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New Species of *Phyllophaga* Harris (Coleoptera: Scarabaeidae: Melolonthinae) from northeastern Mexico

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Melolonthinae) from northeastern Mexico.

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New Species of *Phyllophaga* Harris (Coleoptera: Scarabaeidae: Melolonthinae) from northeastern Mexico.

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Abstract. Three new species of *Phyllophaga* are described from northeastern Mexico: *P. (s.str.) gramma* n. sp. from grasslands near Monterrey city, state of Nuevo Leon; *P. (s.str.) jeanmathieui* n. sp. from mixed forests of Sierra Chipinque, Nuevo Leon; and *P. (Listrochelus) pinophilus* n. sp. from pine-oak forests of mountains in Nuevo Leon and Coahuila. Illustrations of diagnostic structures and comments about the relations of each species are provided.

Key words. May beetles, taxonomy, pine-oak forests, grassland.

Resumen. Se describen tres especies nuevas de *Phyllophaga* procedentes del noreste de México: *P. (s.str.) gramma* n. sp. de los pastizales cercanos a la ciudad de Monterrey, Nuevo León; *P. (s.str.) jeanmathieui* n. sp. de los bosques mixtos de la Sierra de Chipinque, Nuevo León; y *P. (Listrochelus) pinophilus* n. sp. de los bosques mixtos en las montañas de Nuevo León y Coahuila. Se incluyen ilustraciones de las estructuras diagnósticas y comentarios sobre las relaciones de cada una de las especies descritas.

Palabras clave. Escarabajos de mayo, taxonomía, bosques de pino y encino, pastizal.

Introduction

The Scarabaeoidea from northeastern Mexico are poorly studied, although the ecological conditions in many localities are quite varied and interesting. This area frequently represents the limits between temperate and subtropical forests, natural grasslands, and desert, or mixed communities with many elements of xeric shrubs.

From 1962 to 1969, Jean M. Mathieu and Milton W. Sanderson collected extensive samples of *Phyllophaga* species in diverse localities of the Mexican states of Nuevo Leon, Coahuila, and Tamaulipas, obtaining data on plant hosts and notes on flying habits of some. Some samples included new or rare records for species previously known from northern Mexico or southern Texas, but others represented undescribed taxa, retained in the private collections of Mathieu and Sanderson awaiting study. But some years ago these collections were deposited in our institutions, and we have the opportunity to work on the identification of these important specimens. In this paper 2 new species of the subgenus *Phyllophaga* and 1 new species of the subgenus *Listrochelus* are described and figured.

Materials

Characters and terms used in the descriptions are those of Saylor (1942), Sanderson (1958), and Morón (1986, 2003). In this work the phylogenetic species concept of Wheeler and Platnick (2000) is applied. Drawings were made with the aid of a Leica MZ8 stereomicroscope provided with a camera lucida. Measurements were obtained with an ocular micrometer or caliper. Specimens are deposited in the Florida State Collection of Arthropods, Gainesville (FSCA), Canadian Museum of Nature, Ottawa

(CMNC), Instituto de Biología, UNAM, Mexico City (CNIN), Instituto de Ecología, A.C., Xalapa, Veracruz, Mexico (IEXA) and Miguel Angel Morón collection (MXAL).

***Phyllophaga (Phyllophaga) gramma* Morón and Woodruff, new species**

(Figures 1-8)

Description. Holotype male. Total body length: 11.7 mm. Humeral width: 5.0 mm. Head and pronotum shiny, dark reddish brown; elytra velvety reddish brown; abdomen and legs shiny yellowish brown. Clypeus with scattered erect short setae, 2.4 times wider than long, anterior border strongly elevated, anterior margin broadly curved, disk surface nearly flattened, briefly rising at middle, densely covered with round punctures. Frontoclypeal suture clearly impressed, sinuate at middle. Frons 2.8 times wider than long, broadly convex, rugo-punctate with sparse medium sized erect setae on disk.

Antenna with 9-antennomeres and 3-lamellate club, lamellae 2.2 times longer than length of preceding 5 antennomeres combined; antennomeres 3 and 4 each same length, antennomere 5 as long as preceding 2; antennomere 6 much shorter than 5 with acute prominence on anterior side. Frons 4.8 times wider than dorsal diameter of eye. Eye canthus long, narrow, with 12 setae (Fig. 1). Labrum reniform, slightly concave, with scattered setae along borders. Mentum nearly flat, with scarce punctures and slender setae at sides, anterior border briefly sinuate.

Pronotum 1.7 times wider than long and 2.4 times wider than frons. Pronotal disk with many erect, slender setae and round punctures irregularly separated by 1-4 diameters; anterior bead complete, with long, slender setae; lateral borders broadly angled, lateral marginal bead weakly crenulate, with slender, long setae; basal bead indicated by regular row of punctures, with long setae near middle; anterior angles slightly obtuse, rounded; posterior angles broadly obtuse, weakly prominent (Fig. 1).

Scutellum 1.4 times wider than long, without punctures; anterior border broadly sinuate, with many long setae.

Elytron 2.3 times longer than wide, pruinose, with setiferous punctures densely and irregularly distributed on disk; a group of erect, long setae around scutellum, and scattered short setae near the apex; epipleural border progressively narrowed toward apex, with fringe of long setae; humeral callus rounded, prominent; apical callus rounded. Metathoracic wings completely developed.

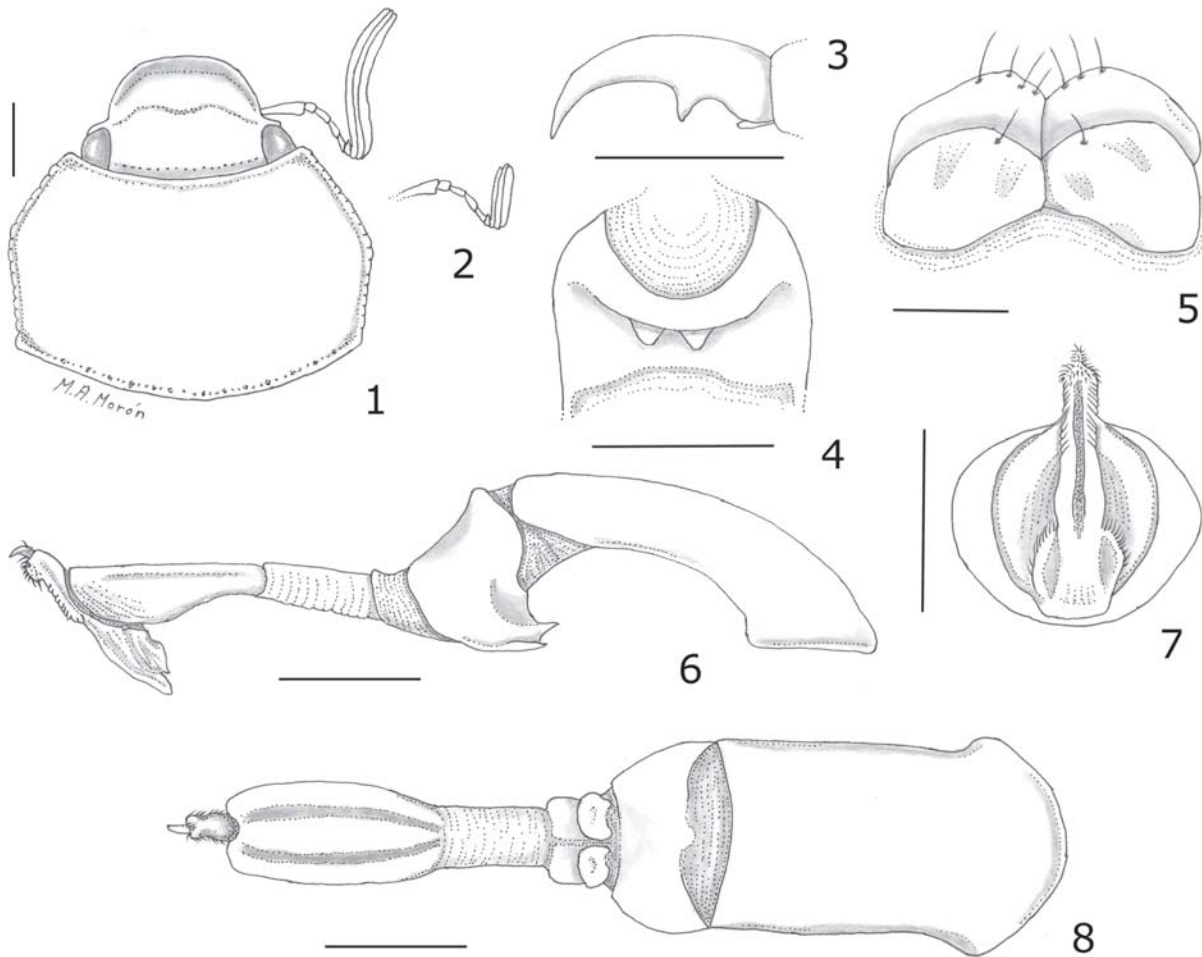
Pterosternum with many yellowish, long setae. Visible abdominal sternites 2 to 5 with white pruinosity and scattered yellow setae at sides, shallowly depressed at middle; anal plate short, narrow, with weak transverse keel near basal margin and brief depression at middle, and scattered long setae along posterior border.

Propygidium dull, densely punctuate, with many short setae. Pygidium shiny, widely convex, with numerous, shallow punctures, and medium sized setae, regularly distributed; apical margin with 14 slender setae; basal margin narrow, not distinct at middle.

Protibia slightly shorter than protarsus (0.9:1), with 2 large teeth and a basal small tooth on external border, preapical spur acute, straight, shorter than 2nd protarsomere. Mesotibia with an oblique, well-marked, setiferous carina and small setiferous teeth on external side; upper apical spur with acute apex, as long as lower spur. Metatibia slightly shorter than metatarsus (0.9:1), with an oblique setiferous carina and small setiferous tooth on external side; upper apical spur articulated, slightly curved, apex rounded, nearly as long as basal metatarsomere, and 1.3 times longer than lower spur; lower apical spur articulated, nearly straight, apex rounded. Protarsomeres 1-4 semicylindrical elongate with enlarged apex, with scattered ventral setae and crown of apical setae. Meso- and meta-tarsomeres semicylindrical, elongate, with enlarged apex, crown of apical setae, and 2 rows of setae along ventral side. Tarsal claws dentate, with ventral tooth small, acute, located toward base (Fig. 3).

Genital capsule with short, widened, curved parameres fused dorsally and ventrally, apex with 2 small rounded teeth (Fig. 4, 6-8). Aedeagus with poorly sclerotized tube-like support; inner sac with apical sclerotized claw and many latero-ventral minute spines (Fig. 6-8). Tectum wide, uniformly convex. Length of genital capsule from apex of parameres to border of basal piece: 3.4 mm.

Allotype female. Similar to male except as follows: total body length: 14.5 mm. Humeral width: 5.4 mm.; antennal club as long as preceding 5 antennomeres combined (Fig. 2); head and pronotal punctua-



Figures 1-8. *Phyllophaga gramma*. **1)** Head and pronotum. **2)** Female antenna. **3)** Male fore tarsal claw. **4)** Parameres, ventral view. **5)** Female genital plates, ventral view. **6)** Genital capsule with extended aedeagus, lateral view. **7)** Parameres and aedeagus, distal view. **8)** Genital capsule, dorsal view. Scale lines = 1 mm, except in Fig.3 = 0.5 mm.

tion deeper. Visible abdominal sternites 2 to 4 convex, with scattered, short setae near midline; sternite 5 enlarged, with many punctures and long setae; anal plate short, widely convex, with shallow punctures and slender setae. Both apical spurs of metatibia widened, curved, with rounded apices. Ventral genital plates sclerotized, short, nearly symmetrical, broadly convex, with rounded distal border, each with 1 apical seta; dorsal genital plates not fused, large, with distal border slightly angled, with 3-4 apical setae (Fig. 5).

Variation. Body varies from 11.4 mm to 14.6 mm in length and 4.9 to 5.5 mm in humeral width.

Type Series. (Described from 38 males and 11 females). Holotype male; MEXICO: Nuevo Leon, 7 km sur Monterrey, 17-II-1962, on gramma flying close to ground, J. Mathieu (FSCA). Paratypes (37 males, 11 females): same data as holotype, (10 males, 1 female FSCA; 4 males IEXA; 2 males MXAL); same data except 17-II-1967 (4 males IEXA). Nuevo Leon, 4 km S Galeana, 13-V-1961, J. Mathieu (1 male, FSCA); Nuevo Leon, El Cercado, 11-III-1967, J. Mathieu (8 males FSCA); Nuevo Leon, Cañón de Iturbide, 30-VII-1969, on *Rhus pachyrhachis*, J. Mathieu and M. W. Sanderson (1 female FSCA); Nuevo Leon, Cañón de Iturbide, 8-VII-1969, black light trap, M. W. Sanderson, J. Mathieu and D. Cadena (1 male FSCA). Nuevo Leon, Santiago, San Francisco, 22-IV-1989, 540 m, luz, N. Celestino (3 pairs MXAL; 2 pairs CMNC; 2 pairs CNIN, 2 females IEXA).

Type Locality. Parque Nacional Cumbres de Monterrey, Monterrey municipality, state of Nuevo Leon, Mexico (25°36' 49"N; 100° 18' 29" W).

Biological Data. Apparently this species only inhabits grasslands and open pine-oak forests located at 500-600 m of elevation in the northern slopes of Cumbres de Monterrey, on the road to Villa de Santiago and south of Galeana. Specimens studied were collected during February (22), March (8), April (16), May (1) and July (2), but most of the males were taken at dusk during February flying close to ground over short tall grass (*gramma*), apparently searching for females hidden between soil and grass. One female was collected feeding on leaves of *Rhus pachyrhachis* Hemsl. (Anacardiaceae). All the specimens from Santiago were attracted by electric lights during April. The date of capture of many specimens, mainly from south of Monterrey city, is very early in comparison with the usual phenology of the genus in Central Mexico (May-July).

Remarks. *Phyllophaga gramma* is similar to the species group "anodentata" as defined by Morón (1986), but has the antennae with 9, rather than 10, antennomeres, and the structure of the male anal plate is very simple, nearly convex, without tooth-like projection on the basal border. The ring-shaped parameres are as in other members of this group, but details in the form of apical border and ventral teeth, as well as the shape and microstructures of the aedeagus, are clearly different from other species.

Etymology. We recognize the early studies on this species, giving the same name proposed on labels by Sanderson and Mathieu, *gramma*, in reference to its habits on the short grasses, so called grama, Spanish name with Latin root (*gramen*, *graminis*, *gramineus*; Jaeger, 1955) applied to many species of wild and cultivated grasses in Mexico.

***Phyllophaga (Phyllophaga) jeanmathieui* Morón and Woodruff, new species**

(Figures 9-14)

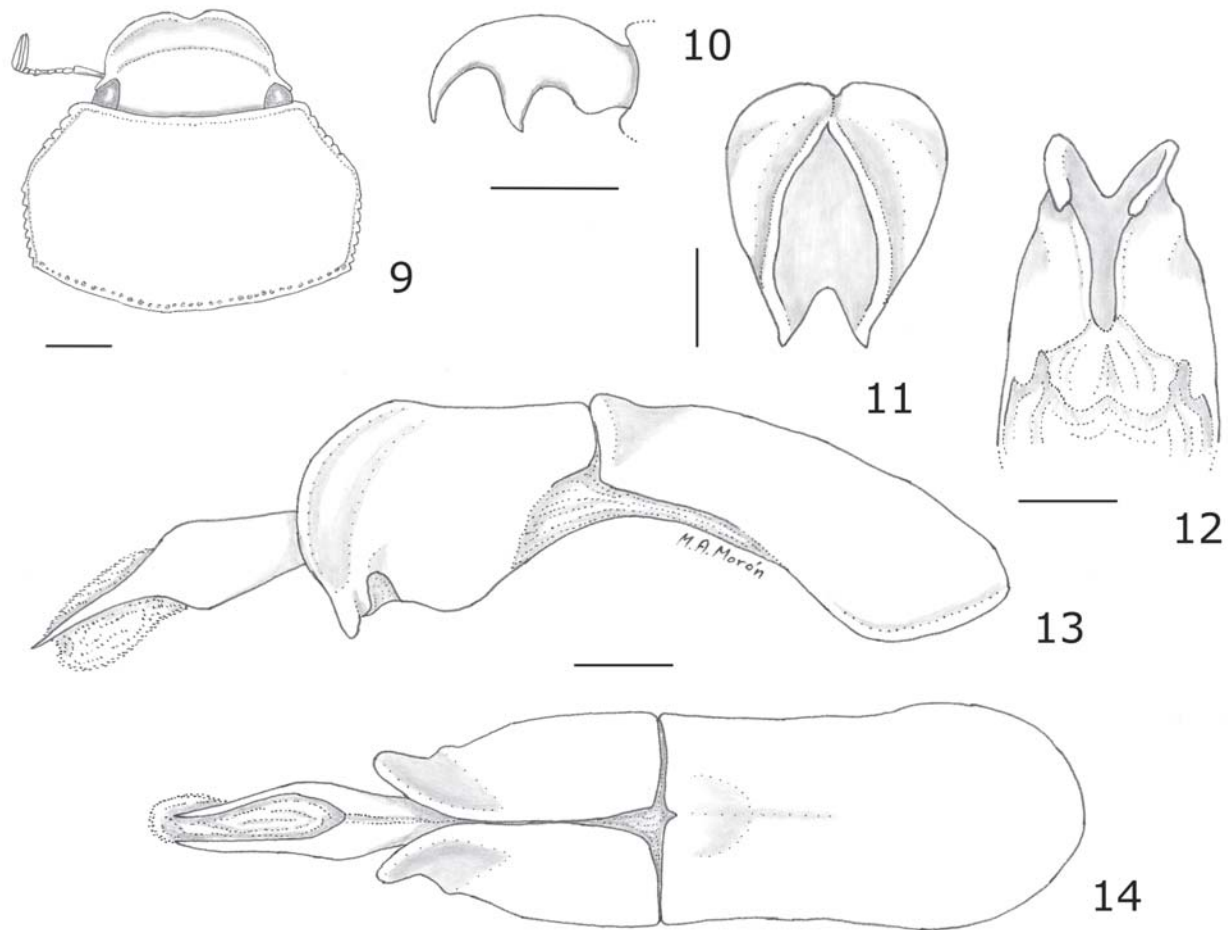
Description. Holotype male. Total body length: 20.0 mm. Humeral width: 8.4 mm. Head, pronotum, elytra, abdomen and legs shiny, dark to reddish brown. Clypeus with scattered erect short setae, 3.3 times wider than long, anterior border slightly elevated, anterior margin broadly notched, disk surface convex, coarsely rugo-punctuate. Frontoclypeal suture nearly straight, partially hidden by coarse punctures. Frons 2.2 times wider than long, convex, densely rugo-punctuate with sparse medium size erect setae on disk.

Antenna with 10 antennomeres and 3-lamellate club, lamellae 1.2 times longer than length of preceding 5 antennomeres combined; antennomeres 3 and 4 each with same length, antennomere 5 as long as preceding but slightly wider; antennomere 6 much shorter than 5 with rounded prominence on anterior side; antennomere 7 as short as preceding but anterior prominence slightly flattened. Frons 5 times wider than dorsal diameter of eye (Fig. 9) Eye canthus long, narrowed, with 9 setae. Labrum bilobed, deeply notched, with setae along borders. Mentum concave, with scarce punctures and slender setae at sides, anterior border slightly notched.

Pronotum 1.6 times wider than long and 1.8 times wider than frons. Pronotal disk with many round punctures irregularly separated by 1-5 diameters, each puncture with minute seta; anterior bead complete, narrowed, with long, slender setae; lateral borders broadly angled, lateral marginal bead narrow, strongly crenulate, with slender, long setae; basal bead weakly impressed at sides, but indicated by regular row of punctures with long setae on middle third; anterior angles slightly obtuse, prominent; posterior angles broadly obtuse, weakly prominent (Fig. 9).

Scutellum 1.6 times wider than long, glabrous, without punctures; anterior border broadly sinuate.

Elytron 2.8 times longer than wide, with punctures densely and irregularly distributed on disk, virtually glabrous, with whitish pruinosity on central part of first elytral interstria, and some scattered rows of short setae near lateral borders; epipleural border progressively narrowed toward apex, with some long setae near basal end; humeral callus rounded, prominent; apical callus rounded. Metathoracic wings completely developed.



Figures 9-14. *Phyllophaga jeanmathieui*. **9)** Head and pronotum. **10)** Male fore tarsal claw. Parameres: **11)** distal view. **12)** ventral view. Complete genital capsule: **13)** lateral view. **14)** dorsal view. Scale lines: Fig. 9 = 2 mm, Fig. 10 = 0.5 mm, Fig. 11-14 = 1 mm.

Pterosternum with many yellowish, long setae. Visible abdominal sternites 2 to 5 with weak white pruinosity and scattered yellow setae at sides, sternites 2 to 4 broadly convex at middle, shiny, glabrous; sternite 5 with scattered punctures and short setae on posterior half, and transverse depression near posterior border; anal plate short, shallowly excavated, with narrow basal and distal margins and scattered erect setae on each side. Propygidium with whitish pruinosity, densely punctuate, with many minute setae. Pygidium shiny, broadly convex, with numerous rounded punctures, and short, erect setae, regularly distributed; apical margin with 10 slender setae; basal margin narrow, not distinct at middle.

Protibia slightly shorter than protarsus (0.9:1), with 2 large teeth and a basal small tooth on external border, preapical spur with rounded apex, straight, as long as 2nd protarsomere. Mesotibia with an oblique, well-marked, setiferous carina and small setiferous teeth on external side; lower apical spur with acute apex, shorter than upper spur (broken). Metatibia shorter than metatarsus (1:1.3), with an oblique transverse setiferous carina and small setiferous tooth on external side; upper apical spur articulated, slightly curved, apex rounded, nearly as long as basal metatarsomere, and 1.3 longer than lower spur; lower apical spur articulated, nearly straight, apex rounded. Protarsomeres 1-4 semicylindrical elongate with enlarged apex, with scattered ventral setae and crown of apical setae; tarsomeres 1-2 each with ventro-apical short tubercle. Meso- and metatarsomeres semicylindrical, elongate, with enlarged apex, crown of apical setae; mesotarsomeres with a row of scattered setae along ventral side; metatarsomeres with 2 rows of stout setae ventrally. Tarsal claws dentate, with ventral tooth long, acute, located near the middle of ventral border (Fig. 10).

Genital capsule with short, distally widened parameres not fused dorsally or ventrally, each apex with small rounded tooth (Fig. 11-14). Aedeagus with narrow sclerotized tube-like support with preapical slender spine on each side; inner sac membranous with microscopic granules (Fig. 13-14). Tectum wide, uniformly convex. Length of genital capsule from apex of parameres to border of basal piece: 6.2 mm.

Female. Unknown.

Type Series. (Described from 1 male). Holotype; MEXICO: Nuevo Leon, Sierra de Anahuac, Mesa de Chipinque, 21-VI-1969, trampa luz negra, J. Mathieu and M. W. Sanderson (FSCA).

Type Locality. Mesa de Chipinque, Monterrey municipality, state of Nuevo Leon, Mexico (25°36' 49"N; 100° 18' 29" W).

Biological Data. This species inhabits pine-oak forests located at 600 m of elevation near Monterrey city. The only known specimen was obtained during June, attracted by black light trap.

Remarks. *Phyllophaga jeanmathieui* is closely similar to the ungrouped species *P. regiomontana* Morón, but the body of *P. regiomontana* is more slender, has rows of long setae at each side of elytral suture, and scattered long setae near lateral and apical borders (Morón 2001), also the shape of parameres is distinct, with acute apical spines directed externally.

Etymology. Respectfully, we named this new species for Jean M. Mathieu, enthusiastic Mexican collector of beetles who studied many interesting species of *Phyllophaga* in northern Mexico.

***Phyllophaga (Listrochelus) pinophilus* Morón and Woodruff, new species**

(Figures 15-21)

Description. Holotype male. Total body length: 11.8 mm. Humeral width: 4.7 mm. Head and pronotum shiny, reddish brown; elytra shiny, yellowish brown; abdomen and legs shiny reddish brown. Clypeus glabrous, 1.5 times wider than long, anterior border slightly elevated, anterior margin broadly curved, slightly sinuate at middle, disk nearly flattened, slightly rising at middle, with numerous round punctures, separated nearly 1 diameter from each other. Frontoclypeal suture clearly impressed, slightly sinuate at middle. Frons 1.2 times wider than long, nearly flattened, glabrous, with many round punctures irregularly distributed; occipital carina well-marked, occipital surface with scattered punctures, mainly at sides (Fig. 15).

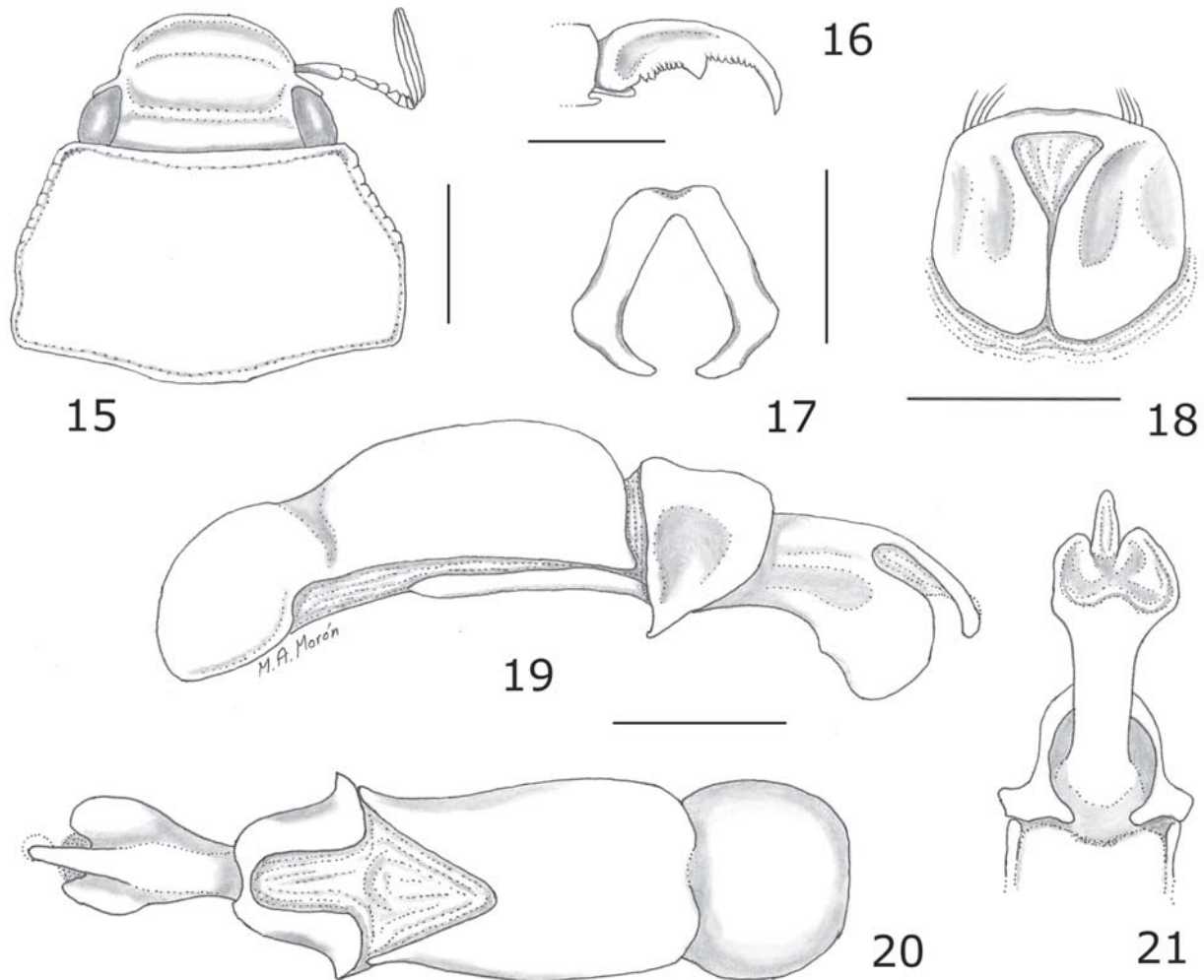
Antenna with 10 antennomeres and 3-lamellate club, lamellae 2.8 times longer than length of preceding 5 antennomeres combined; antennomeres 3 and 4 equal in length; antennomeres 5 and 6 shorter than preceding, each with prominence on anterior side, segment 7 much short, hidden at base of antennal club. Frons 3.3 times wider than dorsal diameter of eye. Eye canthus long, narrow, with 9 setae (Fig. 15). Labrum reniform, broadly concave, with scattered setae along borders. Mentum shallowly concave, with scarce punctures and slender setae at sides, anterior border slightly sinuate.

Pronotum 1.7 times wider than long and 2.5 times wider than frons. Pronotal disk glabrous, with small, round punctures regularly distributed, except along smooth midline; anterior bead narrowed, complete, without setae; lateral borders broadly angled, lateral marginal bead clearly crenulate, with slender, long setae; basal bead very thin, but complete, without setae; anterior angles broadly obtuse, rounded; posterior angles broadly obtuse, not prominent (Fig. 15).

Scutellum 1.2 times wider than long, with punctures on posterior half; anterior border broadly sinuate, with many short setae.

Elytron 2.5 times longer than wide, shiny, glabrous, with abundant punctures irregularly distributed on disk; epipleural border progressively narrowed toward apex, with irregular row of slender, short setae; humeral callus rounded, prominent; apical callus rounded. Metathoracic wings completely developed.

Pterosternum with many yellowish, long setae. Visible abdominal sternites 2 to 5 with white pruinosity and scattered yellow setae at sides, slightly convex at middle; anal plate wide, convex, with row of short



Figures 15-21. *Phyllophaga (Listrochelus) pinophilus*. **15)** Head and pronotum. **16)** Male fore tarsal claw. **17)** Parameres, distal view. **18)** Female genital plates, ventral view. Complete genital capsule: **19)** lateral view. **20)** dorsal view. **21)** Aedeagus and parameres, ventral view. Scale lines = 1 mm, except in Fig. 15 = 2 mm, Fig. 16 = 0.5 mm.

setae along posterior border. Propygidium shiny, with many small punctures and some minute setae. Pygidium shiny, widely convex, glabrous, with numerous, shallow punctures regularly distributed; apical margin with 16 slender, short setae; basal margin narrow, not distinct at sides.

Protibia slightly shorter than protarsus (0.8:1), with 2 large teeth and 1 basal small tooth on external border, preapical spur acute, straight, as long as 2nd protarsomere. Mesotibia with an oblique, well-marked, setiferous carina and small setiferous teeth on external side; upper apical spur with acute apex, longer than lower spur. Metatibia as long as metatarsus (1:1), with an oblique setiferous carina and small setiferous tooth on external side; upper apical spur articulated, straight, sharply pointed, longer than basal metatarsomere, and 1.4 times longer than lower spur; lower apical spur articulated, slightly curved, apex rounded. Protarsomeres 1-4 semicylindrical elongate with enlarged apex, with scattered ventral setae and crown of apical setae. Meso- and meta tarsomeres semicylindrical, elongate, with enlarged apex and crown of apical setae, and a narrow keel along ventral side, with scattered erect setae. Ventral border of tarsal claws serrate, with acute, small tooth near middle (Fig. 16).

Genital capsule with short, widened, curved parameres fused dorsally, apex narrowed (Fig. 17, 19-21). Aedeagus with sclerotized tube-like support with apex deeply cleft at each side (Fig. 19-20); inner sac membranous with scarce minute spines. Tectum strongly convex. Length of genital capsule from apex of parameres to border of basal piece: 3.1 mm.

Allotype female. Similar to male except as follows: total body length: 13.3 mm. Humeral width: 5.4 mm.; antennal club slightly longer than preceding 5 antennomeres combined; pronotal punctuation deeper; anal plate slightly longer; pygidium smaller, less convex. Ventral and dorsal genital plates sclerotized, fused distally, nearly symmetrical, convex, with slightly rounded distal border, with 3-4 setae near lateral angles (Fig. 18).

Variation. Body length varies from 11.2 mm to 13.7 mm in length and 4.3 to 5.9 mm in humeral width. Color of elytra varies from yellowish to reddish brown.

Type Series. (Described from 22 males and 18 females). Holotype male; MEXICO: Nuevo Leon, Cerro del Potosí (base), 2 km del ejido 18 de marzo, 1-VII-1969, en pino agujas cortas, J. M. Mathieu and M. W. Sanderson (FSCA). Paratypes (21 males, 18 females): same data as holotype, (4 males, 5 females FSCA, 2 pairs IEXA, 2 pairs MXAL); Nuevo Leon, Zaragoza, Sierra de Guacamayas, 2/3-VII-1969, hospedero *Pinus ayacahuite* var. *brachyptera* Shaw, J. M. Mathieu and M. W. Sanderson (1 male, 1 female IEXA); Nuevo Leon: 6 km S Galeana, 30-VI-1969, J. M. Mathieu and M. W. Sanderson (2 males FSCA, 2 males CMNC, 2 males MXAL); Nuevo Leon: 7 km S Galeana, 3-VIII-1968, en *Pinus montezuma*, J. M. Mathieu y C. Reyes (4 females FSCA, 1 pair IEXA, 1 pair MXAL); Coahuila, Sierra de La Encantada, rancho La Encantada, 16-VII-1969, en *Pinus cembroides*, J. M. Mathieu, M. W. Sanderson and E. Friezer (1 female FSCA,); same data except 17-VII-1969, en pino piñonero (1 male IEXA, 2 males IEXA); same data except: en *Quercus mohriana* (1 pair FSCA).

Type Locality. Cerro Potosí, Galeana municipality, state of Nuevo Leon, Mexico (24°51' 12"N; 100° 13' 35" W).

Biological Data. This species inhabits pine-oak forests located at 2300-3100 m elevation in the mountains between Sierra de la Encantada, Coahuila and the region of Galeana, Nuevo Leon, including Cerro Potosi. Studied specimens were obtained during July (32) and August (8), frequently in coupling pairs, most of them on the needles of *Pinus ayacahuite* Ehr., *P. montezuma* Lamb. and *P. cembroides* Zucc. (rarely on leaves of *Quercus mohriana* Buckl.ex Rydb.).

Remarks. *Phyllophaga* (L.) *pinophilus* is a member of the "parilis" species group (*sensu* Morón, 1986) possessing similar genitalia, except that the sclerotized support of the aedeagus is nearly symmetrical. The shortened parameres are as in other members of this group, but the form of its apical half, broadly angled and latero-basally prominent, is clearly different from other species in the subgenus.

Etymology. The specific epithet is derived from Latin *pinus*, pine, and ancient Greek *philos*, loving, fond of (Jaeger 1955), in reference to its host.

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