at middle. Punctation on clypeus, frons, pronotum, and elytra denser and deeper. Pygidium flattened on basal half, shallowly depressed on distal half, with scattered setiferous small punctures; marginal bead widened near apex, with 14 short setae. Fifth sternite widely convex with few lateral short setae. Anal plate convex, with numerous short and medium-size setae. Tarsal claws irregularly serrate-dentate along external ventral borders, and irregularly pectinate along internal ventral borders (Fig. 10). Ventral genital plates irregularly concave, with apical border membranous, widely sinuate. Dorsal genital plates not fused, irregularly excavate, with rounded and irregularly reflexed apical border, with few short setae near the border (Fig. 9).

VARIATION

Males. Total body length 16.2–17.0 mm. Humeral width 5.6–6.4 mm. Convexity grade of pygidial plate varies slightly between specimens, as well as number of setae. The pygidium in the specimen from Totoliboqui, Sonora, is more convex, and the setae on pygidial disc are longer; this specimen also has minute setae on the elytra.

Females. Total body length 16.5–17.0 mm. Humeral width 6.6–6.9 mm. One specimen from Las Praderas has a feeble longitudinal keel near the basal border of pygidium and medium-size setae on disc of the pygidium.

TYPE MATERIAL

HOLOTYPE: male—MEXICO: Sinaloa, El Fuerte, Sierra de Balacachi, 09-VIII-2010, 104 m, G. A. Lugo (IEXA). ALLOTYPE: female—same data as holotype (IEXA). PARATYPES: 6 males and 1 female—same data as holotype (IEXA, MXAL). PARATYPES: 1 female—MEXICO: Sinaloa, El Fuerte, Las Praderas, 29-VII-2010, 160 m, G. A. Lugo (MasAgro); 1 male—Sonora, Huatabampo, Totoliboqui, 30-VII-2010, 78 m, G. A. Lugo (UAS).

TYPE LOCALITY

Sierra de Balacachi, Sinaloa, México (26°7'32.9"N, 108°52'54.2"W).

BIOLOGICAL DATA

Specimens of *P. balacachiana* were collected in tropical thorny forest, at 78–160 m elevation in Jul (2 specimens) and Aug (9 specimens). Other species of *Phyllophaga* flying at the same time and place were *P.* (*Listrochelus*) *cristagalli* (Arrow), *P.* (*L.*) *granti* Saylor, and another undescribed species.

TAXONOMIC REMARKS

Phyllophaga balacachiana is very similar to *P. granti* Saylor, but in the latter the parameres have an acute projection dorsally, and the surface of elytra in both sexes is clothed with scattered minute setae. See modification of the Saylor (1940) key at the end of the *P. tascatensis* **sp. nov.** description.

ETYMOLOGY

The species epithet was derived from the indigenous language name “yoreme” of the type locality “Balacachi.”

Phyllophaga (*Listrochelus*) *tascatensis* **sp. nov.** (Figs. 3–4, 11–16)

MALE HOLOTYPE

Body length 16.9 mm; humeral width 6.0 mm. Head reddish yellow, body and legs testaceous (Figs. 3–4). Clypeus wider than long (2.8:1.0), anterior border widely curved, with margin clearly elevated, surface convex at center, punctate laterally, glabrous. Frons wider than long (2.5:1.0), slightly concave, with regularly distributed, dense punctures, glabrous, 3.5× wider than 1 eye diameter. Canthus with 15 setae. Vertex of head with a transverse carinate ridge. Occipital area without punctures. Antenna 10-segmented; club 1.1× longer than preceding 6 segments combined.

Pronotum wider than long (1.6:1.0) and 2.2× wider than frons, but only 1.4× wider than head including eyes. Pronotal disc with shallow, small punctures regularly separated and distributed on disc, but less dense near midline; lateral margins obtusely angled, widest behind middle; lateral marginal bead irregularly crenulate, with long, slender setae; anterior marginal bead without setae; anterior angles obtuse, not prominent; posterior angles broadly obtuse, rounded. Scutellum 1.4× wider than long, with 10 shallow, minute, round punctures. Elytron 3.1× longer than wide, with shallow, rugose, round punctures along the striae and weakly rugo-punctate interstriae, with numerous erect, short setae. Pterosternum with long, abundant light yellowish setae. Protibia shorter than protarsus (1.0:1.4). Metatibia shorter than metatarsus (1.0:1.2). Tarsal claws regularly bi-pectinate (Fig. 11).

Propygidium completely dull, regularly punctate, with many short setae. Pygidium strongly convex (Fig. 3), prominent, glossy, with sparse, shallow setiferous punctures throughout; apical margin with 13 medium-size setae. Fifth abdominal sternite shallowly concave at the middle, weakly furrowed on midline; anal plate short, deeply furrowed on midline, with 40 short setae, posterior margin entire at middle. Parameres large, fused dorsally, clearly dentate on ventral margin, lateral border carinate; tectum large, uniformly convex; sclerotized support of aedeagus curved downward and widely bifurcate apically (Figs. 12–14). Length of genital capsule from the apex of parameres to the border of basal piece 4.9 mm.

FEMALE ALLOTYPE

Similar to male, except: Body length 17.1 mm. Humeral width 6.0 mm. Antennal club as long as preceding 5 segments combined. Anterior border of clypeus nearly truncate at middle. Punctation on clypeus, frons, pronotum, and elytra more dense and deep. Pygidium flattened, with scattered setiferous punctures; marginal bead widened near apex, with 10 short setae. Fifth sternite widely convex with few lateral short setae. Anal plate convex, with numerous short and medium-size setae. Tarsal claws irregularly serrate-dentate along external ventral margin distad of tooth, and irregularly pectinate along internal ventral margin mesad of tooth (Fig. 15). Ventral genital plates convex, with apical border widely emarginate. Dorsal genital plates fused, excavated, with angled and reflexed apical border, with few short setae near the apices (Fig. 16).

VARIATION

Total body length 16.2–16.8 mm. Humeral width 5.0–5.2 mm.

TYPE MATERIAL

HOLOTYPE: male—MEXICO: Chihuahua, Morelos, Los Tascates, 08-VIII-2009, 1,488 m, G. A. Lugo (IEXA). ALLOTYPE: female—same data as holotype except 09-VII-2009 (IEXA). PARATYPES: 2 females—same data as allotype (IEXA, MXAL); 1 male—same data except 05-VIII-2009 (MXAL).

TYPE LOCALITY

Los Tascates, Chihuahua, México (26°38'45.4"N, 107°51’8.8"W).

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BIOLOGICAL DATA

Specimens of *P. tascatensis* were collected in pine–oak forest, at 1,488 m elevation in Jul (1 specimen) and Aug (4 specimens). Other species of *Phyllophaga* flying at the same time and place were *P.* (*Phyllophaga*) *ravida* (Blanchard), *P.* (*P.*) *vetula* (Horn), *P.* (*P.*) *opaca* (Moser), *P.* (*P.*) *setifera* (Burmeister), *P.* (*Phytalus*) *obsoleta* (Blanchard), and *P.* (*Listrochelus*) *reyesolivasi* **sp. nov.**

TAXONOMIC REMARKS

Externally, *P. tascatensis* appears similar to *P. granti* Saylor, but in the latter the dorsal edge of the fused parameres has an acute and anteriorly curved projection, and the surface of elytra in both sexes is clothed with many setae. In order to accommodate this and the previously described new species, the key to male *Listrochelus* proposed by Saylor (1940) needs to be modified. The new species will key easily to couplet 19:

19 (15).— Elytra testaceous, surface never pruinose; sclerotized support of aedeagus symmetrical, curved downward and widely bifurcate apically 20

19'.— Elytra rufobrunneous to rufopiceous, usually at least slightly pruinose, especially on elytra; sclerotized support of aedeagus asymmetrical, with form variable 21

20.— Elytral disc with many erect, short setae; sternites II–IV concave or furrowed; phallobase lacking keels 20a

20'.— Elytral disc lacking short setae; sternites II–IV convex medially; phallobase with strong convergent keels (Fig. 8). El Fuerte, Sinaloa . . . . . *P. balacachiana* **sp. nov.**

20a.— Antennal club length equal to funicle; parameres simply convex or toothed dorsally 20b

20a'.— Antennal club longer than funicle; parameres with 1 curved projection medially along dorsal margin. Arizona, Sonora, and Sinaloa . . . . . *P. granti* Saylor

20b.— Clypeal surface uniformly and closely punctate; fused parameres with 2 short teeth on dorsal margin. Arizona and New Mexico . . . . . *P. flavipennis* (Horn)

20b'.— Clypeal surface lacking punctures medially; dorsal margin of parameres simple, convex, lacking teeth (Fig. 13). Los Tascates, Chihuahua, and Sinaloa . . . . . *P. tascatensis* **sp. nov.**

ETYMOLOGY

Derived from the name of the type locality "Los Tascates," "tascate" is a local popular name applied to the species of *Juniperus* tree found in Chihuahua and Sinaloa (Martínez 1979).

Phyllophaga (*Listrochelus*) *choixiana* **sp. nov.** (Figs. 17–18, 23–27)

MALE HOLOTYPE

Body length 16.9 mm; humeral width 6.4 mm. Reddish brown (Figs. 17–18). Clypeus wider than long (2.9:1.0), anterior border slightly sinuate, with margin clearly elevated, surface nearly flat, with dense punctures, glabrous. Frons wider than long (3.1:1.0), slightly convex, with irregularly distributed punctures, glabrous, 3.4× wider than 1 eye diameter. Canthus with 23 setae. Vertex with conspicuous transverse carinate ridge. Occipital area glossy, without punctures. Antenna 10-segmented; with club 1.3× longer than preceding 6 segments combined.

Pronotum wider than long (1.6:1.0) and 2.3× wider than frons, but only 1.4× wider than head including eyes. Pronotal disc with shallow punctures separated and regularly distributed on disc; lateral margins widely angled, lateral marginal bead irregularly crenulate, with long setae; anterior marginal bead without setae; anterior angles obtuse, not prominent; posterior angles broadly obtuse, rounded. Scutellum 1.3× wider than long, with 10 shallow, minute, round punctures. Elytron 2.4× longer than wide, with shallow punctures along the striae, and the interstriae weakly rugo-punctate, mostly glabrous, with a few scattered short setae near posterior borders. Pterosternum with long, abundant light-yellowish setae. Protibia shorter than protarsus (1.0:1.7). Metatibia shorter than metatarsus (1.0:1.2). Protarsomeres 1–4 with ventral- apical tufts of reddish setae. Tarsal claws irregularly bi-pectinate (Fig. 23).

Propygidium 1.3× longer than pygidium, dull, irregularly punctate. Pygidium strongly convex (Fig. 18), glossy, with sparse shallow punctures throughout; apical margin with 10 medium-size setae. Fifth abdominal sternite nearly flat at the middle, with weak transverse keel near posterior border; anal plate large, slightly convex, irregularly punctate along midline, with few short setae, posterior margin entire at middle. Parameres asymmetrical, fused dorsally; right paramere narrowed, left paramere widened (Figs. 25–26); phallobase short, with distal bilobed projection on middle dorsally, and basal rounded prominences; sclerotized support of aedeagus curved downward with apex asymmetrical (Figs. 24–27). Length of genital capsule from the apex of parameres to the border of basal piece 6.0 mm. Female unknown.

TYPE MATERIAL

HOLOTYPE: male—MEXICO: Sinaloa, Choix, Santa Ana, 18-VII-2009, 270 m. M. Romero (IEXA).

TYPE LOCALITY

Santa Ana, Choix, Sinaloa, México (26°19'17.9"N, 108°19'19.3"W).

BIOLOGICAL DATA

This specimen of *P. choixiana* was collected in a black-light trap in a tropical deciduous forest at 270 m elevation in Jul (1 specimen).

TAXONOMIC REMARKS

Phyllophaga choixiana dorsally appears similar to *P. cristagalli* (Arrow), but in the latter the lateral border of the pronotum is strongly crenulate, the sternites have a large tridentate keel on the midline, and the parameres are symmetrical. Male genital form of the new species is near those of *P.* (*L.*) *praesidi* (Bates) and another undescribed species from the Pacific Coast of Mexico and Balsas River Depression, but none of these have a bilobed tubercle on distal border of the phallobase (Figs. 24 and 27).

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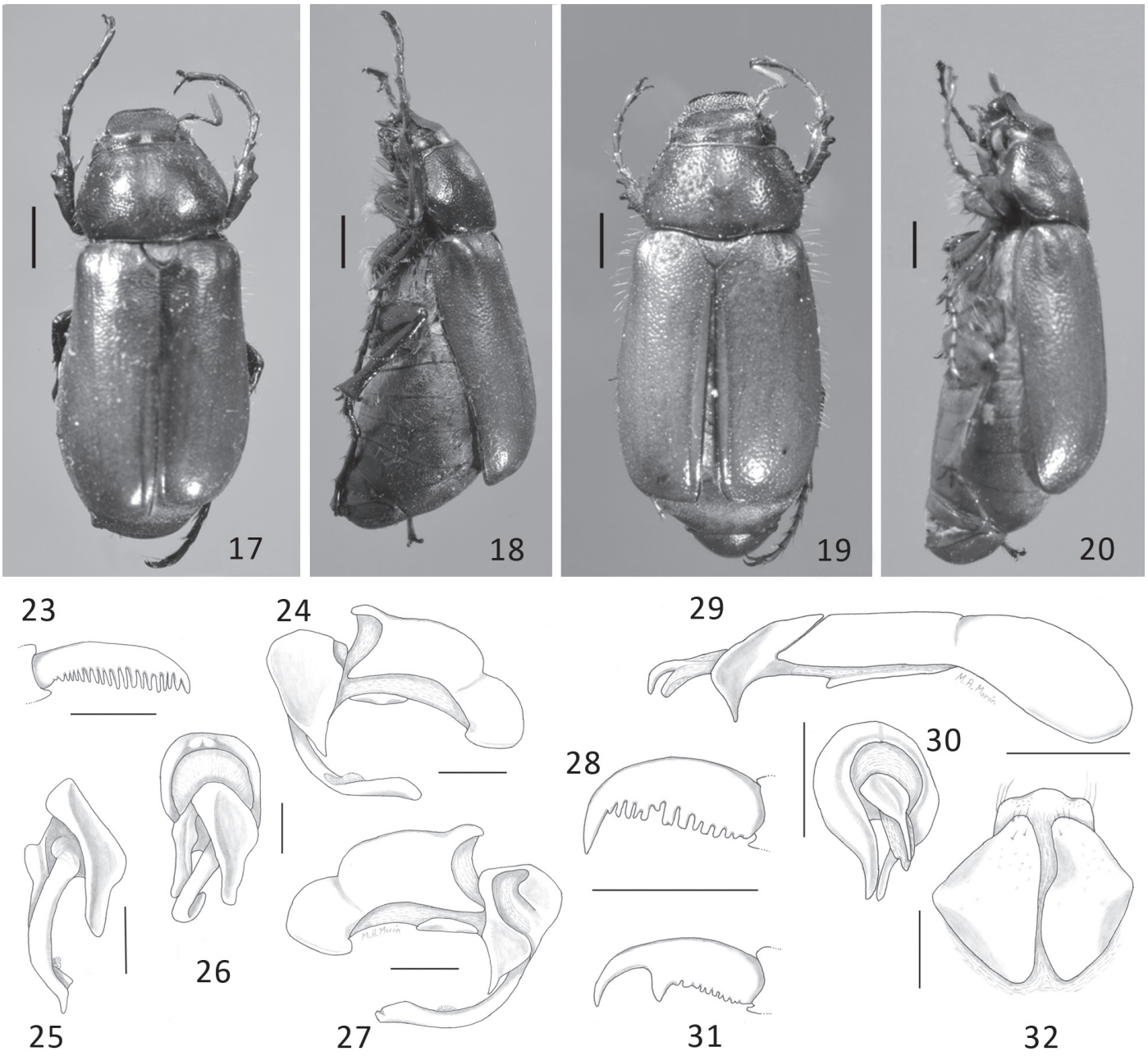

Figs. 17–32 (without Figs. 21 and 22). Habitus and morphological characters of *Phyllophaga choixiana*, **new species** and *Phyllophaga reyesolivasi*, **new species**. **17–20.** Habitus of males: 17–18. *P. choixiana*, **new species**, 17. dorsal view, 18. lateral view; 19–20. *P. reyesolivasi*, **new species**, 19. dorsal view, 20. lateral view; scale bar = 2 mm. **23–27.** *Phyllophaga choixiana*, **new species**: 23. male tarsal claw; 24–27. male genital capsule: 24. right lateral view, 25. distal view, 26. dorso-distal view, 27. left lateral view; scale bar = 1 mm, except in Fig. 23 = 0.5 mm. **28–32.** *Phyllophaga reyesolivasi*, **new species**: 28. male tarsal claw; 29–30. male genital capsule: 29. lateral view, 30. distal view; 31. female tarsal claw; 32. female genital plates, ventral view; scale bar = 1 mm, except in Figs. 28 and 31= 0.5 mm.

ETYMOLOGY

Derived from the name of the type locality "Choix," of the ancient "cahita" indigenous language, meaning "site of resin collectors."

Phyllophaga (*Listrochelus*) *reyesolivasi* **sp. nov.** (Figs. 19–20, 28–32)

MALE HOLOTYPE

Body length 14.0 mm; humeral width 5.1 mm. Head and pronotum reddish brown, elytra yellowish brown (Figs. 19–20). Clypeus wider than long (4.4:1.0), anterior border nearly straight, with margin clearly elevated, surface slightly concave, with deep punctures, glabrous. Frons wider than long (2:1), slightly convex, with sparsely distributed, deep punctures, glabrous, 5.4× wider than each eye's dorsal diameter. Canthus with 7 setae. Vertex with a transverse carinate ridge. Occipital area with scattered small setiferous punctures. Antenna 10-segmented; club 1.4× longer than preceding 6 segments combined.

Pronotum wider than long (1.7:1.0) and 2.0× wider than frons, but only 1.5× wider than head including eyes. Pronotal disc with shallow punctures irregularly distributed on disc, but less dense near midline; lateral margins obtusely angled, widest just behind middle, lateral marginal bead irregularly crenulate, with long setae; anterior marginal bead without setae; anterior angles obtuse, not prominent; posterior

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angles widely obtuse, rounded. Scutellum 1.5× wider than long, with 24 shallow, minute, round punctures near edges. Elytron 2.5× longer than wide, with shallow, irregular punctures along the striae and deep punctures on interstriae, glabrous, with fine silky sheen.

Propygidium dull, with shallow transverse punctures regularly distributed. Pygidium strongly convex (Fig. 20), glossy, with sparse, shallow punctures throughout; apical margin nearly truncate, with 14 short setae. Pterosternum with long, abundant yellowish setae. Fifth abdominal sternite deeply furrowed on midline, with posterior border briefly notched at middle; anal plate short, shallowly furrowed on midline, posterior margin widely curved, with 12 short setae. Protibia shorter than protarsus (1.0:1.1). Metatibia as long as metatarsus (1:1). Tarsal claws irregularly uni-pectinate (Fig. 28).

Parameres short, fused dorsally, deeply excavated and with symmetrical curved blades on distal surface, apex strongly projecting ventrally; phallobase long, evenly convex; sclerotized support of aedeagus widened and laterally compressed apically, bifurcate and curved downward (Figs. 29–30). Length of genital capsule from the apex of parameres to the border of basal piece 5.0 mm.

FEMALE ALLOTYPE

Similar to male, except: Body length 14.0 mm. Humeral width 5.1 mm. Antennal club 1.1× longer than the preceding 5 segments combined. Pygidium convex, prominent towards the apex, apex with border curved, with 16 short setae. Anal plate convex, with numerous setiferous punctures, posterior border with 12 setae at each side. Tarsal claws with acute tooth before middle, and border posterior to tooth irregularly serrate (Fig. 31). Ventral genital plates convex, not fused, with projected apical border, with 3 setae on distal border. Dorsal genital plates fused, sclerotized, apical border briefly bi-sinuate, with 6 long setae at each lateral corner (Fig. 32).

VARIATION

Male. The only other male examined has a body length of 13.0 mm and humeral width of 4.6 mm. Clypeal surface more concave than in holotype.

Females. Total body length 11.1–12.5 mm, humeral width 4.2–4.8 mm. Clypeal surface less concave than in allotype; frons less rugo-punctate; antennal club as long as preceding 5 segments.

TYPE MATERIAL

HOLOTYPE: male—MEXICO: Chihuahua, Morelos, Los Tascates, 09-VII-2009, 1,488 m, Adilene (IEXA). ALLOTYPE: female—same data as holotype (IEXA). PARATYPES: 1 male and 2 females—same data as holotype (IEXA, MXAL).

TYPE LOCALITY

Los Tascates, Morelos, Chihuahua, México (26°38'45.4"N, 107°51'08.8"W).

BIOLOGICAL DATA

Specimens of *P. reyesolivasi* were collected in a pine–oak forest of, at 1,488 m elevation in Jul (1 specimen) and Aug (4 specimens). Other species of *Phyllophaga* flying at the same time and place were *P.* (*Phytalus*) *obsoleta* (Blanchard), *P.* (*Phyllophaga*) *ravida* (Blanchard), *P.* (*P.*) *vetula* (Horn), *P.* (*P.*) *opaca* (Moser), *P.* (*P.*) *setifera* (Burmeister), *P.* (*P.*) *collaroides* **sp. nov.**, and *P.* (*Listrochelus*) *tascatensis* **sp. nov.**

TAXONOMIC REMARKS

Phyllophaga reyesolivasi is member of the "cavata" species group (sensu Morón 1986, 2004) and externally appears similar to *P. cavata* (Bates), but in the latter the posterior border of 5th sternite is entire and the parameres are longer and less angulate apically (lateral view see Morón 2004: Fig. 7) giving a more gradually curved appearance. This species keys to couplet 8 in the key to males of the "cavata" group proposed by Morón (2004). The key needs to be modified as follows:

8.— Parameres proportionately short, less than one half length of phallobase (Fig. 29), with acute apices touching or nearly so 8a

8'.— Parameres proportionately long, over one-half length of phallobase, with parallel, well separated apices. San Jose Babicora, Chihuahua . . . . . *P. babicora* Morón

8a.— In lateral view, apical third of parameres curved; phallobase moderately lengthened basally, basal and apical sections equal in length; sclerotized support of aedeagus narrow, cylindrical. San Antonio and Buenos Aires, Durango . . . . . *P. meadei* Saylor

8a'.— In lateral view, apical third of parameres straight; phallobase strongly lengthened basally, basal section longer than apical section (Fig. 30); sclerotized support of aedeagus expanded, compressed laterally and bifurcate apically. Tascates, Chihuahua . . . . . *P. reyesolivasi* **sp. nov.**

ETYMOLOGY

This new species is dedicated to Dr. Álvaro Reyes Olivas, Mexican botanist, teacher, and promoter of biotic studies in Sinaloa.

Phyllophaga (*s.str.*) *collaroides* **sp. nov.** (Figs. 21–22, 33–37)

MALE HOLOTYPE

Total body length 15.6 mm, humeral width 5.8 mm. Head and pronotum glossy reddish brown, elytra glossy pale brownish yellow (Figs. 21–22). Clypeus wider than long (3.4:1.0), anterior border deeply sinuate medially, with margin raised, surface slightly convex, with scarce punctures and scattered long setae. Frons wider than long (2:1), convex, rugo-punctate, with scattered erect setae, 3.7× wider than 1 eye diameter. Canthus with 11 setae. Vertex rounded. Occipital area with scattered small punctures toward sides. Antenna 10-segmented; club 1.4× longer than preceding 6 segments combined.

Pronotum wider than long (2:1) and 2.0× wider than frons, 1.3× wider than head including eyes. Pronotal disc glabrous, with small, shallow punctures irregularly distributed on disc, but less dense laterally and basally; lateral margins obtusely angled, widest at middle, lateral marginal bead with small crenulations and long setae; anterior marginal bead with some setae at sides; anterior angles obtuse, scarcely prominent; posterior angles widely obtuse, rounded . Scutellum 1.4× wider than long, with 18 shallow, minute punctures. Elytron 2.5× longer than wide, disc glabrous, glossy, shallow and irregularly punctate, with striae vaguely indicated. Epipleural border with many short setae.

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Propygidium densely covered with short yellow setae. Pygidium convex (Fig. 21), glossy, with sparse short setae throughout; apical margin widely rounded, with 10 short setae. Pterosternum with long, abundant yellowish setae. Second to fifth abdominal sternites convex, with many short setae; posterior border of 5th sternite slightly depressed; anal plate large, shallowly excavated, finely rugo-punctate with some erect setae, posterior margin widely curved, clearly notched at middle, with few short setae. Protibia as long as protarsus (1:1). Metatibia shorter than metatarsus (1.0:1.1). Tarsal claws with large tooth at middle of ventral border (Fig. 33).

Parameres symmetrical, long, fused dorsally, strongly curved downward with large tooth-like projection on the middle of distal surface; phallobase long, convex; sclerotized support of aedeagus widened apically and curved upward, and with sclerotized accessories on the dorsum of pre-apical membranous sac (Figs. 34–36). Length of genital capsule from the apex of parameres to the border of basal piece 5.0 mm.

FEMALE ALLOTYPE

Similar to male, except: Body length 19.0 mm. Humeral width 7.4 mm. Antennal club 0.9× longer than the preceding 5 segments combined. Sternites with dense vestiture of short setae. Anal plate convex, with posterior border widely projecting. Surface of pygidial disc punctate, with abundant erect setae; strongly prominent pre-apically, rounded. Ventral genital plates convex, glabrous, not fused, with inner border sinuate. Dorsal genital plates fused, sclerotized, with 2 longitudinal keels along midline, apical border widely rounded with few scattered setae (Fig. 37).

VARIATION

Male: The only other male examined has a body length of 17.3 mm and humeral width of 6.6 mm. Dorsal color slightly darker than holotype. Punctation of head is slightly denser, and vestiture of pronotum and abdomen is longer than in holotype.

Female: The second female examined has a body length of 19.3 mm and humeral width of 7.5 mm.

TYPE MATERIAL

HOLOTYPE: male—MEXICO: Sinaloa, Choix, Los Tascates, 09-VII-2009, 1,488 m, Adilene (IEXA). ALLOTYPE: female—same data as holotype except 20-VII-2009, Graciela (IEXA). PARATYPES: 1 female—same data as holotype except Graciela (MXAL). 1 male—MEXICO: Chihuahua, Morelos, Los Tascates, 09-VII-2009, 1,488 m, G. A. Lugo (MXAL).

TYPE LOCALITY

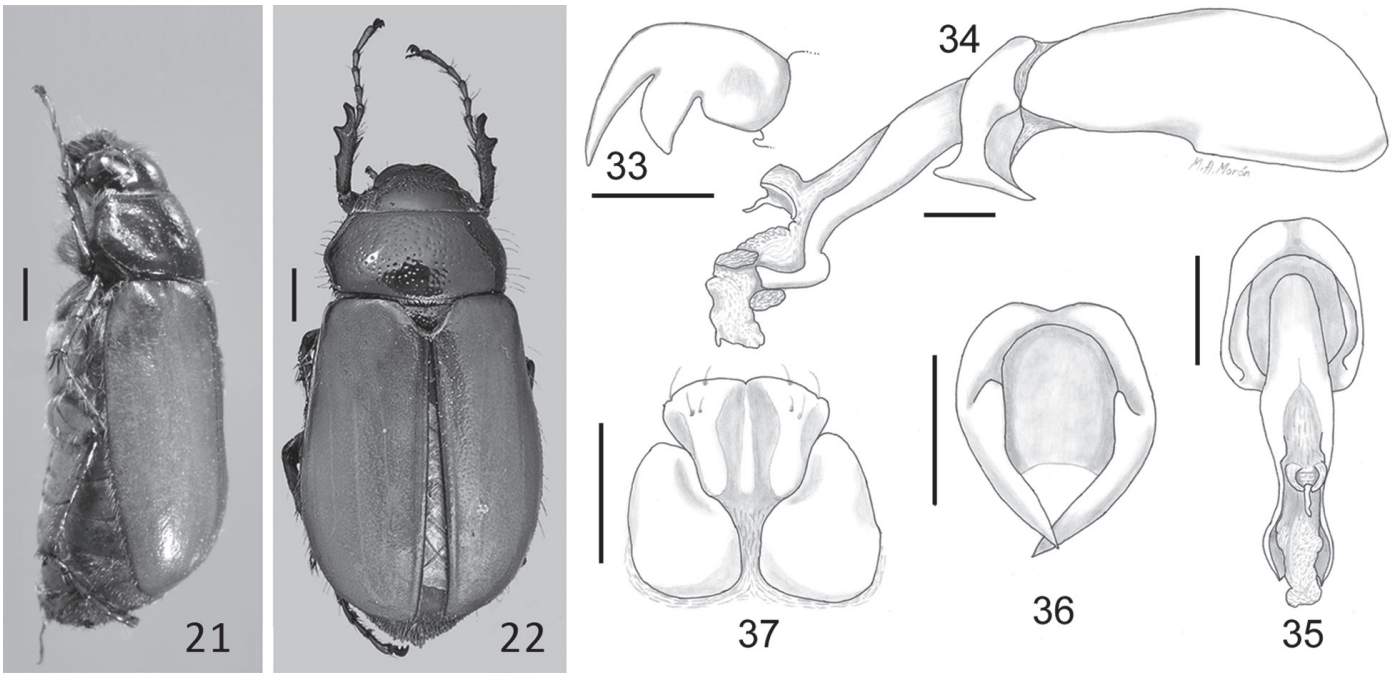
Los Tascates, Choix, Sinaloa, Mexico (26°38'45.4"N, 107°51'8.8"W).

BIOLOGICAL DATA

Specimens of *P. collaroides* were collected in a pine–oak forest at 1,488 m elevation using a black-light trap and white-fluorescent–light trap in Jul (4 specimens). Other species of *Phyllophaga* flying at the same time and place were *P.* (*Phytalus*) *obsoleta* (Blanchard), *P.* (*Phyllophaga*) *ravida* (Blanchard), *P.* (*P.*) *vetula* (Horn), *P.* (*P.*) *opaca* (Moser), *P.* (*P.*) *setifera* (Burmeister), *P.* (*L.*) *reyesolivasi* **sp. nov.**, and *P.* (*Listrochelus*) *tascatensis* **sp. nov.**

TAXONOMIC REMARKS

Phyllophaga collaroides is part of the "blanchardi" species group (sensu Morón 1986). This group is one of the largest and most complex within the subgenus *Phyllophaga* (*s.str.*), with some undescribed Mexican species and subspecies, and frequently represented by large numbers in light-trap samples. The group is currently under study by the senior author. *Phyllophaga collaroides* looks quite different from *P. collaris* (Moser) externally, but the form of parameres of the 2 species is very similar. Shape of the clypeus, pro-



Figs. 33–37, with Figs. 21–22. Habitus and morphological characters of *Phyllophaga collaroides*, **new species**. **21–22.** Habitus of males: 21. lateral view, 22. dorsal view, scale bar = 2 mm. **33–37.** Morphological characters: 33. male tarsal claw; 34–36. male genital capsule: 34. lateral view, 35. dorso-distal view, with aedeagus, 36. distal view; 37. female genital plates, ventral view; scale bar = 1 mm, except in Fig. 33 = 0.5 mm.

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portions of the antennomeres, form of the tarsal claws, and punctation of the elytra are similar between the two, but in *P. collaris* body size is much smaller (10.5–11.5 mm); the abdominal sternites have few setae; the pygidial surface is glabrous and coarsely rugose; the male anal plate is moderately expanded; and the female pygidium is uniformly convex. In *P. collaroides* body size is larger (15.5–17.3 mm); the abdominal sternites are covered with many short setae; the pygidial surface is densely punctate and setiferous; the male anal plate is widely expanded; and the female pygidium has a large pre-apical prominence.

ETYMOLOGY

The Latinized name of the new species references the genital similarity between it and *Phyllophaga collaris* (Moser).

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