

Revision of the *Phyllophaga* s.s. *schizorhina* species group (Coleoptera: Melolonthidae: Melolonthinae)

Miguel-Angel Morón¹

Departamento de Entomología, Instituto de Ecología, A.C. Apartado Postal 63, Xalapa, Veracruz 91000, Mexico

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Abstract—The *Phyllophaga schizorhina* (Bates) species group is revised, and the following new species are described from specimens collected in Mexico, Guatemala, Nicaragua, Costa Rica, Panama, and Ecuador: *P. changuena* sp. nov., *P. onoreana* sp. nov., *P. solisiana* sp. nov., *P. schizorhinoides* sp. nov., *P. boruca* sp. nov., *P. izabalana* sp. nov., *P. canoana* sp. nov., *P. chortiana* sp. nov., *P. zarcoana* sp. nov., *P. chiblacana* sp. nov., *P. javepacuana* sp. nov., *P. ocozocuana* sp. nov., *P. chimoxtila* sp. nov., *P. cholana* sp. nov., *P. tuxtleca* sp. nov., *P. zaragozana* sp. nov., *P. matacapana* sp. nov., *P. catemacoana* sp. nov., *P. atratoides* sp. nov., *P. humboldtiana* sp. nov., *P. comaltepecana* sp. nov., *P. dsaimana* sp. nov., *P. quiana* sp. nov., *P. yoloxana* sp. nov., and *P. pseudoatra* sp. nov. *Phyllophaga schizorhina* and *P. nigrita* are recorded for first time from Costa Rica. A key is provided for males of the 38 species. Diagnostic structures of all species are illustrated and distribution maps are provided.

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Résumé—On trouvera ici la révision du groupe d'espèces de *Phyllophaga schizorhina* (Bates) avec la description des nouvelles espèces suivantes du Mexique, du Guatemala, du Costa Rica, du Panama et de l'Équateur : *P. changuena* sp. nov., *P. onoreana* sp. nov., *P. solisiana* sp. nov., *P. schizorhinoides* sp. nov., *P. boruca* sp. nov., *P. izabalana* sp. nov., *P. canoana* sp. nov., *P. chortiana* sp. nov., *P. zarcoana* sp. nov., *P. chiblacana* sp. nov., *P. javepacuana* sp. nov., *P. ocozocuana* sp. nov., *P. chimoxtila* sp. nov., *P. cholana* sp. nov., *P. tuxtleca* sp. nov., *P. zaragozana* sp. nov., *P. matacapana* sp. nov., *P. catemacoana* sp. nov., *P. atratoides* sp. nov., *P. humboldtiana* sp. nov., *P. comaltepecana* sp. nov., *P. dsaimana* sp. nov., *P. quiana* sp. nov., *P. yoloxana* sp. nov. et *P. pseudoatra* sp. nov. *Phyllophaga schizorhina* et *P. nigrita* sont recensées pour la première fois au Costa Rica. Une clé d'identification permet de distinguer les mâles des 38 espèces. Les structures distinctives de toutes les espèces sont illustrées et des cartes de répartition sont dressées.

[Traduit par la Rédaction]

Introduction

Publications on the taxonomy, habits, biology, distribution, economic importance, and keys to the 380 species of the genus *Phyllophaga* Harris listed for the continental area between northern Mexico and Ecuador are scarce (Blackwelder 1944; Cano and Morón 1998; Solís and Morón 1998; Morón *et al.* 1998). Morón (1986) proposed an introductory treatment to the genus in Mexico, and a supraspecific classification with a key to 7 subgenera, 37 species groups, and 5 species complexes represented in Mexico,

¹ Corresponding author (e-mail: moron_ma@ecologia.edu.mx).

but no similar studies are available for other Latin American countries. Between 1986 and 2001, 80 new species were described from this area, but nearly 100 species await description. Nearly 600 species of *Phyllophaga* s.l. are known between Mexico and Ecuador. The species group "*schizorhina*" defined by Morón (1986: 241) included 11 species of the genus *Phyllophaga* s.s. from Mexico to Panama.

Until recently, most of the species in the group "*schizorhina*" were known only from type specimens, and little ecological and geographical data were published. They are poorly represented in collections, perhaps because of their small isolated populations, limited flight time, or rare habits. The examination of type specimens and material collected since 1940, including recent and productive collecting trips to southeastern Mexico and Guatemala, have produced numerous new species. Four Mexican species [*P. scissa* (Bates), *P. angulicollis* (Bates), *P. plairi* (Saylor), *P. certanca* Saylor] previously included in the group "*schizorhina*" by Morón (1986) are considered now as members of other species groups. A diagnosis of the group of species, descriptions or redescriptions of adults of 38 species, distribution data, keys to species, and brief comments on each species of the *Phyllophaga schizorhina* group are provided.

Materials and methods

Repository abbreviations

AMNH	American Museum of Natural History, New York, United States of America
CAS	California Academy of Sciences, San Francisco, United States of America
CIBIO	Centro Iberoamericano de la Biodiversidad, Universidad de Alicante, España
CNC	Canadian National Collection of Insects and Arachnids, Ottawa, Canada
CUNY	Cornell University, New York, United States of America
ECOSUR	Colegio de la Frontera Sur, Chiapas, Mexico
EGRC	Personal collection of Edward G. Riley Collection, College Station, Texas, United States of America
IBUNAM	Instituto de Biología, Universidad Nacional Autónoma de México, Mexico City, Mexico
IEXA	Instituto de Ecología, A.C. Xalapa, Veracruz, Mexico
INBIO	Instituto Nacional de Biodiversidad, Santo Domingo de Heredia, Costa Rica
HAHC	Personal collection of Henry and Anne Howden, Canadian Museum of Nature, Ottawa, Canada
LACM	Los Angeles County Museum, California, United States of America
MELN	Museo Entomológico de León, Nicaragua
MNHN	Museum National d'Histoire Naturelle, Paris, France
MXAL	Personal collection of Miguel A Morón, Xalapa, Veracruz, Mexico
NHM	Natural History Museum, London, United Kingdom
QCAZ	Pontificia Universidad Católica de Ecuador, Quito, Ecuador
TAMU	Texas A & M University, College Station, Texas, United States of America
UNSM	University of Nebraska State Museum, Lincoln, Nebraska, United States of America
USNM	United States of America National Museum, Washington, District of Columbia, United States of America
UVGC	Universidad del Valle de Guatemala, Guatemala
ZMHU	Zoologische Museum für Naturkunde, Berlin, Germany

Illustrations were drawn with the aid of a camera lucida adapted to a stereo microscope. Measurements were obtained with an ocular micrometer or caliper. Technical terms used in descriptions are those of Böving (1942), Saylor (1942), Sanderson (1958), and Morón (1986).

Taxonomic treatment

Description of the *Phyllophaga* “*schizorhina*” species group

Body elongate, robust, slightly widened posteriorly; dorsal integument shiny black, dark or reddish brown, rarely with greenish blue vitreous luster; dorsal areas mostly glabrous, sometimes with scattered vestiture of short or minute setae, or rarely with dense vestiture of short setae, or scale-like setae; male and female tarsal claws usually similar, with acute tooth near basal prominence shorter than apical tooth, located toward basal dilation or near the middle of ventral border (Figs. 2, 18, 31). Ratio of head width : prothorax width 0.6–0.7:1; eyes large, prominent; clypeus short with anterior border notched, or nearly bilobed, anterior angles rounded, or slightly acute; eye canthi moderately wide, rounded at apex, bearing 10–12 erect setae. Antennae with 10 antennomeres, antennal club length subequal (Fig. 48), or shorter than remaining segments (Fig. 100). Pronotum 1.5–1.6 times wider than long, with posterior angles obtuse, rounded or weakly acute. Elytron with humeral and apical calla prominent, rounded; epipleural border progressively narrowed toward apex, with scattered short setae. Hind wings fully developed. Sternal vestiture scarce. Posterior half of abdominal sternite 5 clearly constricted in relation with preceding sternites (Figs. 7–8). Pygidium convex, moderately to slightly bulging, with basal border widely effaced at middle, bearing 6–10 slender setae on the apical border. Protibia with two large teeth and one small, rounded tooth on external border. Protibial spur nearly straight, 1.4–1.5 times longer than second tarsomere. Protarsomeres longer than protibia (1:0.8). First and second protarsomeres usually with rounded ventro-apical projections. Meso- and meta-tibiae with one transverse, oblique, setiferous carina near middle of external side. Meso- and meta-tarsomeres elongate, widened toward apex, with fringe of apical setae and one ventral row of stout, short setae (Fig. 5). Metatarsomeres longer than metatibia (1.2:1). Sexual dimorphism not pronounced in length of antennal club, surface and micro-sculpture of last sternites, and convexity or texture of pygidium. Both sexes have metatibia with apical spurs articulated, upper spur 1.2–1.3 times longer than lower spur (Fig. 6), female spurs slightly wider than male spurs, with apex less acute. Parameres usually elongate, fused dorso-basally only; aedeagus wide and long, with sclerotized support, macroscopic apical, and preapical spurs, blade- or spine-like. Dorsal genital plates of female usually fused medially (Figs. 16, 29, 38, 56, 65). Females are difficult to distinguish without association with males. Females of nine species are unknown.

At present, the group consists of 38 species distributed in Mexico, Central America, and Ecuador (Appendix A). Many of the species closely resemble one another externally, but the male genitalia are distinctive. For simplicity, the “*schizorhina*” species group is separated into seven subgroups, based on body size, dorsal texture and vestiture, and genital characters. The diagnosis of each subgroup precedes the included species.

Key to males of the *Phyllophaga schizorhina* species group

1. Elytral disk moderately or densely punctate, lacking setae 2
- 1'. Elytral disk rugose, rugose punctate, or densely punctate, usually with scattered, minute or short setae 21

2. Body length 19–30 mm 3
- 2'. Body length 15–19 mm 28
3. Phallobase with dorso-distal border scarcely or moderately expanded, nearly straight, rounded, sinuated, or briefly notched (Figs. 4, 9, 13, 46); parameres short or moderately enlarged 4
- 3'. Phallobase with dorso-distal border noticeably bifurcated or projected as curved, upturned structure (Figs. 69, 71, 74, 133, 140); parameres narrowed and much enlarged 13
4. Body length 20–30 mm 5
- 4'. Body length 19–20 mm (rarely 19–23 mm) 32
5. Anterior half of lateral border of pronotum clearly irregular, crenulate (Fig. 1) 6
- 5'. Anterior half of lateral border of pronotum nearly regular, continuous (Fig. 48) 10
6. Antennal club as long as the preceding six or seven segments; elytra shiny dark brown; dorso-distal border of phallobase notched or projected; aedeagus without large, dorsal, sclerotized hook before the apex 7
- 6'. Antennal club as long as the preceding five segments; elytra dark brown with greenish blue vitreous iridescence; dorso-distal border of phallobase widely sinuated (Fig. 294); aedeagus with large, dorsal, sclerotized hook before the apex (Fig. 293). Oaxaca, Mexico *P. dsaimana* **sp. nov.**
7. Tarsal claws with ventral tooth short, located near the basal prominence (Figs. 2–3); dorso-distal border of phallobase widely or briefly sinuated (Figs. 10, 61) 8
- 7'. Tarsal claws with ventral tooth long, located near the middle of ventral border (Fig. 18); dorso-distal border of phallobase widely rounded or slightly acute (Figs. 20–22). Costa Rica and Panama *P. schizorhinoides* **sp. nov.**
8. Distal half of parameres with lateral, tooth-like, large blades (Fig. 276); aedeagus with wide, strongly sclerotized support, and one large hook at the apex (Fig. 275). Oaxaca, Mexico *P. comaltepecana* **sp. nov.**
- 8'. Distal half of parameres straight (Figs. 4, 59); aedeagus with narrow, weakly sclerotized support 9
9. Ventral membrane of genital capsule without sclerotized plates (Fig. 14); aedeagus with weak sclerotized structures at the apex (Figs. 9–12). Nicaragua to Panama *P. schizorhina* (Bates)
- 9'. Ventral membrane of genital capsule with two sclerotized plates (Fig. 62); aedeagus with two sclerotized asymmetrical hooks near the apex (Figs. 60, 63–64). Ecuador *P. onoreana* **sp. nov.**
10. Tarsal claws with ventral tooth near the basal prominence (Figs. 53–54) 11
- 10'. Tarsal claws with ventral tooth near the middle of ventral border (Figs. 31, 41) 12
11. Phallobase narrowed, with dorso-distal border moderately projected (Figs. 50–51); aedeagus with tube-like, strongly sclerotized support, and two ventral hooks near the apex (Figs. 51–52). Veracruz, Mexico *P. zaragozana* **sp. nov.**
- 11'. Phallobase widened, with dorso-distal border strongly projected (Figs. 282–283); aedeagus with large “Y” shaped, asymmetrical sclerotized structure near the base (Figs. 285–286). Chiapas, Mexico *P. ocozocuana* **sp. nov.**
12. Dorso-distal border of phallobase expanded (Fig. 36); aedeagus with weak sclerotized support and asymmetrical sclerotized structures at the apex (Figs. 32–33, 37). Costa Rica *P. boruca* **sp. nov.**
- 12'. Dorso-distal border of phallobase not expanded, widely sinuated (Fig. 46); aedeagus with strong sclerotized, asymmetrical support, without sclerotized structures at the apex (Figs. 42–43, 47). Guatemala *P. izabalana* **sp. nov.**
13. Anterior half of lateral border of pronotum nearly regular, continuous (Fig. 77) 14
- 13'. Anterior half of lateral border of pronotum irregular, crenulate (Figs. 84, 130) 18
14. Tarsal claws with ventral tooth located slightly toward basal dilation (Figs. 78, 106) 15
- 14'. Tarsal claws with ventral tooth located near middle of ventral border (Fig. 120) 16
15. Antennal club as long as preceding seven segments; dorso-basal border of phallobase briefly rounded (Fig. 83); aedeagus with two curved spines before the apex (Figs. 79–80). Puebla, Mexico *P. necaxa* Saylor
- 15'. Antennal club as long as preceding five segments; dorso-basal border of phallobase greatly projected basally (Fig. 101); aedeagus with apical, asymmetrical, sclerotized plate (Figs. 102–103, 105). Veracruz, Mexico *P. tuxtleca* **sp. nov.**
16. Elytra shiny, dark brown or reddish brown; bifurcation of dorso-distal border of phallobase nearly symmetrical, with each apex rounded (Figs. 69, 71, 111–112, 114); sclerotized support of aedeagus with asymmetrical rounded apex 17

- 16'. Elytra dark brown, with greenish blue vitreous iridescence; bifurcation of dorso-distal border of phallobase asymmetrical, with each apex expanded (Figs. 121, 123, 125); sclerotized support of aedeagus with preapical, asymmetrical tooth-like structure (Figs. 122–124). Chiapas, Mexico, and western Guatemala *P. javepacuana* **sp. nov.**
17. Parameres 1.8 times longer than width of phallobase, with parallel apex (Fig. 69); dorso-basal border of phallobase projected basally (Fig. 74); apical half of sclerotized support of aedeagus widened and angled (Figs. 70–72). Chiapas, Mexico. *P. ginigra* Saylor
- 17'. Parameres 2.5 times longer than width of phallobase, with crossed apex (Fig. 111); dorso-basal border of phallobase widely rounded and briefly notched (Fig. 112); apical half of sclerotized support of aedeagus widened and sinuose (Figs. 113–115). Oaxaca, Mexico *P. humboldtiana* **sp. nov.**
18. Tarsal claws with ventral tooth located slightly toward basal dilation. (Fig. 131); dorso-distal border of phallobase with an asymmetrical sclerotized structure curved upward (Fig. 133); aedeagus without spines 19
- 18'. Tarsal claws with ventral tooth located near middle of ventral border. (Fig. 85); dorso-distal border of phallobase asymmetrically bifurcated (Figs. 86, 90, 93, 95–96); aedeagus with sclerotized curved spines before apex (Figs. 87–88, 91, 94). Tamaulipas and Nuevo León, Mexico *P. saylora* Sanderson
19. Tectum with shallow longitudinal sulcus (Figs. 140, 145) 20
- 19'. Tectum with deep longitudinal sulcus and one strong carina at each side (Figs. 132–134). Hidalgo and Puebla, Mexico *P. atra* (Moser)
20. Parameres thickened, 1.6 times longer than phallobase width; median structure of dorso-distal border of phallobase widened and glabrous (Figs. 139–140, 142). San Luis Potosí, Mexico *P. pseudoatra* **sp. nov.**
- 20'. Parameres slender, 2 times longer than phallobase width; median structure of dorso-distal border of phallobase narrowed, with many erect setae (Figs. 144–145, 147). Veracruz, Mexico *P. atratoides* **sp. nov.**
21. Pygidium tumescent, coarsely tubercled, with shallow depressions or longitudinal carina (Figs. 179, 190, 202) densely punctate to rugose punctate; anterior half of lateral border of pronotum nearly regular, continuous (Figs. 151, 164, 173); parameres without ventral notch 22
- 21'. Pygidium slightly and uniformly convex, moderately punctate; anterior half of lateral border of pronotum irregular, crenulate (Fig. 225); parameres with ventral notch (Fig. 228). Veracruz, Mexico *P. matacapana* **sp. nov.**
22. Abdominal sternites 2–5 with pairs of rounded tubercles along midline 27
- 22'. Abdominal sternites 2–5 convex, without tubercles along midline 23
23. Each abdominal sternite without tufts of long setae at each side 24
- 23'. Each abdominal sternite with a tuft of golden long setae at each side, near to the border of each elytron; genitalia as in Figures 153–161. Southeastern Mexico and western Guatemala *P. rugulosa* (Blanchard)
24. Pronotum glabrous; elytra, pygidium, and sternites with scattered, short or minute setae; apex of parameres convergent; spines of aedeagus shorter than parameres 25
- 24'. Pronotum, elytra, pygidium, and sternites with dense vestiture of whitish, short setae; apex of parameres divergent (Fig. 196); spines of aedeagus much longer than parameres (Fig. 197). Guatemala, Nicaragua, and Costa Rica *P. solisiana* **sp. nov.**
25. Pygidium irregularly punctate. 26
- 25'. Pygidium coarsely rugose punctate; genitalia as in Figures 217–222. Guatemala . . . *P. aenea* (Moser)
26. Pygidium with two wide tubercles toward basal border; parameres with brief distal folds (Figs. 165, 167, 169); aedeagus with small spines. Guatemala *P. chortiana* **sp. nov.**
- 26'. Pygidium slightly tumescent, with one shallow depression at each side near basal border; parameres with wide distal folds (Figs. 207–208); aedeagus with large spines. Veracruz, Mexico *P. subrugosa* (Moser)
27. Abdominal sternites 3–5, prepygidium, and pygidium with whitish scale-like setae; apex of parameres nearly truncate, with acute lateral projections (Figs. 175, 177–178). Guatemala. *P. submetallica* (Bates)
- 27'. Abdominal sternites 3–5, prepygidium, and pygidium with short yellowish setae; apex of parameres rounded, convergent (Figs. 184–186, 189). Chiapas, Mexico. *P. chimoxtila* **sp. nov.**

28. Anterior half of lateral border of pronotum nearly regular, continuous (Figs. 233, 306); tarsal claws with ventral tooth near middle of ventral border. (Figs. 234, 265, 307) 29
- 28'. Anterior half of lateral border of pronotum irregular, crenulate (Figs. 331, 340). Tarsal claws with ventral tooth slightly toward basal dilation. (Figs. 332, 341) 31
29. Parameres symmetrical, 1.5–1.7 times longer than width of phallobase. 30
- 29'. Parameres strongly asymmetrical, nearly as long as the width of phallobase *P. yoloxana* sp. nov.
30. Dorso-distal border of phallobase briefly notched (Fig. 238); aedeagus with two spines at the apex of sclerotized support (Figs. 236–237). Hidalgo, Mexico *P. atrata* (Moser)
- 30'. Dorso-distal border of phallobase deep and widely notched (Fig. 268); aedeagus with two digitiform blades before the apex of sclerotized support (Figs. 267, 269, 271). Izabal, Guatemala *P. zarcoana* sp. nov.
31. Dorso-distal border of phallobase wide and deeply sinuated (Fig. 339); aedeagus with dense vestiture of short setae (Figs. 335, 339). Nicaragua, Costa Rica, and Panama *P. changuena* sp. nov.
- 31'. Dorso-distal border of phallobase nearly straight, narrowed, slightly asymmetrical (Fig. 344); aedeagus asymmetrical sclerotized support and asymmetrical dorsal sclerite near apex (Figs. 343–346) *P. catemacoana* sp. nov.
32. Anterior half of lateral border of pronotum irregular, crenulate (Figs. 253, 298, 315, 324, 249, 356); tarsal claws with ventral tooth near basal dilation (Figs. 254, 299, 316, 325, 350, 357); aedeagus with spines 33
- 32'. Anterior half of lateral border of pronotum regular, continuous (Fig. 242); tarsal claws with ventral tooth near middle of ventral border. (Fig. 243); aedeagus without spines (Figs. 245–246, 249). Nuevo Leon and Tamaulipas, Mexico. *P. rolbakeri* Saylor
33. Dorso-basal border of phallobase briefly or moderately projected basally (Figs. 303, 319, 330) 34
- 33'. Dorso-basal border of phallobase strongly projected basally (Figs. 258, 354, 362) 36
34. Phallobase shortened (Figs. 303, 319); apex of parameres narrowed (Figs. 300, 302, 317, 320); aedeagus with tube-like sclerotized support and ventral spurs (Figs. 301–318) 35
- 34'. Phallobase enlarged (Figs. 327–330); apex of parameres widened (Figs. 326, 329); aedeagus with tube-like sclerotized support and lateral lyre-shaped projections (Figs. 327–328). Guatemala. *P. canoana* sp. nov.
35. Dorso-apical border of phallobase widely notched (Fig. 303); aedeagus with large, asymmetrical sclerite at apex (Figs. 301, 304–305); elytra dark brown with greenish blue vitreous iridescence. Oaxaca, Mexico *P. quiana* sp. nov.
- 35'. Dorso-apical border of phallobase bilobed (Fig. 319); aedeagus without sclerite at apex (Figs. 318, 319–320); elytra shiny dark brown. Chiapas, Mexico *P. cholana* sp. nov.
36. Dorso-apical border of phallobase narrowed and notched (Figs. 358, 351, 354) 37
- 36'. Dorso-apical border of phallobase nearly truncated (Figs. 358, 362); aedeagus longer than phallobase and basal piece (Fig. 360). Huehuetenango, Guatemala *P. mentalis* Saylor
37. Dorso-apical border of phallobase with rounded folds; distal half of parameres short and not flattened (Figs. 256–257, 259). Nicaragua, Costa Rica, and Panama *P. nigrita* (Moser)
- 37'. Dorso-apical border of phallobase with two well-developed lobes; distal half of parameres long and flattened (Figs. 351–353). Huehuetenango, Guatemala *P. chiblacana* sp. nov.

Diagnosis of subgroup 1

Large species (body length 21–30 mm). Head, pronotum, and elytra shiny black, dark, or reddish brown, glabrous. Elytra and pygidium deeply and irregularly punctured. Abdominal sternites 3 and 5 convex and smooth near midline. Both sexes with pygidium more or less convex. Phallobase without projections on the dorso-distal border. Parameres symmetrical, aedeagus without distinct spines or sclerotized structures. Southeastern Mexico to Ecuador.

1. *Phyllophaga (Phyllophaga) schizorhina* (Bates)

(Figs. 1–16)

Lachnosterna schizorhina Bates, 1888: 202.

Lachnosterna schizorhina: Dalla-Torre 1912: 198.

Phyllophaga schizorhina (Bates): Blackwelder 1944: 226.

Phyllophaga (*Phyllophaga*) *schizorhina*: Morón 1982: 97, 1986: 242, 1993: 67, 1997: 249.

Material examined

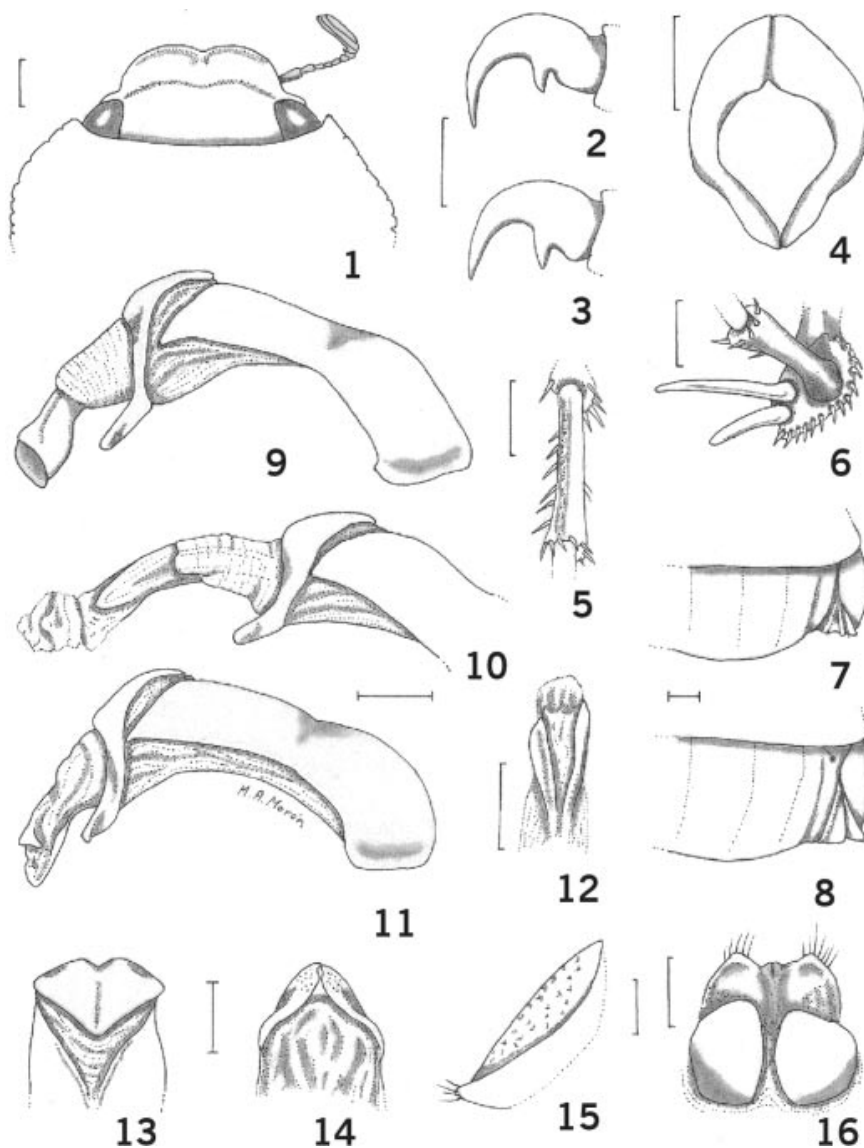
Thirty-eight samples, ♂♀. **Lectotype** ♂: Nicaragua, Chontales, Belt “sp. figured” (NHM). **Paralectotype** ♂: Panama, Chiriqui, Trötsch (NHM) (Morón 1982: 97). **NICARAGUA. Zelaya**: 2 ♂♂, Reserva Biosfera Bosawas, cerro Saslaya, campamento-3, 950 m, iv.1999, JM Maes and B Hernández (MELN). **COSTA RICA. Alajuela**: ♂, San Ramón, Rio San Lorencito, 800 m, 15.vi.1988, A Solís. **Guanacaste**: 2 ♂♂, 1 ♀, Tilarán, Tenorio, Tierras Morenas, Rio San Lorenzo, 1050 m, v.1994, G Rodríguez; 3 ♀♀, same data except viii.1992; ♂, same data except vii.1993; ♂, same data except v.1991, C Alvarado; ♂♀, Estacion Pitilla, 9 km S de Santa Cecilia, 700 m, iii.1994, C Moraga; ♀, same data except 18.iv.1993; 2 ♀♀, same data except vii.1995; ♀, Dos de Tilaran, San Ramón, 1100 m, v.1995, G Rodríguez; ♂, West side volcan Cacao, Estación Cacao, Derrumbe, v.1992 (INBIO). **Puntarenas**: ♂, Parque Nacional Corcovado, Estación Sirena, 100 m, ii.1990, G Fonseca (MXAL); ♂♀, same data except i.1990; ♀, same data except iii.1990; ♀, same data except 21.iv.1992, Z Fuentes; ♀, same data except iv.1992, G Rodríguez; ♂, same data except iv.1989, R Blanco and G Fonseca; ♀, Estación Agujas, Sendero Zamia, 300 m, 15.iv.1996, A Azofeifa; ♂, 14.i.2003, same data except 26.xi.1995; ♂, Península de Osa, Rancho Quemado, 6.ii.1994, AL Marín. **San José**: ♀, Parque Nacional Braulio Carrillo, Estación Carrillo, 730 m, 23.iii.1986, AM Chacón (INBIO). **PANAMA. Chiriqui**: ♂, Renacimiento, N Santa Clara, Finca Hartman, 1340 m, 14.vi.1993, B Ratcliffe y M Jameson (UNSM); ♀, same data (MXAL); ♀, Renacimiento, Santa Clara, 1330 m, 22.v.1982, BC Ratcliffe y C Messenger (MXAL); ♀, same data except, 1500 m, 4.vi.1986, BC Ratcliffe (UNSM). **Panama**: ♂, Cerro Campana, 31.v.1986, BC Ratcliffe (MXAL); 2 ♀♀, same data (UNSM); ♀, same data except 820 m, 22.v.1976 (UNSM).

Etymology

From the Greek *schizo* meaning to split or cleave and *rhinos* meaning a nose; “split nose” (Jaeger 1978) as a reference to the shape of anterior border of the clypeus.

Description

Male. Length 21–24 mm. Antennal club as long as the preceding six segments (Fig. 1). Anterior half of lateral border of pronotum irregular, crenulate. Abdominal sternite 5 without setae at sides. Pygidium widely and uniformly convex (Fig. 7). Tarsal claws with ventral tooth located toward the basal dilatation. (Figs. 2–3). Phallobase with the dorso-distal border briefly sinuated and the dorso-basal border projected basally (Fig. 13). Parameres 1.36 times longer than the width of the phallobase, with the distal half straight and the apex rounded, entire (Fig. 4). Ventral membrane of genital capsule without sclerotized plates (Fig. 14). Aedeagus slightly asymmetrical, with narrow, weakly sclerotized support and poorly sclerotized hook-like structures at the apex (Figs. 9–12). **Female**. Length 22–24 mm. Similar to male except as follows: pygidium slightly and uniformly convex (Fig. 15); ventral genital plates nearly ovate, without setae; apex of dorsal genital plates slightly acute, with setae (Fig. 16).



FIGURES 1–16. *Phyllophaga schizorhina*. 1, head of male, dorsal view; 2, tarsal claw, male from Puntarenas; 3, tarsal claw, male from Chiriqui; 4, parameres, distal view; 5, second hind tarsal segment, ventral view; 6, apex of hind tibia of male, distal view showing the articulation of tibial spurs; 7, abdomen of male, lateral view; 8, abdomen of female, lateral view; 9, genital capsule of male from Zelaya, right lateral view; 10, same, male from Puntarenas; 11, same, male from Chiriqui; 12, apex of aedeagus, dorsal view; 13, phallobase, dorsal view; 14, parameres, ventral view; 15, pygidium of female, lateral view; 16, genital plates of female, ventral view. Scale bars = 1 mm (Figs. 1, 4–16) and 0.5 mm (Figs. 2–3).

Variation

Specimens from Costa Rica and Panama present slight differences in the shape and length of the sclerotized structures placed near the apex of the aedeagus (Figs. 10–11). Some specimens from Panamanian localities are reddish brown.

Biology

This species inhabits localities with diverse plant communities and high rainfall such as cloud forests, tropical rain forests, and montane rain forests located at altitudes from 100 to 1500 m. Months of collection: January (2), February (2), March (4), April (6), May (11), June (4), July (3), August (3), and November (1). Other species flying at the same time and place were *Phyllophaga lissopyge* (Bates), *P. nigrita* (Moser), *P. chorotega* Morón, and *P. changuena* **sp. nov.**

Distribution

Central Nicaragua to central Panama (Fig. 67).

Type locality

“Chontales” (Bates 1888), department of Chontales, Nicaragua (approximately 11°45′–12°20′N, 84°40′–85°35′W).

Remarks

Phyllophaga schizorhina is similar to *P. onoreana* **sp. nov.** from Ecuador, but the absence of sclerotized plates on the ventral membrane and the apex of the aedeagus without defined sclerotized hooks are the main distinctive characters. Morón (1993) and Morón *et al.* (1997) erroneously cited this species from Chiapas, Oaxaca, and Veracruz, Mexico.

2. *Phyllophaga (Phyllophaga) schizorhinoides* **sp. nov.**

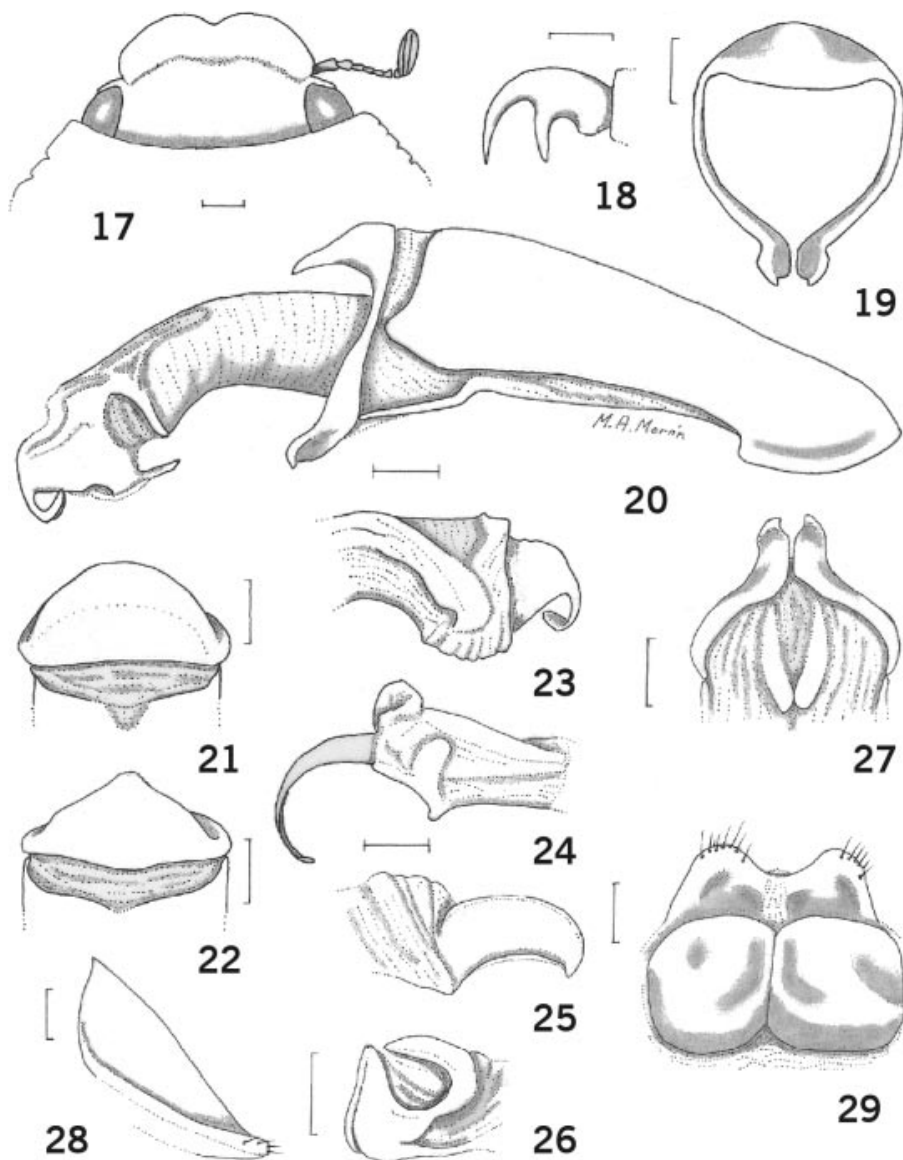
(Figs. 17–29)

Material examined

Twelve specimens, ♂♀. **Holotype** ♂: Costa Rica. Cartago: Parque Nacional Fauna Silvestre Tapantí, 1480 m, xi.1992, G Mora (INBIO). **Allotype** ♀: Costa Rica. Cartago: Parque Nacional Fauna Silvestre Tapanti, Quebrada Salto, 1400 m, 12.ix.1991, F Muñoz (INBIO). **Paratypes: COSTA RICA. Cartago:** ♀, Parque Nacional Fauna Silvestre Tapanti, 1150 m, 1.i.1992, G Mora and F Quezada (MXAL); ♀, same data except 1650 m, ii.1994, G Mora; ♂, P.N. Tapanti, Río Dos Amigos, 1480 m, iii.1994, G Mora, A Solís, and E Ulate (INBIO). **Heredia:** ♀, Parque Nacional Braulio Carrillo, estación Zurqui, tunel, 1500 m, 20.ix.1985, I Chacón (MXAL); ♀, same data except 11.xii.1985, IA Chacón and AM Chacón; ♂, Parque Nacional Braulio Carrillo, Cerro Cacho Negro, 2136 m, 15.vii.1988, A Chacón (INBIO); ♂, San Gerardo de Dota, 2000–2500 m, 22.ii.1992 (INBIO). **Puntarenas:** ♂, Coto Brus, 1500 m, 23.iii.1992, F Araya (MXAL); ♂, Parque Nacional La Amistad, Estación Las Mellizas, Finca Cafrosa, 1300 m, iv.1989, M Ramírez and G Mora (INBIO). **PANAMA. Chiriqui:** ♂, Cerro Punta, 2.vi.1986, BC Ratcliffe (UNSM).

Etymology

From the Greek *schizo* meaning to split or cleave, *rhinos* meaning a nose, and *oeidos* meaning likeness of form; “like a split nose” (Jaeger 1978) as a reference to the similarity with *P. schizorhina*.



FIGURES 17–29. *Phyllophaga schizorhinoides*. 17, head of male, dorsal view; 18, tarsal claw of male; 19, parameres, male from Cartago, distal view; 20, genital capsule, male from Cartago, right lateral view; 21, phallobase, male from Cartago, dorsal view; 22, same, male from Heredia; 23, apex of aedeagus, male from Cartago, left lateral view; 24, apex of aedeagus, male from Cartago, right lateral view; 25, same, male from Heredia, left lateral view; 26, same, male from Chiriqui, ventral view; 27, parameres, male from Cartago, ventral view; 28, pygidium, female from Heredia, lateral view; 29, genital plates of female, ventral view. Scale bars = 1 mm (Figs. 17, 19–29) and 0.5 mm (Fig. 18).

Description

Male (holotype). Length 27 mm. Antennal club as long as the preceding six segments (Fig. 17). Anterior half of lateral border of pronotum irregular, crenulate. Abdominal sternite 5 without setae at sides. Pygidium widely and uniformly convex. Tarsal claws with ventral tooth located near the middle of ventral border (Fig. 18). Phallobase

with the dorso-distal border widely curved, projected, and the dorso-basal border nearly straight (Fig. 21). Parameres 1.25 times longer than the width of phallobase, with the distal half slightly angled and the apex expanded, briefly notched (Fig. 19). Ventral membrane of genital capsule with sclerotized plates (Fig. 27). Aedeagus asymmetrical, with weak sclerotized support and large sclerotized hook-like structures at the apex (Figs. 20, 23–24). **Female** (allotype). Length 29 mm. Similar to male except as follows: pygidium convex, slightly flattened toward the apex (Fig. 28); ventral genital plates slightly squared, without setae; apex of dorsal genital plates widely rounded, with setae (Fig. 29).

Variation

Paratype males from Heredia, Costa Rica, and Chiriqui, Panama, present differences in the shape and length of the sclerotized structures placed at the apex of the aedeagus (Figs. 25–26). Also, male from Heredia have the dorso-distal border of the phallobase slightly angled, projected distally (Fig. 22). Body length 24–29 mm.

Biology

This species inhabits localities with diverse plant communities and high rainfall such as cloud forests and montane rain forests located at altitudes from 1150 to 2500 m. Months of collection: January (1), February (2), March (2), April (1), June (1), July (1), September (2), November (1), December (1). Other species flying at the same time and place were *Phyllophaga lissopyge* (Bates), *P. hemilissa* (Bates), and *P. changuena* **sp. nov.**

Distribution

Central Costa Rica to northwestern Panama (Fig. 67).

Type locality

Parque Nacional Fauna Silvestre Tapantí, province of Cartago, Costa Rica (approximately 9°42'N, 83°42'W).

Remarks

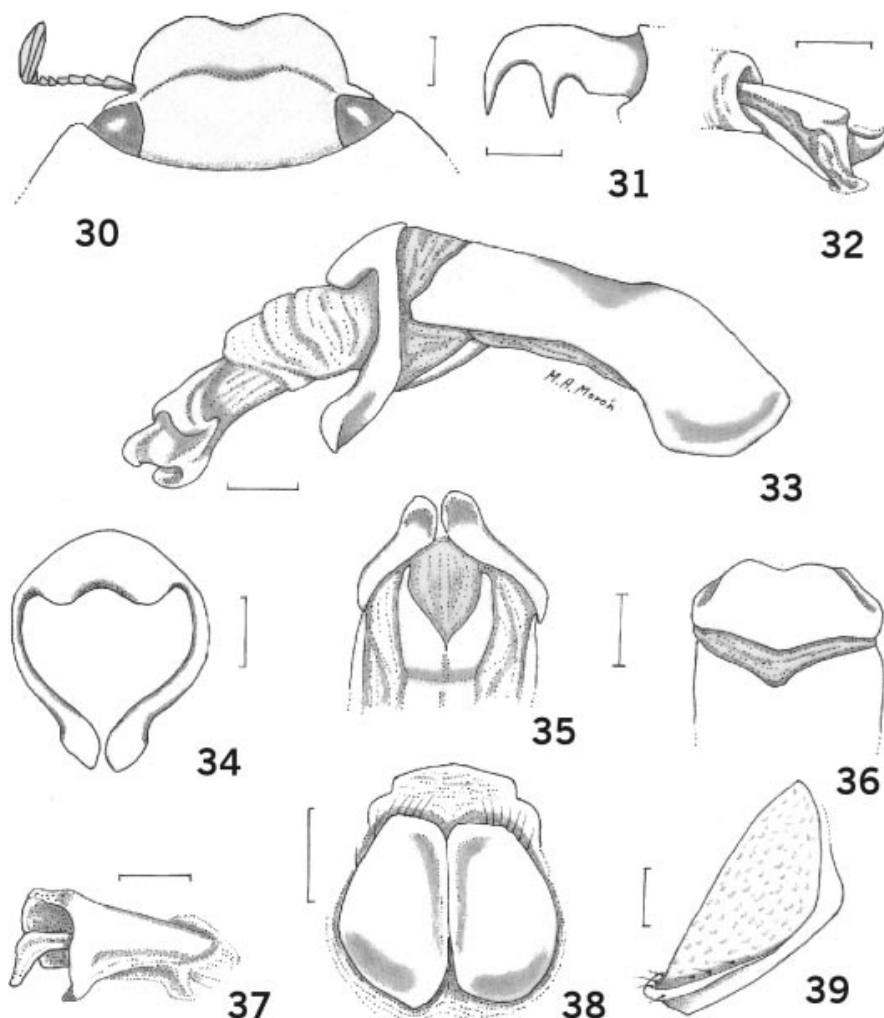
Phyllophaga schizorhinoidea is similar to *P. boruca* **sp. nov.** from Monteverde, Costa Rica, but the shape of the phallobase, thickness of the parameres, structure of the apex of the aedeagus, and shape of the female's ventral genital plates are distinctive.

3. *Phyllophaga (Phyllophaga) boruca* **sp. nov.**

(Figs. 30–39)

Material examined

Seven specimens, ♂♀. **Holotype** ♂: Costa Rica. Puntarenas: Monteverde Forest Reserve, 1500 m, 19.v.1988, B Ratcliffe and M Jameson (UNSM). **Allotype** ♀: Costa Rica. Puntarenas: Monteverde, Campbells Woods, 1520 m, 29.v.1992, B Ratcliffe and M Jameson (UNSM). **Paratypes: COSTA RICA. Puntarenas:** ♀, Reserva Biológica Monteverde, Estación La Casona, 1520 m, iii.1994, N Obando; ♀, same data except v.1993 (INBIO); ♀, same data except 12.v.1996, K Martínez; ♂, same data except vii.1993, N Obando (MXAL); ♂, Reserva Biológica Monteverde, San Luis, 1040 m, iii.1993, Z Fuentes (INBIO).



FIGURES 30–39. *Phyllophaga boruca*. 30, head of male, dorsal view; 31, tarsal claw of male; 32, apex of aedeagus, left lateral view; 33, genital capsule, right lateral view; 34, parameres, distal view; 35, same, ventral view; 36, same, dorsal view; 37, apex of aedeagus, dorsal view; 38, genital plates of female, ventral view; 39, pygidium of female, lateral view. Scale bars = 1 mm (Figs. 30, 32–39) and 0.5 mm (Fig. 31).

Etymology

Derived from the indigenous people named *Borucas* or *Bruncas* who in the recent past lived in some localities of the Pacific slopes of Cordillera de Talamanca, Costa Rica.

Description

Male (holotype). Length 25 mm. Antennal club as long as the preceding six segments (Fig. 30). Anterior half of lateral border of pronotum regular, entire. Abdominal sternite 5 without setae at sides. Pygidium widely and uniformly convex. Tarsal claws with ventral tooth located near the middle of ventral border (Fig. 31). Phallobase with

the dorso-distal border briefly sinuated, and the dorso-basal border slightly projected basally (Fig. 36). Parameres 1.23 times longer than the width of phallobase, with the distal half slightly curved, and the apex expanded (Figs. 33–34). Ventral membrane of genital capsule with sclerotized plates (Fig. 35). Aedeagus asymmetrical, with weak sclerotized support and irregular sclerotized structures at the apex (Figs. 32–33, 37). **Female** (allotype). Length 26 mm. Similar to male except as follows: pygidium convex, slightly flattened toward the apex (Fig. 39); ventral genital plates longer than wide, with scattered setae on the distal border; apex of dorsal genital plates weakly sclerotized, without setae (Fig. 38).

Variation

Paratype specimens only present slight differences in the length of the sclerotized structures at the apex of the aedeagus. Body length 25–26 mm.

Biology

This species inhabits localities with moderate rainfall, in deciduous tropical and montane cloud forests located at altitudes from 1040 to 1520 m. Months of collection: March (3), May (4), and July (1). Another species flying at the same time and place was *Phyllophaga monteverdosa* Morón.

Distribution

Central Costa Rica (Fig. 67).

Type locality

Reserva Biológica Monteverde, province of Puntarenas, Costa Rica (approximately 10°20'N, 84°47'W).

Remarks

Phyllophaga boruca is similar to *P. schizorhinoides* **sp. nov.** from Costa Rica and Panama, but the entire border of the pronotum, shape of the phallobase, thickness of the parameres, structure of the apex of the aedeagus, and shape of genital plates of females are distinctive.

4. *Phyllophaga (Phyllophaga) izabalana* **sp. nov.**

(Figs. 40–47)

Material examined

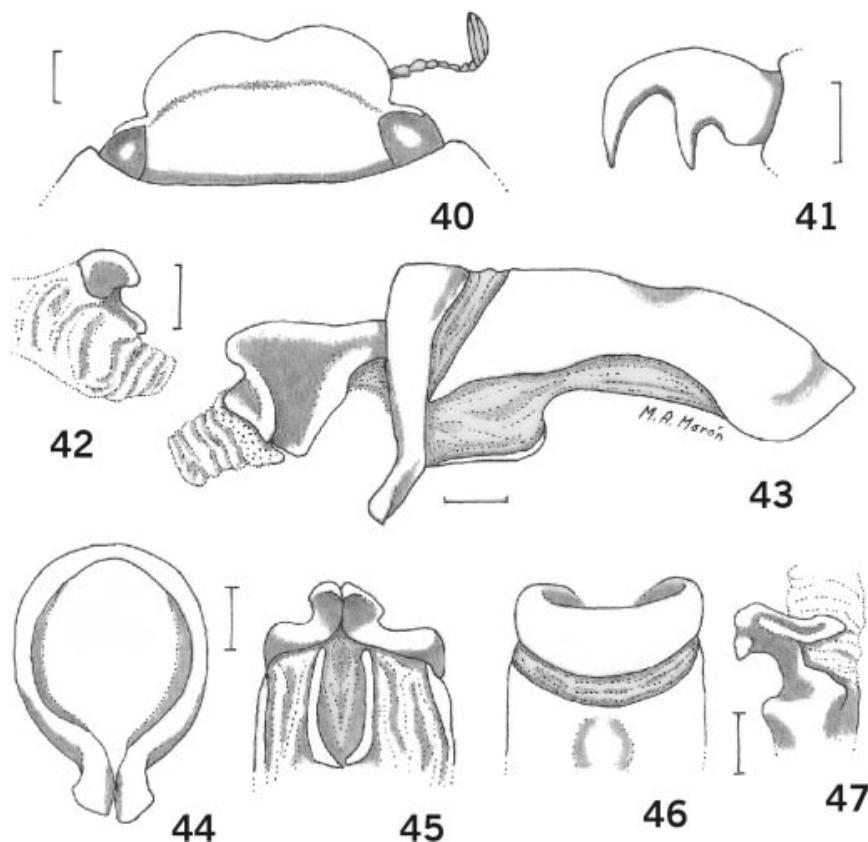
Two specimens, ♂. **Holotype** ♂: Guatemala. Izabal: near Rio Zarco, above El Arenal, 11.iv.1993, E Cano (UVG). **Paratype** ♂, same data as holotype (MXAL).

Etymology

Derived from the indigenous Maya Itza name *Izabal*, applied to a lake in eastern Guatemala and from the adjacent region known as the department of Izabal.

Description

Male (holotype). Length 30 mm. Antennal club as long as the preceding six segments (Fig. 40). Anterior half of lateral border of pronotum regular, entire. Abdominal



FIGURES 40–47. *Phyllophaga izabalana*. 40, head of male, dorsal view; 41, tarsal claw of male; 42, apex of aedeagus, left lateral view; 43, genital capsule, right lateral view; 44, parameres, distal view; 45, same, ventral view; 46, same, dorsal view; 47, apex of aedeagus, dorsal view. Scale bars = 1 mm (Figs. 40, 42–47) and 0.5 mm (Fig. 41).

sternite 5 without setae at sides. Pygidium widely and uniformly convex. Tarsal claws with ventral tooth located near the middle of ventral border (Fig. 41). Phallobase with the dorso-distal border widely sinuated and the dorso-basal border widely curved (Fig. 46). Parameres 1.44 times longer than the width of phallobase, with the distal half angled and the apex expanded (Figs. 43–44). Ventral membrane of genital capsule with narrowed sclerotized plates (Fig. 45). Aedeagus asymmetrical, with strong sclerotized support and asymmetrical sclerotized structures before the apex (Figs. 42–43, 47). **Female.** Unknown.

Variation

Paratype male specimen similar to holotype except in body length (29.4 mm).

Biology

This species is known from a montane cloud forest with high rainfall located at an altitude of 1500 m. Month of collection: April (2). Other species flying at the same time and place were *Phyllophaga obsoleta* (Blanchard), *P. rugipennis* (Schauffus),

P. submetallica Bates, *P. chortiana* sp. nov., *P. canoana* sp. nov., and *P. zarcoana* sp. nov.

Distribution

Eastern slopes of Sierra de Las Minas, Guatemala (Fig. 67).

Type locality

El Arenal, Rio Zarco Grande, department of Izabal, Guatemala (approximately 15°44'N, 89°17'W).

Remarks

Phyllophaga izabalana is similar to *P. boruca* from Costa Rica, but the shape of the phallobase and the sclerotized structure of the aedeagus are distinctive. *Phyllophaga izabalana* is the largest species of the genus *Phyllophaga* from Guatemala.

5. *Phyllophaga (Phyllophaga) zaragozana* sp. nov.

(Figs. 48–56)

Material examined

Three specimens, ♂♀. **Holotype** ♂: Mexico. Veracruz: Catemaco, Pipiapan, 600 m, 20.iv.1991, F Capistrán (MXAL). **Allotype** ♀: Mexico. Veracruz: Santiago Tuxtla, Cerro El Vigía, vii.1962, S Zaragoza (MXAL). **Paratype: MEXICO. Veracruz:** ♂, 2 km E Sontecomapan, 11.iv.1969, M Cabrera (IEXA).

Etymology

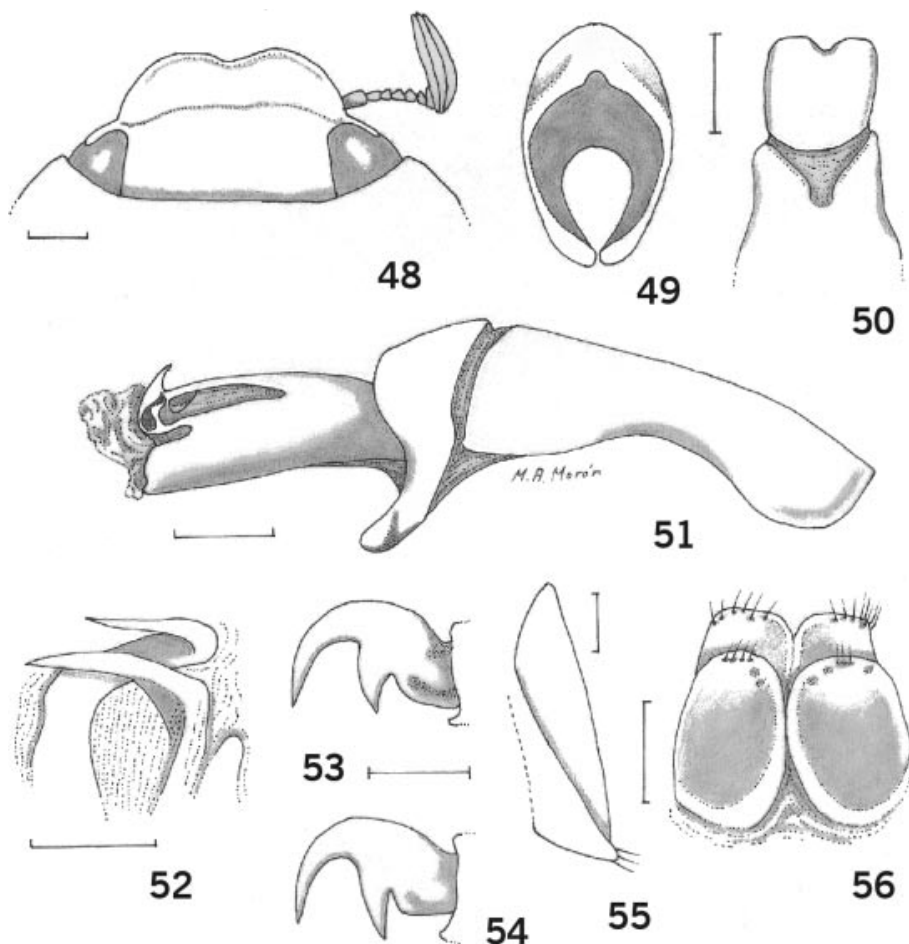
This new species is dedicated to Santiago Zaragoza whose support was invaluable during the author's early studies of beetles.

Description

Male (holotype). Length 24 mm. Antennal club as long as the preceding seven segments (Fig. 48). Anterior half of lateral border of pronotum regular, continuous. Abdominal sternite 5 without setae at sides. Pygidium widely and uniformly convex. Tarsal claws with ventral tooth located toward the basal dilatation (Fig. 53). Phallobase narrowed, with the dorso-distal border briefly sinuated, and the dorso-basal border widely curved (Fig. 50). Parameres 1.60 times longer than the width of phallobase, with the distal half slightly curved and the apex narrowly rounded (Figs. 49–51). Ventral membrane of genital capsule without sclerotized plates. Aedeagus nearly symmetrical, with strong, tube-like, sclerotized support and sclerotized hook-like structures before the apex (Figs. 51–52). **Female** (allotype). Length 26 mm. Similar to male except as follows: pygidium convex, slightly flattened toward the apex (Fig. 55); ventral genital plates longer than wide, with scattered setae near the distal border; apex of dorsal genital plates truncated, with scattered setae (Fig. 56).

Variation

Paratype male specimen is slightly smaller (23 mm) and is mahogany reddish brown, whereas the holotype is black.



FIGURES 48–56. *Phyllophaga zaragozana*. 48, head of male, dorsal view; 49, parameres, distal view; 50, same, dorsal view; 51, genital capsule, right lateral view; 52, apex of aedeagus, dorsal view; 53, tarsal claw of male; 54, tarsal claw of female; 55, pygidium of female, lateral view; 56, genital plates of female, ventral view. Scale bars = 1 mm (Figs. 48–52, 55–56) and 0.5 mm (Figs. 53–54).

Biology

The species inhabits localities in tropical rainforests with high rainfall located at altitudes from 500 to 850 m. Months of collection: April (2) and July (1). Another species flying at the same time and place was *Phyllophaga tenuipilis* (Bates).

Distribution

Sierra de Los Tuxtlas, Veracruz, Mexico (Fig. 67).

Type locality

Parque de la Flora y Fauna Silvestre Papiapan, municipality of Catemaco, Veracruz, Mexico (approximately 18°26'N, 95°10'W).

Remarks

Phyllophaga zaragozana is similar to *P. schizorhina* from Nicaragua, but the length of male antennal club, entire border of the pronotum, shape of the phallobase, structure of the sclerotized support of the aedeagus, and shape of genital plates of the female are distinctive. Morón (1993: 67) erroneously cited some of these specimens as *P. (s.s.) schizorhina* (Bates).

6. *Phyllophaga (Phyllophaga) onoreana* sp. nov.

(Figs. 57–66)

Material examined

Five specimens, ♂♀. **Holotype** ♂: Ecuador. Cotopaxi: La Otonga, 2050 m, 23.ii.1998, A Paucar (QCAZ). **Allotype** ♀: same data as holotype (QCAZ). **Paratypes**: **ECUADOR. Cotopaxi**: ♀, Los Libres, 2000 m, 5.xi.1994, L Endara (MXAL); ♂, Naranjito, Toachi, La Otonga, 2000 m, 2.iii.1994, G Onore (MXAL). **Pichincha**: ♂, M Cornejo Astorga, 1700 m, 12.xi.1991, R Sandora (QCAZ).

Etymology

This new species is dedicated to Giovanni Onore, a well-known entomology teacher, indefatigable collector of beetles, and promoter of wildlife conservation in Ecuador.

Description

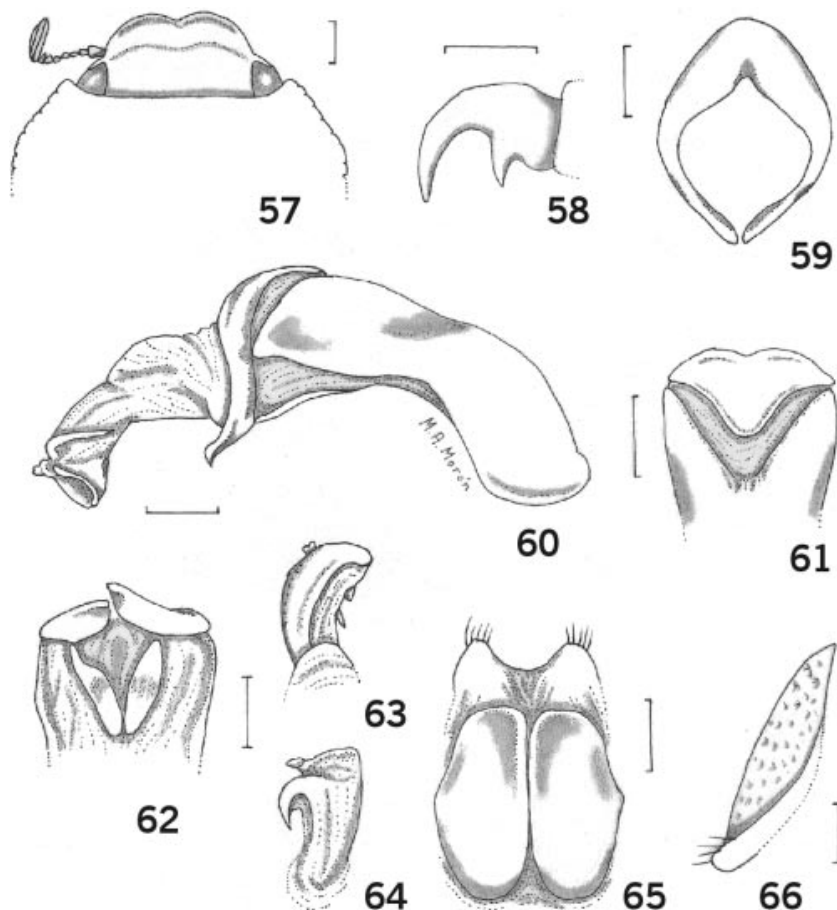
Male (holotype). Length 24 mm. Antennal club as long as the preceding six segments (Fig. 57). Anterior half of lateral border of pronotum irregular, crenulated. Abdominal sternite 5 with scarce setae at sides. Pygidium widely and uniformly convex. Tarsal claws with ventral tooth short, located toward the basal dilatation (Fig. 58). Phallobase with the dorso-distal border briefly sinuated and the dorso-basal border strongly projected basally (Fig. 61). Parameres 1.30 times longer than the width of phallobase, with the distal half nearly straight and the apex narrowly rounded (Figs. 59–60). Ventral membrane of genital capsule with sclerotized plates (Fig. 62). Aedeagus slightly asymmetrical, with weak sclerotized support and two sclerotized hook-like structures near the apex (Figs. 60, 63–64). **Female** (allotype). Length 25 mm. Similar to male except as follows: pygidium convex, slightly bulging toward the base (Fig. 66); ventral genital plates longer than wide, without setae on the distal border; apex of dorsal genital plates rounded, prominent, with scattered setae (Fig. 65).

Variation

Paratypes vary in color, from black to dark or mahogany reddish brown. Body length 22–25 mm.

Biology

This species inhabits localities in tropical montane forests with high rainfall located at altitudes from 1700 to 2050 m. Months of collection: February (2), March (1), and November (2). Specimens collected during February were collected in a bat mist net.



FIGURES 57–66. *Phyllophaga onoreana*. 57, head of male, dorsal view; 58, tarsal claw of male; 59, parameres, dorsal view; 60, genital capsule, right lateral view; 61, parameres, dorsal view; 62, same, ventral view; 63, apex of aedeagus, lateral view; 64, same, dorsal view; 65, genital plates of female, ventral view; 66, pygidium of female, lateral view. Scale bars = 1 mm (Figs. 57, 59–66) and 0.5 mm (Fig. 58).

Distribution

Northern Pacific slopes of Ecuador (Fig. 67).

Type locality

Area de Conservación La Otonga, Toachi, province of Cotopaxi, Ecuador (approximately 0°40'S, 79°05'W).

Remarks

Phyllophaga onoreana is similar to *P. schizorhina* from Nicaragua, but the shape of the phallobase, sclerotized plates on the ventral membrane of genital capsule, form of the sclerotized hook-like structures of the aedeagus, and shape of genital plates of females are distinctive. This is the only species of the “*schizorhina*” group known from South America.

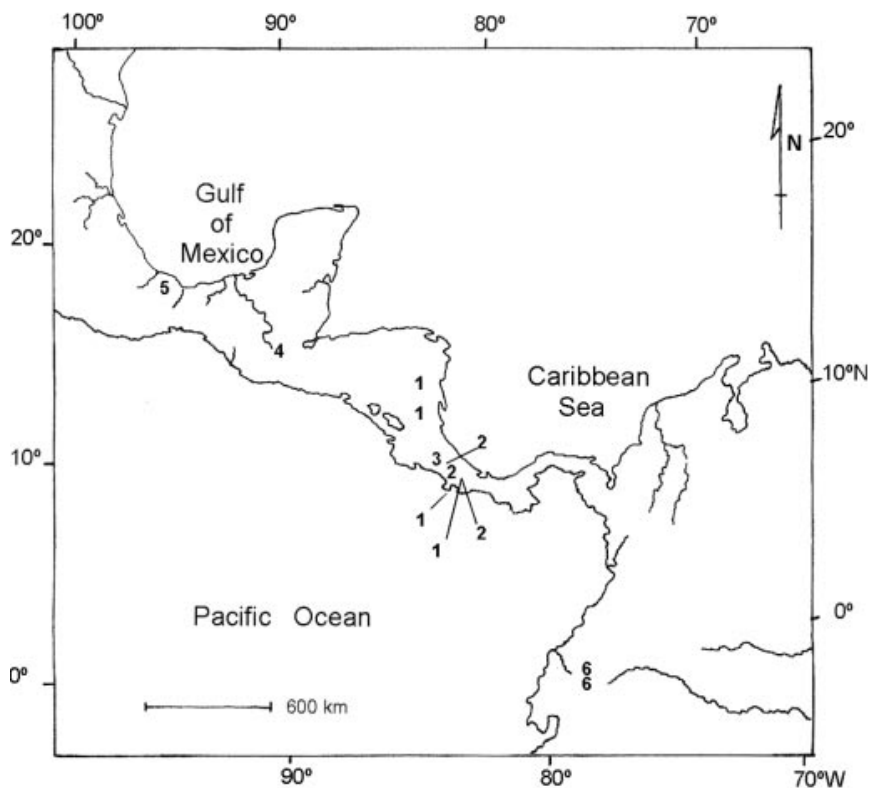


FIGURE 67. Collection localities in Mexico, Central America, and Ecuador of *Phyllophaga schizorhina* (1), *P. schizorhinoides* (2), *P. boruca* (3), *P. izabalana* (4), *P. zaragozana* (5), and *P. onoreana* (6).

Diagnosis of subgroup 2

Large species (body length 19–30 mm). Head, pronotum, and elytra shiny black, dark, or reddish brown, glabrous, rarely with greenish blue vitreous luster. Elytra and pygidium with deep, wide, irregular punctures. Abdominal sternites 3–5 convex and smooth near midline. Males with the pygidium more or less convex. Females with the pygidium concave, convex, or tumescent. Phallobase with two finger-like asymmetrical projections on the dorso-distal border. Parameres symmetrical or slightly asymmetrical; aedeagus with noticeable spines or strong sclerotized structures. Northeastern Mexico to southwestern Guatemala.

1. *Phyllophaga (Phyllophaga) ginigra* Saylor

(Figs. 68–76)

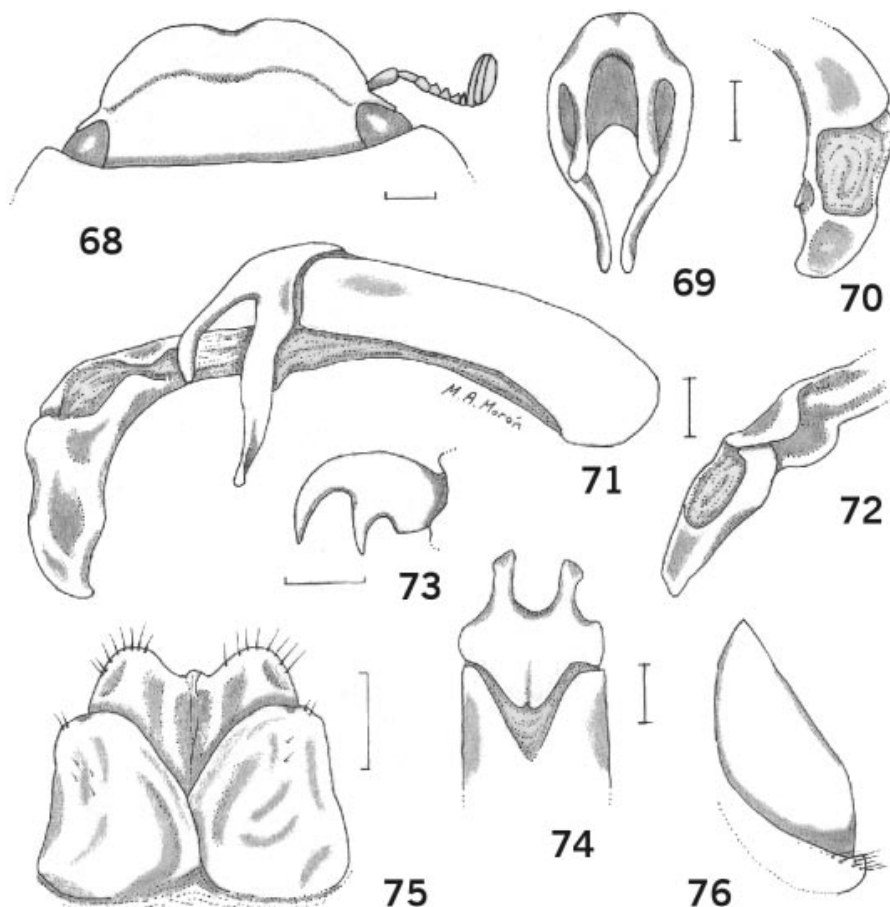
Phyllophaga (Phyllophaga) ginigra Saylor, 1940: 112.

Phyllophaga ginigra: Blackwelder 1944: 224.

Phyllophaga (Phyllophaga) ginigra: Morón 1986: 242, 1993: 67, Morón *et al.* 1997: 245.

Material examined

Four specimens, ♂♀. **Holotype** ♂: “Mexico” (CAS). **MEXICO. Chiapas:** ♂, 8 mi [1 mi = 1.61 km] S Palenque, 15.ix.1985, BC Ratcliffe and C Messenger (UNSM);



FIGURES 68–76. *Phyllophaga ginigra*. 68, head of male, dorsal view; 69, parameres, distal view; 70, apex of aedeagus, right lateral view; 71, genital capsule, right lateral view; 72, apex of aedeagus, dorsal view; 73, tarsal claw of male; 74, parameres, dorsal view; 75, genital plates of female, ventral view; 76, pygidium of female, lateral view. Scale bars = 1 mm (Figs. 68–72, 74–76) and 0.5 mm (Fig. 73).

♀, 9 mi N Ocozocuatla, 18.vii.1973, Mastro and Schaffner (TAMU); ♂, Ishuatán, 14.v.1967, G Halffter (CNC).

Etymology

From the Greek *gigas* meaning giant or mighty and the Latin *niger* meaning black; “black giant” (Jaeger 1978) as a reference to the large and black body of the beetle.

Description

Male. Length 25–26 mm. Antennal club as long as the preceding five segments (Fig. 68). Anterior half of lateral border of pronotum regular, continuous. Abdominal sternite 5 without setae at sides. Pygidium widely and uniformly convex. Tarsal claws with ventral tooth located near the middle of ventral border (Fig. 73). Phallobase with two long, finger-like projections on the dorso-distal border and the dorso-basal border projected basally (Figs. 69, 74). Parameres 1.78 times longer than the width of

phallobase, with the distal half widely curved and the apex rounded, entire (Figs. 69, 71). Ventral membrane of genital capsule without sclerotized plates. Aedeagus asymmetrical, with strong sclerotized support and twisted sclerotized structures at the apex (Figs. 70–72). **Female.** Length 26 mm. Similar to male except as follows: pygidium slightly protruded toward the apex (Fig. 76); ventral genital plates slightly narrowed toward the apex, with minute setae; apex of dorsal genital plates rounded, with setae (Fig. 75).

Variation

Male specimen from Ishuatlán, Chiapas, present slight differences in the shape of the sclerotized structures placed at the apex of aedeagus (Fig. 72).

Biology

This species inhabits diverse plant communities such as tropical rain forests and subdeciduous tropical forests located at altitudes from 160 to 1000 m. Months of collection: May (1), July (1), and September (1). Other species flying at the same time and place were *Phyllophaga obsoleta* (Blanchard), *P. pruinosa* (Blanchard), and *P. chimoxtila* **sp. nov.**

Distribution

Northern and western Chiapas, Mexico (Fig. 150).

Type locality

“Mexico” (Saylor 1940). Here designated Ishuatán, state of Chiapas, Mexico (approximately 17°14'N, 93°02'W).

Remarks

Phyllophaga ginigra is similar to *P. necaxa* Saylor from the mountains of Puebla and Hidalgo, Mexico, but the reduced size of antennal club, larger body size, proportions of phallobase and parameres, and absence of sclerotized hooks on the aedeagus are distinctive. Morón (1993) and Morón *et al.* (1997) erroneously cited this species from Los Tuxtlas, Veracruz, Mexico.

2. *Phyllophaga (Phyllophaga) necaxa* Saylor

(Figs. 77–83)

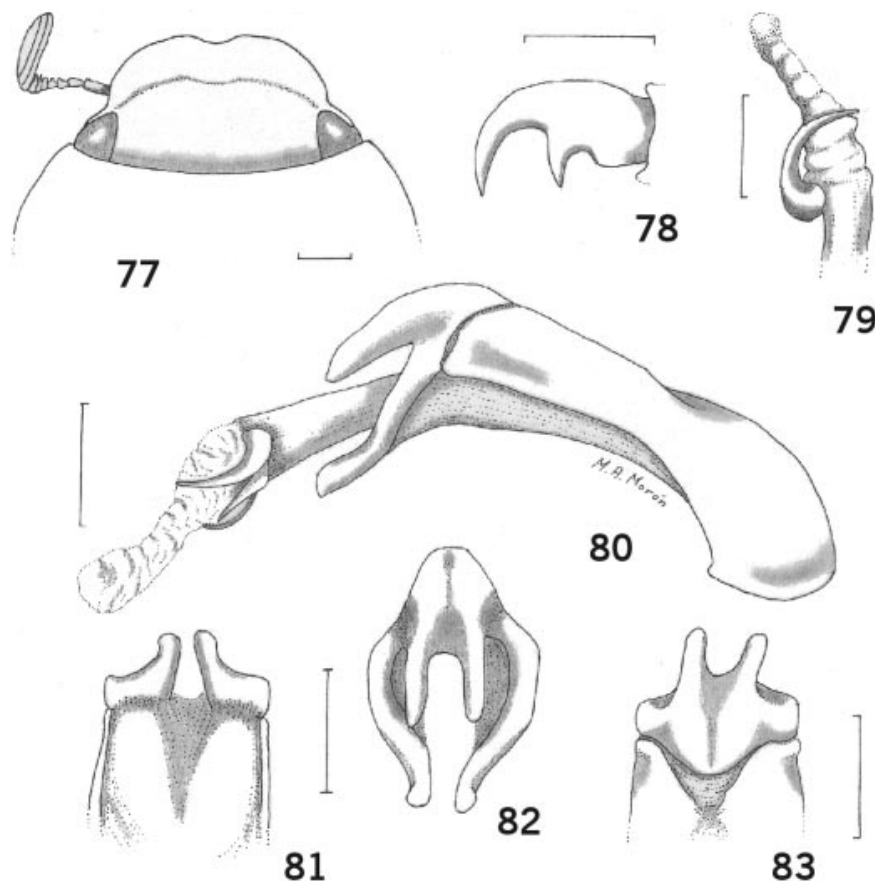
Phyllophaga (Phyllophaga) necaxa Saylor, 1943: 279; Morón 1986: 205; Morón *et al.* 1997: 241.

Material examined

Two specimens, ♂. **Holotype** ♂: Necaxa, Puebla, Mexico (CAS type 7986). **MEXICO. Hidalgo:** ♂, 3 mi N Chapulhuacán Hwy 85, 28.v.1984, D Thomas and BC Ratcliffe (UNSM).

Etymology

Derived from the village name *Necaxa* where the holotype was collected.



FIGURES 77–83. *Phyllophaga necaxa*. 77, head of male, dorsal view; 78, tarsal claw of male; 79, apex of aedeagus, dorsal view; 80, genital capsule, right lateral view; 81, parameres, ventral view; 82, same, distal view; 83, same dorsal view. Scale bars = 1 mm (Figs. 77, 79–83) and 0.5 mm (Fig. 78).

Description

Male. Length 19.0–19.5 mm. Antennal club as long as the preceding seven segments (Fig. 77). Anterior half of lateral border of pronotum regular, continuous. Abdominal sternite 5 without setae at sides. Pygidium widely and uniformly convex. Tarsal claws with ventral tooth located near the middle of ventral border (Fig. 78). Phallobase with two long, finger-like projections on the dorso-distal border and the dorso-basal border moderately projected basally (Figs. 82–83). Parameres 1.52 times longer than the width of phallobase, with the distal half slightly curved and the apex rounded, entire (Figs. 80, 82). Ventral membrane of genital capsule without sclerotized plates (Fig. 81). Aedeagus asymmetrical, with strong sclerotized support and two curved spines on the right side, before the membranous apex (Figs. 79–80). **Female.** Unknown.

Variation

Male specimen from Chapulhuacán is entirely dark brown, nearly black, whereas the holotype is reddish brown.

Biology

This species inhabits mountainous localities with high seasonal rainfall and frequent fog such as cloud forests or humid pine–oak forests located at altitudes from 1300 to 1500 m. Month of collection: May (1). Another species flying at the same time and place was *Phyllophaga rugipennis* (Schauffus).

Distribution

Mountains of northern Hidalgo and Puebla, Mexico (Fig. 150).

Type locality

“Necaxa” (Saylor 1943) Nuevo Necaxa, state of Puebla, Mexico (20°13′N, 98°01′W).

Remarks

Phyllophaga necaxa is similar to *P. saylori* Sanderson from the mountains of Nuevo León and Tamaulipas, Mexico, but the larger antennal club, entire structure of the lateral border of the pronotum, shape of the tarsal claws, and proportions of the phallobase and parameres are distinctive.

3. *Phyllophaga (Phyllophaga) saylori* Sanderson

(Figs. 84–99)

Phyllophaga (Phyllophaga) saylori Sanderson, 1965: 560.

Material examined

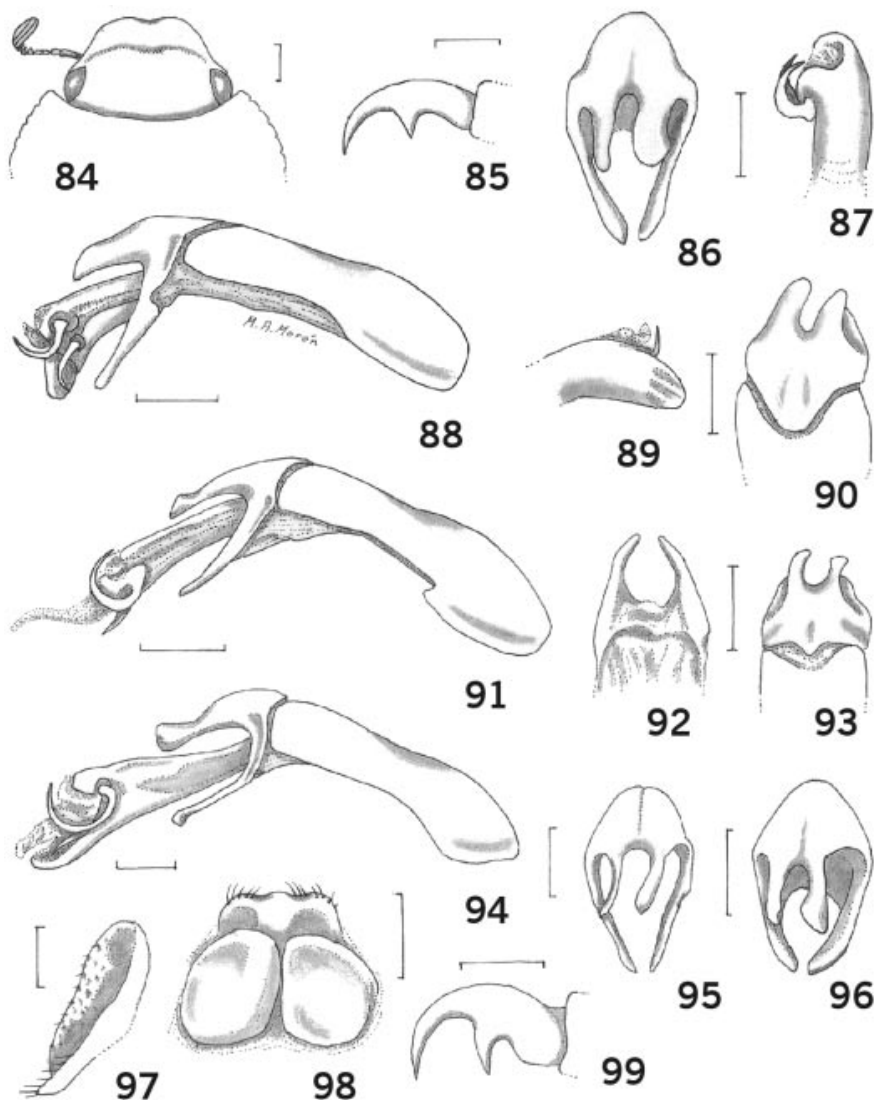
Seven specimens, ♂♀. **Paratypes:** 2 ♂♂, 4 km S Galeana, Nuevo León, 2000 m, 13.v.1961, J Mathieu (CAS). **MEXICO. Nuevo León:** ♂♀, Cerro Potosí, 3330 m, 3.v.1971 (CNC); ♂♀, same data (MXAL). **Tamaulipas:** ♂, 9 km W Rio Sabinas, near Encino, 26.viii.1985, EG Riley (EGRC).

Etymology

Named in honor of the American scarabaeoidologist Lawrence W Saylor.

Description

Male. Length 23 mm. Antennal club as long as the preceding six segments (Fig. 84). Anterior half of lateral border of pronotum irregular, crenulated. Abdominal sternite 5 without setae at sides. Pygidium widely and uniformly convex. Tarsal claws with ventral tooth located at the middle of ventral border (Fig. 85). Phallobase with two long, finger-like asymmetrical projections on the dorso-distal border and the dorso-basal border widely projected basally (Figs. 88, 90). Parameres 1.72 times longer than the width of phallobase, with the distal half nearly straight and the apex rounded, entire (Figs. 86, 88). Ventral membrane of genital capsule without sclerotized plates (Fig. 92). Aedeagus asymmetrical, with strong sclerotized support and two curved spines on the right side before the membranous apex (Figs. 87–89). **Female.** Length 24 mm. Similar to male except as follows: disk of pygidium slightly protruded, mainly toward the basal border (Fig. 97); ventral genital plates irregularly ovate, without setae; apex of dorsal genital plates briefly bisinuated, with scattered setae (Fig. 98).



FIGURES 84–99. *Phyllophaga saylori*. 84, head of male, dorsal view; 85, tarsal claw of male; 86, parameres, male from Galeana, distal view; 87, apex of aedeagus, same male, dorsal view; 88, genital capsule, same male, right lateral view; 89, apex of aedeagus, same male, left lateral view; 90, parameres, same male, dorsal view; 91, genital capsule, male from Cerro Potosí; 92, parameres, same male, ventral view; 93, parameres, same male, dorsal view; 94, genital capsule, male from Tamaulipas; 95, parameres, same male, distal view; 96, parameres, male from Cerro Potosí, distal view; 97, pygidium of female, lateral view; 98, genital plates of female, ventral view; 99, tarsal claw of male from Tamaulipas. Scale bars = 1 mm (Figs. 84, 86–98) and 0.5 mm (Figs. 85, 99).

Variation

Males from Cerro Potosí, Nuevo León, have the projections of the dorso-distal border of the phallobase narrowed and asymmetrical (Figs. 91, 93) and the distal half of the parameres slightly curved (Fig. 96). A male specimen from Rio Sabinas, Tamaulipas, has scattered erect, short setae on frons and microscopic setae on the elytra; the projections of the dorso-distal border of the phallobase more narrowed and

asymmetrically curved (Figs. 94–95); distal half of the parameres nearly straight, but narrowed, with apex compressed (Figs. 94–95); and male tarsal claws with ventral tooth located near the middle of ventral border (Fig. 99). Body length 19–24 mm.

Biology

This species inhabits mountainous localities with seasonal rainfall such as humid pine–oak forests or pine forests located at altitudes from 2000 to 3330 m. Months of collection: May (6) and August (1). According to Sanderson (1965), the type series was collected falling from the foliage of *Pinus teocote* Schl. et Cham (Pinaceae) during early morning. Another species flying at the same time in Rio Sabinas was *Phyllophaga rugipennis* (Schauffus).

Distribution

Mountains of southeastern Nuevo León and southwestern Tamaulipas, Mexico (Fig. 150).

Type locality

“Galeana” (Sanderson 1965) Mountains at south of Galeana, state of Nuevo León, Mexico (approximately 24°40′N, 100°05′W).

Remarks

Phyllophaga saylori is similar to *P. necaxa* Saylor from the mountains of Hidalgo and Puebla, Mexico, but the shorter antennal club, crenulated lateral border of the pronotum, shape of the tarsal claws, and proportions of the phallobase and parameres are distinctive.

4. *Phyllophaga (Phyllophaga) tuxtleca* sp. nov.

(Figs. 100–109)

Material examined

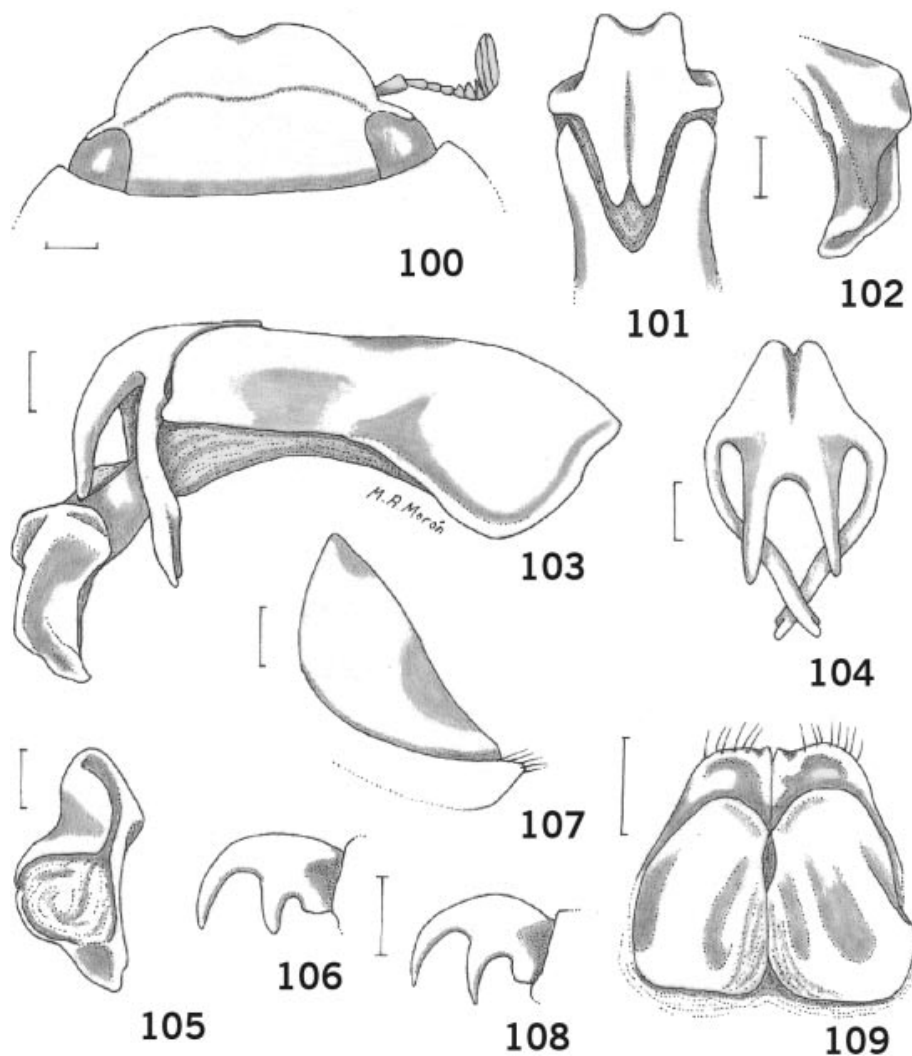
Seven specimens, ♂♀. **Holotype** ♂: Mexico. Veracruz: Estación Biología Tropical Los Tuxtlas, 480 m, 15.ix.1985, E Ramírez (MXAL). **Allotype** ♀: Mexico. Veracruz: Los Tuxtlas, Sierra Santa Marta, 28.vi.1976, R Terrón (MXAL). **Paratypes: MEXICO. Veracruz:** ♂♀, Lago Catemaco, 1.v.1969, DE Bright and JM Campbell (CNC); ♂♀, Lago Catemaco, 9.vi.1969, HF Howden (HAHC); ♀, SE slope volcán San Martín, vi.1970, B and B Valentine (HAHC).

Etymology

Derived from the indigenous Nahúatl language; *toztli* meaning parrot and *tlan* meaning near to; “Toztlan”, distorted “Tuxtla”, meaning place near to parrots (Hasler 1964); name that is applied to the volcanic mountainous area around Lake Catemaco, Veracruz, where this beetle was collected.

Description

Male (holotype). Length 27 mm. Antennal club as long as the preceding five segments (Fig. 100). Anterior half of lateral border of pronotum regular, continuous. Abdominal sternite 5 without setae at sides. Pygidium widely and uniformly convex. Tarsal claws with ventral tooth short, located toward the basal dilatation (Fig. 106). Phallobase



FIGURES 100–109. *Phyllophaga tuxtleca*. 100, head of male, dorsal view; 101, parameres, dorsal view; 102, apex of aedeagus, left lateral view; 103, genital capsule, right lateral view; 104, parameres, distal view; 105, apex of aedeagus, dorsal view; 106, tarsal claw of male; 107, pygidium of female, lateral view; 108, tarsal claw of female; 109, genital plates of female, ventral view. Scale bars = 1 mm (Figs. 100–105, 107, 109) and 0.5 mm (Figs. 106, 108).

with two long, finger-like, slightly asymmetrical projections on the dorso-distal border, and the dorso-basal border largely projected basally, basal extreme of projection narrowly notched (Fig. 101). Parameres 1.62 times longer than the width of phallobase, with the distal half long and sinuose and the apex briefly cleft (Figs. 103–104). Ventral membrane of genital capsule without sclerotized plates. Aedeagus asymmetrical, with strong sclerotized support and irregular sclerotized structure at the apex (Figs. 102–103, 105). **Female** (allotype). Length 29 mm. Similar to male except as follows: pygidium convex, with wide concavity on the preapical half (Fig. 107); tarsal claws with the ventral tooth long, placed near the middle of ventral border (Fig. 108); ventral genital

plates longer than wide, without setae on the distal border; apex of dorsal genital plates rounded, with scattered setae and inner angles slightly toothed (Fig. 109).

Variation

Paratype specimens only present slight differences in the color, dark-brown, near black, to dark reddish brown. Body length 27–29 mm.

Biology

This species inhabits tropical rain forests with high rainfall located at altitudes from 450 to 700 m. Months of collection: May (2), June (4), and September (1). Other species flying at the same time and place were *Phyllophaga tenuipilis* (Bates), *P. dasypoda* (Bates), and *P. rugipennis* (Schauffus).

Distribution

Sierra de Los Tuxtlas, Veracruz (Fig. 67).

Type locality

Estación de Biología Tropical, UNAM, Los Tuxtlas, state of Veracruz, Mexico (18°34′–18°36′N, 95°04′–95°09′W).

Remarks

Phyllophaga tuxtleca is similar to *P. ginigra* Saylor from Chiapas, Mexico, but the shape of phallobase, apex of the parameres, form of the sclerotized structure of the aedeagus, the concave surface of female pygidium, and shape of genital plates of females are distinctive.

5. *Phyllophaga (Phyllophaga) humboldtiana* sp. nov.

(Figs. 110–118)

Material examined

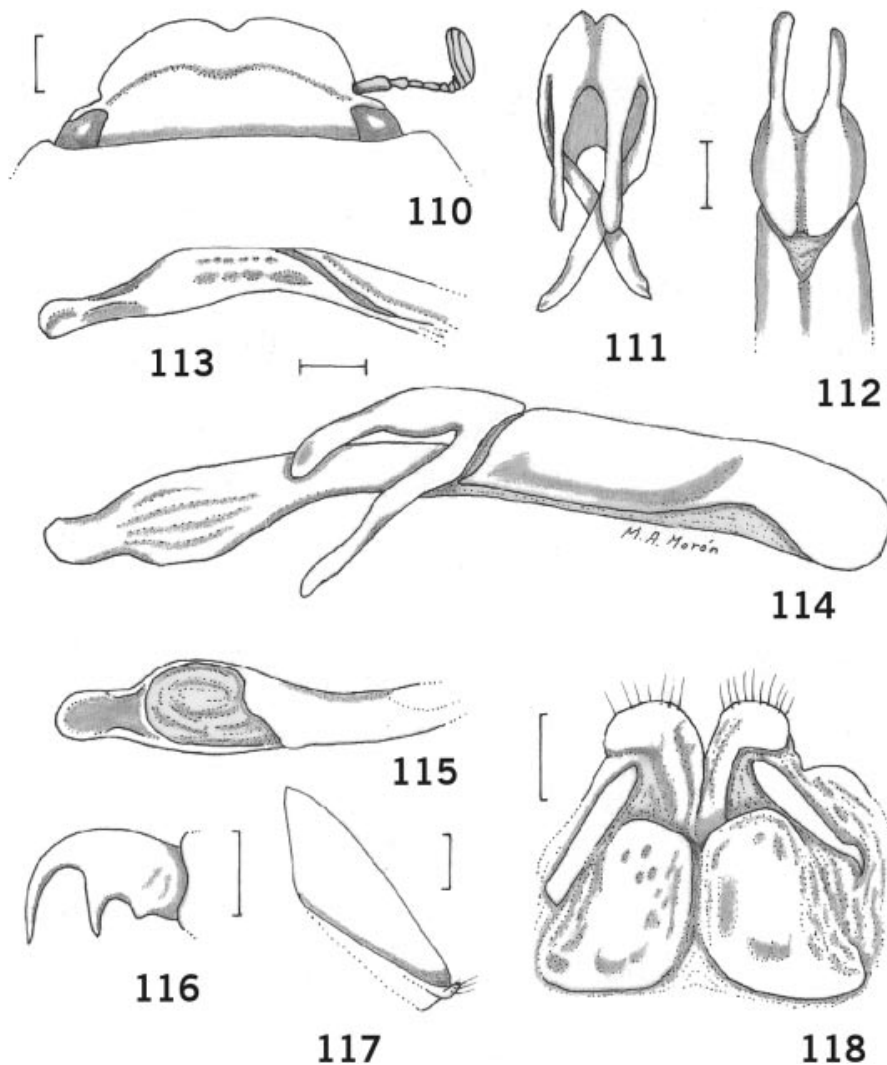
Thirty-one specimens, ♂♀. **Holotype** ♂: Mexico. Oaxaca: Comaltepec, 1820 m, 17.v.1996, G Nogueira (MXAL). **Allotype** ♀: same data as holotype (MXAL). **Paratypes**: 18 ♂♂, 8 ♀♀, same data as holotype (MXAL, IEXA, IBUNAM, CNC, HAHC, AMNH, ZMHU); ♀, same data except 18.v.1996 (IEXA); 2 ♂♂, same data except 15.v.1997 (IEXA).

Etymology

Named in honor of the German naturalist Alexander von Humboldt whose explorations provided important information regarding the structure and origin of the Mexican mountains.

Description

Male (holotype). Length 28 mm. Antennal club as long as the proceeding five segments (Fig. 110). Anterior half of lateral border of pronotum regular, entire. Abdominal sternite 5 without setae at sides. Pygidium widely and uniformly convex. Tarsal claws with ventral tooth long, located near the middle of ventral border (Fig. 116).



FIGURES 110–118. *Phyllophaga humboldtiana*. 110, head of male, dorsal view; 111, parameres, distal view; 112, same, dorsal view; 113, apex of aedeagus, dorsal view; 114, genital capsule, right lateral view; 115, apex of aedeagus, left lateral view; 116, tarsal claw of male; 117, pygidium of female, lateral view; 118, genital plates of female, ventral view. Scale bars = 1 mm (Figs. 110–115, 117–118) and 0.5 mm (Fig. 116).

Phallobase with two long, finger-like, slightly asymmetrical projections on the dorso-distal border and the dorso-basal border widely rounded, briefly notched at the middle (Figs. 111–112). Parameres 2.5 times longer than the width of phallobase, with the distal half very long and sinuose and the apex briefly cleft (Figs. 111, 114). Ventral membrane of genital capsule without sclerotized plates. Aedeagus asymmetrical, with strong sclerotized support and twisted, irregular sclerotized structure before the apex (Figs. 113–115). **Female** (allotype). Length 30 mm. Similar to male except as follows: pygidium convex, slightly flattened at the middle of disk (Fig. 117); ventral genital

plates irregular, slightly longer than wide, without setae on the distal border; apex of dorsal genital plates widely rounded, with some setae on the border (Fig. 118).

Variation

Paratypes 28–30 mm long.

Biology

This species is known only from the type locality, a cloud forest at altitudes from 1820 to 1875 m, with *Engelhardtia mexicana* Miranda (Juglandaceae). Month of collection: May (31). Other species flying at the same time and place were *Phyllophaga comaltepecana* **sp. nov.** and *P. dsaimana* **sp. nov.**

Distribution

Sierra de Juárez, Oaxaca (Fig. 67).

Type locality

Municipality of Santiago, state of Oaxaca, Mexico (approximately 17°34'–17°37'N, 97°34'–97°40'W).

Remarks

Phyllophaga humboldtiana is similar to *P. ginigra* Saylor from Chiapas, Mexico, but the shape of phallobase, length of the parameres, form of the sclerotized structure of the aedeagus, convex surface of female pygidium, and shape of genital plates of females are distinctive.

6. *Phyllophaga (Phyllophaga) javepacuana* **sp. nov.**

(Figs. 119–129)

Material examined

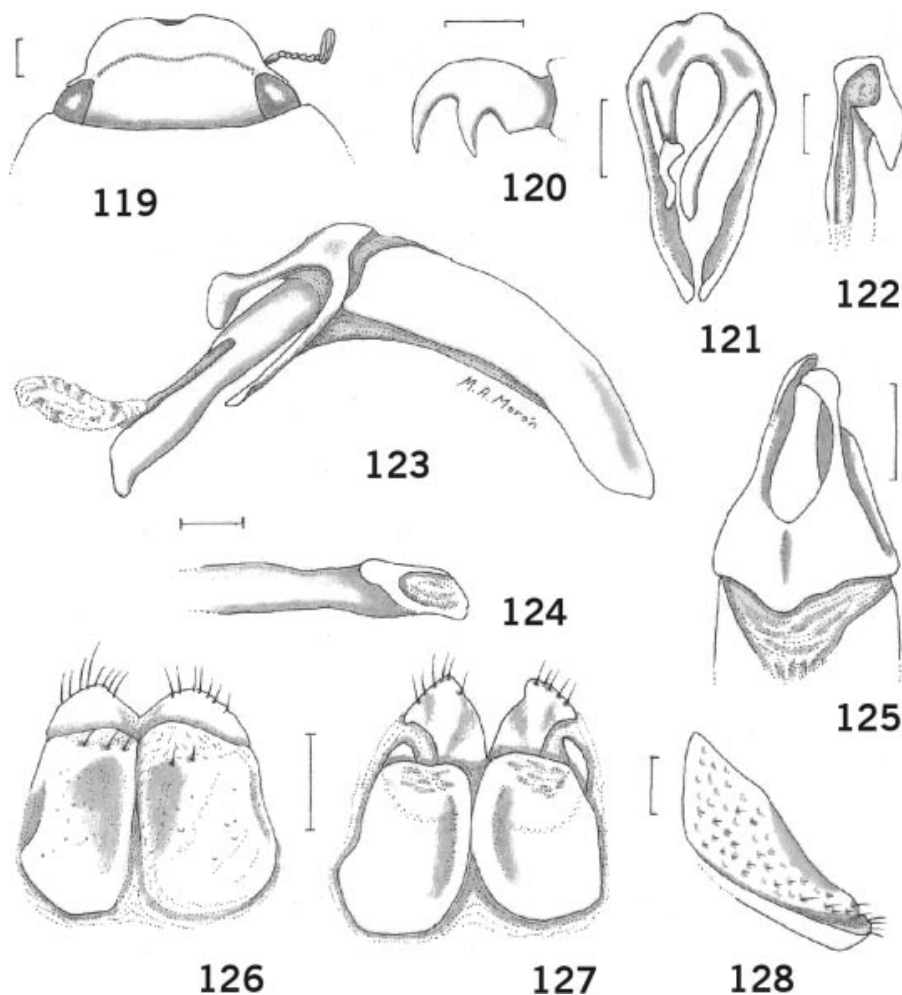
Eleven specimens, ♂♀. **Holotype** ♂: Mexico. Chiapas: Trinitaria, Lagos de Montebello, 720 m, 17.v.1995, P Hernández and D Navarro (MXAL). **Allotype** ♀: Mexico. Chiapas: Ocosingo, Santa Rosa, 21.v.1967, G Halffter (MXAL). **Paratypes**: **MEXICO. Chiapas**: ♂, same data as allotype (CNC); ♂♀, 18 km N Ocozocuaula, Laguna Bélgica, 1000 m, 8.ix.1985, BC Ratcliffe and C Messenger (UNSM, MXAL); ♂, Parque Laguna Bélgica, vii.1984, D Thomas (UNSM). **GUATEMALA. Huehuetenango**: ♂♀, Barillas, Malpais, BV Chiblac, 1200 m, 27.v.1998, E Cano (MXAL); 2 ♂♂, 1 ♀, same data except 1500 m, vii.1998 (UVG).

Etymology

Derived from the indigenous Zoque language; *Jave-pag-cuay* is the name of the ancient Zoque settlement near Ocozocuaula, Chiapas (Vega *et al.* 1984).

Description

Male (holotype) (Fig. 129). Length 24 mm. Antennal club as long as the preceding five segments (Fig. 119). Anterior half of lateral border of pronotum slightly irregular to nearly entire. Elytra with greenish blue vitreous luster. Abdominal sternite 5 without setae at sides. Pygidium widely and uniformly convex. Tarsal claws with



FIGURES 119–128. *Phyllophaga javepacuana*. 119, head of male, dorsal view; 120, tarsal claw of male; 121, parameres, distal view; 122, apex of aedeagus, dorsal view; 123, genital capsule, right lateral view; 124, apex of aedeagus, left lateral view; 125, parameres, dorsal view; 126, genital plates of female from Chiapas, ventral view; 127, same, female from Huehuetenango; 128, pygidium of female, lateral view. Scale bars = 1 mm (Figs. 119, 121–128) and 0.5 mm (Fig. 120).

ventral tooth long, located near the middle of ventral border (Fig. 120). Phallobase with two long, finger-like, compressed, asymmetrical projections on the dorso-distal border and the dorso-basal border slightly projected basally (Fig. 125). Parameres 1.9 times longer than the width of phallobase, with the distal half long and nearly straight, and the apex entire (Figs. 121, 123). Ventral membrane of genital capsule without sclerotized plates. Aedeagus asymmetrical, with strong sclerotized support and irregular, spur-like, left turned, sclerotized structure at the apex (Figs. 122–124). **Female** (allotype). Length 26 mm. Similar to male except as follows: pygidium flat at base, with wide concavity on the preapical half (Fig. 128); ventral genital plates longer than wide, with some setae before the distal border; apex of dorsal genital plates rounded, with erect setae near the border (Fig. 126).

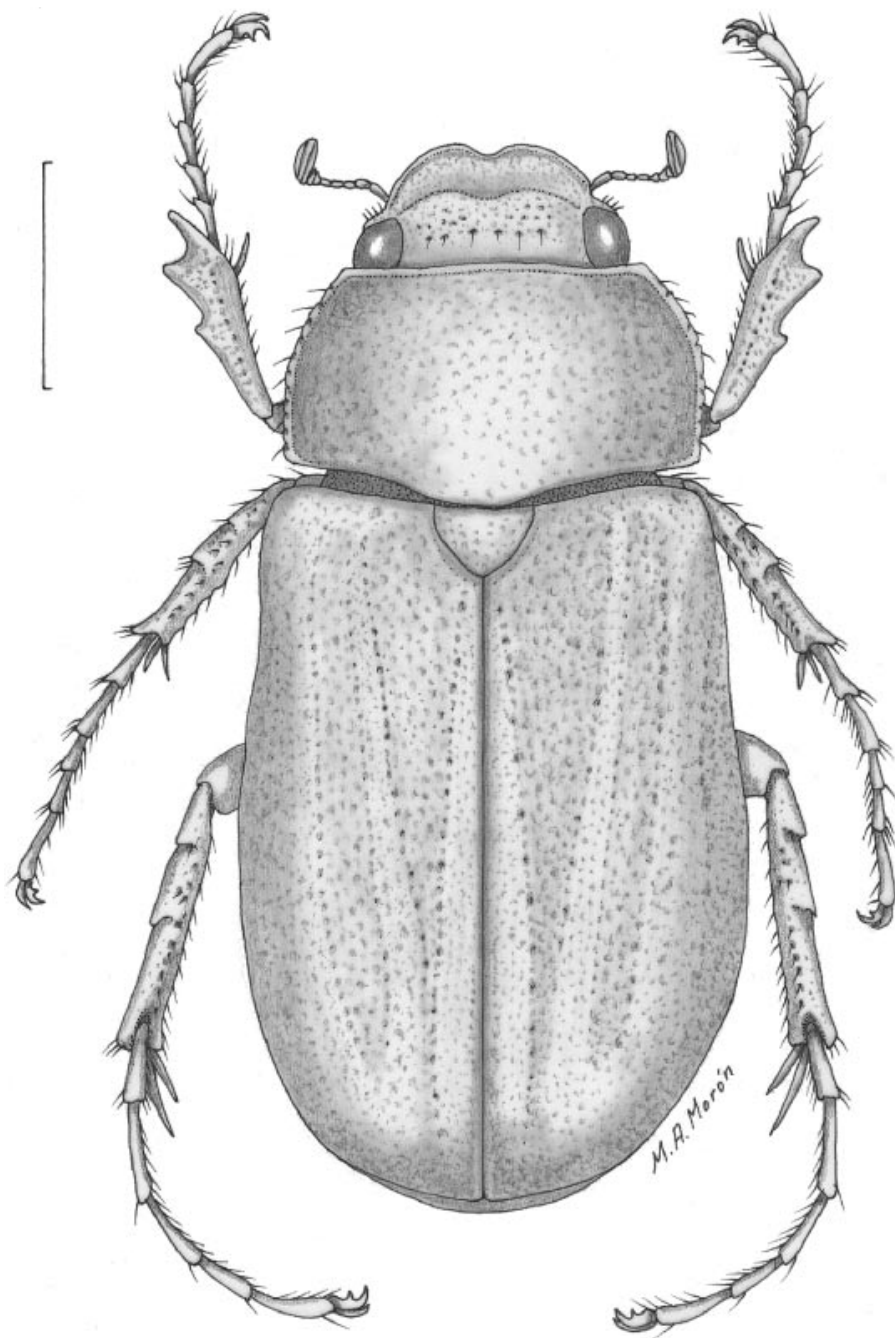


FIGURE 129. *Phyllophaga javepacuana*, male. Scale bar = 5 mm.

Variation

Paratypes 22–26 mm long. Females from Guatemala have ventral genital plates without setae, dorsal genital plates with more acute apices, and the lateral margins deeply notched (Fig. 127).

Biology

This species inhabits cloud forests or humid deciduous tropical forests at altitudes from 720 to 1500 m, with high seasonal rainfall. Months of collection: May (5), July (4), and September (2). Other species flying at the same time and place were *Phyllophaga rugipennis* (Schauffus), *P. mentalis* Saylor, and *P. chiblacana* **sp. nov.**

Distribution

Sierra Norte de Chiapas, Mexico, and Cuchumatanes, Guatemala (Fig. 67).

Type locality

Lagos de Montebello, municipality of Trinitaria, state of Chiapas, Mexico (approximately 16°40'N, 91°45'W).

Remarks

Phyllophaga javepacuana is similar to *P. humboldtiana* Morón from Oaxaca, Mexico, but the greenish blue vitreous luster of the elytra, asymmetrical expansions of the apex of dorso-mesial projections of phallobase, form of the sclerotized structure of the aedeagus, concave surface of female pygidium, and shape of genital plates of females are distinctive.

Diagnosis of subgroup 3

Large species (body length 19–25 mm). Head, pronotum, and elytra shiny black, dark brown, or reddish brown, without setae. Elytra and pygidium with deep, wide, irregular punctures. Abdominal sternites 3–5 convex and smooth near the midline. Males with the pygidium more or less convex. Females with the pygidium convex. Phallobase with asymmetrical, curved, upturned structure at the middle of dorso-distal border; parameres slightly asymmetrical; aedeagus with strongly sclerotized tube-like support. Central eastern mountains of Mexico.

1. *Phyllophaga (Phyllophaga) atra* (Moser)

(Figs. 130–137)

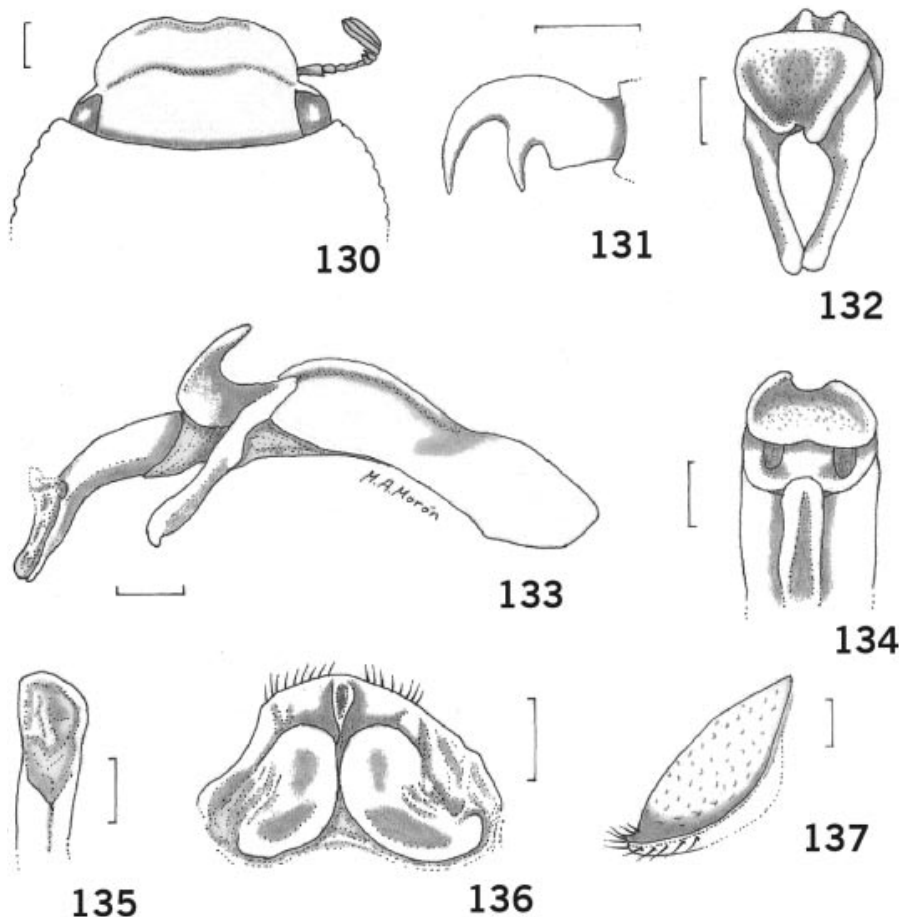
Lachnosterna atra Moser, 1918: 116.

Phyllophaga atra (Moser): Blackwelder 1944: 224.

Phyllophaga (Phyllophaga) atra (Moser): Morón 1986: 242, 1993: 68; Morón *et al.* 1997: 230.

Material examined

Twenty-two specimens, ♂♀. **Holotype** ♂: Necaxa, Puebla, Mexico, G Heine (ZMHU). **Paratype**: ♂, Necaxa, G Heine (CAS). **MEXICO. Hidalgo**: 2 ♂♂, Zacualtipán, 2060 m, 15.vii.1977, MA Morón (MXAL); ♀, same data except 10.ix.1977 (MXAL); ♂, 16.vii.1978; ♀, 4.viii.1978; ♂, 9.v.1980, R Terrón (IEXA); ♂, Zacualtipán,



FIGURES 130–137. *Phyllophaga atra*. 130, head of male, dorsal view; 131, tarsal claw of male; 132, parameres, distal view; 133, genital capsule, right lateral view; 134, parameres, dorsal view; 135, apex of aedeagus, dorsal view; 136, genital plates of female, ventral view; 137, pygidium of female, lateral view. Scale bars = 1 mm (Figs. 130, 132–137) and 0.5 mm (Fig. 131).

Ferrería, 1900 m, 3.v.1980, H Huacuja (MXAL); ♂, Molango, cañada de Otongo, 650 m, 2.iv.1981, R Terrón (MXAL); ♂, 3 km N Tlanchinol, 1550 m, vi.1992, J Blackaller (IEXA); 7 ♂♂, Tlanchinol, 1500 m, 6.vi.1995, G Nogueira (MXAL). **Puebla:** ♂, Xicotepec de Juárez, Mi Ranchito, 1000 m, 15.vi.1952, L Vázquez (IBUNAM); ♀, Xicotepec de Juárez, 22.ix.1973, MA Morón (MXAL); ♀, Huachinango, 8 km El Potrero, 18.vii.1981, C Deloya (MXAL). **Querétaro:** ♂, Xilitla, 229 km, 20.vii.1989, TW Taylor (UNSM).

Etymology

From the Latin *atra* meaning black; feminine adjective (Jaeger 1978).

Description

Male. Length 22–25 mm. Antennal club as long as the preceding five segments

(Fig. 130). Anterior half of lateral border of pronotum irregular, crenulate. Abdominal sternite 5 without setae at sides. Pygidium widely and uniformly convex. Tarsal claws with large ventral tooth located toward the basal dilatation (Fig. 131). Phallobase with fan-like asymmetrical projection curved upward, without setae on its upper, concave surface (Figs. 132–134). Tectum with two parallel keels at the midline (Figs. 132–134). Parameres 1.70 times longer than the width of phallobase, stout, with the distal half nearly straight and the apex rounded, entire (Figs. 132–133). Ventral membrane of genital capsule without sclerotized plates. Aedeagus asymmetrical, with membranous apex (Figs. 133, 135). **Female.** Length 24–25 mm. Similar to male except as follows: pygidium more convex before the apex (Fig. 137); ventral genital plates weakly sclerotized, irregularly reniform, without setae; apex of dorsal genital plates widely curved, with setae (Fig. 136).

Variation

Some specimens from Hidalgo are reddish brown, with weakly sclerotized genital structures, suggesting an immature condition.

Biology

This species inhabits mountainous localities with high seasonal rainfall and frequent fog such as cloud forests or humid pine–oak forests at altitudes from 650 to 2060 m. Months of collection: April (1), May (2), June (9), July (5), August (1), and September (2). Other species flying at the same time and place were *P. (Phyllophaga) heteronycha* (Bates), *P. (Phyllophaga) rugipennis* (Schauffus), *P. (Phytalus) obsoleta* (Blanchard), and *P. (Phytalus) pruinosa* (Blanchard).

Distribution

Mountains and humid canyons of northern Hidalgo and Puebla, Mexico (Fig. 150).

Type locality

“Necaxa” (Moser 1918) Nuevo Necaxa, state of Puebla, Mexico (approximately 20°13'N, 98°01'W).

Remarks

Phyllophaga atra is similar to *P. pseudoatra* **sp. nov.** from the mountains of San Luis Potosí, Mexico, but the shape of the phallobase, tectum, and parameres are the distinctive characters.

2. *Phyllophaga (Phyllophaga) pseudoatra* **sp. nov.**

(Figs. 138–142)

Material examined

Five specimens, ♂. **Holotype** ♂: Mexico. San Luis Potosí: Sierra de Alvarez, 2050 m, 15.vii.1999, G Nogueira (MXAL). **Paratypes:** MEXICO. San Luis Potosí: 4 ♂♂, same data as holotype (MXAL, IEXA).

Etymology

From the Greek *pseudes* meaning false or deceptive and the Latin *atra* meaning black (Jaeger 1978).

Description

Male (holotype). Length 20 mm. Antennal club as long as the preceding five segments (Fig. 138). Anterior half of lateral border of pronotum irregular, crenulate. Abdominal sternite 5 without setae at sides. Pygidium widely and uniformly convex. Tarsal claws with large ventral tooth located toward the basal dilatation. Phallobase with fan-like asymmetrical projection curved upward, without setae on its upper, partially convex surface (Figs. 139, 140, 142). Tectum with shallow furrow at the midline (Fig. 140). Parameres 1.58 times longer than the width of phallobase, stout, with the distal half nearly straight and the apex rounded, entire (Figs. 139, 142). Ventral membrane of genital capsule without sclerotized plates. Aedeagus asymmetrical, with membranous apex (Figs. 141–142). **Female**. Unknown.

Variation

Paratypes 19–20 mm long.

Biology

This species inhabits a humid pine–oak forest located at an altitude of 2050 m. Month of collection: July (5). Other species flying at the same time and place were *P. (Phyllophaga) xanthe* (Bates), *P. (Phyllophaga) vetula* (Horn), and *P. (Phytalus) pameana* Morón.

Distribution

Sierra de Alvarez, San Luis Potosí, Mexico (Fig. 150).

Type locality

Northeast of Ciudad del Maíz, Sierra de Alvarez, state of San Luis Potosí, Mexico (approximately 22°40'N, 99°21'W).

Remarks

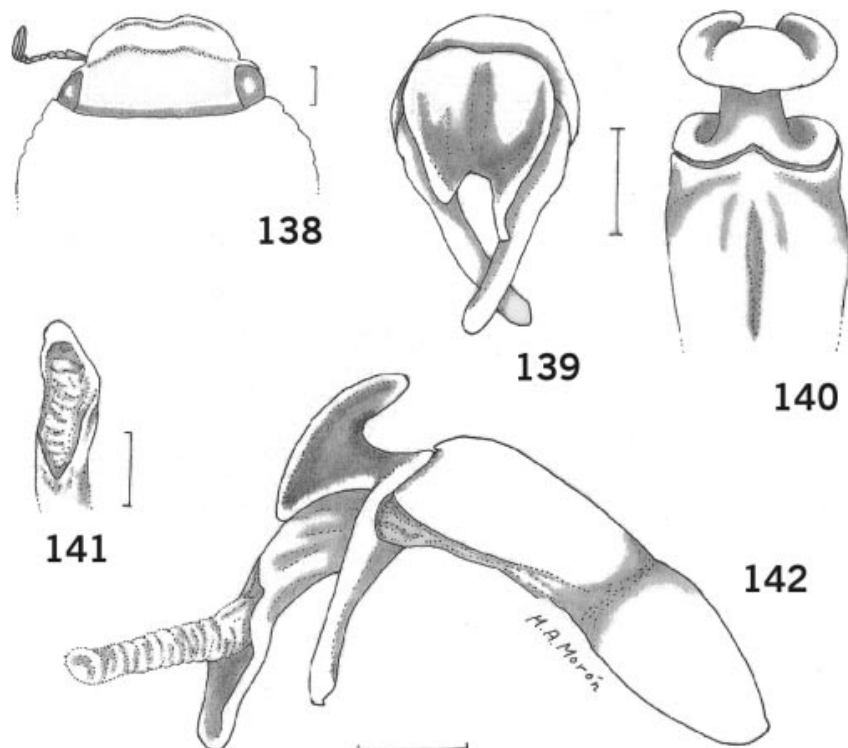
Phyllophaga pseudoatra is similar to *P. atra* (Moser) from Hidalgo and Puebla, Mexico, but the asymmetrical expansion of the dorso-mesial projection of the phallobase is wider, with a longer stalk and upper surface convex; also, the tectum does not have the strong longitudinal keels at the midline.

3. *Phyllophaga (Phyllophaga) atratoides* sp. nov.

(Figs. 143–149)

Material examined

Twenty-four specimens, ♂♀. **Holotype** ♂: Mexico. Veracruz: Tlacolulan, San José de Arriba, El Fresno, 1840 m, 19.vii.2000, E Micó (MXAL). **Allotype** ♀: same data as holotype (MXAL). **Paratypes: MEXICO. Veracruz:** 14 ♂♂, 4 ♀♀, same data as (MXAL, CIBIO); ♂, Xalapa, Parque Ecológico, FJ Clavijero, 1430 m, 17.viii.1989, J Blackaller and L Delgado (IEXA); ♂, 1.5 km S Calcahualco, 2060 m, 19.vii.1973, RR



FIGURES 138–142. *Phyllophaga pseudoatra*. 138, head of male, dorsal view; 139, parameres, distal view; 140, same, dorsal view; 141, apex of aedeagus, dorsal view; 142, genital capsule, right lateral view. Scale bar = 1 mm.

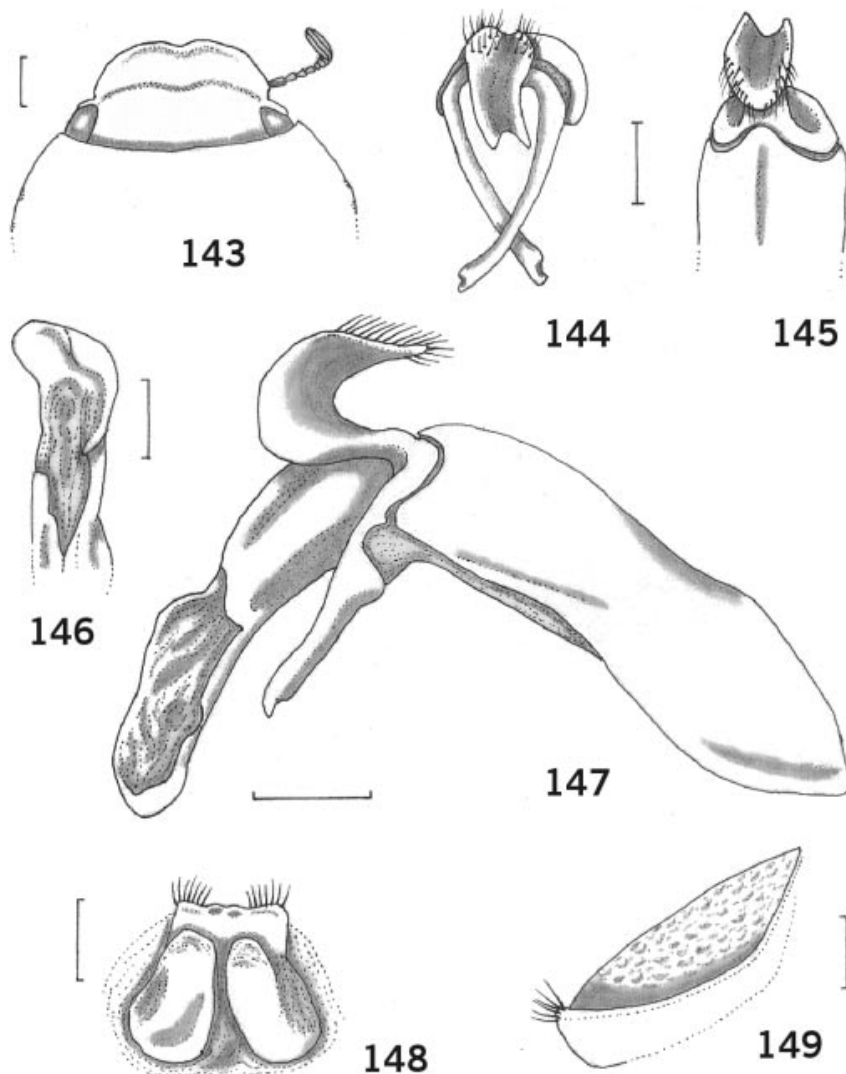
Snelling and TW Taylor (LACM); ♂, Calchualco, Atotonilco, 2120 m, 9.x.1984 (UNSM); ♂, Excola, 9.ix.1985, TW Taylor (IEXA).

Etymology

From the Latin *atra* meaning black and the adjective suffix *oideus* meaning form of (Jaeger 1978).

Description

Male (holotype). Length 24 mm. Antennal club as long as the preceding five segments (Fig. 143). Anterior half of lateral border of pronotum slightly irregular, entire. Abdominal sternite 5 without setae at sides. Pygidium widely and uniformly convex. Tarsal claws with large ventral tooth located toward the basal dilatation. Phallobase with cup-like asymmetrical projection curved upward, with setae on the upper border of the concave surface (Figs. 144–145, 147). Tectum convex, with shallow furrow at the midline (Fig. 145). Parameres 2 times longer than the width of phallobase, slender, with the distal half slightly curved and the apex briefly notched (Figs. 144, 147). Ventral membrane of genital capsule without sclerotized plates. Aedeagus asymmetrical, with membranous apex (Figs. 146–147). **Female** (allotype). Length 24 mm. Similar to male except as follows: pygidium less convex, rugose punctate (Fig. 149); ventral genital



FIGURES 143–149. *Phyllophaga atratoides*. 143, head of male, dorsal view; 144, parameres, distal view; 145, same, dorsal view; 146, apex of aedeagus, dorsal view; 147, genital capsule, right lateral view; 148, genital plates of female, ventral view; 149, pygidium of female, lateral view. Scale bar = 1 mm.

plates moderately sclerotized, slightly longer than wide, without setae; apex of dorsal genital plates briefly tri-sinuated, with setae at sides (Fig. 148).

Variation

Paratypes 21–24 mm long.

Biology

This species inhabits humid pine–oak forests and cloud forests located at altitudes

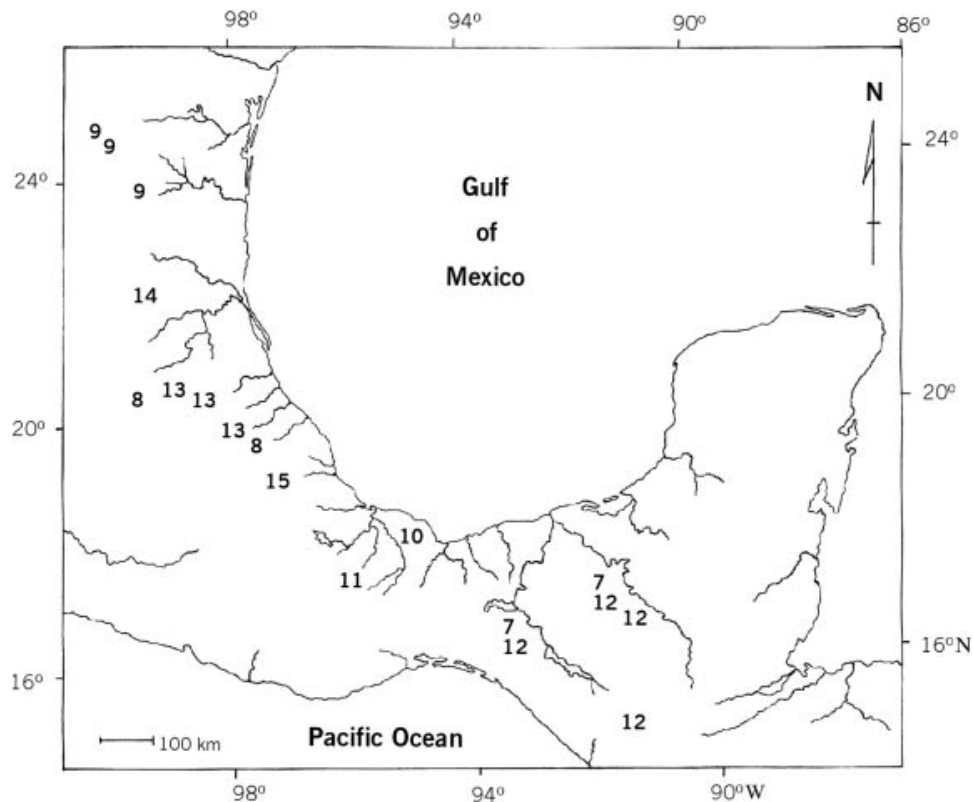


FIGURE 150. Collection localities in Mexico and Guatemala of *Phyllophaga ginigra* (7), *P. necaxa* (8), *P. saylori* (9), *P. tuxtleca* (10), *P. humboldtiana* (11), *P. javepacuana* (12), *P. atra* (13), *P. pseudoatra* (14), and *P. atratoides* (15).

from 1430 to 2120 m. Months of collection: July (21), August (1), September (1), and October (1).

Distribution

Eastern slopes of Cofre de Perote and Pico de Orizaba, Veracruz, Mexico (Fig. 150).

Type locality

El Fresno, municipality of Tlacolulan, state of Veracruz, Mexico (approximately 19°40'N, 96°56'W).

Remarks

Phyllophaga atratoides is similar to *P. atra* (Moser) from Hidalgo and Puebla, Mexico, but the asymmetrical expansion of the dorso-mesial projection of the phallobase is much narrowed and the upper apex have setae; the parameres are slender with notched apex; and the tectum does not have the strong longitudinal keels at the midline. Morón (1993) erroneously cited some of these specimens as *P. atra* (Moser).

Diagnosis of subgroup 4

Medium-sized species (body length 15–20 mm). Head, pronotum, and elytra shiny black, dark brown, or reddish brown, sometimes with iridescent brassy luster, and with minute or short setae. Elytra and pygidium densely punctate, coarsely rugose punctate, or rugose. Sternites 3–5 convex and smooth or with rounded tubercles near the midline. Males with the pygidium convex, tumescent, or keeled. Females with the pygidium slightly convex or excavated. Phallobase with the dorso-distal border variably notched, without projections; parameres mostly symmetrical; aedeagus with sclerotized support and usually with large, ventral sclerotized spines. Central-eastern Mexico to Costa Rica.

1. *Phyllophaga (Phyllophaga) rugulosa* (Blanchard)

(Figs. 151–163)

Ancylonycha rugulosa Blanchard, 1851: 134.

Lachnosterna rugulosa (Blanchard): Gemminger and Harold 1869: 1169; Bates 1888: 203; Dalla-Torre 1912: 198.

Phyllophaga rugulosa (Blanchard): Blackwelder 1944: 185: 226.

Phyllophaga (Phyllophaga) rugulosa (Blanchard): Morón 1986: 242, Morón 1993: 68; Morón *et al.* 1997: 248.

Material examined

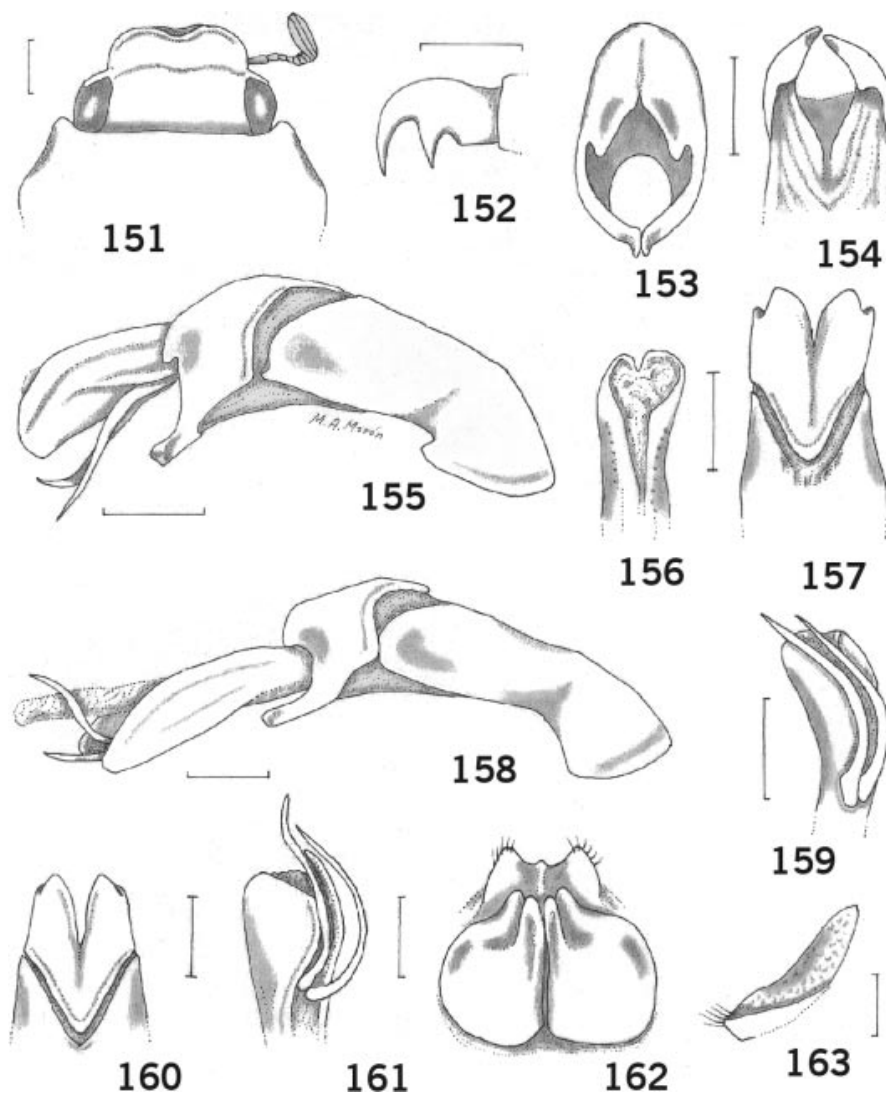
Thirty-one specimens, ♂♀. **Syntype** ♀: “Mexique Giesbreigt”/“18/42” (MNHN). **MEXICO. Chiapas:** 2 ♂♂, 1 ♀, 17 km N Pueblo Nuevo, Rt. 195, 1730 m, 26.iv.1966, GE Ball and DE Whitehead (CNC); ♂, same data (HAHC); ♂, Palenque 22.v.1965, G Halffter; ♂♀, Ishuatlán, 14.v.1967, G Halffter; ♂, Lagos de Colores, 12.v.1969, JM Campbell; ♀, Santa Rosa, 20.v.1967, G Halffter (CNC); ♀, 4 km E Tzizcao, 1310 m, 14.vi.1983, MA Morón; ♂, Oxchuc, 23.v.2000, J Gómez (MXAL); ♂♀, Oxchuc, Piedra Escrita, 20.v.2001, E Santiz (ECOSUR); ♀, Tenejapa, 8.v.2000, C Ramírez (MXAL). **Oaxaca:** ♂, 9 km S Valle Nacional, 660 m, 18.v.1971, DH Bright (CNC); ♀, 22 km S Valle Nacional, 20.v.1971, HF Howden (HAHC); ♂, Sierra de Juárez, 1650 m, 11.v.1997, G Nogueira; ♀, same data except 1630 m, 13.v.1997 (IEXA); ♂, Comaltepec, 1300 m, 20.v.1996, G Nogueira; ♀ Sierra de Juárez, 1290 m, 12.v.1997, G Nogueira; ♀, same data except 1650 m, 11.v.1997; ♂, Sierra de Juárez, Metates, 900 m, 18.x.1981, L González (MXAL). **Veracruz:** ♂, Coatepec, Briones, 1340 m, 14.v.1998, MA Morón; ♀, same data except 16.v.1998 (MXAL); ♂, “Xalapa” (CAS); ♂, “Jalapa, Mexico, Hoge” (NHML); ♂, Lago Catemaco, 9.vi.1961, HF Howden (HAHC). **GUATEMALA. Baja Verapaz:** ♂, Purulha, El Quetzal, 19.iv.1998, E Cano (UVGC). **Huehuetenango:** ♂, Barillas, Malpais, 1200 m, vii.1998, E Cano (MXAL). **Izabal:** ♂, Morales, Sierra del Caral, La Firmeza, aldea Negro Norte, 1150 m, 27.vi.1998, E Cano (UVGC).

Etymology

From new Latin *rugulosus* meaning wrinkled or full of wrinkles, diminutive (Jaeger 1978).

Description

Male. Length 17–18 mm. Body shiny dark brown. Antennal club as long as the preceding six segments (Fig. 151). Anterior half of lateral border of pronotum regular,



FIGURES 151–163. *Phyllophaga rugulosa*. 151, head of male, dorsal view; 152, tarsal claw of male; 153, parameres, distal view; 154, same, ventral view; 155, genital capsule, male from Oaxaca, right lateral view; 156, apex of aedeagus, dorsal view; 157, parameres, male from Oaxaca, dorsal view; 158, genital capsule, male from Oaxaca, right lateral view; 159, apex of aedeagus, male from Oaxaca, ventral view; 160, parameres, male from Baja Verapaz, dorsal view; 161, apex of aedeagus, male from Baja Verapaz; 162, genital plates of female; 163, pygidium of female. Scale bars = 1 mm (Figs. 151, 153–163) and 0.5 mm (Fig. 152).

continuous, slightly sinuated. Pronotum and elytra with scattered setae. Elytra shallowly rugose. Sternites 2–4 have on each lateral suture a pencil of long, golden yellow setae. Abdominal sternite 5 with scattered, erect setae at sides. Sternites 3–5 convex and smooth near the midline, without setae. Pygidium rugose, widely tumescent, mainly toward the base. Tarsal claws with large ventral tooth located toward the middle of ventral border (Fig. 152). Phallobase with distal border deeply cleft and basal border

largely projected basally (Fig. 157). Parameres 1.80 times longer than the width of phallobase, with the distal half widely curved and the apex briefly angled (Figs. 153, 155). Ventral membrane of genital capsule without sclerotized plates (Fig. 154). Aedeagus asymmetrical, with compressed tube-like, sclerotized support and membranous apex; ventrally with two sinuose, long spines (Figs. 155–156, 159). **Female.** Length 17–18 mm. Similar to male except as follows: pygidium widely and shallowly concave (Fig. 163); ventral genital plates with apex prominent, narrowly rounded, and mesial, preapical projections slightly upturned, without setae; apex of dorsal genital plates prominent, widely rounded, with setae (Fig. 162).

Variation

Specimens from Guatemala vary in the shape of phallobase, parameres, and aedeagus (Figs. 158, 160–161).

Biology

This species inhabits mountainous cloud and tropical forests with high rainfall and frequent fog, between altitudes of 400 and 1730 m. Months of collection: April (5), May (18), June (3), July (1), and October (1). Other species flying at the same time and place were *P. (Phyllophaga) rugipennis* (Schauffus), *P. (P.) mentalis* Saylor, *P. (P.) chiblacana* **sp. nov.**, *P. (P.) dsaimana* **sp. nov.**, *P. (P.) quiana* **sp. nov.**, and *P. (P.) yoloxana* **sp. nov.**

Distribution

Central-eastern and southeastern Mexico and western Guatemala (Fig. 252).

Type locality

“Mexique” (Blanchard 1851). Here designated Xalapa, state of Veracruz, Mexico (19°32'N, 96°55'W).

Remarks

Phyllophaga rugulosa is similar to *P. chortiana* **sp. nov.** from Izabal, Guatemala, but the presence of the pencils of long, golden yellow setae at the sides of the sternites, shape of the phallobase, parameres, aedeagus, and female genital plates are distinctive.

2. *Phyllophaga (Phyllophaga) chortiana* **sp. nov.**

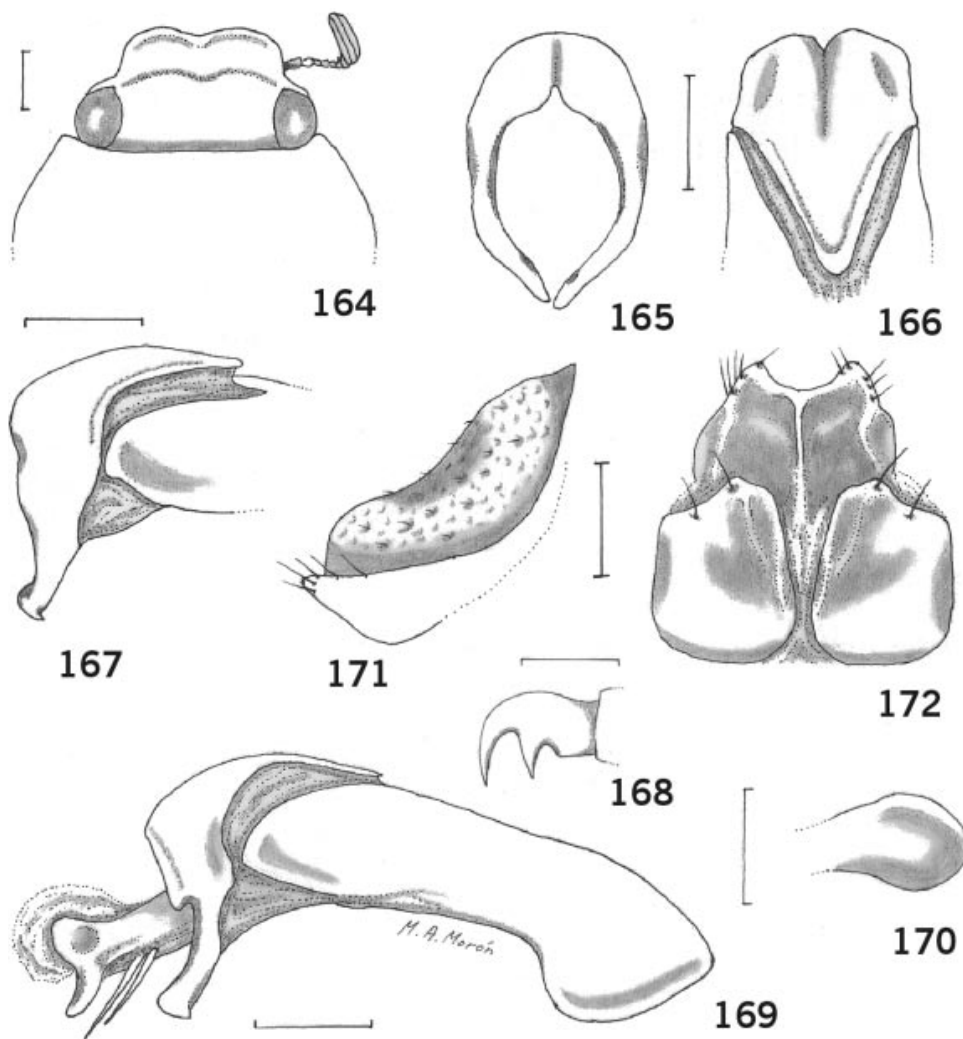
(Figs. 164–172)

Material examined

Five specimens, ♂♀. **Holotype** ♂: Guatemala. Izabal: near Rio Zarco, above El Arenal, 11.iv.1993, E Cano (UVGC). **Allotype** ♀: same data as holotype (UVGC). **Paratypes: GUATEMALA.** 2 ♂♂, 1 ♀, same data as holotype (MXAL, UVGC).

Etymology

Derived from the Chorti language used by the indigenous people in the recent past who lived in eastern Guatemala and western Honduras (Edmonson 2000).



FIGURES 164–172. *Phyllophaga chortiana*. 164, head of male, dorsal view; 165, parameres, distal view; 166, same, dorsal view; 167, same of male from Izabal, right lateral view; 168, tarsal claw of male; 169, genital capsule, male from Izabal, right lateral view; 170, apex of aedeagus, left lateral view; 171, pygidium of female, lateral view; 172, genital plates of female, ventral view. Scale bar = 1 mm.

Description

Male (holotype). Length 17 mm. Body shiny dark brown. Antennal club as long as the preceding six segments (Fig. 164). Anterior half of lateral border of pronotum regular, not crenulated, slightly curved. Pronotum and elytra with scattered setae. Elytra moderately rugose. Sternites 2–4 without pencils of setae. Abdominal sternite 5 with scattered, erect setae at sides. Sternites 3–5 convex and smooth near the midline, without setae. Pygidium rugose punctate, with two wide tubercles near the base. Tarsal claws with large ventral tooth located toward the middle of ventral border. Phallobase with distal border briefly notched and the basal border largely projected basally (Fig. 166). Parameres 1.50 times longer than the width of phallobase, with the distal

half nearly straight and apex slightly hooked (Figs. 165, 167). Ventral membrane of genital capsule without sclerotized plates. Aedeagus asymmetrical, with compressed tube-like, sclerotized support and membranous apex; ventrally with two nearly straight, long spines (Figs. 169–170). **Female** (allotype). Length 18 mm. Similar to male except as follows: pygidium concave at middle of disk, widely prominent toward the apex (Fig. 171); ventral genital plates with apex squared, without mesial, preapical projections, with few setae; apex of dorsal genital plates prominent, widely rounded, with setae (Fig. 172).

Variation

Paratypes 17–18 mm long.

Biology

This species inhabits montane cloud forests at an altitude of 1500 m. Month of collection: April (5). Other species flying at the same time and place were *Phyllophaga* (*Phytalus*) *obsoleta* (Blanchard), *P. (Phyllophaga) rugipennis* (Schauffus), *P. (P.) submetallica* Bates, *P. (P.) izabalana* **sp. nov.**, *P. (P.) canoana* **sp. nov.**, and *P. (P.) zarcoana* **sp. nov.**

Distribution

Eastern slopes of Sierra de Las Minas, Guatemala (Fig. 252).

Type locality

El Arenal, Rio Zarco, department of Izabal, Guatemala (approximately 15°45'N, 89°20'W).

Remarks

Phyllophaga chortiana is similar to *P. rugulosa* (Blanchard) from Mexico and western Guatemala, but the absence of the pencils of long, golden yellow setae at the sides of the sternites, shape of the phallobase, parameres, aedeagus, and female genital plates are distinctive.

3. *Phyllophaga (Phyllophaga) submetallica* (Bates)

(Figs. 173–181)

Lachnosterna submetallica Bates, 1888: 204; Dalla-Torre 1912: 199.

Phyllophaga submetallica (Bates): Blackwelder 1944: 226.

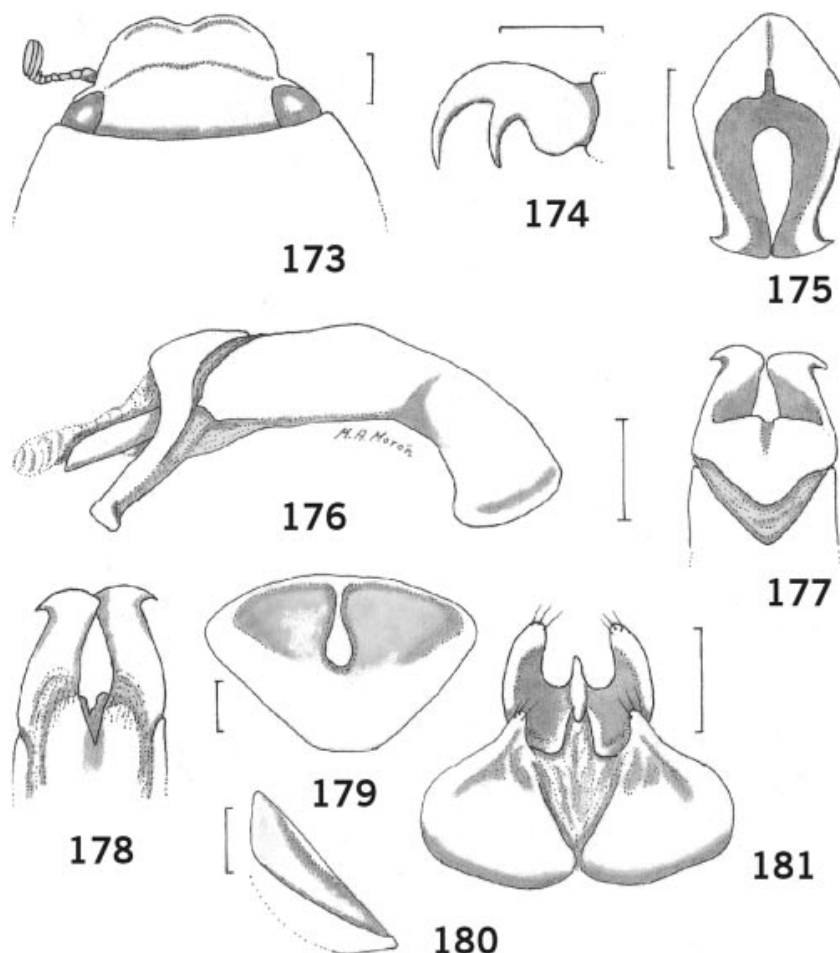
Phyllophaga (Phyllophaga) submetallica: Morón 1993: 68; Morón *et al.* 1997: 250.

Material examined

Eight specimens, ♂♀. **Lectotype** ♂: Guatemala. Panimá: Vera Paz, Champion (NHML). **Paralectotype** ♀: Guatemala. Senahú: Vera Paz, Champion (NHML). Guatemala. Izabal: 2 ♂♂, 1 ♀ near Rio Zarco, above El Arenal, 11.iv.1993, E Cano (UVGC); 2 ♂♂, 1 ♀, same data (MXAL).

Etymology

From the Latin *sub* meaning almost or somewhat and the Greek *metallites* meaning metallic (Jaeger 1978).



FIGURES 173–181. *Phyllophaga submetallica*. 173, head of male, dorsal view; 174, tarsal claw of male; 175, parameres, distal view; 176, genital capsule, right lateral view; 177, parameres, dorsal view; 178, same, ventral view; 179, pygidium of male, distal view; 180, pygidium of female, lateral view; 181, genital plates of female, ventral view. Scale bars = 1 mm (Figs. 173, 175–181) and 0.5 mm (Fig. 174).

Description

Male. Length 19 mm. Body shiny dark brown with brassy luster. Antennal club as long as the preceding five segments (Fig. 173). Anterior half of lateral border of pronotum regular, continuous, slightly curved. Pronotum and elytra with dense vestiture of scale-like, short setae. Elytra rugose punctate. Sternites 2–4 without pencils of long, golden yellow setae. Abdominal sternite 5 with scattered, erect setae laterally. Sternites 3–5 with pairs of rounded tubercles near the midline, surrounded by dense vestiture of scale-like, short setae. Pygidium rugose punctate with a longitudinal, median keel progressively expanded distally, surrounded by wide, shallow concavities (Fig. 179) and scattered scale-like, short setae. Tarsal claws with large ventral tooth located toward the middle of ventral border (Fig. 174). Phallobase with distal border briefly notched and basal border moderately projected basally (Fig. 177). Parameres 1.60 times longer than the width of phallobase, with the distal half stout, nearly straight and the apex widely

toothed laterally (Figs. 175–176). Ventral membrane of genital capsule with sclerotized plates (Fig. 178). Aedeagus symmetrical, with tube-like, sclerotized support and membranous apex; ventrally without long spines (Fig. 176). **Female.** Length 20 mm. Similar to male except as follows: pygidium with mesial keel less elevated and lateral concavities less deep (Fig. 180); ventral genital plates with apex acute, prominent, with some setae and without mesial, preapical projections; dorsal genital plates with strong mesial keel and the apex enlarged, prominent, with setae (Fig. 181).

Variation

Specimens range in body length from 19 to 20 mm and in the intensity of brassy luster, which varies from dark golden to light purplish red.

Biology

This species inhabits mountainous cloud and tropical forests with high rainfall located at altitudes from 600 to 1500 m. Month of collection: April (6). Other species flying at the same time and place were *Phyllophaga (Phytalus) obsoleta* (Blanchard), *P. (Phyllophaga) rugipennis* (Schauffus), *P. (P.) chortiana* **sp. nov.**, *P. (P.) izabalana* **sp. nov.**, *P. (P.) canoana* **sp. nov.**, and *P. (P.) zarcoana* **sp. nov.**

Distribution

Sierra de Las Minas, Guatemala (Fig. 252).

Type locality

Panimá, department of Baja Verapaz, Guatemala (approximately 15°16'N, 90°08'W).

Remarks

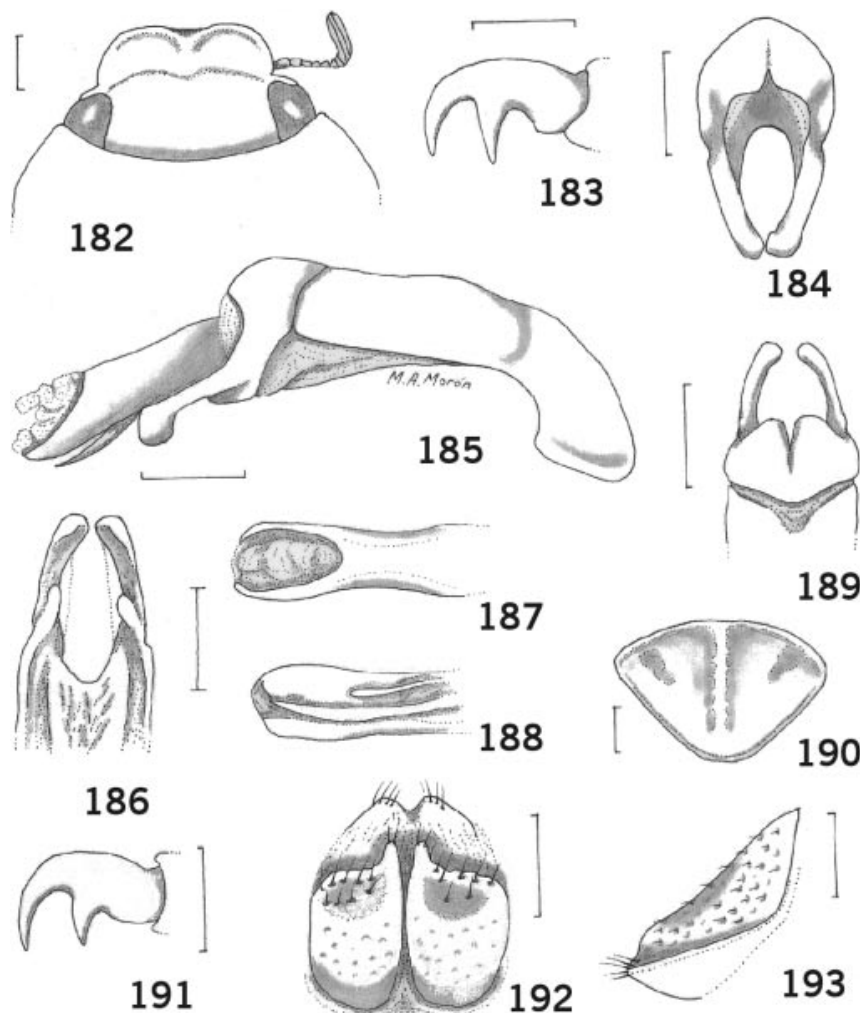
Phyllophaga submetallica is similar to *P. chimoxtila* **sp. nov.** from southeastern Mexico, but the shortened antennal club, scale-like setae on pronotum, elytra, sternites, and pygidium, form of the median keel of the pygidium (Fig. 179), shape of the phallobase, parameres, aedeagus, and female genital plates are distinctive. Morón (1993) and Morón *et al.* (1997) erroneously cited specimens from Veracruz, Oaxaca, and Chiapas, Mexico.

4. *Phyllophaga (Phyllophaga) chimoxtila* **sp. nov.**

(Figs. 182–193)

Material examined

Seventeen specimens, ♂♀. **Holotype** ♂: Mexico. Oaxaca: Palomares, San Carlos, 200 m, 30.v.1945, Bolívar and Medellín (MXAL). **Allotype** ♀: Mexico. Chiapas: Parque Laguna Bélgica, 12.vi.1991, B Ratcliffe, J Ashe, and M Jameson (UNSM). **Paratypes: MEXICO.** ♂, same data as allotype (UNSM). **Chiapas:** ♂♀, 7.5 km SW El Bosque, 10.vi.1969, JM Campbell (CNC); ♂♀, same data (HAHC); ♂, same data (MXAL); 3 ♂♂, 2 ♀♀, Parque Laguna Bélgica, 16 km NW Ocozocuatla, 970 m, 7.vi.1990, H and A Howden; ♂, same data except 13.vi.1990; ♂, same data except 21.vi.1989, H Howden; ♂, Laguna Bélgica 28.v.1990, H and A Howden (HAHC); ♂, Parque Laguna Bélgica, 8.vi.1989, DB Thomas (MXAL).



FIGURES 182–193. *Phyllophaga chimoxtila*. 182, head of male, dorsal view; 183, tarsal claw of male; 184, parameres, distal view; 185, genital capsule, right lateral view; 186, parameres, ventral view; 187, apex of aedeagus, dorsal view; 188, same, ventral view; 189, parameres, dorsal view; 190, pygidium of male, distal view; 191, tarsal claw of female; 192, genital plates of female; 193, pygidium of female, lateral view. Scale bars = 1 mm (Figs. 182, 184–190, 192–193) and 0.5 mm (Figs. 183, 191).

Etymology

Derived from the indigenous language Maya Tzeltal from Tenejapa, Chiapas: *chimol* meaning May beetle and *xtil* meaning shiny; “shiny May beetle” (Gómez *et al.* 2000).

Description

Male (holotype). Length 18 mm. Body shiny dark brown with light brassy luster. Antennal club as long as the preceding six segments (Fig. 182). Anterior half of lateral border of pronotum entire, slightly curved, not crenulate. Pronotum and elytra with

many slender, short setae. Elytra moderately rugose punctate. Sternites 2–4 without pencils of setae. Abdominal sternite 5 with scattered, erect setae at sides. Sternites 3–5 with pairs of rounded tubercles near the midline, surrounded by dense vestiture of slender, short setae. Pygidium rugose punctate, with a longitudinal, median keel obliterated distally, surrounded by wide, shallow concavities (Fig. 190) and scattered slender, short setae. Tarsal claws with large ventral tooth located at the middle of ventral border (Fig. 183). Phallobase with distal border deeply notched and the basal border slightly projected basally (Fig. 189). Parameres 1.60 times longer than the width of phallobase, with the distal half stout, nearly straight and apex widely rounded (Figs. 184–185). Ventral membrane of genital capsule with sclerotized plates. Aedeagus nearly symmetrical, with tube-like, sclerotized support and membranous apex; ventrally with two long spines of different size and form (Figs. 185, 187–188). **Female** (allotype). Length 19 mm. Similar to male except as follows: pygidium slightly concave at middle of disk, widely prominent toward the apex (Fig. 193); tarsal claws with short tooth at the middle of ventral border (Fig. 191); apex of ventral genital plates acute and projected, without medial, preapical projections and with few scattered setae; apex of dorsal genital plates widely rounded, with some setae (Fig. 192).

Variation

Paratype specimens vary slightly in intensity of brassy luster and abundance of vestiture. Body length 16–19 mm.

Biology

This species inhabits tropical rain forests and tropical subdeciduous forests at altitudes from 200 to 970 m. Months of collection: May (2) and June (15). Other species flying at the same time and place were *P. (Phyllophaga) rugipennis* (Schauffus), *P. (P.) ocozocuana* **sp. nov.** and *P. (Phytalus) pruinosa* (Blanchard).

Distribution

Northern slopes of Sierra de Niltepec, Oaxaca, and western slopes of Sierra Norte de Chiapas, Mexico (Fig. 252).

Type locality

Finca San Carlos, Palomares, state of Oaxaca, Mexico (approximately 17°07'N, 95°04'W).

Remarks

Phyllophaga chimoxtila is similar to *P. submetallica* (Bates) from Guatemala, but the presence of slender, short setae instead of scale-like setae on the pronotum, elytra, sternites, and pygidium, texture of the pygidium, shape of the phallobase, parameres, aedeagus, and female genital plates are distinctive.

5. *Phyllophaga (Phyllophaga) solisiana* **sp. nov.**

(Figs. 194–204)

Material examined

Fifteen specimens, ♂♀. **Holotype** ♂: Costa Rica. Guanacaste: W side volcano Cacao, Estación Mengo, derrumbe, 1400 m, 5.vi.1988, D Janzen and D Hallwachs

(INBio). **Allotype** ♀: Costa Rica. Alajuela: San Ramón, Rio San Lorencito, 800 m, 24.v.1986, A Solís (INBio). **Paratypes: GUATEMALA. Izabal:** ♂, Morales, Sierra del Caral, Finca La Firmeza, cerca Aldea Negro Norte, 1150 m, 27.vi.1998, E Cano (UVGC); ♂, same data except 30.vii.1997, J Monzón (MXAL); ♂, Sierra del Caral, 1400 m, vi.1996, J Monzón and E Giesbert (UVGC). **NICARAGUA. Jinotega:** 2 ♂♂, Cerro Kilambe, camp 6, Las Torres, 1000 m, 19.vi.2001, J Sunyer and B Hernández (MELN). **COSTA RICA. Alajuela:** ♂, R.B. San Ramón, 800 m, ix.1994, G Carballo (INBio); ♀, San Ramón, 5 km N colonia Palmareña, 900 m, iii.1990 (INBio); ♂, same data as allotype; ♀, same data except 7.viii.1986 (MXAL). **Guanacaste:** ♂, R.F. Cordillera Guanacaste, Tenorio, Río San Lorenzo, 1050 m, v.1991, C Alvarado (INBio); ♂, SW volcán Cacao, Estación Cacao, 1000–1400 m, 21.v.1992, F Araya (MXAL); ♀, W volcán Cacao, Estación Maritza, 600 m, 22.ii.1992, E López (INBio); ♂, W volcán Cacao, Quebrada Marilin, 600 m, 25.ii.1994 (INBio). **Puntarenas:** ♂, Monteverde, San Luis, Arenal, 1000–1350 m, v.1994, Z Fuentes (INBio).

Etymology

This new species is dedicated to Angel Solís, a well-known coleopterist in Costa Rica, who has greatly facilitated our knowledge of the genus *Phyllophaga* in Central America.

Description

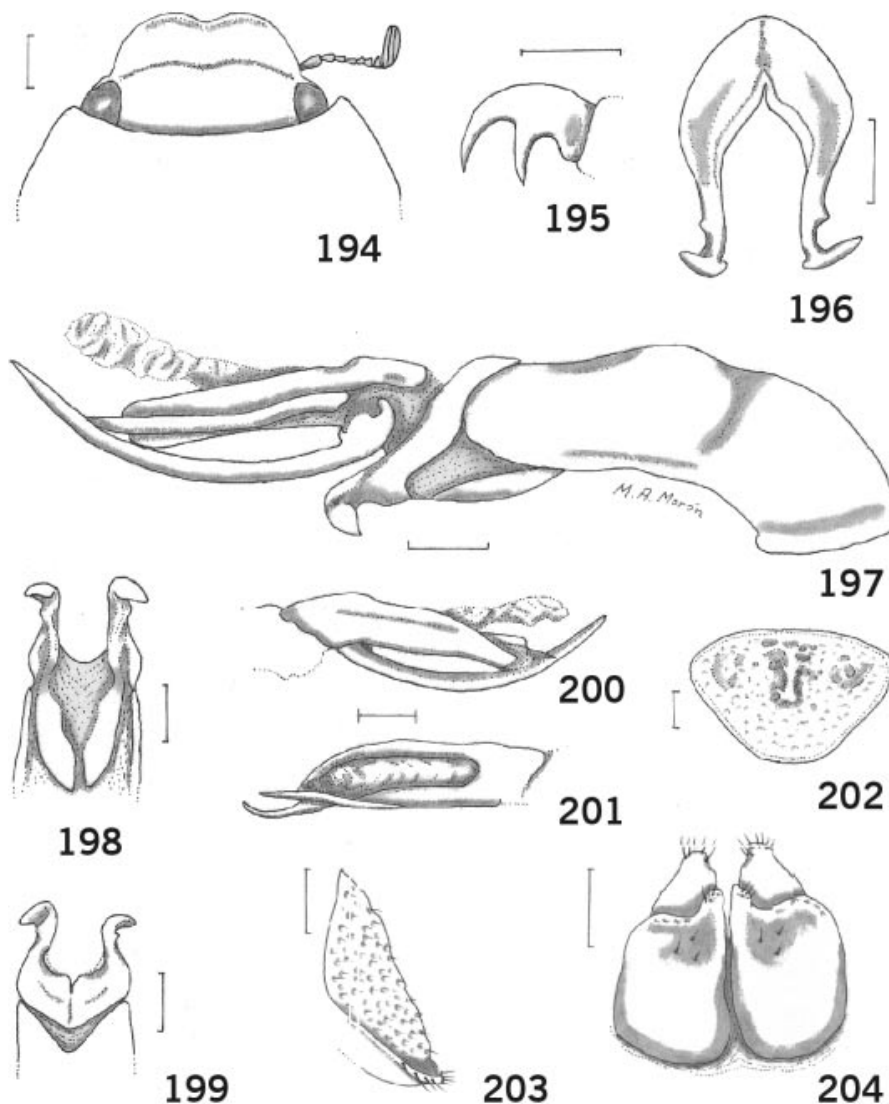
Male (holotype). Length 19 mm. Body shiny dark brown with light brassy luster. Antennal club as long as the preceding five segments (Fig. 194). Anterior half of lateral border of pronotum entire, slightly curved, not crenulate. Pronotum and elytra with vestiture of slender, short setae. Elytra densely punctate. Sternites 2–4 do not have pencils of setae. Abdominal sternite 5 with scattered, erect setae at sides. Sternites 3–5 convex and smooth near the midline, surrounded by sparse vestiture of short, slender setae. Pygidium rugose punctate, with vague longitudinal, median keel or group of rugosities on the basal half, surrounded by vague, irregular concavities (Fig. 202) and scattered slender, short setae. Tarsal claws with large ventral tooth located at the middle of ventral border (Fig. 195). Phallobase with distal border narrowly notched and the basal border slightly projected basally (Fig. 199). Parameres 1.45 times longer than the width of phallobase, with the distal half sinuate and the apex abruptly angled toward sides (Figs. 196–199). Ventral membrane of genital capsule with sclerotized plates. Aedeagus asymmetrical, with tube-like, sclerotized support and membranous apex; ventrally with two stout, very long spines of different size (Figs. 197, 200–201). **Female** (allotype). Length 20 mm. Similar to male except as follows: pygidium slightly convex, coarsely rugose punctate (Fig. 203); apex of ventral genital plates acute, projecting, without medial, preapical projections, with a few scattered minute setae; apex of dorsal genital plates widely rounded, prominent, with some setae (Fig. 204).

Variation

Paratypes vary in the intensity of brassy luster and abundance of vestiture. Body length 19–20 mm.

Biology

This species inhabits tropical rain forests and humid montane forests at altitudes from 600 to 1400 m. Months of collection: February (2), March (1), May (5), June (4), July (1), August (1), and September (1). Other species flying at the same time and place



FIGURES 194–204. *Phyllophaga solisiana*. 194, head of male, dorsal view; 195, tarsal claw of male; 196, parameres, distal view; 197, genital capsule, right lateral view; 198, parameres, ventral view; 199, same, dorsal view; 200, apex of aedeagus, left lateral view; 201, same, dorsal view; 202, pygidium of male, distal view; 203, pygidium of female, lateral view; 204, genital plates of female, ventral view. Scale bars = 1 mm (Figs. 194, 196–204) and 0.5 mm (Fig. 195).

were *P. (Phyllophaga) rugulosa* (Blanchard) in Guatemala and *P. (P.) changuena* sp. nov. in Costa Rica.

Distribution

East of Guatemala to central Costa Rica (Fig. 272).

Type locality

Western and southwestern slopes of volcano Cacao, province of Guanacaste, Costa Rica (approximately 10°50'N, 85°30'W).

Remarks

Phyllophaga solisiana is externally similar to *P. chimoxtila* **sp. nov.** but lack the tubercles at the midline of sternites, and the well-defined keel of the pygidium and coarse punctuation on the pygidium are distinctive. The shape of both the male and female genitalia are also distinct.

6. *Phyllophaga (Phyllophaga) subrugosa* (Moser)

(Figs. 205–213)

Lachnosterna subrugosa Moser, 1924: 1554.

Phyllophaga subrugosa (Moser): Blackwelder 1944: 226.

Phyllophaga (Phyllophaga) subrugosa (Moser): Morón 1986: 205; Morón *et al.* 1997: 250.

Material examined

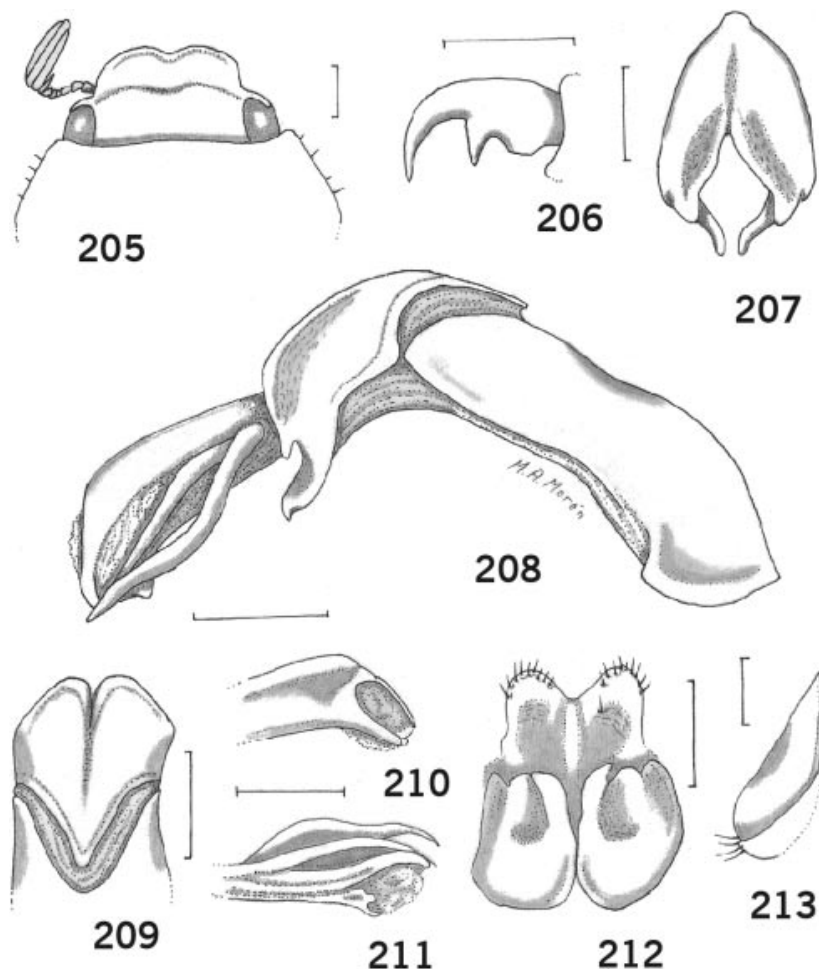
Twenty specimens, ♂♀. **Holotype** ♂: “Sierra Madre de Durango, Mexico” (ZMHU). **MEXICO. Veracruz:** ♂, 7.5 km N Huatusco, 29.vi.1971, Clark, Murray and Schaffner (TAMU); ♂, Excola, 24.v.1981, TW Taylor (UNSM); ♂♀, 2 km SE Calcahualco, 1600 m, 21.v.1993, L Delgado (IEXA); ♂, same data (MXAL); ♂♀, Coatepec, Briones, 1350 m, v.1991, MA Morón (IEXA); ♂, same data except 21.v.1996; ♂, same 26.v.2000; ♂, 1.v.2001; 2 ♂♂, 24.v.2001; 2 ♂♂, 8.vi.2001 (MXAL); ♀, Xalapa, Rancho Guadalupe, 1450 m, v.1989, G Ruiz; ♂♀, same data except 27.v.1995, R Novelo; ♀, same data except 6.vi.1997 (IEXA); ♂, same data except 28.iv.1991, MA Morón (MXAL); ♂, Xalapa, Rancho Viejo, 1400 m, 26.v.1991, BC Ratcliffe (UNSM); ♂, “Xalapa” (CAS).

Etymology

From the Latin *sub* meaning almost or somewhat and *rugosus* meaning wrinkled; somewhat wrinkled (Jaeger 1978).

Description

Male. Length 15–17 mm. Body shiny dark brown, nearly black. Antennal club slightly longer than the preceding seven segments (Fig. 205). Anterior half of lateral border of pronotum regular, continuous, slightly curved, with scattered short setae. Pronotum and elytra with scattered, minute setae. Elytra deeply punctate. Sternites 2–4 lack lateral pencils of long, golden yellow setae. Abdominal sternite 5 with scattered, erect setae at sides. Sternites 3–5 convex, smooth, surrounded by scattered vestiture of slender short setae. Pygidium slightly convex, punctate, with scattered slender, short setae. Tarsal claws with short ventral tooth located toward the middle of ventral border (Fig. 206). Phallobase with distal border narrowly cleft and basal border largely projected basally (Fig. 209). Parameres 1.51 times longer than the width of the phallobase, with the distal half short, sinuose and the apex slightly angled ventrally (Figs. 207–208). Ventral membrane of genital capsule without sclerotized plates. Aedeagus asymmetrical, with tube-like, sclerotized support and membranous apex; ventrally with two strong spines of different size (Figs. 208, 210–211). **Female.** Length 17–18 mm.



FIGURES 205–213. *Phyllophaga subrugosa*. 205, head of male, dorsal view; 206, tarsal claw of male; 207, parameres, distal view; 208, genital capsule, right lateral view; 209, parameres, dorsal view; 210, apex of aedeagus, left lateral view; 211, same, dorsal view; 212, genital plates of female, ventral view; 213, pygidium of female, lateral view. Scale bars = 1 mm (Figs. 205, 207–213) and 0.5 mm (Fig. 206).

Similar to male except as follows: pygidium slightly concave and widely bulging before the apex (Fig. 213); ventral genital plates with apex slightly rounded, not prominent, without setae, and with medial, preapical projections; dorsal genital plates with medial keel and the apex widely rounded, prominent, with short setae (Fig. 212).

Variation

Individuals vary in the degree of dorsal vestiture. The antennal club of males may be slightly longer than the preceding seven segments or as long as the preceding six segments. Body length 15–18 mm.

Biology

The species inhabits montane areas with high rainfall, especially cloud forests and

humid pine–oak forests at altitudes from 1350 to 1600 m. Months of collection: April (1), May (15), and June (4). Other species flying at the same time and place were *Phyllophaga* (*Phytalus*) *obsoleta* (Blanchard), *P.* (*Chlaenobia*) *latipes* (Bates), *P.* (*Phyllophaga*) *rugipennis* (Schauffus), *P.* (*P.*) *menetriesi* (Blanchard), and *P.* (*P.*) *testaceipennis* (Blanchard).

Distribution

Eastern slopes between Cofre de Perote and Pico de Orizaba, Veracruz, Mexico (Fig. 252).

Type locality

Here designated Xalapa, state of Veracruz, Mexico (19°32'N, 96°55'W).

Remarks

Moser's type specimen may have been mislabeled because *P. subrugosa* is not known to occur from the mountains of Durango. It does agree with material from Xalapa. *Phyllophaga subrugosa* is similar to *P. rugulosa* from southeastern Mexico, but the longer antennal club, absence of pencils of golden setae at the sides of sternites, lack of tumescence on pygidium, shape of the phallobase, shorter parameres, larger ventral spines of aedeagus, and female genital plates are distinctive. Following Moser (1924), Morón *et al.* (1997) erroneously cited this species from Durango, Mexico.

7. *Phyllophaga* (*Phyllophaga*) *aenea* (Moser)

(Figs. 214–224)

Lachnosterna aenea Moser, 1921: 252.

Phyllophaga aenea (Moser): Blackwelder 1944: 224.

Material examined

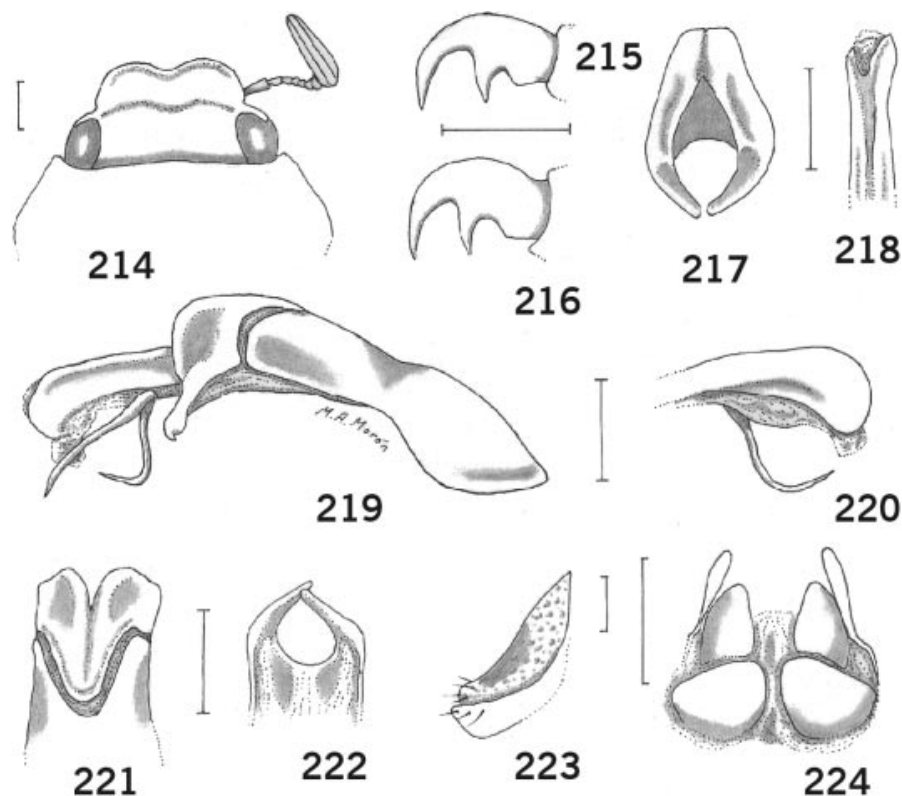
Five specimens, ♂♀. **Holotype** ♀: “Guatemala (Tumbador) Riedel S. 4–12” (ZMHU). **GUATEMALA. Quetzaltenango:** ♂, Viejo Palmar, San Juan Patzulin, 1320 m, 21.iii.1998, I Chávez (MXAL). **San Marcos:** ♂, El Tumbador, Finca Australia, 1510 m, 4.iv.1998, I Chavez (MXAL); ♂♀, Norte La Feria, 1600 m, 28.iv.1998, J Monzón (UVGC).

Etymology

From the Latin *aeneus* meaning of bronze or copper (Jaeger 1978); in reference to the slight metallic luster of this species.

Description

Male. Length 16 mm. Body shiny reddish brown, with light coopery luster. Antennal club as long as the preceding seven segments (Fig. 214). Anterior half of lateral border of pronotum regular, continuous, slightly curved. Pronotum and elytra with scattered, minute setae. Elytra rugose punctate. Sternites 2–4 lack lateral pencils of long, golden yellow setae. Abdominal sternite 5 with scattered, erect setae at sides. Sternites 3–5 convex, smooth, surrounded by scattered vestiture of slender, short setae. Pygidium moderately convex, rugose punctate, with scattered slender, short setae. Tarsal claws with short ventral tooth located toward the middle of ventral border (Fig. 215). Phallobase with distal border deeply cleft and basal border largely projected



FIGURES 214–224. *Phyllophaga aenea*. 214, head of male, dorsal view; 215, tarsal claw of male; 216, same, female; 217, parameres, distal view; 218, apex of aedeagus, dorsal view; 219, genital capsule, right lateral view; 220, apex of aedeagus, left lateral view; 221, parameres, dorsal view; 222, same, ventral view; 223, pygidium of female, lateral view; 224, genital plates of female, ventral view. Scale bars = 1 mm (Figs. 214, 217–224) and 0.5 mm (Figs. 215–216).

basally (Fig. 221). Parameres 1.47 times longer than the width of phallobase, with the distal half short, slightly curved and the apex briefly hooked ventrally (Figs. 217, 219). Ventral membrane of genital capsule without sclerotized plates. Aedeagus nearly symmetrical, with tube-like, compressed sclerotized support and membranous apex; ventrally with two long spines of different form (Figs. 218–220). **Female.** Length 17 mm. Similar to male except as follows: tarsal claws with ventral tooth located at the middle of ventral border (Fig. 216); pygidium widely concave on distal half, and briefly prominent before the apex (Fig. 223); ventral genital plates wider than long, with apex rounded, not prominent, without setae, and without medial, preapical projections; dorsal genital plates with medial area weakly sclerotized and the apex widely rounded, prominent, without setae; dorso-lateral plates narrowed and weakly sclerotized (Fig. 224).

Variation

In some specimens the metallic luster is limited to the lateral borders of the elytra, whereas the dorsal vestiture is nearly absent in others. Body length 16–17 mm.

Biology

This species inhabits mountainous cloud forests and humid pine–oak forests with

high rainfall located at altitudes from 1320 to 1600 m. Months of collection: March (1) and April (4). Other species flying at the same time and place were *P. (Phyllophaga) trichia* (Bates), *P. (P.) scabrifrons* (Bates), and *P. (P.) rugipennis* (Schauffus).

Distribution

Mountains of southwestern Guatemala (Fig. 252).

Type locality

El Tumbador, department of San Marcos, Guatemala (approximately 14°52'N, 91°55'W).

Remarks

Phyllophaga aenea is similar to *P. rugulosa* from southeastern Mexico and western Guatemala, but the longer antennal club, absence of pencils of golden setae at the sides of sternites, lack of tumescence on pygidium, and male and female genitalia are distinctive.

8. *Phyllophaga (Phyllophaga) matacapana* sp. nov.

(Figs. 225–232)

Material examined

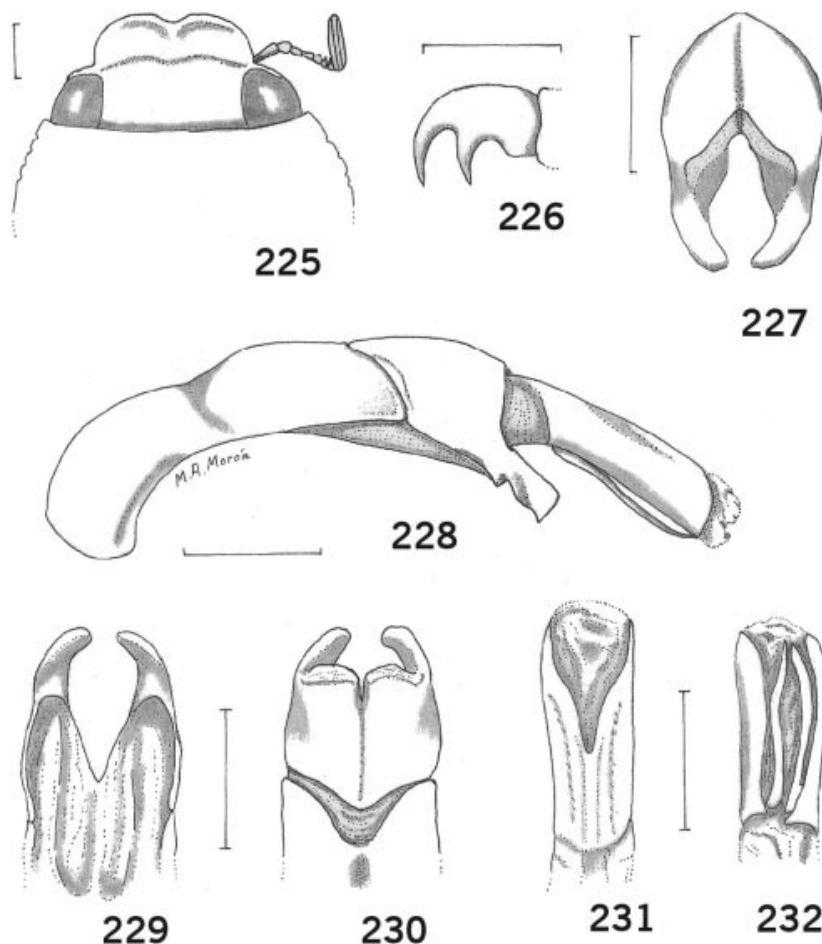
One specimen, ♂. **Holotype** ♂: Mexico. Veracruz: Estación Biología Tropical Los Tuxtlas, 340 m, 29.v.1985, P Sinaca (MXAL).

Etymology

Derived from the Nahuátl language and is an ancient name of an important indigenous settlement, “Matacapán” (Pool 1993), located near the volcano San Martín Tuxtla, the type locality.

Description

Male (holotype). Length 16 mm. Body shiny reddish brown with light brassy luster. Antennal club as long as the preceding six segments (Fig. 225). Anterior half of lateral border of pronotum crenulate. Pronotum and elytra with scattered short, slender setae. Elytra densely punctate. Sternites 2–4 lack lateral pencils of setae. Abdominal sternite 5 with scattered, erect setae at sides. Sternites 3–5 convex, smooth, surrounded by scattered vestiture of short, slender setae. Pygidium widely convex, densely punctate with scattered slender, short setae. Tarsal claws with large ventral tooth located at the middle of ventral border (Fig. 226). Phallobase with distal border narrowly cleft and the basal border moderately projected basally (Fig. 230). Parameres 1.54 times longer than the width of the phallobase, with the distal half stout, moderately curved and the apex slightly angled ventrally (Figs. 227–228). Ventral membrane of genital capsule without sclerotized plates (Fig. 229). Aedeagus nearly symmetrical, with tube-like, cylindrical sclerotized support and membranous apex; ventrally with two spines of different form (Figs. 228, 231–232). **Female**. Unknown.



FIGURES 225–232. *Phyllophaga matacapana*. 225, head of male, dorsal view; 226, tarsal claw of male; 227, parameres, distal view; 228, genital capsule, left lateral view; 229, parameres, ventral view; 230, same, dorsal view; 231, apex of aedeagus, dorsal view; 232, same, ventral view. Scale bars = 1 mm (Figs. 225, 227–232) and 0.5 mm (Fig. 226).

Biology

This species inhabits tropical rain forests located at an altitude of 340 m. Month of collection: May (1). Another species flying at the same time and place was *P. (Phyllophaga) dasypoda* (Bates).

Distribution

East slope of Volcán de San Martín Tuxtla, Veracruz, Mexico (Fig. 252).

Type locality

Estación de Biología Tropical “Los Tuxtlas” Universidad Nacional Autónoma de México, municipality of Monte Pío, state of Veracruz, Mexico (18°34′–18°36′N, 95°04′–95°09′W).

Remarks

Phyllophaga matacapana is similar to *P. aenea* (Moser) of Guatemala. It is distinguished by the crenulate pronotal margin, texture of the elytra and pygidium, and shape of the genitalia.

Diagnosis of subgroup 5

Medium-sized species (body length 17–23 mm). Head, pronotum, and elytra shiny black, dark brown, or reddish brown, without setae. Elytra and pygidium moderately or densely punctate. Sternites 3–5 convex and smooth. Males with the pygidium convex. Females with the pygidium convex or bulging toward the apex. Phallobase with the dorso-distal border notched or sinuate, without projections; parameres symmetrical; aedeagus with sclerotized support, with or without preapical sclerotized spurs. North-eastern to central-eastern Mexico.

1. *Phyllophaga (Phyllophaga) atrata* (Moser)

(Figs. 233–241)

Lachnosterna atrata Moser, 1918: 34.

Phyllophaga atrata (Moser): Blackwelder 1944: 224.

Phyllophaga (Phyllophaga) atrata: Morón 1986: 205; Morón *et al.* 1997: 230.

Material examined

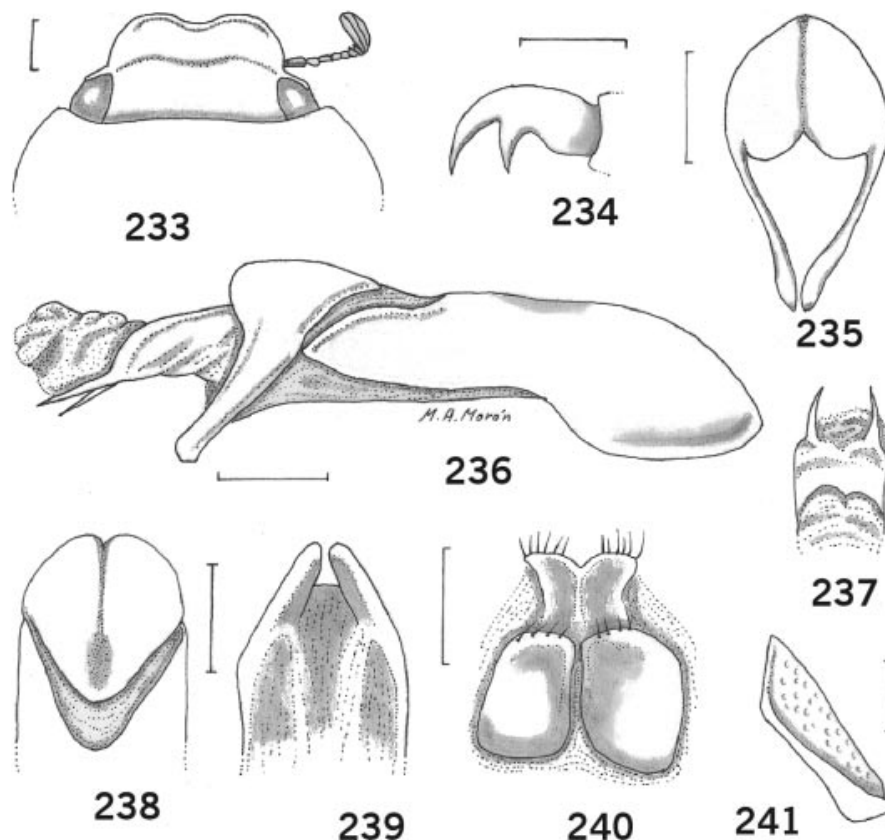
Twenty-three specimens, ♂♀. **Holotype** ♂: “Mexico (Puebla) G. Heine” (ZMHU). **MEXICO. Hidalgo:** 3♂♂, 2♀♀, Jacala, 31.viii.1960, HF Howden (CNC); ♂♀, same data (MXAL); ♂, Molango, 1650 m, 9.iv.1978, MA Morón; ♂, same data except 30.iv.1978; ♂, 2 ♀♀, 4 km N Tlanchinol 1420 m, 3.vi.1981, MA Morón; ♂, 4.5 km N Chapulhuacán, Hwy 85, 28.v.1984, BC Ratcliffe (MXAL); ♂♀, same data (UNSM); 3 ♂♂, 2 ♀♀, Maguey Verde, 2228 m, 19.vi.1999, G Nogueira (IEXA); ♂♀, same data (MXAL).

Etymology

From the Latin *atratus* meaning blackened; clothed in black (Jaeger 1978).

Description

Male. Length 18 mm. Body shiny dark brown to black. Antennal club as long as the preceding five segments (Fig. 233). Anterior half of lateral border of pronotum slightly curved, entire. Elytra without setae. Abdominal sternite 5 without setae at sides. Sternites 3–5 convex, smooth, near the midline, with scattered short setae at sides. Pygidium moderately convex, punctate, with scattered short setae. Tarsal claws with short ventral tooth located at the middle of ventral border (Fig. 234). Phallobase with distal border briefly notched and basal border largely projected basally (Fig. 238). Parameres 1.69 times longer than the width of phallobase, with the distal half long, slender, slightly sinuose and the apex rounded, entire (Figs. 235–236). Ventral membrane of genital capsule without sclerotized plates (Fig. 239). Aedeagus nearly symmetrical, with tube-like, weakly sclerotized support and membranous apex; ventrally with two subapical acute spurs (Figs. 236–237). **Female.** Length 19 mm. Similar to male except as follows: pygidium widely convex, slightly prominent before the apex (Fig. 241); ventral genital plates longer than wide, apex widely rounded, not prominent, and with



FIGURES 233–241. *Phyllophaga atrata*. 233, head of male, dorsal view; 234, tarsal claw of male; 235, parameres, distal view; 236, genital capsule, right lateral view; 237, apex of aedeagus, ventral view; 238, parameres, dorsal view; 239, same, ventral view; 240, genital plates of female, ventral view; 241, pygidium of female, lateral view. Scale bars = 1 mm (Figs. 233, 235–241) and 0.5 mm (Fig. 234).

few setae; dorsal genital plates with medial area weakly keeled and the apex widely rounded, slightly projected laterally, with some setae (Fig. 240).

Variation

Body length 17–19 mm.

Biology

This species inhabits mountainous cloud forests and humid pine–oak forests with seasonal high rainfall located at altitudes from 1420 to 2230 m. Months of collection: April (2), May (3), June (10), and August (7). Other species flying at the same time and place were *P. (Phyllophaga) necaxa* Saylor and *P. (Chlaenobia) vexata* (Horn).

Distribution

Mountains of central eastern Mexico (Fig. 252).

Type locality

“Puebla” (Moser 1918). Here designated Nuevo Necaxa, state of Puebla, Mexico (approximately 14°52'N, 91°55'W).

Remarks

Phyllophaga atrata is similar to *P. rolbakeri* from northeastern Mexico, but the smaller body size, form of the anterior border of the clypeus, and genitalia are distinctive.

2. *Phyllophaga (Phyllophaga) rolbakeri* Saylor

(Figs. 242–251)

Lachnosterna rolbakeri Saylor, 1940: 111.

Phyllophaga rolbakeri(Saylor): Blackwelder 1944: 226.

Phyllophaga (Phyllophaga) rolbakeri: Morón 1986: 242; Morón *et al.* 1997: 248.

Material examined

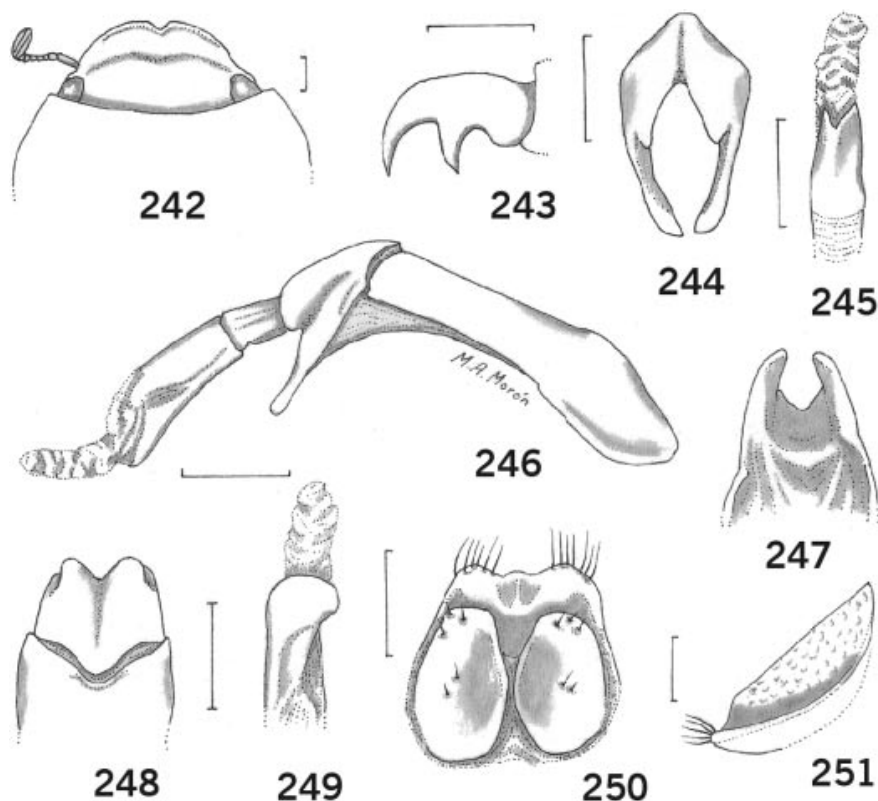
One-hundred and twenty-six specimens, ♂♀. **Holotype** ♂: “Buena Vista, Coahuila, Mex. 6000' VII-7-38, Rollin H Baker, Sierra de La Encantada” (CAS type 7999). **MEXICO. Coahuila:** ♂, 25 km SE Saltillo, 26.v.1984, D Thomas and BC Ratcliffe (UNSM); ♂, Terán, La Unión, 20.vii.1945, L. Vázquez (IBUNAM). **Nuevo León:** 2 ♂♂, 1 ♀, 25 km W Linares, 21.vii.1976, Peigler and Schaffner (TAMU); ♂, 8 km S Monterrey, 660 m, 17.vii.1963, HF Howden (CNC); 10 ♂♂, 7 ♀♀, Chipinque, 1500 m, 2.vi.1983, M Kaulbars and R Anderson; 3 ♂♂, 7 ♀♀, Chipinque, 1660 m, 22.vi.1971, HF Howden; ♂, Chipinque, 1800 m, 30.vii.1963, AT Howden (HAHC); 8 ♂♂, 4 ♀♀, Mesa Chipinque, Monterrey, 8.vii.1963, HF Howden; 5 ♂♂, 7 ♀♀, same data except 23.vii.1963, H and A Howden; 2 ♂♂, 2 ♀♀, same data except, on oaks, 26.viii.1960, HF Howden; ♀, same data, 1800 m, 30.vii.1963 (CNC); 7 ♂♂, 10 ♀♀, Mesa Chipinque, near Monterrey, 1800 m, 23.vii.1963, AT Howden; 2 ♂♂, 2 ♀♀, same data 8.vii.1963; ♂♀, Monterrey, Mesa de Chipinque, 1365 m, 16.vii.1965 (CUNY); 2 ♂♂, 1 ♀, Villa Santiago, Hacienda Vista Hermosa, 500 m, 19.vi.1940, Hoogstraal and Knight (CAS). **San Luis Potosi:** ♀, 3 km W Antiguo Morelos, 28.vii.1981, BC Ratcliffe and C Messenger; 1 ♂, 2 ♀♀, 38 km W Ciudad Valles, Los Cuates, 2.vi.1984, BC Ratcliffe; 2 ♂♂, 3 ♀♀, 8 km E Ciudad del Maiz, 1500 m, 27.v.1984, BC Ratcliffe (UNSM); 2 ♂♂, Ciudad del Maiz, 1250 m, 19.vii.1999, G Nogueira (IEXA); 5 ♂♂, 2 ♀♀, same data (MXAL). **Tamaulipas:** ♂, 31 km E Villa de Casas, 500 m, 5.vii.1966, G Ball and D Whitehead (CNC); ♂, same data (HAHC); ♂, 11 km E Jaumave, Salamanca, 29.vii.1981, BC Ratcliffe and C Messenger (UNSM); ♂♀, Ciudad Victoria, Rancho La Reja, 2000–2260 m, viii.1981, B Ratcliffe and C Messenger (IEXA); 5 ♂♂, 3 ♀♀, same data (UNSM); ♂♀, same data (MXAL); ♂, Gomez Farías, 6.vi.1986, W Warfield and MH Evans (CUNY); 2 ♂♂, Gómez Farías, 400–600 m, 20.vii.1965 (CUNY).

Etymology

Named in honor of Rollin H Rolbaker, collector of the type specimen (Saylor 1940).

Description

Male. Length 19–21 mm. Body shiny dark brown to black. Antennal club as long as the preceding five segments (Fig. 242). Anterior half of lateral border of pronotum



FIGURES 242–251. *Phyllophaga rolbakeri*. 242, head of male, dorsal view; 243, tarsal claw of male; 244, parameres, distal view; 245, apex of aedeagus, dorsal view; 246, genital capsule, right lateral view; 247, parameres, ventral view; 248, same, dorsal view; 249, apex of aedeagus, ventral view; 250, genital plates of female, ventral view; 251, pygidium of female, lateral view. Scale bars = 1 mm (Figs. 242, 244–251) and 0.5 mm (Fig. 243).

regular, continuous, slightly curved. Elytra without setae. Abdominal sternite 5 with erect setae at sides. Sternites 3–5 convex, smooth, near the midline, with scattered, short setae at sides. Pygidium moderately convex, punctate, with scattered short setae. Tarsal claws with short ventral tooth located at the middle of ventral border (Fig. 243). Phallobase with distal border widely notched and basal border moderately projected basally (Fig. 248). Parameres 1.66 times longer than the width of phallobase, with the distal half long, stout, slightly curved and the apex rounded, entire (Figs. 244, 246). Ventral membrane of genital capsule without sclerotized plates (Fig. 247). Aedeagus slightly asymmetrical, with tube-like, weakly sclerotized support and membranous apex; ventrally without spurs (Figs. 245–246, 249). **Female.** Length 20–23 mm. Similar to male except as follows: pygidium widely convex, slightly bulging before the apex (Fig. 251); ventral genital plates longer than wide, with the apex widely rounded, not prominent, with scattered setae; dorsal genital plates with mesial area briefly keeled, and the apex widely rounded, slightly projected, with slender setae (Fig. 250).

Variation

Some specimens are reddish brown. Body length 19–23 mm.

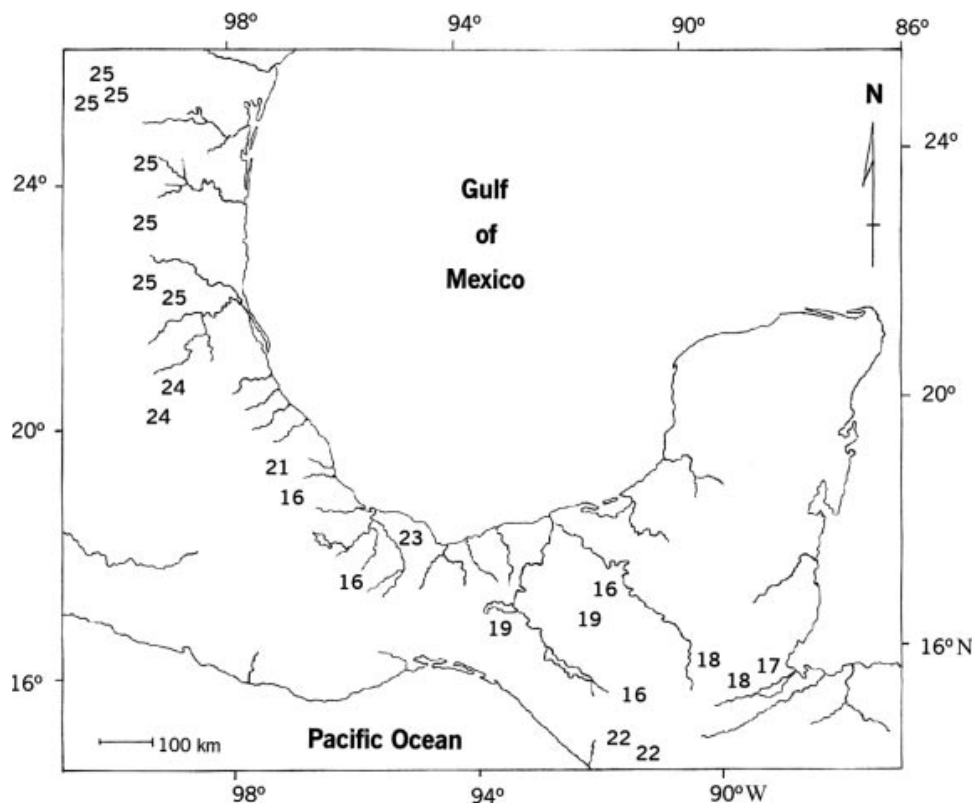


FIGURE 252. Collection localities in Mexico and Guatemala of *Phyllophaga rugulosa* (16), *P. chortiana* (17), *P. submetallica* (18), *P. chimoxtila* (19), *P. subrugosa* (21), *P. aenea* (22), *P. matacapana* (23), *P. atrata* (24), and *P. rolbakeri* (25).

Biology

This species inhabits mountainous humid pine–oak forests or mixed broad leaf forests with seasonal rainfall located at altitudes from 400 to 2260 m. Months of collection: May (6), June (34), July (70), and August (16). Another species flying at the same time and place was *P. (Phyllophaga) quetzala* Morón,

Distribution

Northern slopes of Sierra Madre Oriental, Mexico (Fig. 252).

Type locality

Buenavista, Sierra de La Encantada, state of Coahuila, Mexico (approximately 25°19'N, 101°01'W).

Remarks

Phyllophaga rolbakeri is similar to *P. atrata* from central-eastern Mexico, but the larger body size, more rounded anterior border of clypeus, and shape of male and female genitalia are distinctive.

Diagnosis of subgroup 6

Medium-sized species (body length 17–20 mm). Head, pronotum, and elytra shiny black, dark brown, or reddish brown, without setae. Elytra and pygidium moderately or densely punctate. Sternites 3–5 convex and smooth. Males and females with the pygidium convex. Phallobase with the dorso-distal border notched, without projections; parameres symmetrical; aedeagus with sclerotized support and preapical, sclerotized projections. Eastern Guatemala to Panama.

1. *Phyllophaga (Phyllophaga) nigrita* (Moser)

(Figs. 253–263)

Lachnosterna nigrita Moser, 1918: 37.

Phyllophaga nigrita (Moser): Blackwelder 1944: 225.

Phyllophaga (Phyllophaga) nigrita: Solís and Morón 1998: 24.

Material examined

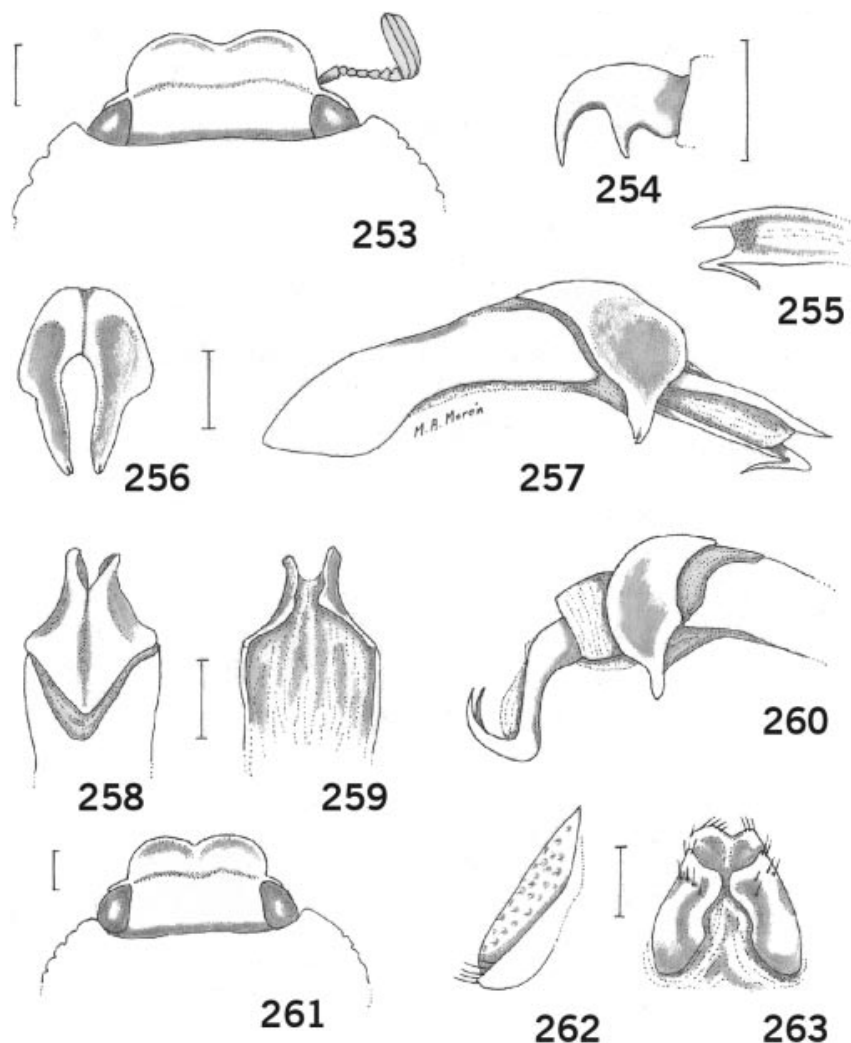
Eleven specimens, ♂♀. **Holotype** ♂: “Chiriqui” (ZMHU). **NICARAGUA. Zelaya**: ♂, Cerro Saslaya, 700 m, iv.1996, JM Maes and B Hernández; ♀, same data except 950 m, iv.1999 (MELN). **COSTA RICA. Alajuela**: ♀, Río San Lorencito, 800 m, 31.v.1997, IA Chacón. **Guanacaste**: ♀, Río San Lorenzo, Tierras Morenas, Tenorio A.C.A., 1050 m, vii.1993, G Rodríguez (INBIO). **San José**: ♂, J.B. Las Cruces, iv.1994, LD Gómez (MXAL). **Puntarenas**: ♂, Las Mellizas, 1360 m, 24.iv.1995, E Alfaro (MXAL); ♀, Estación Biológica Las Alturas, Coto Brus, 1500 m, iv.1992, M Ramírez (INBIO). **PANAMA. Chiriqui**: ♂, Renacimiento, Santa Clara, 1500 m, 4.vi.1986, BC Ratcliffe (MXAL); ♀, same data except, 1330 m, 20.v.1977, BC Ratcliffe (UNSM); ♂, 22.v.1982, BC Ratcliffe and C Messenger (UNSM).

Etymology

From the new Latin *nigritus* meaning blackened (Jaeger 1978).

Description

Male. Length 19–20 mm. Body shiny black. Antennal club as long as the preceding six segments (Fig. 253). Anterior half of lateral border of pronotum coarsely irregular, crenulated. Elytra rugose punctate, with three longitudinal costae clearly marked, without setae. Abdominal sternite 5 without erect setae at sides. Sternites 3–5 convex, smooth, near the midline, without setae at sides. Pygidium moderately convex, rugose punctate, with scattered short setae. Tarsal claws with short, ventral tooth located near the middle of ventral border (Fig. 254). Phallobase with distal border narrowly notched and basal border moderately projected basally (Fig. 258). Parameres 1.38 times longer than the width of the phallobase, with the distal half short, stout, nearly straight and the apex vaguely cleft (Figs. 256–257). Ventral membrane of genital capsule without sclerotized plates (Fig. 259). Aedeagus asymmetrical, with tube-like, weakly sclerotized support, with two projections of different form, the right one hook-like, and membranous apex (Figs. 255, 257). **Female.** Length 20 mm. Similar to male except as follows: anterior border of clypeus with lateral lobes more rounded (Fig. 261); pygidium widely convex, slightly prominent before the apex (Fig. 262); ventral genital plates longer than wide, with apex slightly sinuated, with scattered setae; dorsal genital plates with mesial area briefly keeled and the apex briefly rounded, with short setae (Fig. 263).



FIGURES 253–263. *Phyllophaga nigrita*. 253, head of male, dorsal view; 254, tarsal claw of male; 255, apex of aedeagus, right lateral view; 256, parameres, distal view; 257, genital capsule, male from Cartago, left lateral view; 258, parameres, dorsal view; 259, same, ventral view; 260, distal half of genital capsule, male from Zelaya, right lateral view; 261, head of female, dorsal view; 262, pygidium of female, lateral view; 263, genital plates of female, ventral view. Scale bars = 1 mm (Figs. 253, 255–263) and 0.5 mm (Fig. 254).

Variation

The male specimen from Nicaragua has a slightly different phallobase and the projections of the sclerotized support of the aedeagus nearly symmetrical, with up-turned hook-like structures (Fig. 260). Body length 19–20 mm.

Biology

This species inhabits mountainous tropical rain forest and cloud forests with high seasonal rainfall located at altitudes from 700 to 1500 m. Months of collection: April

(5), May (3), June (1), and July (1). Other species flying at the same time and place were *P. (Phyllophaga) laeviscutata* (Moser) and *P. (Phyllophaga) hemilissa* (Bates).

Distribution

Central Nicaragua to northeastern Panama (Fig. 272).

Type locality

“Chiriqui” (Moser, 1918); mountains in the province of Chiriqui, Panama (approximately 8°10′–8°45′N, 81°30′–82°30′W).

Remarks

Phyllophaga nigrita is similar to *P. zarcoana* **sp. nov.** from eastern Guatemala. It is distinguished by the deep punctuation and clearly marked costae of the elytra, larger body size, anterior border of clypeus more bilobed, shape of the phallobase, and straight parameres.

2. *Phyllophaga (Phyllophaga) zarcoana* **sp. nov.**

(Figs. 264–271)

Material examined

Two specimens, ♂. **Holotype** ♂: Guatemala. Izabal: near Rio Zarco, above El Arenal, 11.iv.1993, E Cano (UVGC). **Paratype** ♂: same data as holotype (MXAL).

Etymology

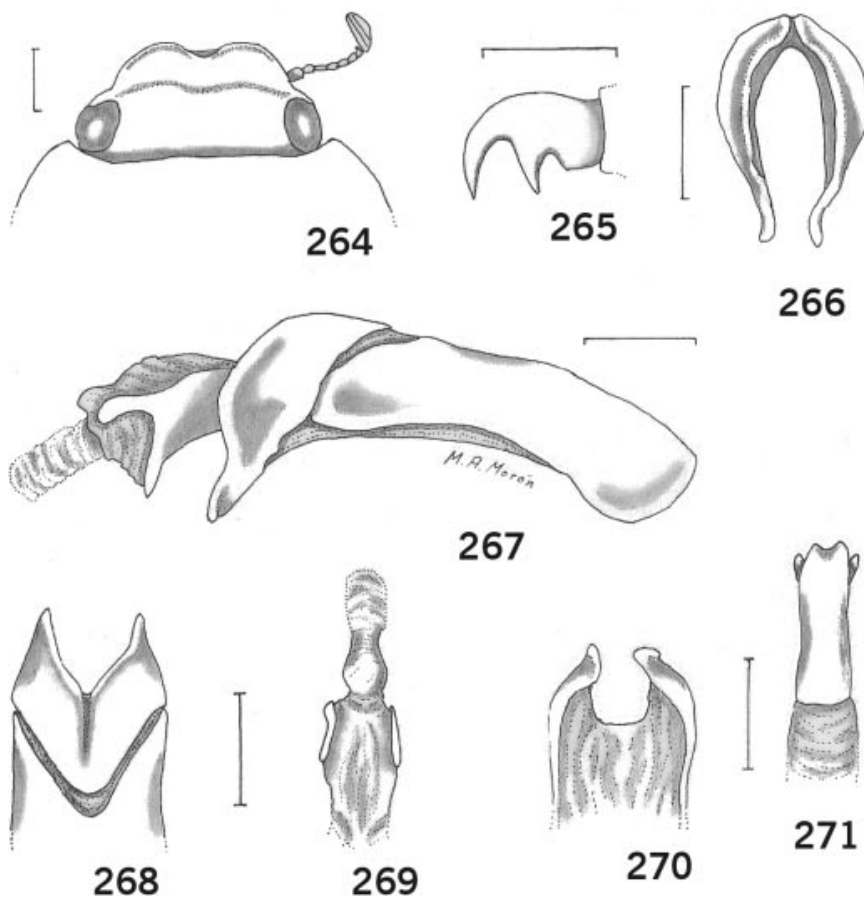
Named after the type locality Rio Zarco. Zarco is Spanish for “light blue waters” and was adapted from the ancient Arabic *zarqua* meaning women with blue eyes (Real Academia de la Lengua Española 1970).

Description

Male (holotype). Length 17 mm. Body shiny black. Antennal club as long as the preceding five segments (Fig. 264). Anterior half of lateral border of pronotum slightly curved, entire. Elytra densely and shallowly punctate, with three longitudinal costae weakly marked, without setae. Abdominal sternite 5 without erect setae at sides. Sternites 3–5 convex, smooth, near the midline, with scattered short setae at sides. Pygidium moderately convex, shallowly punctate, with scattered, short setae. Tarsal claws with short, ventral tooth located near the middle of ventral border (Fig. 265). Phallobase with distal border widely and deeply notched and basal border moderately projected basally (Fig. 268). Parameres 1.50 times longer than the width of phallobase, with the distal half short, slender, sinuate and the apex vaguely angled on the external sides (Figs. 266–267). Ventral membrane of genital capsule without sclerotized plates (Fig. 270). Aedeagus symmetrical, with tube-like, strongly sclerotized support, with two preapical, dorsal finger-like projections and membranous apex (Figs. 267, 269, 271). **Female**. Unknown.

Variation

Paratype male specimen differs only slightly in the density of dorsal punctuation.



FIGURES 264–271. *Phyllophaga zarcoana*. 264, head of male, dorsal view; 265, tarsal claw of male; 266, parameres, distal view; 267, genital capsule, right lateral view; 268, parameres, dorsal view; 269, apex of aedeagus, dorsal view; 270, parameres, ventral view; 271, apex of aedeagus, ventral view. Scale bars = 1 mm (Figs. 264, 266–271) and 0.5 mm (Fig. 265).

Biology

This species inhabits a montane cloud forest located at an altitude of 1500 m. Month of collection: April (2). Other species flying at the same time and place were *Phyllophaga (Phytalus) obsoleta* (Blanchard), *P. (Phyllophaga) rugipennis* (Schauffus), *P. (P.) submetallica* Bates, *P. (P.) chortiana* Morón, and *P. (P.) canoana* **sp. nov.**

Distribution

Eastern slopes of Sierra de Las Minas, Guatemala (Fig. 272).

Type locality

El Arenal, Rio Zarco Grande, department of Izabal, Guatemala (approximately 15°44'N, 89°17'W).

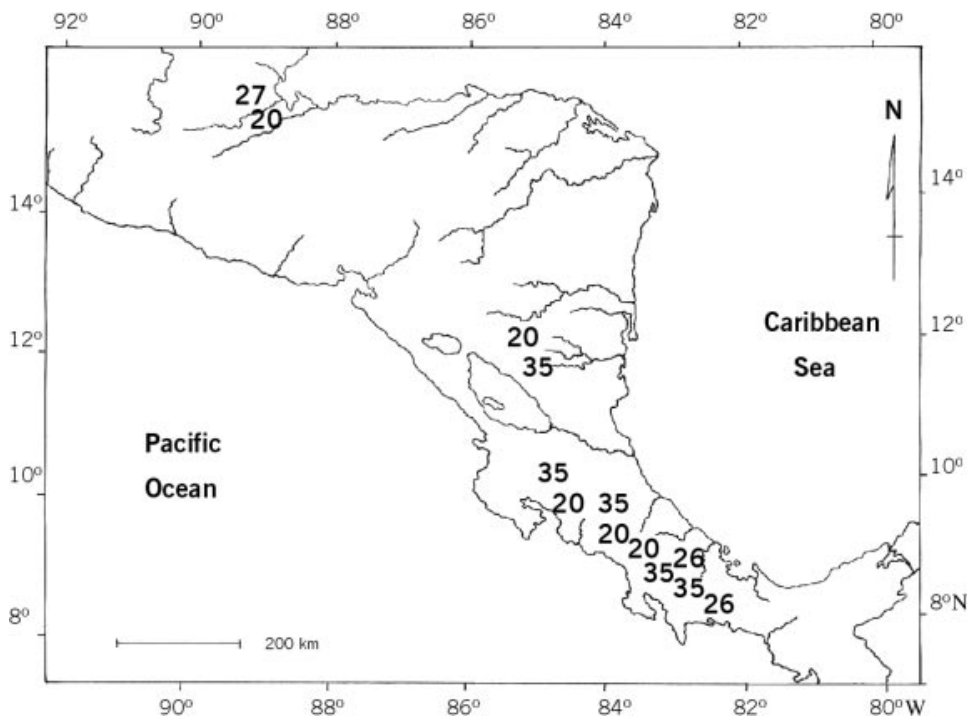


FIGURE 272. Collection localities in Central America of *Phyllophaga solisiana* (20), *P. nigrita* (26), *P. zarcoana* (27), and *P. changuena* (35).

Remarks

Phyllophaga zarcoana is similar to *P. nigrita* (Moser) from Nicaragua, Costa Rica, and Panama but differs in having an entire pronotal margin, less dense punctation of the elytra and pygidium, and in the shape of the genitalia.

Diagnosis of subgroup 7

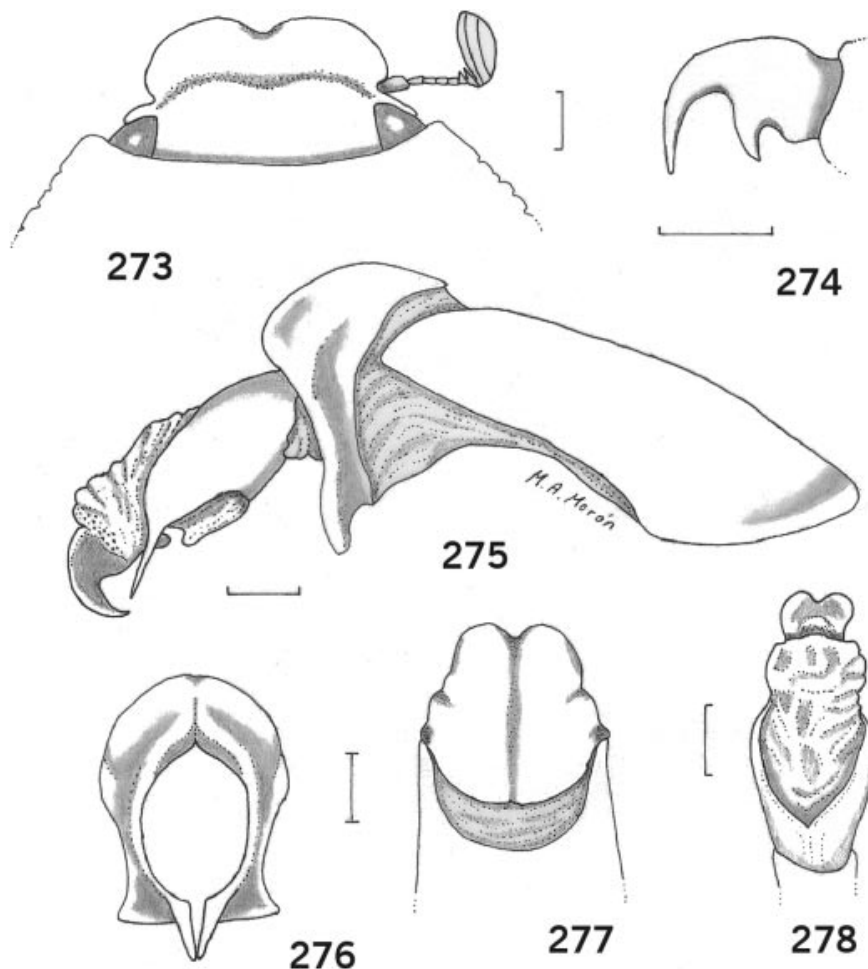
Medium to large species (body length 17–28 mm). Head, pronotum, and elytra shiny black, dark brown, or reddish brown, rarely with greenish blue vitreous luster, and glabrous. Elytra and pygidium moderately or densely punctate. Sternites 3–5 convex and smooth. Males with the pygidium convex. Females with the pygidium convex or concave. Phallobase with the dorso-distal border notched or sinuate, without projections; parameres symmetrical or asymmetrical; aedeagus with sclerotized support and preapical strongly sclerotized structures of diverse forms. Southeastern Mexico to northwestern Panama.

1. *Phyllophaga (Phyllophaga) comaltepecana* sp. nov.

(Figs. 273–278)

Material examined

Two specimens, ♂. **Holotype** ♂: Mexico. Oaxaca: Sierra de Juárez, 1800 m,



FIGURES 273–278. *Phyllophaga comaltepecana*. 273, head of male, dorsal view; 274, tarsal claw of male; 275, genital capsule, right lateral view; 276, parameres, distal view; 277, same, dorsal view; 278, apex of aedeagus, dorsal view. Scale bars = 1 mm (Figs. 273, 275–278) and 0.5 mm (Fig. 274).

2.vi.1995, G Nogueira (MXAL). **Paratype** ♂: **MEXICO. Oaxaca:** Comaltepec, 1875 m, 18.v.1996, G Nogueira (MXAL).

Etymology

Derived from the ancient indigenous Nahuátl name *Comaltepeco*, which means on the mountain where ceramic hot plates are made (Simeón 1988); the locality where the specimens were collected.

Description

Male (holotype). Length 27 mm. Body shiny black. Antennal club as long as the preceding six segments (Fig. 273). Anterior half of lateral border of pronotum crenulate. Elytra densely and deeply punctate, without setae. Abdominal sternite 5 without erect setae at sides. Sternites 3–5 convex, smooth, near the midline, with scattered

short setae at sides. Pygidium moderately convex, densely punctate, with scattered, short setae. Tarsal claws with short, ventral tooth located toward the basal dilatation (Fig. 274). Phallobase shallowly furrowed along the midline of dorsal surface, distal border briefly and widely notched, and basal border widely rounded (Fig. 277). Parameres 1.48 times longer than the width of phallobase, with the distal half curved, with strong tooth-like projection on external sides and the apex compressed, nearly acute (Figs. 275–276). Ventral membrane of genital capsule without sclerotized plates. Aedeagus symmetrical, with wide tube-like, strongly sclerotized support, with one subapical, acute spur, and hook-like, sclerotized apical plate (Figs. 275, 278). **Female.** Unknown.

Variation

Paratype 25–27 mm long.

Biology

This species inhabits a montane cloud forest at altitudes from 1800 to 1875 m. Months of collection: May (1) and June (1). Other species flying at the same time and place were *P. (Phyllophaga) humboldtiana* Morón and *P. (P.) dsaimana* **sp. nov.**

Distribution

Gulf slopes of Sierra de Juárez, Oaxaca, Mexico (Fig. 366).

Type locality

Municipality of Santiago Comaltepec, state of Oaxaca, Mexico (approximately 17°34'–17°37'N, 97°34'–97°40'W).

Remarks

Phyllophaga comaltepecana is similar externally to *P. nigrita* (Moser) from Nicaragua, Costa Rica, and Panama. It is distinguished by its large size and genitalia.

2. *Phyllophaga (Phyllophaga) ocozocuana* **sp. nov.**

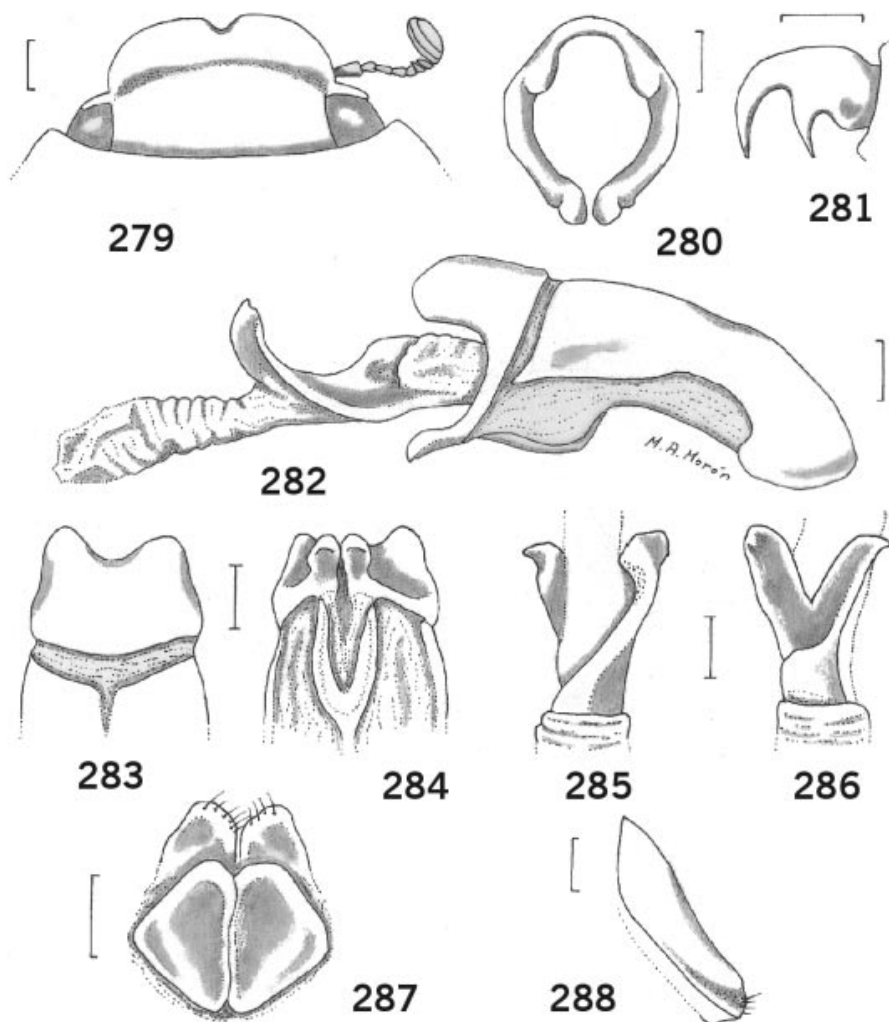
(Figs. 279–288)

Material examined

Four specimens, ♂♀. **Holotype** ♂: Mexico. Chiapas: Ocozocuautla, El Ocote, 9 km SW Cuauhtémoc, 23.iv.1994, B Gómez (MXAL). **Allotype** ♀: same data as holotype (MXAL). **Paratypes: MEXICO. Chiapas:** ♂, same data as holotype except 24.iv.1994 (ECOSUR); ♂, 5 mi SW El Bosque, 10.vi.1969, JM Campbell (CNC).

Etymology

Derived from the ancient indigenous Nahúatl name *Ocozocuautlan*, which means the site where sweet gum trees are abundant (Simeón 1988); the locality where the specimens were collected.



FIGURES 279–288. *Phyllophaga ocozocuana*. 279, head of male, dorsal view; 280, parameres, distal view; 281, tarsal claw of male; 282, genital capsule, right lateral view; 283, parameres, dorsal view; 284, same, ventral view; 285, apex of aedeagus, ventral view; 286, same, dorsal view; 287, genital plates of female, ventral view; 288, pygidium, lateral view. Scale bars = 1 mm (Figs. 279–280, 282–288) and 0.5 mm (Fig. 281).

Description

Male (holotype). Length 27 mm. Body shiny black. Antennal club as long as the preceding five segments (Fig. 279). Anterior half of lateral border of pronotum entire. Elytra densely punctate, glabrous. Abdominal sternite 5 without erect setae at sides. Sternites 3–5 convex, smooth, near the midline, with scattered short setae at sides. Pygidium moderately convex, densely punctate, with scattered, short setae. Tarsal claws with long, acute, ventral tooth located toward the basal dilation (Fig. 281). Phallobase without furrow along the midline of dorsal surface, distal border widely sinuate and basal border broadly rounded (Fig. 283). Parameres 1.17 times longer than the width of phallobase, stout, with the distal half curved, with preapical, weak, external notch and

the apex rounded (Figs. 280, 282). Ventral membrane of genital capsule with sclerotized bifurcate plate. Aedeagus asymmetrical, with strongly sclerotized support, and preapical, bifurcate, twisted structure, and membranous apex (Figs. 282, 285–286). **Female** (allotype). Length 28 mm. Similar to male except as follows: pygidium widely concave toward distal half, and briefly bulging before the apex (Fig. 288); ventral genital plates semi-triangular, with the apex widely rounded, not prominent, without setae; dorsal genital plates with narrowed, medial area membranous and the apex widely rounded, with scattered setae (Fig. 287).

Variation

Paratype 26–28 mm long.

Biology

This species inhabits in deciduous and subdeciduous tropical forests at altitudes from 1200 to 1500 m. Months of collection: April (3) and June (1). Other species flying at the same time and place were *P. (Phyllophaga) rugipennis* (Schauffus), *P. (P.) chimoxtila* Morón, and *P. (Phytalus) pruinosus* (Blanchard).

Distribution

Eastern slopes of Sierra Norte de Chiapas, Mexico (Fig. 366).

Type locality

Reserva de la Biosfera El Ocote, municipality of Ocozocuatla, state of Chiapas, Mexico (approximately 16°50'N, 93°40'W).

Remarks

Phyllophaga ocozocuana is similar to *P. schizorhina* (Bates) from Nicaragua, Costa Rica, and Panama but is distinguished by the twisted aedeagus, a character unique in the “*schizorhina*” species group.

3. *Phyllophaga (Phyllophaga) dsaimana* sp. nov.

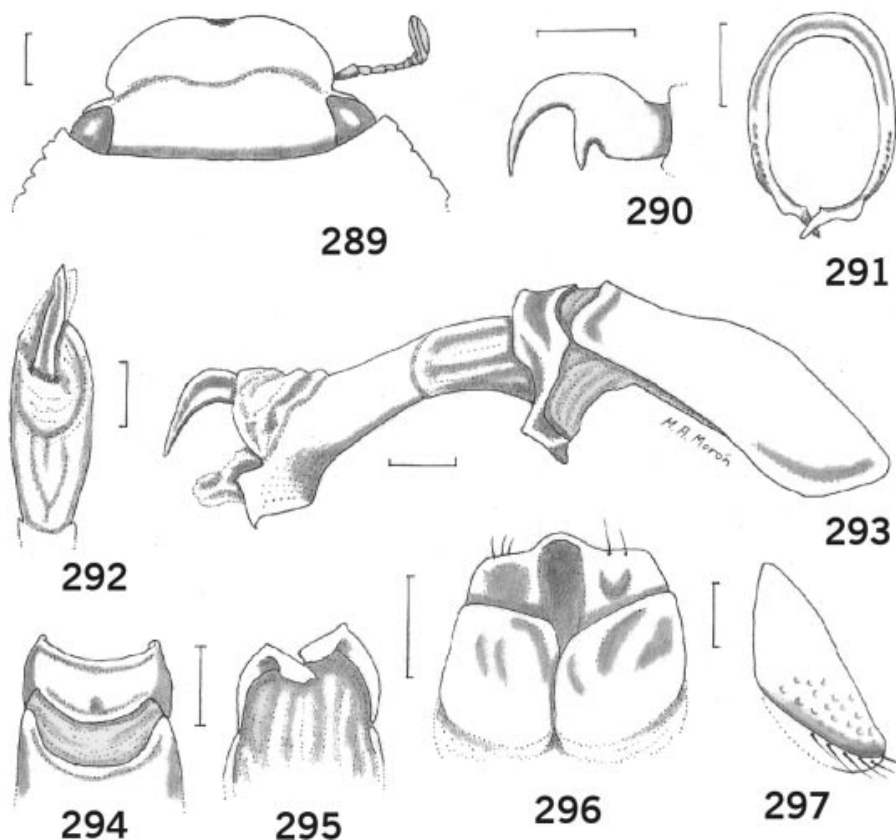
(Figs. 289–297)

Material examined

Eight specimens, ♂♀. **Holotype** ♂: Mexico. Oaxaca: Sierra de Juárez, Comaltepec, 1700 m, 21.v.1996, G Nogueira (MXAL). **Allotype** ♀: Mexico. Oaxaca: Sierra de Juárez, 1650 m, 11.v.1997 (MXAL). **Paratypes**: **MEXICO. Oaxaca**: ♂♂, Comaltepec, 1820 m, 17.v.1996, G Nogueira; ♀, Sierra de Juárez, 1290 m, 12.v.1997, G Nogueira (MXAL); ♂♂, same data as allotype; ♂, same data except 1800 m, 15.v.1997 (IEXA).

Etymology

Derived from ancient indigenous Chinanteca mythology; *Dsaima*, which means a knight of the mountain, a beneficial spirit, lord of the animals, and protector of nature in Chinantlan (Pardo 1995); the region where this species was collected.



FIGURES 289–297. *Phyllophaga dsaimana*. 289, head of male, dorsal view; 290, tarsal claw of male; 291, parameres, distal view; 292, apex of aedeagus, dorsal view; 293, genital capsule, right lateral view; 294, parameres, dorsal view; 295, same, ventral view; 296, genital plates of female, ventral view; 297, pygidium, lateral view. Scale bars = 1 mm (Figs. 289, 291–197) and 0.5 mm (Fig. 290).

Description

Male (holotype). Length 23 mm. Body shiny black, with greenish blue vitreous luster on the elytra. Antennal club as long as the preceding five segments (Fig. 289). Anterior half of lateral border of pronotum crenulate. Elytra densely punctate, without setae. Abdominal sternite 5 with erect setae at sides. Sternites 3–5 convex, smooth, near the midline, with scattered short setae at sides. Pygidium moderately convex, densely punctate, with scattered, short setae. Tarsal claws with short, acute, ventral tooth located toward the basal dilation (Fig. 290). Phallobase without furrow along the midline of dorsal surface, distal border widely and briefly sinuated, and basal border widely curved (Fig. 294). Parameres 1.50 times longer than the width of the phallobase, slender, with the distal half curved, with preapical, weak, external blade, and the apex acute (Figs. 291, 293). Ventral membrane of genital capsule without sclerotized plates (Fig. 295). Aedeagus symmetrical, with strongly sclerotized support, and preapical, dorsal, strong, sclerotized hook-like structure, and membranous apex (Figs. 292–293). **Female** (allotype). Length 24 mm. Similar to male except as follows: pygidium widely convex, slightly flattened toward the apex (Fig. 297); ventral genital plates sub-

quadrate, with the apex widely truncated, without setae; dorsal genital plates with wide mesial area depressed, projected distally, with scattered setae at sides (Fig. 296).

Variation

Paratypes vary in length, 20–24 mm, in density of punctuation on the pronotum and elytra, and in the degree of the greenish blue vitreous luster.

Biology

This species inhabits montane rain and cloud forests at altitudes from 1290 to 1820 m. Month of collection: May (8). Other species flying at the same time and place were *P. (Phyllophaga) humboldtiana* Morón and *P. (P.) comaltepecana* Morón.

Distribution

Gulf slopes of Sierra de Juárez, Oaxaca, Mexico (Fig. 366).

Type locality

Municipality of Santiago Comaltepec, state of Oaxaca, Mexico (approximately 17°34'–17°37'N, 97°34'–97°40'W).

Remarks

Externally, *P. dsaimana* is similar to *P. javepacuana* **sp. nov.** from Chiapas, Mexico, but is distinguished by the crenulate margin of the pronotum, absence of projections on the distal border of phallobase, form of the parameres, and the strong hook-like sclerotized structure on the aedeagus.

4. *Phyllophaga (Phyllophaga) quiana* **sp. nov.**

(Figs. 298–305)

Material examined

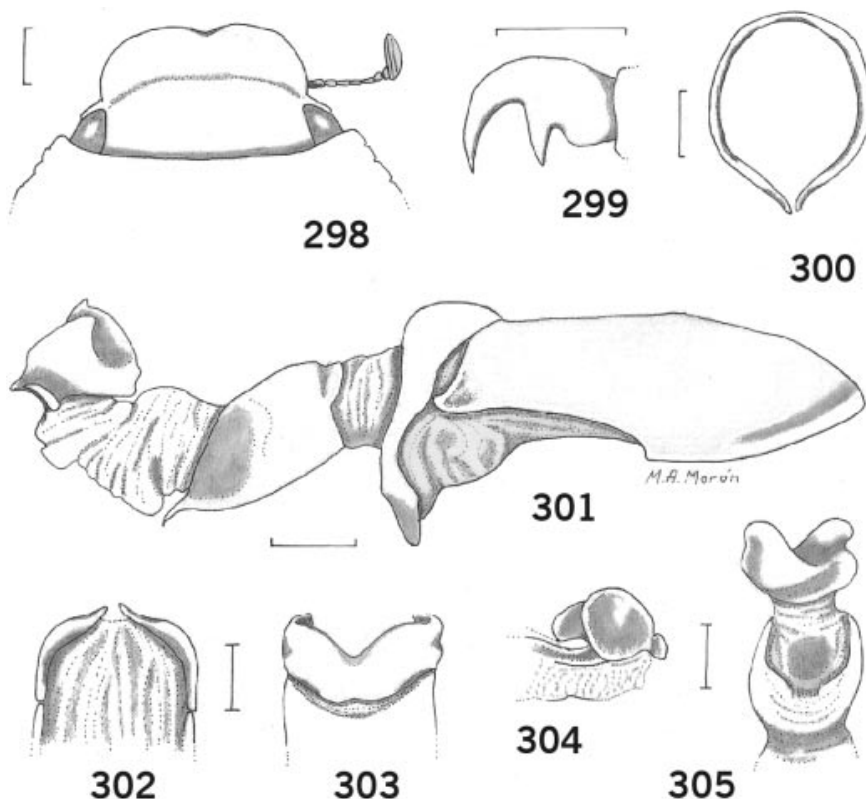
Three specimens, ♂. **Holotype** ♂: Mexico. Oaxaca: Sierra de Juárez, 1650 m, 11.v.1997, G Nogueira (MXAL). **Paratypes**: **MEXICO. Oaxaca**: ♂, same data as holotype (MXAL); ♂, Sierra de Juárez, 1700 m, 21.v.1996, G Nogueira (MXAL).

Etymology

Derived from the ancient indigenous Chinanteca history; *Quia-na*, which means good, kind man, founder of the Quiana culture in the mountains of northern Oaxaca (Pardo 1995).

Description

Male (holotype). Length 20 mm. Body shiny black, with greenish blue vitreous luster on the elytra. Antennal club as long as the preceding five segments (Fig. 298). Anterior half of lateral border of pronotum irregular, crenulated. Elytra densely punctate, without setae. Abdominal sternite 5 with erect setae at sides. Abdominal sternites 3–5 convex, smooth, near the midline, without setae at sides. Pygidium moderately convex, densely punctate, with scattered, minute setae. Tarsal claws with short, acute, ventral tooth located toward the basal dilation (Fig. 299). Phallobase without



FIGURES 298–305. *Phyllophaga quiana*. 298, head of male, dorsal view; 299, tarsal claw of male; 300, parameres, distal view; 301, genital capsule, right lateral view; 302, parameres, ventral view; 303, same, dorsal view; 304, apex of aedeagus, left lateral view; 305, same, dorsal view. Scale bars = 1 mm (Figs. 298, 300–305) and 0.5 mm (Fig. 299).

furrow along the midline of dorsal surface, distal border widely and deeply notched, and basal border slightly bilobed (Fig. 303). Parameres 1.18 times longer than the width of phallobase, slender, with the distal half slightly curved, with apex weakly angled (Figs. 300–301). Ventral membrane of genital capsule without sclerotized plates (Fig. 302). Aedeagus asymmetrical, with strongly sclerotized support, and apical, strong, sclerotized asymmetrical structure (Figs. 301, 304–305). **Female.** Unknown.

Variation

Paratypes 19–20 mm long; color varies in the intensity of vitreous luster of the elytra.

Biology

This species inhabits montane cloud forests at altitudes from 1650 to 1700 m. Month of collection: May (3). Other species flying at the same time and place were *P. (Phyllophaga) rugulosa* (Blanchard) and *P. (P.) dsaimana* Morón.

Distribution

Gulf slopes of Sierra de Juárez, Oaxaca, Mexico (Fig. 366).

Type locality

Municipality of Santiago Comaltepec, state of Oaxaca, Mexico (approximately 17°34'–17°37'N, 97°34'–97°40'W).

Remarks

Phyllophaga quiana is externally similar to *P. dsaimana* Morón, but the phallobase, parameres, and aedeagus are distinct.

5. *Phyllophaga (Phyllophaga) yoloxana* sp. nov.

(Figs. 306–314)

Material examined

Four specimens, ♂♀. **Holotype** ♂: Mexico. Oaxaca: Sierra de Juárez, 1290 m, 12.v.1997, G Nogueira (MXAL). **Allotype** ♀: same data as holotype (MXAL). **Paratypes: MEXICO. Oaxaca:** 2 ♂♂, same data as holotype (IEXA).

Etymology

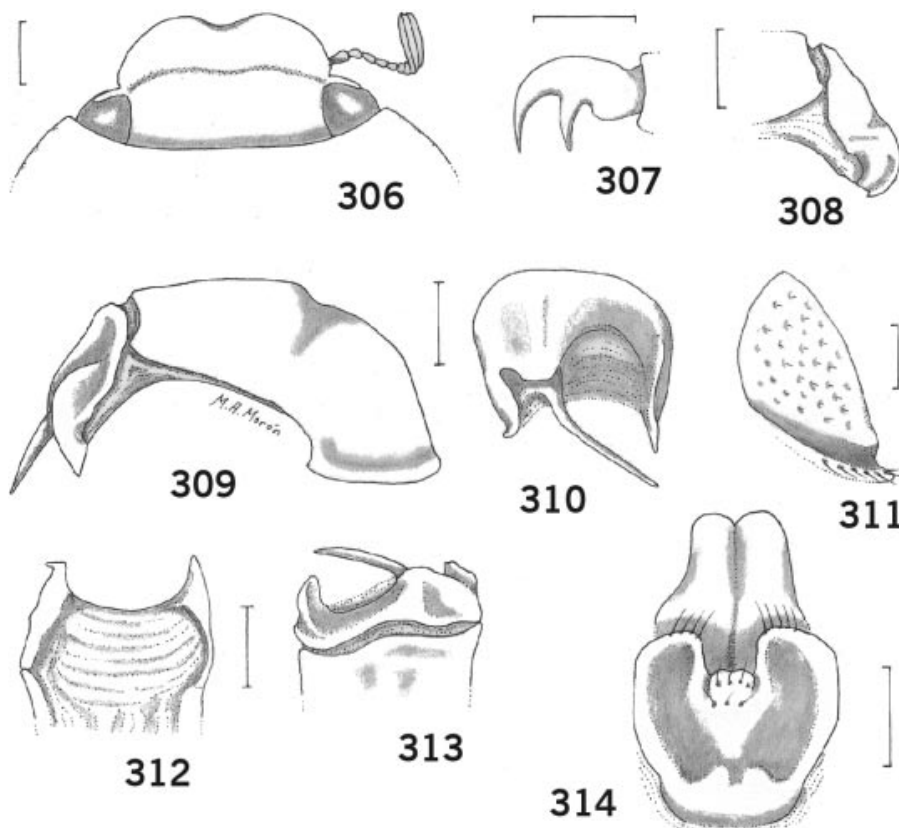
Derived from the ancient indigenous Chinanteca settlement named *Yolox* by the Nahúatl people, head of the kingdom of Chinantla-Pichinche in the upper Gulf slopes of the mountains of northern Oaxaca (Pardo 1995) where this species was collected.

Description

Male (holotype). Length 18 mm. Body shiny black. Antennal club as long as the preceding six segments (Fig. 306). Anterior half of lateral border of pronotum slightly irregular, finely crenulated. Elytra densely punctate, without setae. Abdominal sternite 5 without erect setae at sides. Abdominal sternites 3–5 convex, smooth, near the midline, with scattered minute setae at sides. Pygidium moderately and uniformly convex, densely rugose punctate, with scattered, minute setae. Tarsal claws with long, acute, ventral tooth located toward the basal dilation (Fig. 307). Phallobase without furrow along the midline of dorsal surface, distal border asymmetrical, widely and deeply sinuated at the right side; basal border asymmetrical, widely sinuate (Figs. 310, 313). Parameres asymmetrical, 0.96 times longer than the width of phallobase, short, right paramere nearly straight, with the apex acute; left paramere with the apex curved (Figs. 308–310). Ventral membrane of genital capsule without sclerotized plates (Fig. 312). Aedeagus asymmetrical, with short sclerotized support, and a long, preapical, dorsal spine (Figs. 309–310). **Female** (allotype). Length 19 mm. Similar to male except as follows: pygidium widely convex toward the basal half, slightly prominent before the apex (Fig. 311); ventral genital plates fused medially, “U” shaped, with shallow concave surface and the broadly rounded apex, with scattered setae; dorsal genital plates longer than wide, fused medially, with shallow furrow medially, rounded apex, and without setae (Fig. 314).

Variation

Paratypes vary slightly in the density of punctuation on the pronotum, elytra, and pygidium.



FIGURES 306–314. *Phyllophaga yolojana*. 306, head of male, dorsal view; 307, tarsal claw of male; 308, parameres, left lateral view; 309, genital capsule, right lateral view; 310, parameres, distal view; 311, pygidium of female, lateral view; 312, parameres, ventral view; 313, same, dorsal view; 314, genital plates of female, ventral view. Scale bars = 1 mm (Figs. 306, 308–314) and 0.5 mm (Fig. 307).

Biology

This species inhabits montane rain forests at an altitude of 1290 m. Month of collection: May (4). Other species flying at the same time and place were *P. (Phyllophaga) rugulosa* (Blanchard) and *P. (P.) dsaimana* Morón.

Distribution

Gulf slopes of Sierra de Juárez, Oaxaca, Mexico (Fig. 366).

Type locality

Municipality of Santiago Comaltepec, state of Oaxaca, Mexico (approximately 17°34'–17°37'N, 97°34'–97°40'W).

Remarks

Phyllophaga yolojana is similar externally to *P. nigrita* (Moser) from Central America but is distinguished by the finely crenulated lateral margin of the pronotum,

strongly asymmetrical male genital structures, and the unique form of the genital plates of the female.

6. *Phyllophaga (Phyllophaga) cholana* sp. nov.

(Figs. 315–323)

Material examined

Five specimens, ♂♀. **Holotype** ♂: Mexico. Chiapas: Parque Laguna Bélgica, 18 km N Ocozocuautila, 29.iv.1985, D Thomas (UNSM). **Allotype** ♀: Mexico. Chiapas: Ocozocuautila, El Ocote, 2 km S Alvaro Obregón, 15.iv.1994, B Gómez (MXAL). **Paratypes: MEXICO. Chiapas:** ♂, same data as holotype (MXAL); ♂, same data as allotype (MXAL); ♂, 17 km N Ocozocuautila, 1060 m, 10.vi.1966, G Ball and D Whitehead (CNC).

Etymology

Derived from the old language Chol, which is used by the indigenous Mayan people in the northern mountains of Chiapas, Mexico, and Guatemala (Manrique 1988).

Description

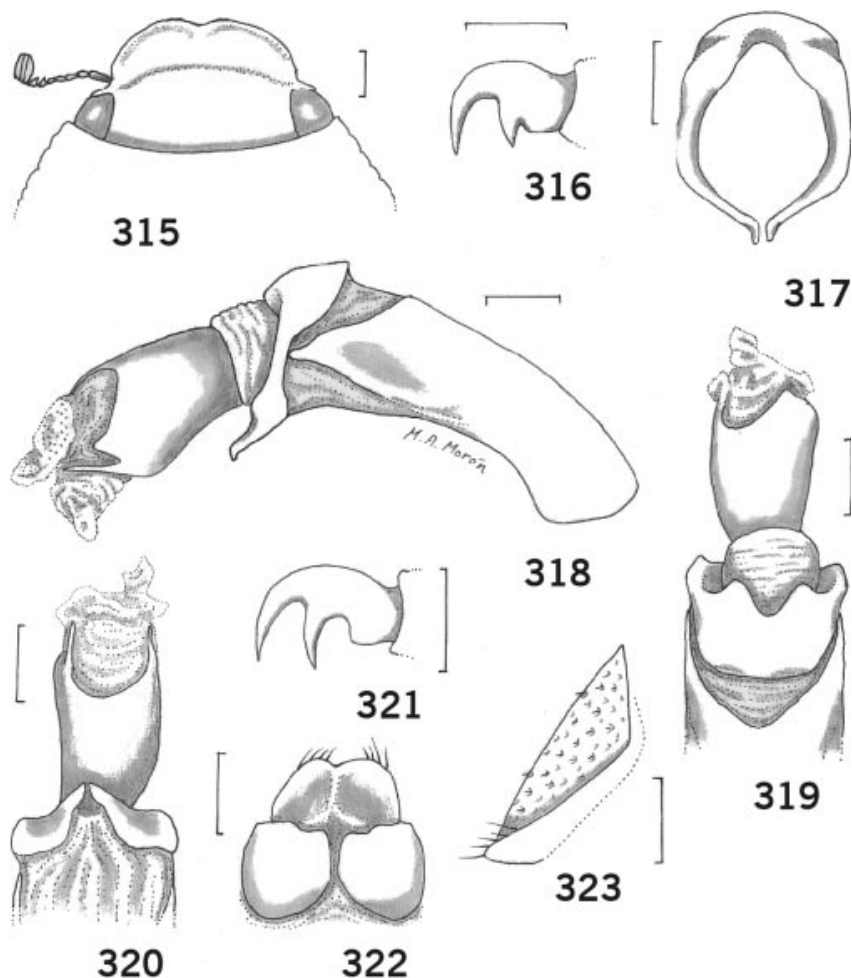
Male (holotype). Length 19 mm. Body shiny black; elytra with reddish brown iridescent luster. Antennal club as long as the preceding five segments (Fig. 315). Anterior half of lateral border of pronotum irregular, crenulate. Elytra densely punctate, without setae. Abdominal sternite 5 with erect setae at sides; sternites 3–5 convex, smooth, near the midline, with scattered, minute setae at sides. Pygidium moderately and uniformly convex, densely rugose punctate, with scattered, minute setae. Tarsal claws with short, acute, ventral tooth located toward the basal dilation (Fig. 316). Phallobase without furrow along the midline of dorsal surface, distal border symmetrical, deeply bisinuate, with basal border nearly straight (Figs. 317, 319). Parameres symmetrical, 1.29 times longer than the width of phallobase, slender, curved, with apex briefly angled (Figs. 317–318). Ventral membrane of genital capsule without sclerotized plates (Fig. 320). Aedeagus nearly symmetrical, with wide, tube-like sclerotized support, with narrow subapical spurs (Figs. 318–320). **Female** (allotype). Length 20 mm. Similar to male except as follows: tarsal claws with long, curved, acute ventral tooth located at middle of ventral border (Fig. 321); pygidium widely convex, weakly bulging before the apex (Fig. 323); ventral genital plates nearly as wide as long, not fused medially, with the apex bisinuate, without setae; dorsal genital plates fused medially with feeble longitudinal keel, apices rounded with scarce setae (Fig. 322).

Variation

Paratypes vary in the density of punctuation on the pronotum and elytra. Iridescent luster is less marked in one specimen. Body length 19–20 mm.

Biology

This species inhabits deciduous and subdeciduous tropical forests with seasonal high rainfall, between altitudes of 800 and 1100 m. Months of collection: April (4) and June (1). Other species flying at the same time and place were *P. (Phyllophaga) rugipennis* (Schauffus), *P. (P.) tenuipilis* (Bates), *P. (P.) densata* (Moser), *P. (Phytalus) obsoleta* (Blanchard), and *P. (Chlaenobia) tumulosa* (Bates).



FIGURES 315–323. *Phyllophaga cholana*. 315, head of male, dorsal view; 316, tarsal claw of male; 317, parameres, distal view; 318, genital capsule, right lateral view; 319, parameres and aedeagus, dorsal view; 320, same, ventral view; 321, tarsal claw of female; 322, genital plates of female, ventral view; 323, pygidium of female, lateral view. Scale bars = 1 mm (Figs. 315, 317–320, 322–323) and 0.5 mm (Figs. 316, 321).

Distribution

Mesa de Ocozocuautila, Chiapas, Mexico (Fig. 366).

Type locality

Parque Laguna Bélgica, municipality of Ocozocuautila, state of Chiapas, Mexico (approximately 16°52'N, 93°30'W).

Remarks

Phyllophaga cholana is similar to *P. quiana* Morón from Oaxaca, Mexico, is distinguished by the absence of greenish vitreous luster on the elytra and the male genitalia.

7. *Phyllophaga (Phyllophaga) canoana* sp. nov.

(Figs. 324–330)

Material examined

Three specimens, ♂♀. **Holotype** ♂: Guatemala. Izabal: near Rio Zarco, above El Arenal, 11.iv.1993, E Cano (UVGC). **Allotype**: ♀, same data as holotype (UVGC). **Paratype**: GUATEMALA. Izabal: ♂, same data as holotype (MXAL).

Etymology

This species is dedicated to Enio B Cano, an expert on the natural history of Guatemala and collector of rare beetles, in recognition of his work on the genus *Phyllophaga* of Central America.

Description

Male (holotype). Length 19 mm. Body shiny dark brown to blackish. Antennal club as long as the preceding five segments (Fig. 324). Anterior half of lateral border of pronotum irregular, crenulate. Elytra densely punctate, without setae. Abdominal sternite 5 with erect setae at sides; sternites 3–5 convex, smooth, near the midline, with scattered, minute setae at sides. Pygidium moderately and uniformly convex, densely punctate, with scattered, minute setae. Tarsal claws with short, curved, ventral tooth located toward the basal dilation (Fig. 325). Phallobase without furrow along the midline of dorsal surface, distal border symmetrical, deeply sinuate, with basal border shallowly notched (Fig. 330). Parameres symmetrical, 1.95 times longer than the width of the phallobase, stout, sinuate, with the apical third expanded, curved inward, and shallowly concave on the distal surface (Figs. 326–327, 329). Ventral membrane of genital capsule without sclerotized plates (Fig. 329). Aedeagus nearly symmetrical, with strongly sclerotized, tube-like support, with narrow, subapical spurs lyre-shaped and sinuate (Figs. 327–328). **Female** (allotype). Length 20 mm. Similar to male except as follows: pygidium widely convex, slightly bulging before the apex; ventral genital plates wider than long, not fused medially, with apices curved and with scattered, short setae; dorsal genital plates fused medially with strong, longitudinal keel, with widely rounded apex, without setae.

Variation

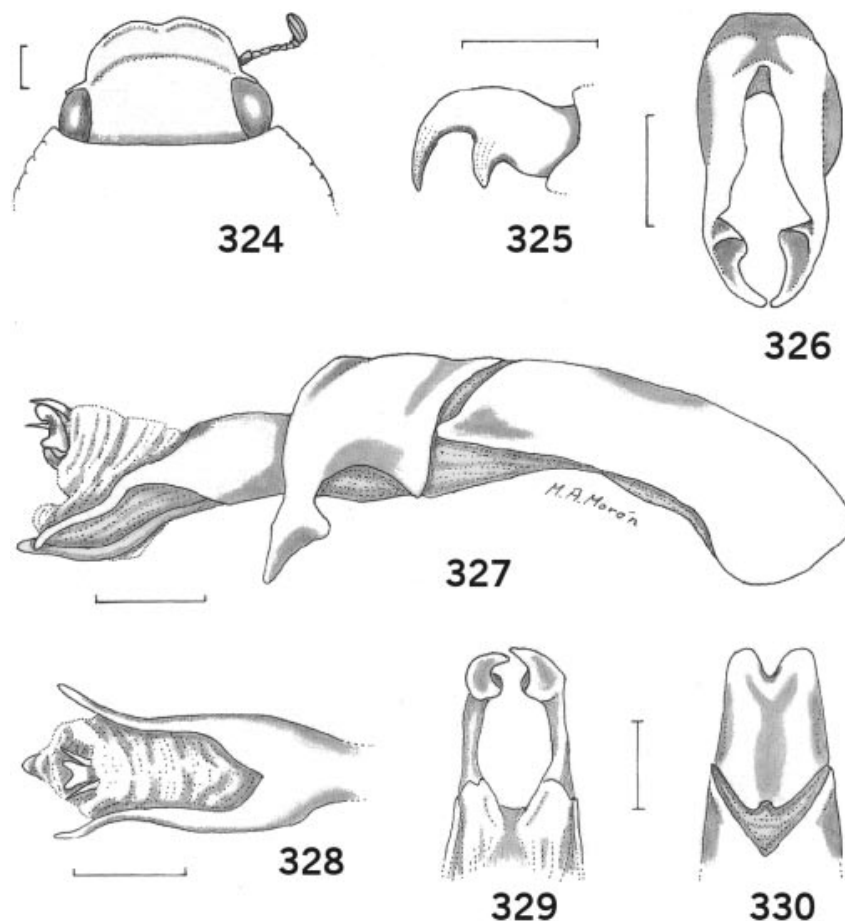
Paratype varies slightly in the density of punctures on the frons, pronotum, elytra, and pygidium. Body length 19.5 mm.

Biology

This species inhabits montane cloud forest at an altitude of 1500 m. Month of collection: April (3). Other species flying at the same time and place were *Phyllophaga (Phytalus) obsoleta* (Blanchard), *P. (Phyllophaga) rugipennis* (Schauffus), *P. (P.) submetallica* (Bates), *P. (P.) chortiana* Morón, and *P. (P.) zarcoana* Morón.

Distribution

Eastern slopes of Sierra de Las Minas, Guatemala (Fig. 366).



FIGURES 324–330. *Phyllophaga canoana*. 324, head of male, dorsal view; 325, tarsal claw of male; 326, parameres, distal view; 327, genital capsule, right lateral view; 328, apex of aedeagus, dorsal view; 329, parameres, ventral view; 330, same, dorsal view. Scale bars = 1 mm (Figs. 324, 326–330) and 0.5 mm (Fig. 325).

Type locality

El Arenal, Rio Zarco Grande, department of Izabal, Guatemala (approximately 15°44'N, 89°17'W).

Remarks

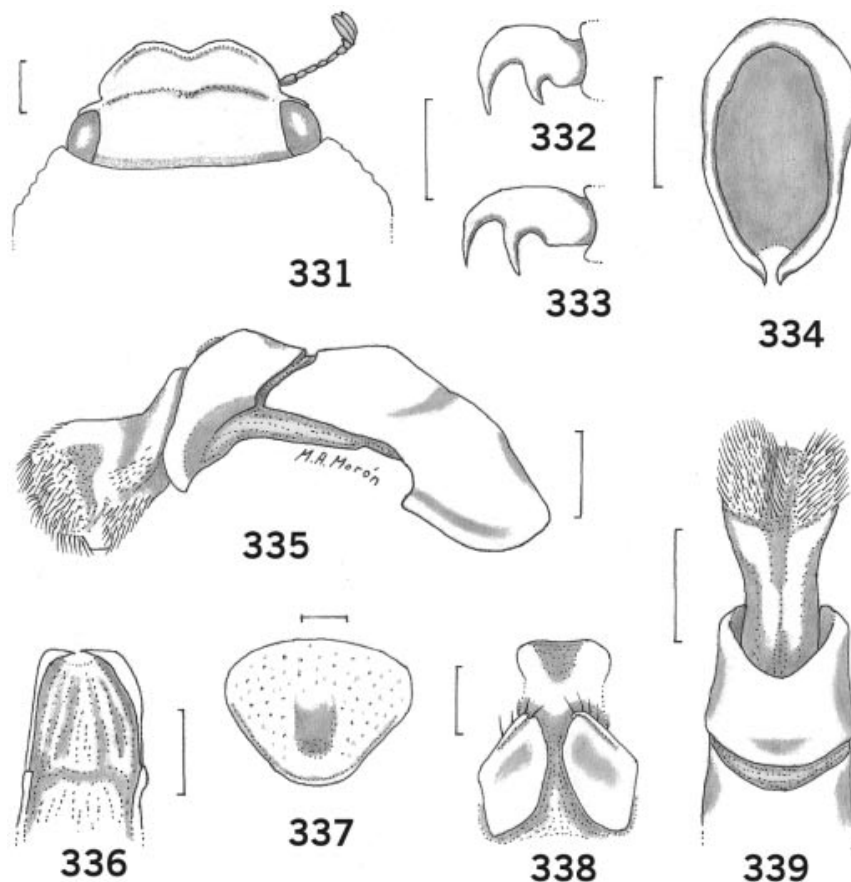
The male genital characters of *P. canoana* are distinctive.

8. *Phyllophaga (Phyllophaga) changuena* sp. nov.

(Figs. 331–339)

Material examined

Twenty-three specimens, ♂♀. **Holotype** ♂: Costa Rica. Alajuela: San Ramón, Rio San Lorencito, 800 m, 7.iii.1986, A Solís (INBio). **Allotype** ♀: same data as holotype,



FIGURES 331–339. *Phyllophaga changuena*. 331, head of males, dorsal view; 332, tarsal claw of male; 333, same, female; 334, parameres, distal view; 335, genital capsule, right lateral view; 336, parameres, ventral view; 337, pygidium of female, distal view; 338, genital plates of female, ventral view; 339, parameres and aedeagus, dorsal view. Scale bars = 1 mm (Figs. 331, 334–339) and 0.5 mm (Figs. 332–333).

except 3.x.1986 (INBio). **Paratypes:** NICARAGUA. **Zelaya:** ♂, Reserva de la Biosfera Bosawas, Cerro Saslaya, camp 3, 950 m, iv.1999, JM Maes and B Hernández (MELN). COSTA RICA. **Alajuela:** ♂, Rio San Lorencito, San Ramón, 800 m, 8.viii.1985, A Solís; ♀, same data except 24.v.1986 (INBio); ♂, same data (MXAL); ♀, Sector Colonia Palmareña, 700 m, ix.1995, G Carballo (INBio); ♀, same data except iv.1995 (MXAL). **Cartago:** Puente Dos Amigos a represa Rio Grande de Orosi, 1400–1800 m, xi.1995, R Delgado (INBio). **Guanacaste:** ♂, 25 km NE Liberia, Sector Santa María, 790 m, 9.x.1996, D Briseño (INBio); ♂, Falda SW volcán Cacao, 1150–1250 m, vi.1996, C Moraga; ♀, Lado W volcán Cacao, estación Maritza, 600 m, 10.iii.1992, E López (MXAL); ♀, SW volcán Cacao, Estación Cacao, 1000–1400 m, xii.1989, R Blanco and D Chávez. **Puntarenas:** ♂, 3 km NE Progreso, sendero El Ripario, 1300 m, 5.vi.1997, A Picado; ♂, Coto Brus, estación Las Alturas, 1500 m, 23.iii.1992, F Araya (INBio); ♀, same data except vi.1992, M Ramírez; ♂, Monteverde, Buen Amigo, San Luis, 1000–1350 m, viii.1994, Z Fuentes (MXAL); ♂, Monteverde, La Casona, 1520 m, vii.1992, N Obando; ♂♀, Monteverde, San Luis, 1040 m, vii.1992, Z Fuentes (INBio);

♂, Parque Nacional La Amistad, estación Las Mellizas, Finca Cafosa, 1300 m, vi.1990, J Saborio (INBio). **PANAMA. Chiriquí:** ♂, Renacimiento, Santa Clara, v.1977 (UNSM); ♂, same data except 1330 m, 20.v.1977, BC Ratcliffe (MXAL); ♂♀, 1500 m, 4.vi.1986, BC Ratcliffe (UNSM).

Etymology

Derived from the ancient indigenous language of Changuena, which was used by people in Costa Rica and Panama (Manrique 1988).

Description

Male (holotype). Length 18 mm. Body shiny black, with slight metallic iridescent luster on the elytra. Antennal club as long as the preceding five segments (Fig. 331). Anterior half of lateral border of pronotum irregular, crenulate. Elytra densely punctate, without setae. Abdominal sternite 5 without erect setae at sides; sternites 3–5 convex, smooth, near the midline, with scattered, minute setae at sides. Pygidium moderately and uniformly convex, densely punctate, with scattered, minute setae. Tarsal claws with short, curved, ventral tooth located toward the basal dilation (Fig. 332). Phallobase without furrow along the midline of dorsal surface, distal border symmetrical, broadly sinuate, and with basal border broadly curved (Fig. 339). Parameres symmetrical, 1.66 times longer than the width of phallobase, stout, compressed, with apical half curved and the apices briefly angled (Figs. 334–335). Ventral membrane of genital capsule without sclerotized plates (Fig. 336). Aedeagus symmetrical; broad, strongly sclerotized tube-like support, with dense, preapical tufts of short, erect setae on each side (Figs. 335, 339). **Female** (allotype). Length 19 mm. Similar to male except as follows: tarsal claws with long, curved, acute ventral tooth located toward the middle of ventral border (Fig. 333); pygidium broadly convex, with shallow concavity near the center of disk (Fig. 337); ventral genital plates longer than wide, not fused medially; apices rounded, narrowly margined and with scattered setae; dorsal genital plates weakly sclerotized, fused medially, with apical border nearly straight, without setae (Fig. 338).

Variation

Paratypes vary in the intensity of the iridescent luster and in the density of punctures on the elytra and pygidium. Body length 17–19 mm.

Biology

This species inhabits tropical rain forests and montane cloud forests, between altitudes of 600 and 1800 m. Months of collection: March (3), April (2), May (3), June (6), July (2), August (2), September (1), October (2), November (1), and December (1). Other species flying at the same time and place were *P. (Phyllophaga) schizorhina* (Bates), *P. (P.) nigrita* (Moser), and *P. (P.) solisiana* Morón.

Distribution

Central Nicaragua to northwestern Panama (Fig. 272).

Type locality

Reserva Forestal San Ramón, Rio San Lorencito, province of Alajuela, Costa Rica (approximately 10°16'N, 85°32'W).

Remarks

Phyllophaga changuena is distinguished by the semimetallic iridescent luster of the elytra, the brief concavity on the surface of female pygidium, and the male genitalia.

9. *Phyllophaga (Phyllophaga) catemacoana* sp. nov.

(Figs. 340–348)

Material examined

Twenty-one specimens, ♂♀. **Holotype** ♂: Mexico. Veracruz: Estación de Biología. Los Tuxtlas, 170 m, 28.iv.1986, A Ibarra (MXAL). **Allotype** ♀: Catemaco, Pipiapan, 600 m, v.1990, F. Capistrán (MXAL). **Paratypes: MEXICO. Veracruz:** 5 ♂♂, 2 ♀♀, Catemaco, 8.vii.1964, PJ Spangler (USNM); ♂♀, same data (MXAL); 3 ♂♂, 2 ♀♀, Lago Catemaco, 25.vi.1969, D Bright and JM Campbell; ♂, Lago Catemaco, 24.v.1969, JEH Martin (CNC); ♂, Lake Catemaco, 8.viii.1960, HF Howden (HAHC); ♂♀, Lago Catemaco, 16.vi.1969, DE Bright and JM Campbell (MXAL); ♂, Dos Amates, 16.x.1971 (AMNH).

Etymology

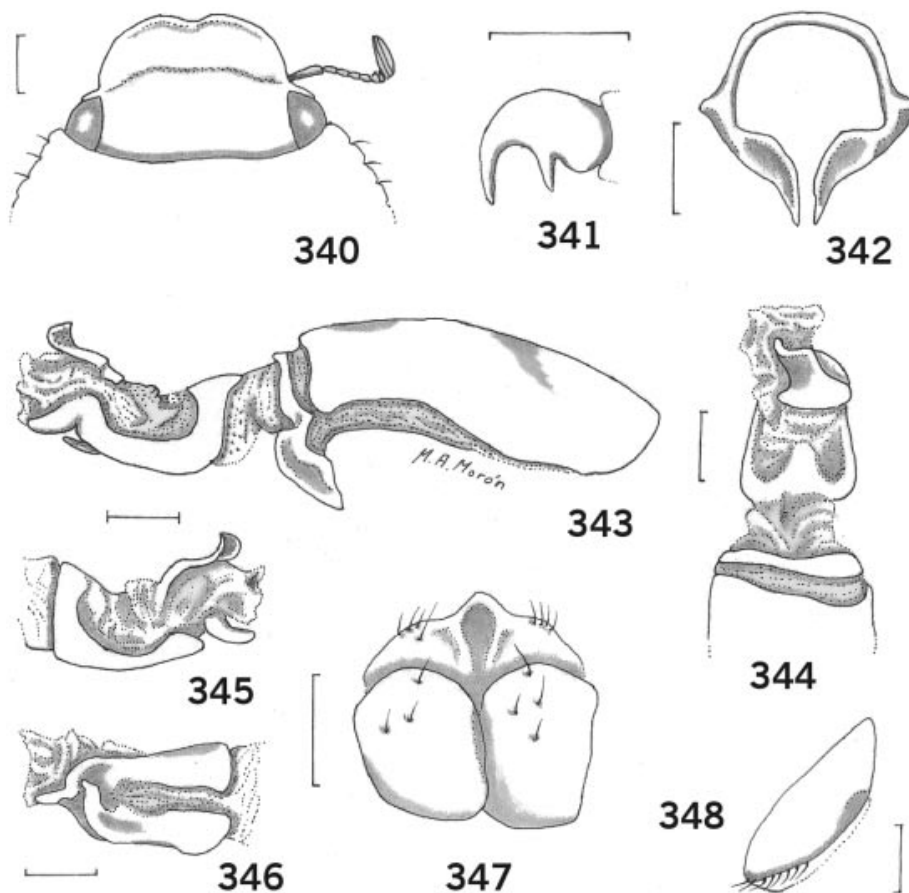
Derived from *Catemaco*, the ancient Nahúatl word for both a volcanic lake and settlement located near the type locality.

Description

Male (holotype). Length 18 mm. Body shiny reddish brown. Antennal club as long as the preceding five segments (Fig. 340). Anterior half of lateral border of pronotum irregular, crenulate, with scattered, erect setae. Elytra densely punctate, without setae. Abdominal sternite 5 with erect setae at sides; sternites 3–5 convex, smooth, near the midline, with scattered, short setae at sides. Pygidium moderately and uniformly convex, densely punctate, with scattered, minute setae. Tarsal claws with short, straight, ventral tooth located toward the basal dilation (Fig. 341). Phallobase narrow, without furrow along the midline of dorsal surface; distal border briefly sinuate, nearly symmetrical; basal border sinuate, asymmetrical (Fig. 344). Parameres symmetrical, as long as the width of phallobase, with the apical half expanded and curved inward, shallowly concave on the distal surface (Figs. 342–343). Ventral membrane of genital capsule without sclerotized plates. Aedeagus asymmetrical, with strongly sclerotized support, sinuate with preapical, dorsal sclerites (Figs. 343–346). **Female** (allotype). Length 18 mm. Similar to male except as follows: pygidium widely convex, slightly bulging toward apex (Fig. 348); ventral genital plates longer than wide, not fused medially, apices broadly curved, with scattered, short setae; dorsal genital plates fused medially, with deep longitudinal concavity, and border projected medially, with a few marginal setae (Fig. 347).

Variation

Paratypes vary in the density of punctures on the pronotum, elytra, and pygidium. Body length 16–18 mm.



FIGURES 340–348. *Phyllophaga catemacoana*. 340, head of male, dorsal view; 341, tarsal claw of male; 342, parameres, distal view; 343, genital capsule, right lateral view; 344, parameres and aedeagus, dorsal view; 345, apex of aedeagus, left lateral view; 346, same, ventral view; 347, genital plates of female, ventral view; 348, pygidium of female, lateral view. Scale bars = 1 mm (Figs. 340, 342–348) and 0.5 mm (Fig. 341).

Biology

This species inhabits tropical rain forests between altitudes of 170 and 600 m. Months of collection: April (1), May (2), June (7), July (9), August (1), and October (1). Other species flying at the same time and place were *P. (Phyllophaga) rugipennis* (Schauffus) and *P. (P.) tenuipilis* (Bates).

Distribution

Sierra de Los Tuxtlas, Veracruz, Mexico (Fig. 366).

Type locality

Estación de Biología Tropical, UNAM, Los Tuxtlas, state of Veracruz, Mexico (18°34'–18°36'N, 95°04'–95°09'W).

Remarks

The male genital structures of *P. catemacoana* are distinctive, as are the small body size, brownish color, and the lateral margins of the pronotum with erect setae.

10. *Phyllophaga (Phyllophaga) chiblacana* sp. nov.

(Figs. 349–355)

Material examined

Three specimens, ♂. **Holotype** ♂: Guatemala. Huehuetenango: Barillas, Malpais, Buena Vista Chiblac, 1200 m, vii.1998, E Cano (UVGC). **Paratypes: GUATEMALA. Huehuetenango:** ♂, same data as holotype (MXAL); ♂, 2 km N Bule, 22.ix.1998, C Bailey and J Monzón (UVGC).

Etymology

Derived from the ancient Quiché name *Chiblac*, the type locality.

Description

Male (holotype). Length 19 mm. Body shiny dark brown. Antennal club as long as the preceding five segments (Fig. 349). Anterior half of lateral border of pronotum irregular, crenulate, without setae. Elytra densely punctate, glabrous. Abdominal sternite 5 without erect setae at sides; sternites 3–5 convex, smooth, near the midline, with scattered, minute setae at sides. Pygidium moderately and uniformly convex, densely punctate, with scattered, minute setae. Tarsal claws with short, curved, ventral tooth located toward the basal dilation (Fig. 350). Phallobase narrowed and elongate, with shallow furrow along the midline of dorsal surface, distal border symmetrical, briefly notched, and with basal border moderately projected basally (Fig. 354). Parameres symmetrical, 2.38 times longer than the width of phallobase, with the apical half of external borders expanded and curved, and preapical inner borders slightly sinuate (Figs. 351–352). Ventral membrane of genital capsule without sclerotized plates (Fig. 353). Aedeagus symmetrical; strongly sclerotized support curved, with subapical long spurs and dorsal, preapical curved sclerite (Figs. 352, 355). **Female.** Unknown.

Variation

Paratype reddish brown. Body length 18.5–19.0 mm.

Biology

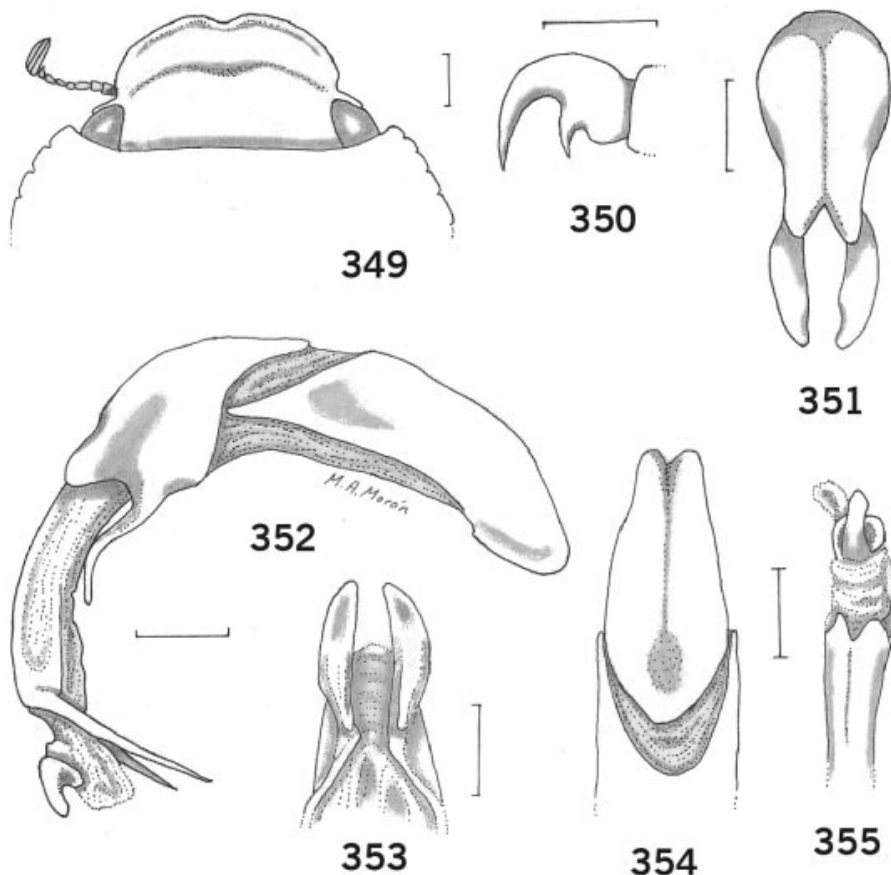
This species inhabits cloud forests between altitudes of 1200 and 1500 m. Months of collection: July (2) and September (1). Other species flying at the same time and place were *P. (Phyllophaga) rugulosa* (Blanchard), *P. (P.) mentalis* Saylor, and *P. (P.) javepacuana* Morón.

Distribution

Northern slopes of Sierra Los Cuchumatanes, Guatemala (Fig. 366).

Type locality

Buena Vista Chiblac, department of Huehuetenango, Guatemala (approximately 15°48'N, 91°20'W).



FIGURES 349–355. *Phyllophaga chiblacana*. 349, head of male, dorsal view; 350, tarsal claw of male; 351, parameres, distal view; 352, genital capsule, right lateral view; 353, parameres, ventral view; 354, same, dorsal view; 355, apex of aedeagus, dorsal view. Scale bars = 1 mm (Figs. 349, 351–355) and 0.5 mm (Fig. 350).

Remarks

Males of *P. chiblacana* are distinguished by the elongate form of phallobase and parameres.

11. *Phyllophaga (Phyllophaga) mentalis* Saylor

(Figs. 356–365)

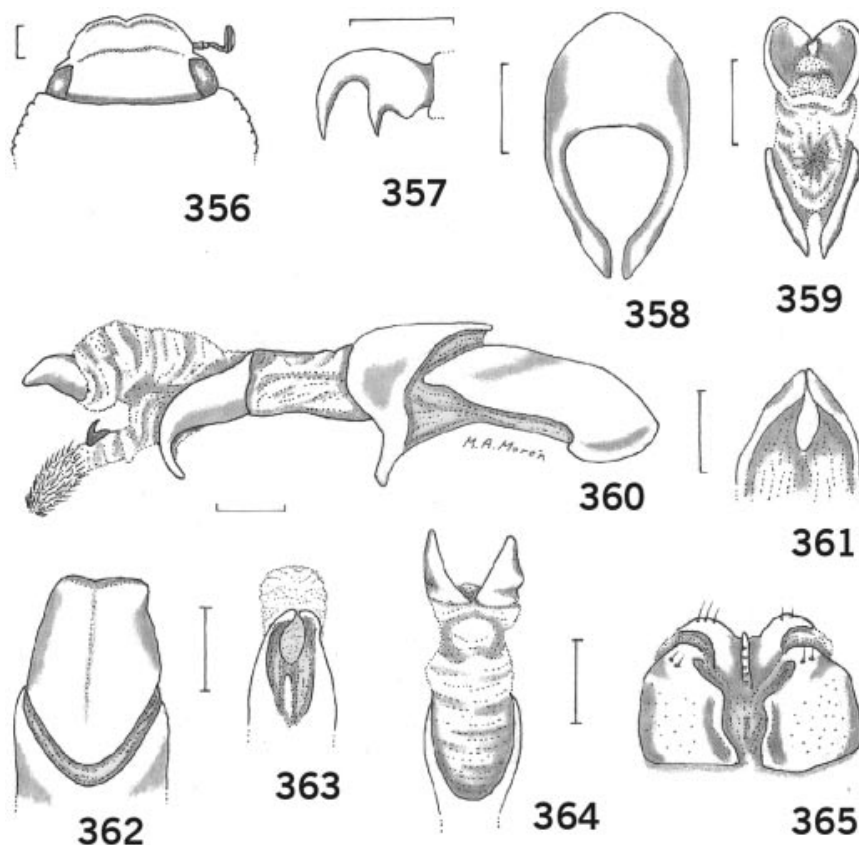
Phyllophaga mentalis Saylor, 1941: 387.

Phyllophaga mentalis: Blackwelder 1944: 225.

Phyllophaga (Phyllophaga) mentalis: Cano and Morón 1998: 15.

Material examined

Nine specimens, ♂♀. **Holotype** ♂: “Guatemala, Trece Aguas, Cacao” (CAS type 7977). **GUATEMALA. Huehuetenango**: 3 ♂♂, Barillas, Malpais, Buena Vista Chiblac, 1200 m, vii.1998, E Cano (UVGC); 2 ♂♂, 1 ♀, same data (MXAL); ♀, same



FIGURES 356–365. *Phyllophaga mentalis*. 356, head of male, dorsal view; 357, tarsal claw of male; 358, parameres, distal view; 359, apex of aedeagus, distal view; 360, genital capsule, right lateral view; 361, parameres, ventral view; 362, same, dorsal view; 363, apex of aedeagus, ventral view; 364, same, dorsal view; 365, genital plates of female, ventral view. Scale bars = 1 mm (Figs. 356, 358–365) and 0.5 mm (Fig. 357).

data except 27.v.1998 (UVGC); ♂, Nenton Yambojoch, Finca San Francisco Quebrada Sancapech, 1270 m, 1998, S Pérez (UVGC).

Etymology

Derived from the Latin *mentum* meaning chin; possibly in reference to the deeply and longitudinally sulcate mentum.

Description

Male. Length 19 mm. Body shiny dark brown. Antennal club as long as the preceding six segments (Fig. 356). Anterior half of lateral border of pronotum irregular, crenulate, glabrous. Elytra densely punctate, without setae. Abdominal sternite 5 without erect setae at sides; sternites 3–5 convex, smooth, near the midline, with scattered, minute setae at sides. Pygidium moderately and uniformly convex, densely punctate, with scattered, short setae. Tarsal claws with short, curved, ventral tooth located toward the basal dilatation (Fig. 357). Phallobase slightly narrowed, with a trace of a furrow

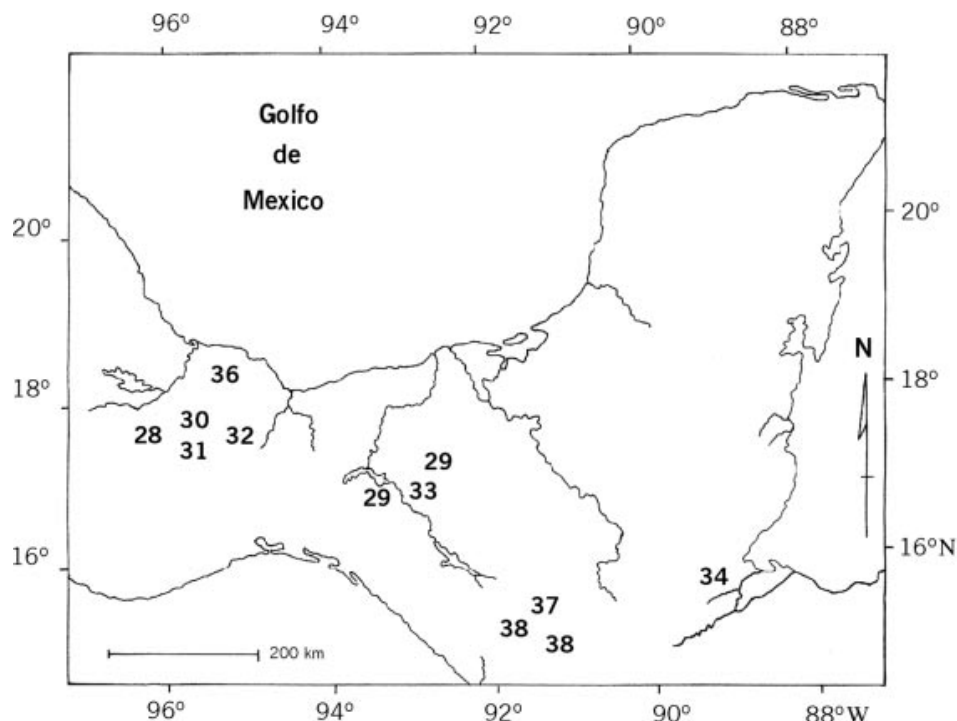


FIGURE 366. Collection localities in Mexico and Guatemala of *Phyllophaga comaltepecana* (28), *P. ocozocuana* (29), *P. dsaimana* (30), *P. quiana* (31), *P. yoloxana* (32), *P. cholana* (33), *P. canoana* (34), *P. catemacoana* (36), *P. chiblacana* (37), and *P. mentalis* (38).

along the midline of dorsal surface; distal border symmetrical, briefly sinuate; basal border moderately projected basally (Fig. 362). Parameres symmetrical, 1.80 times longer than the width of the phallobase, with the apical half stout, slightly curved, apices rounded (Figs. 358, 360). Ventral membrane of genital capsule without sclerotized plates (Fig. 361). Aedeagus symmetrical; strongly sclerotized support with two subapical curved spurs (Fig. 363) and two preapical membranous sacs, the dorsal sac ending with bivalvous sclerites surrounding a granulose papilla; ventral sac with a small, dorsal sclerotized spine and apical vestiture of short bristles (Figs. 359–360, 364). **Female.** Length 20 mm. Similar to male except as follows: ventral genital plates longer than wide, not fused medially, with keels in the mesial borders, and the apex sinuate, with scattered, short setae; dorsal genital plates fused medially, with a weak longitudinal keel, and hook-like lateral lobes directed outward, with some setae near the apex (Fig. 365).

Variation

Specimens vary from bright to dark reddish brown. Body length 19–20 mm.

Biology

This species inhabits cloud forests between altitudes of 1200 and 1500 m. Months of collection: May (1) and July (6). Other species flying at the same time and place were *P. (Phyllophaga) rugulosa* (Blanchard), *P. (P.) chiblacana* Morón, and *P. (P.) javepacuana* Morón.

TABLE 1. Distribution patterns of *Phyllophaga schizorhina* species group.

Lowlands (0–1500 m)	Middle slopes (600–1800 m)	Highlands (1100–3330 m)
<i>P. catemacoana</i>	<i>P. aenea</i>	<i>P. atrata</i>
<i>P. chimoxtila</i>	<i>P. atra</i>	<i>P. atratoides</i>
<i>P. ginigra</i>	<i>P. boruca</i>	<i>P. comaltepecana</i>
<i>P. matabapana</i>	<i>P. canoana</i>	<i>P. humboldtiana</i>
<i>P. schizorhina</i>	<i>P. changuena</i>	<i>P. onoreana</i>
<i>P. tuxtleca</i>	<i>P. chiblacana</i>	<i>P. pseudoatra</i>
<i>P. zaragozana</i>	<i>P. cholana</i>	<i>P. saylori</i>
	<i>P. chortiana</i>	<i>P. schizorhinoides</i>
	<i>P. dsaimana</i>	
	<i>P. izabalana</i>	
	<i>P. javepacuana</i>	
	<i>P. mentalis</i>	
	<i>P. necaxa</i>	
	<i>P. nigrita</i>	
	<i>P. ocozocuana</i>	
	<i>P. quiana</i>	
	<i>P. rolbakeri</i>	
	<i>P. rugulosa</i>	
	<i>P. solisiana</i>	
	<i>P. submetallica</i>	
	<i>P. subrugosa</i>	
	<i>P. yoloxana</i>	
	<i>P. zarcoana</i>	

Distribution

Between northern slopes of Sierra Los Cuchumatanes and northern slopes of Sierra de Las Minas, Guatemala (Fig. 366).

Type locality

“Trece Aguas”, between Panzós and Senahú, department of Alta Verapaz, Guatemala (approximately 15°25′N, 89°45′W).

Remarks

Phyllophaga mentalis is similar to *P. quiana* Morón from the northern mountains of Oaxaca, Mexico, but differs in the structure of the aedeagus.

Discussion

The geographical and ecological distribution of the “*schizorhina*” species group suggests three main distribution patterns: (1) lowlands and slopes of mountains under 1500 m with high temperatures and rainfall throughout most of the year, (2) middle and upper slopes of mountains between 600 and 1800 m with low to moderate temperatures and high rainfall, and (3) highlands and upper slopes of mountains between 1100 and 3330 m with low temperatures and high rainfall (Table 1). Four species (*P. rugulosa*, *P. solisiana*, *P. nigrita*, and *P. changuena*) are broadly distributed between 600 and 1800 m. Twenty-one species are endemic to cloud forests or tropical deciduous forests.

TABLE 2. Areas with higher diversity of *Phyllophaga schizorhina* species group.

Sierra Los Tuxtles, Veracruz, Mexico	Sierra de Juárez, Oaxaca, Mexico	Sierra Norte Chiapas, Mexico	Sierra de Las Minas, Guatemala
<i>P. catemacoana</i> *	<i>P. comaltepecana</i> *	<i>P. chimoxtila</i> *	<i>P. canoana</i> *
<i>P. matacapana</i> *	<i>P. dsaimana</i> *	<i>P. cholana</i> *	<i>P. chortiana</i> *
<i>P. tuxtleca</i> *	<i>P. humboldtiana</i> *	<i>P. ginigra</i> *	<i>P. izabalana</i> *
<i>P. zaragozana</i> *	<i>P. rugulosa</i>	<i>P. javepacuana</i>	<i>P. mentalis</i>
	<i>P. quiana</i> *	<i>P. ocozocuana</i> *	<i>P. solisiana</i>
	<i>P. yolojana</i> *	<i>P. rugulosa</i>	<i>P. submetallica</i> *
			<i>P. zarcoana</i> *

* Endemic species.

The relatively small geographic areas with higher diversity of species in this group are Sierra de Los Tuxtles, Veracruz (4 species, 4 endemic); northern slopes of Sierra de Juárez, Oaxaca (6 species, 5 endemic); western slopes of Sierra Norte de Chiapas (6 species, 4 endemic); and eastern slopes of Sierra de Las Minas, Guatemala (7 species, 5 endemic) (Table 2).

The *Phyllophaga schizorhina* species group appears to be related to the *P. rugipennis* species group (*sensu* Morón 2001), *P. rostripyga* species group (*sensu* Cano y Morón 1998), and *P. blanchardi* species group (*sensu* Morón 1986). Detailed revisions of the two latter species groups, which include more than 130 species, are currently lacking.

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Appendix A

Check list of the *Phyllophaga* (*Phyllophaga*) *schizorhina* species group by subgroup.

Subgroup 1

schizorhina (Bates, 1888)
schizorhinoides **sp. nov.**
boruca **sp. nov.**
izabalana **sp. nov.**
zaragozana **sp. nov.**
onoreana **sp. nov.**

Subgroup 2

ginigra Saylor, 1940
necaxa Saylor, 1943
saylori Sanderson, 1965
tuxtleca **sp. nov.**
humboldtiana **sp. nov.**
javepacuana **sp. nov.**

Subgroup 3

atra (Moser, 1918)
pseudoatra **sp. nov.**
atratoides **sp. nov.**

Subgroup 4

rugulosa (Blanchard, 1851)
chortiana **sp. nov.**
submetallica (Bates, 1888)
chimoxtila **sp. nov.**
solisiana **sp. nov.**
subrugosa (Moser, 1924)
aenea (Moser, 1921)
matacapana **sp. nov.**

Subgroup 5

atrata (Moser, 1918)
rolbakeri Saylor, 1940

Subgroup 6

nigrita (Moser, 1918)
zarcoana **sp. nov.**

Subgroup 7

comaltepecana **sp. nov.**
ocozacuana **sp. nov.**
dsaimana **sp. nov.**
quiiana **sp. nov.**
yoloxana **sp. nov.**
cholana **sp. nov.**
canoana **sp. nov.**
changuena **sp. nov.**
catemacoana **sp. nov.**
chiblacana **sp. nov.**
mentalis Saylor, 1941