

SEVEN NEW SPECIES OF *PHYLLOPHAGA* (S.STR.) HARRIS FROM COSTA RICA (COLEOPTERA: MELOLONTHIDAE: MELOLONTHINAE)

MIGUEL ANGEL MORÓN
Departamento de Entomología
Instituto de Ecología, A.C. (sector SEP-CONACYT)
Apartado Postal 63
Xalapa, Veracruz 91000, MÉXICO

AND

ANGEL SOLÍS
Departamento de Entomología
Instituto Nacional de Biodiversidad (INBio)
Apartado Postal 22-3100
Santo Domingo de Heredia, COSTA RICA

Abstract

New species of *Phyllophaga* (s.str.) are described from 12 Costa Rican localities as follows: *P. tilarana* **new species**, *P. tapantina* **new species**, *P. talamancana* **new species**, *P. guapiloides* **new species**, and *P. puntarenosa* **new species** from Cartago y Puntarenas provinces; *P. naranjina* **new species**, and *P. lorencita* **new species** from Alajuela and Cartago provinces. Most of these species are from submontane rain forests located between 800 and 1,750 m of altitude; *P. talamancana* and *P. naranjina* were collected in grasslands or coffee plantations, and *P. puntarenosa* was collected between 50 and 1,200 m of altitude in areas including tropical deciduous forests. Drawings of male genital capsules, female genital plates and tarsal claws are provided.

Resúmen

Se describen siete especies nuevas de *Phyllophaga* (*sensu stricto*), representadas por 274 ejemplares procedentes de 12 localidades costaricenses: *P. tilarana* n.sp., *P. tapantina* n.sp., *P. talamancana* n.sp., *P. guapiloides* n.sp., and *P. puntarenosa* n.sp. de las provincias de Cartago y Puntarenas; *P. naranjina* n.sp., and *P. lorencita* n.sp. de las provincias de Alajuela y Cartago. La mayor parte de éstas habitan en bosques lluviosos premontanos situados entre los 800 y 1,750 m de altitud; *P. talamancana* y *P. naranjina* fueron recolectadas en potreros y plantaciones de cafeto, y *P. puntarenosa* se encontró en una variedad de ambientes ubicados entre los 50 y 1,200 m de altitud, incluyendo bosques tropicales caducifolios. Se incluyen ilustraciones de las cápsulas genitales masculinas, de las placas genitales femeninas y de las uñas tarsales.

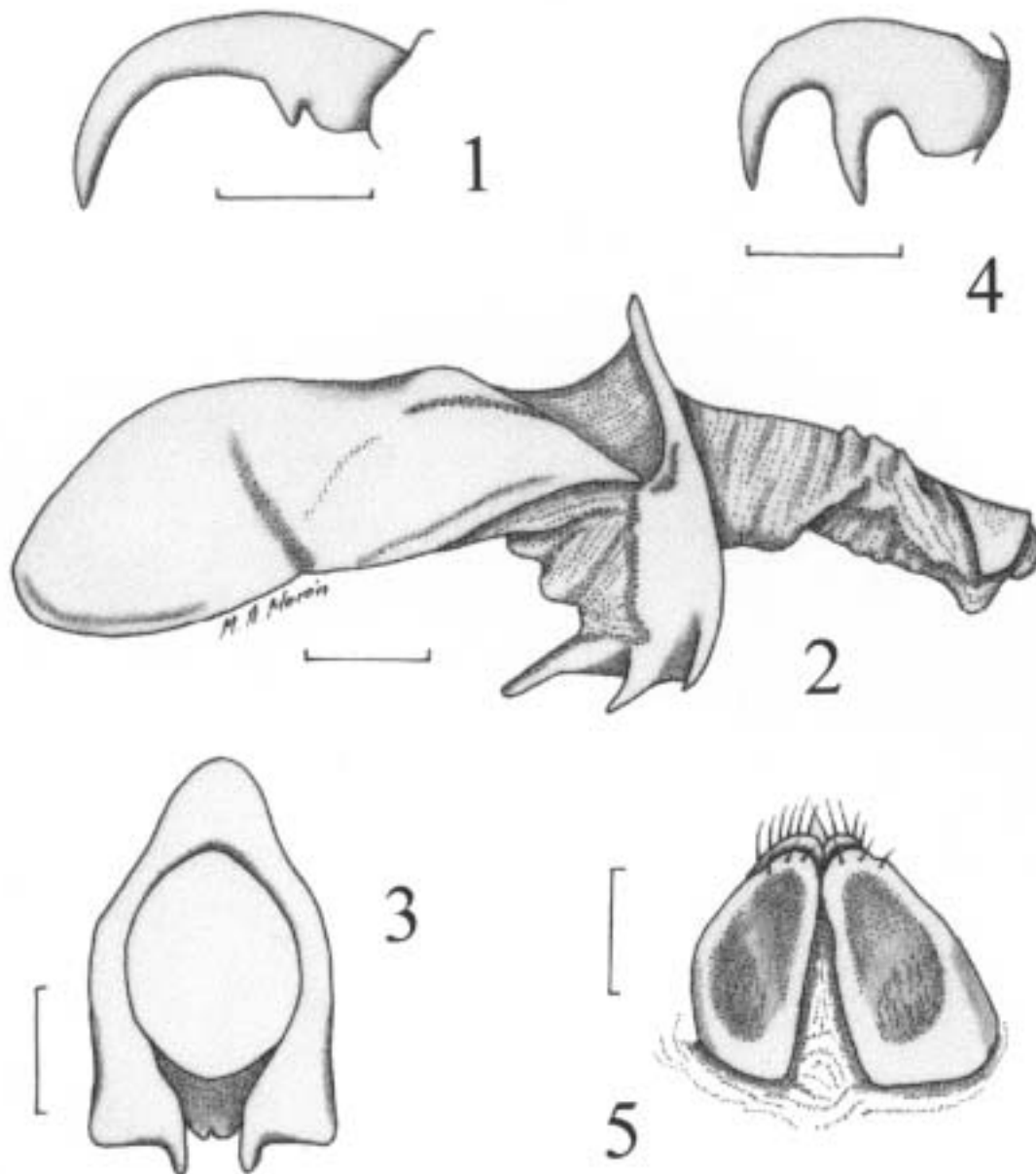
Between 1993 and 1999, we found more than 300 specimens of undescribed Costarican species of *Phyllophaga* (s.str.) in the scarab beetle collections at INBio, Costa Rica (Solís & Morón 1998). Most of these are not related to any species groups described by Morón (1986), others represent undescribed species groups possibly having originated in southeastern Central America or the northern areas of South America. We expect a large number of new species and new records, mainly from poorly collected localities of Nicaragua, Costa Rica, Panamá and Colombia. Because the collection of representative samples is sporadic or scarce, it is better to describe the interesting species before a complete revision of the species groups. This paper describes males, females,

variation and gives the precise distribution of seven new Costarican species of *Phyllophaga* (*s.str.*).

The morphological characters and terms used in the descriptions are those of Morón (1986). Drawings were made with the aid of a camera lucida and Leica stereomicroscope; measurements were obtained with ocular micrometer or caliper. Specimens are deposited in the following collections: California Academy of Sciences, San Francisco (CASC); Canadian National Collection, Ottawa (CNC); Instituto Nacional de Biodiversidad, Costa Rica (INBIO); M. A. Morón, Xalapa, Veracruz, México (MXAL); Natural History Museum, London (NHML); Texas A & M University, College Station (TAMU); and Zoologische Sammlung der Humboldt Universität zu Berlin (ZMHU).

Phyllophaga (*Phyllophaga*) *tilarana* Morón and Solís, **new species**
Figs. 1–5

Holotype. Male. Clypeus, frons and pronotum shiny dark reddish brown; elytra silky, light brown, without macroscopic vestiture; mouthparts, sterna, pygidium and legs shiny dark reddish brown. Clypeus 3.2× wider than long, anterior border scarcely sinuate, with elevated margin, surface slightly irregular, with many uniformly distributed, deep, round shaped punctures and some scattered short setae. Frontoclypeal suture sinuate and deeply impressed. Frons 1.6× wider than long, convex, irregularly and shallowly punctate, with short slender setae at sides and on disk. Antenna 10-segmented, with 3-segmented club, lamellae of 8th to 10th segments 2.0× longer than length of preceding 6 segments combined. Frons 3.2× wider than dorsal diameter of eye. Eye canthus long and narrow, with 16–17 setae. Labrum bilobed, deeply sinuate, with scattered long slender setae. Mentum slightly concave, impunctate, with scarce lateral setae, anterior border briefly sinuate. Pronotum 1.7× wider than long and 3.0× wider than frons. Pronotal disk shiny, with round, shallow punctures regularly separated from one another by 1–2 diameters; lateral borders widely angulated, lateral marginal bead nearly entire at anterior half and slightly crenulate at basal half, with scattered, long, slender setae; basal bead strongly indicated, except in front of scutellum where it is indicated only by punctures; anterior angles obtuse, not prominent; posterior angles obtuse, not prominent. Scutellum 1.6× wider than long, with some minute punctures. Elytron 2.9× longer than wide, silk-shiny, densely rugo-punctate; epipleural border very narrow, extended along complete margin, provided with scattered, short, slender setae; humeral callus rounded, prominent; apical callus rounded. Metathoracic wings completely developed. Propygidium shiny, with scattered, short setae, and dense punctuation. Pygidium very convex, shiny, with round, shallow punctures regularly distributed, with erect setae, shortened toward the basal border; apical margin with 22 long, slender setae; basal margin effaced medially. Pterosterna with long, dense, yellowish setae. Visible abdominal sternites II and IV slightly depressed, with numerous short setae near the midline; sternite V with a transverse, granulated, setose ridge, and scattered setae toward the sides; anal plate large, with wide transverse concavity, with numerous erect setae, posterior border thickened with a transverse row of long setae. Protibia shorter than protarsus (1:1.7), with external border tridentate, proximal tooth much shortened, preapical spur nearly straight, apex rounded, half as long as 2th protarsomere. Mesotibia with one oblique, sharp, setiferous carina on external side; upper apical spur straight, narrow, and 1.3× longer than lower spur. Metatibia one fifth shorter than metatarsus, with one oblique, sharp, setiferous carina on external side; upper apical spur articulated, recurved, apex rounded, slightly longer than basal metatarsomere, and 1.2× longer than lower spur; lower apical spur articulated with tibial border, with rounded apex. Tarsomeres semicylindrical, elongate, with enlarged apices, with some setae apically and two dense lines of long, thick setae on ventral side. Tarsal claws symmetrical, similar on all legs, with an acute short tooth located close to basal dilation (Fig. 1). Genital capsule with large parameres, dorsally and ventrally fused, symmetrical, pentagonal shaped, apex of each elongated, acute, with tooth-like preapical projections. Aedeagus narrowed, with scarce sclerotized preapical structures (Figs. 2–3).



Figs. 1–5. *Phyllophaga tilarana*. 1) protarsal claw, male; 2) genital capsule, lateral view; 3) paramera, distal view; 4) protarsal claw, female; 5) genital plates, female. Scale lines = 1 mm, except Figs. 1, 4 = 0.5 mm.

Tectum shortened, irregularly convex. Length of genital capsule from apex of parameres to border of basal piece: 5.1 mm. Total body length: 23.0 mm. Humeral width: 9.3 mm.

Allotype. Female. Similar to the male except as follows: antennae with lamellae of 8th to 10th segments slightly longer than the length of six preceding segments combined (1:0.9). Visible abdominal sternites II to V convex, with scattered setiferous punctures; anal plate 1.2× longer than male anal plate, convex, with scattered setiferous punctures, with 22 slender setae at the posterior border. Pygidium slightly convex, nearly flattened toward the apex, apical border slightly sinuated. Protibiae with the teeth of external border wider and longer than in the male. Both apical spurs of metatibia articulated, wide,

lanceolate and curved. Tarsomeres only with two single lines of long, slender setae on ventral side. Tarsal claws each with a large tooth at the middle of ventral border (Fig. 4). Ventral genital plates moderately sclerotized, nearly symmetrical, elongate ovate shaped with shallow depression near the apex; dorsal plates wider than ventral plates with scattered setae on the distal border, each plate partially fused with ventral plate along the latero-basal border (Fig. 5). Total body length: 24.6 mm. Humeral width: 10.0 mm.

Paratype Variation. Males. Similar to holotype except in total body length: 20.0–24.0 mm, humeral width: 8.2–9.1 mm, pronotum of some specimens darker than holotype, other specimens with antennal club 2.2× longer than length of preceding six segments combined. Female similar to allotype except as follows: elytra and pygidium with more punctures; total body length: 24.3 mm; humeral width: 10.0 mm.

Type Series. Described from 9 males and 2 females. Holotype male (IN-BIO): “COSTA RICA: Puntarenas, Reserva Biológica Monteverde, Estación La Casona, 1,520 m, XI-90, M. Ramírez.” Allotype female (INBIO): “COSTA RICA: Puntarenas, Reserva Biológica Monteverde, Estación La Casona, 1,520 m, 3/24-IV-95, A. Azofeifa.” Paratypes: same data as holotype except “E. Bello” (2 males); “XII-90” (1 male); “III-92, K. Flores” (1 male, 1 female); “I-93, N. Obando” (1 male); “X-93, N. Obando” (1 male); “3/22-I-95, K. Martínez” (1 male); “17-IV-95, M. Madrigal” (1 male). Paratypes deposited in CNC, INBIO and MXAL.

Type Locality. Estación La Casona, Reserva Biológica Monteverde, province of Puntarenas, cordillera de Tilarán, Costa Rica. (10°18'15"N; 84°47'46"W).

Biological Data. Males and females of *P. tilarana* n.sp. were collected at lights in cloud forest located near 1,520 m of altitude, 1 km southwest of Atlantic/Pacific montane rainfall line. Phenology: January (2), March (2), April (2), October (1), November (3), December (1). Other species of *Phyllophaga* flying at the same time and place were *P. tapantina* n.sp. and two other new species under description.

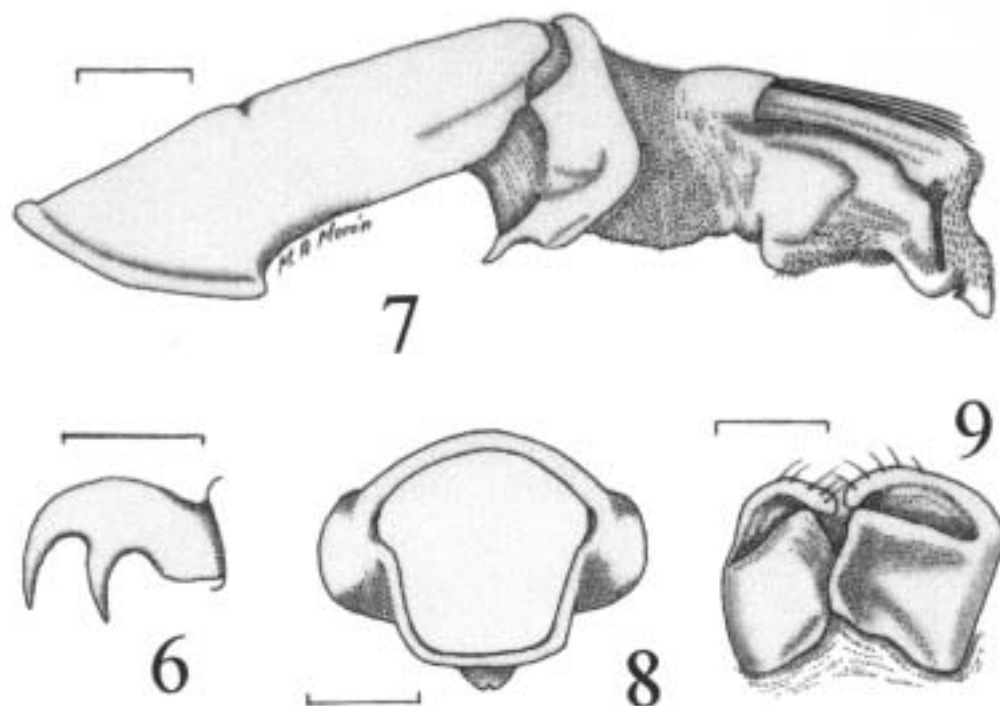
Remarks. *Phyllophaga (Phyllophaga) tilarana* does not belong to any species group described by Morón (1986). Male tarsal claw structure resembles “*rugipennis*” group, but female tarsal claws have typical dentate structure, found in many other groups. *Phyllophaga tilarana* may be related with *P. (P.) nevermanni*, described by Saylor (1935:501) from Guápiles, Costa Rica (holotype USNM 54567) by the body shape, color, dorsal vestiture, antennal structure and the shape of tarsal claws; but the shape and details of the male genital capsule, the accessory structures of male sternites V and VI, vestiture and shape of the pygidium in males and females aid to separate the new species.

Etymology. Derived from Tilarán Mountain System of northwestern Costa Rica where this species was originally collected.

Phyllophaga (Phyllophaga) tapantina Morón and Solís, **new species**

Figs. 6–9

Holotype. Male. Clypeus, frons, pronotum and elytra shiny dark reddish brown; pronotum with scarce, erect, long, setae; elytra with greenish vitreous luster, with long setae around the scutellum and scattered minute setae only toward the apex; mouthparts, sterna, pygidium and legs shiny reddish brown. Clypeus 3.0× wider than long, anterior border scarcely sinuate, with poorly elevated margin, surface nearly flat, with scarce irregularly-distributed, deep, round punctures and some scattered microscopic setae. Frontoclypeal suture sinuate and deeply impressed. Frons 1.8× wider than long, convex, with reduced



Figs. 6-9. *Phyllophaga tapantina*. 6) protarsal claw, male; 7) genital capsule, lateral view; 8) paramera, distal view; 9) genital plates, female. Scale lines = 1 mm, except Fig. 6 = 0.5 mm.

number of coarse wide punctures, long slender setae at sides and short setae scattered on disk. Antenna 10-segmented, with 3-segmented club, lamellae of 8th to 10th segments $1.3\times$ longer than length of preceding 6 segments combined. Frons $2.8\times$ wider than dorsal diameter of eye. Eye canthus long and narrowed, with 7-7 setae. Labrum bilobed, widely sinuated, with scattered slender setae. Mentum slightly convex, impunctate, with scarce slender setae at sides, anterior border widely sinuate. Pronotum $1.6\times$ wider than long and $2.8\times$ wider than frons. Pronotal disk shiny, with some deep, round punctures irregularly separated from one another by 1-5 diameters; lateral borders widely angulated, lateral marginal bead irregularly crenulate, with scattered, long, slender setae; basal bead vaguely indicated toward the posterior angles; anterior angles acute, clearly prominent; posterior angles obtuse, slightly prominent. Scutellum $1.3\times$ wider than long, smooth, without punctures. Elytron $2.8\times$ longer than wide, smooth shiny, with scattered punctures on disk and dense uniformly punctate at external sides; epipleural border very narrow, extended along the complete margin, provided with fringe of medium-size setae; humeral callus rounded, prominent; apical callus rounded. Metathoracic wings completely developed. Propygidium shiny, densely punctate setose. Pygidium moderately convex, shiny, shallowly punctate rugose with scattered erect setae; apical margin with 14 long, slender setae; basal margin effaced medially. Pterosterna with long, dense, yellowish setae. Visible abdominal sternites II and IV convex, smooth and glabrous near the midline; sternite V convex, shiny, with setiferous punctures at the posterior half and numerous setae toward the sides; anal plate narrowed, with a transverse shallow concavity and longitudinal furrow at midline, anterior and posterior borders slightly elevated, with 24 erect setae near the posterior border. Protibia as long as protarsus (1:1), with external border tridentate, apical and subapical teeth long, wide, apices rounded, preapical spur acute, nearly straight, as long as 1st protarsomere. Mesotibia with one oblique, sharp, setiferous carina on external side; upper apical spur straight, narrow, as long as lower spur. Metatibia $0.8\times$ shorter than metatarsus, with one oblique, sharp, setiferous carina on external side; upper apical spur articulated, curved, with apex rounded, $1.3\times$ longer

than basal metatarsomere, and $1.3\times$ longer than lower spur; lower apical spur articulated with tibial border, with rounded apex. Tarsomeres semicylindrical, not much elongated, with enlarged apex, some setae apically and one line of short setae close to fine longitudinal carina on ventral side. Protarsomeres I–IV with a subapical, small spine. Tarsal claws symmetrical, similar on all legs, each with a large acute tooth at the middle of ventral border (Fig. 6). Genital capsule with short parameres, dorsally and ventrally fused, ring-shaped, apex below with short, triangular blade-like projection. Aedeagus short, wide, with preapical ventral dense patches of spinules, dorsal sclerotized plates, narrowed sclerotized support, and basi-dorsal brush of long setae (Figs. 7–8). Tectum uniformly convex. Length of genital capsule from apex of parameres to border of basal piece: 6.0 mm. Total body length: 23.0 mm. Humeral width: 13.2 mm.

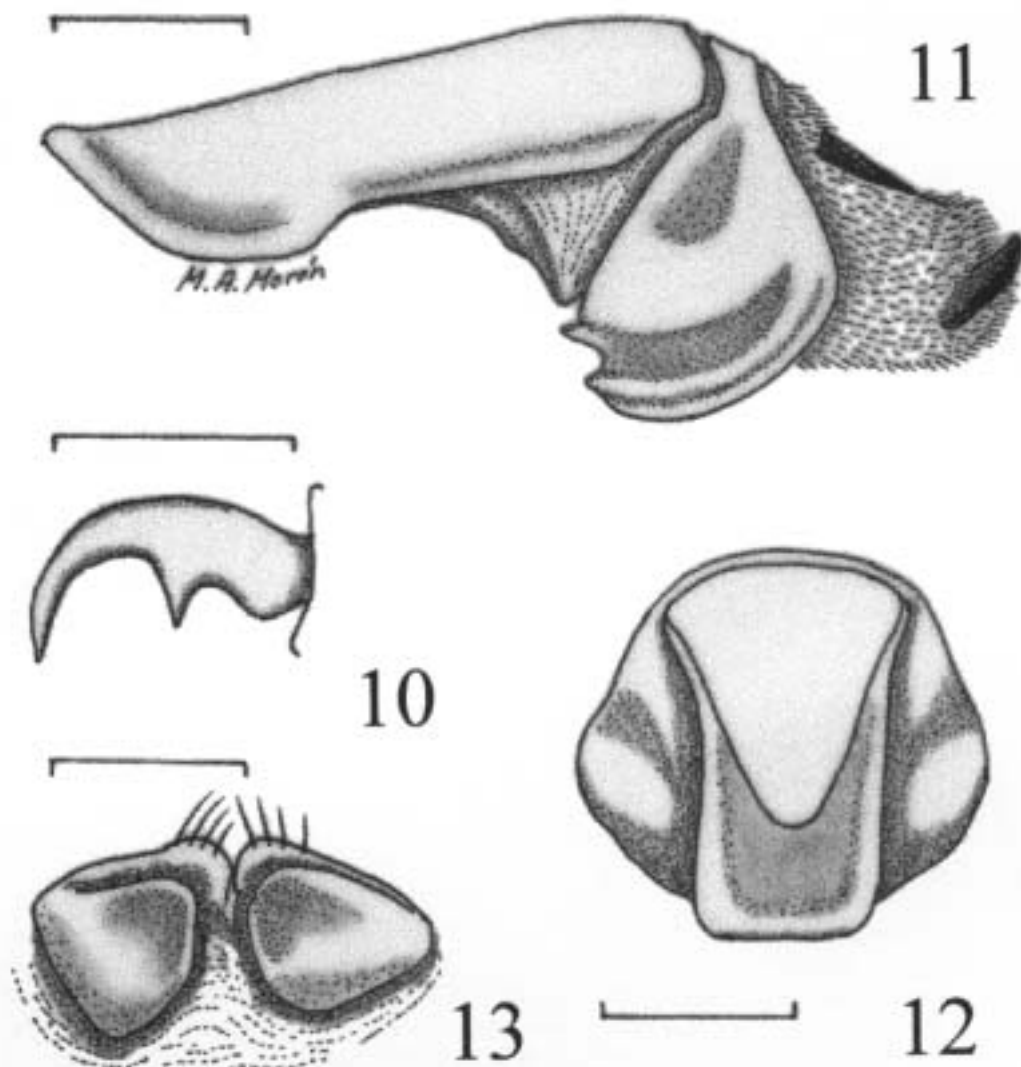
Allotype. Female. Similar to the male except as follows: antennae with lamellae of 8th to 10th segments subequal to the length of six preceding segments combined (1:1). The setae located toward the apex of elytra longer than preceding elytral setae. Anal plate convex, without concavity or furrow, punctate, with 60 scattered slender setae. Both apical spurs of metatibia shorter than in the male. Pygidium less convex. Ventral genital plates slightly sclerotized, nearly symmetrical, with a narrow lateral bridge toward each dorsal plate; dorsal plates with scattered setae at the apex and apparently fused laterally with ventral ones (Fig. 9). Total body length: 21.8 mm. Humeral width: 9.0 mm.

Paratype Variation. Males. Similar to holotype except in total body length: 19.0–22.5 mm, humeral width: 8.2–9.4 mm, body and legs in some specimens are shiny reddish brown, some specimens present scattered setae along the elytral suture, other specimens with antennal club $1.2\text{--}1.4\times$ longer than length of preceding six segments combined. Females similar to allotype except as follows: total body length: 21.5–18.9 mm; humeral width: 8.0–9.1 mm, body and legs shiny reddish brown, some specimens with more setae along the elytral suture.

Type Series. Described from 38 males and 23 females. Holotype male (INBIO): "COSTA RICA: Cartago, Parque Nacional Tapantí, Quebrada Segunda, 1,200 m, 10-IV-87, J. Sánchez." Allotype female (INBIO): "COSTA RICA: Cartago, Parque Nacional Tapantí, Río Grande de Orosi, Sendero La Pava, 1,150–1,600 m, XII-95, G. Mora" (INBio). Paratypes: same data as holotype (19 males); same data except: IV-92, 1,250 m, R. Vargas INBIO CR 1000 459238 (1 male); same data as allotype (7 males, 9 females); same data except: VI-96, INBIO CR 1002 443314 (1 female) "Alajuela, San Ramón, Río San Lorencito, X-91, A. Solís" (10 males, 12 females). Paratypes deposited in CASC, CNC, INBio, MXAL, TAMU and ZMHU.

Type Locality. Parque Nacional Tapantí, Cuenca del Río Grande de Orosi, Cordillera de Talamanca, Costa Rica (approx. $9^{\circ}45'N$; $83^{\circ}49'W$).

Biological Data. Males and females of *P. tapantina* n. sp. were collected at lights between 800 m altitude on Río San Lorencito and 1,500 m altitude at shore of Río Grande de Orosi. These localities are placed along the Atlantic slopes from eastern Cordillera de Tilarán to western Cordillera de Talamanca, and present cloud forests and subtropical evergreen forests with species of *Quercus*, *Alnus*, *Nectandra*, *Ocotea*, *Podocarpus*, *Didymopanax*, *Ulmus*, *Erythrina*, *Vismia* and *Siparuna* (Boza 1988). Phenology: April (25), June (1), October (22), December (16). Other species of *Phyllophaga* flying at the same time and places were: *P. nevermannia* Saylor, *P. nevermanni* Saylor, *P. orosina* Moser, *P. lissopyge* Bates, *P. talamancana* n. sp., *P. tilarana* n. sp., and another four new species under description.



Figs. 10–13. *Phyllophaga lorencita*. 10) protarsal claw, male; 11) genital capsule, lateral view; 12) paramera, ventro-distal view; 13) genital plates, female. Scale lines = 1 mm, except Fig. 10 = 0.5 mm.

Remarks. Is not possible to include *Phyllophaga (Phyllophaga) tapantina* n. sp. in any known species group (*sensu* Morón 1986). The greenish vitreous luster on the elytra, the shortened tarsomeres in both sexes, the spines on protarsomeres and the shape and details of the male genital capsule will aid in the recognition of this new species.

Etymology. Derived from Tapantí National Park in the western Cordillera de Talamanca.

Phyllophaga (Phyllophaga) lorencita Morón and Solís, **new species**

Figs. 10–13

Holotype. Male. Clypeus, frons and pronotum shiny reddish yellow; elytra shiny testaceous, with two erect long setae at the base of each elytron and row of setae along the elytral suture, setae located toward the apex of elytra longer than preceding elytral setae; mouthparts, sterna, pygidium and legs shiny testaceous. Clypeus 4.2× wider than long, anterior border scarcely sinuate, with elevated margin, surface scarcely concave, coarsely

ruغو-punctate and with some scattered short setae. Frontoclypeal suture straight and clearly impressed. Frons 1.3× wider than long, convex, coarsely punctate rugose, with short setae on disk. Antenna 9-segmented, with 3-segmented club, lamellae of 7th to 9th segments 1.2× longer than length of preceding 5 segments combined. Frons 3.2× wider than dorsal diameter of eye. Eye canthus long and narrowed, with 8–10 setae. Labrum bilobed, wide and shallowly sinuated, with scattered slender setae. Mentum slightly convex, finely punctate, with long slender setae at sides, anterior border shallowly notched. Pronotum 1.8× wider than long and 2.7× wider than frons. Pronotal disk shiny, moderately punctate-rugose, punctures irregularly separated from one another by 1–5 diameters, midline with shallow longitudinal depression spaced anteriorly; lateral borders clearly angled, lateral marginal bead irregularly crenulate, with scattered, long, slender setae; complete basal bead indicated by punctures; anterior angles slightly acute, prominent; posterior angles widely obtuse, rounded. Scutellum 1.7× wider than long, with some small punctures. Elytron 2.5× longer than wide, shiny, densely punctate; epipleural border very narrow, extended along complete margin, provided with a row of very short, slender setae; humeral callus rounded, prominent; apical callus rounded. Metathoracic wings completely developed. Propygidium shiny, densely punctate-setiferous. Pygidium scarcely convex, shiny, ruغو-punctate, with round punctures, with very short setae covering entire surface; apical margin with 16 long, slender setae; basal margin effaced medially. Pterosterna with long, dense, yellowish setae. Visible abdominal sternites II and IV slightly depressed, smooth and setiferous near the midline; sternite V granulate setiferous, with a shallow transverse depression on posterior half and some scattered short setae toward the sides; anal plate narrowed with a shallow transverse depression, with posterior border elevate and notched at midline, with 20 erect setae. Protibia slightly shorter than protarsus (1:1.3), with external border clearly tridentate, preapical spur small, slightly curved, acute, shorter than 2nd protarsomere. Mesotibia with one oblique, sharp, setiferous carina on external side; upper apical spur straight, narrow, and 0.1× shorter than lower spur. Metatibia shorter than metatarsus (1:1.2), with one oblique, sharp, setiferous carina on external side; upper apical spur articulated, curved, lanceolate, apex rounded, as long as basal metatarsomere, and 1.3× longer than lower spur; lower apical spur articulated with tibial border, with rounded apex. Tarsomeres semicylindrical, elongate, with enlarged apex, some setae apically and one longitudinal thin carina with a line of scattered, stout setae and other line of small setae at side. Protarsomere 1–4 with two carinae all along the ventral side. Tarsal claws symmetrical, similar on all legs, with curved tooth on the ventral border, slightly displaced toward the basal process (Fig. 10). Genital capsule with short parameres, dorsally and ventrally fused, preapical inner borders of the parameres turned out as a blade-like structure, apex with very short, tooth-like ventral projections. Aedeagus short, with the apex of sclerotized support bifurcate and dorso-basal crest-like brush of progressively enlarged setae (Figs. 11–12). Tectum slightly convex. Length of genital capsule from apex of parameres to border of basal piece: 3.9 mm. Total body length: 15.8 mm. Humeral width: 6.6 mm.

Allotype. Female. Similar to the male except as follows: anterior border of frons elevated, disk of frons coarsely ruغو-punctate; antennae with lamellae of 7th to 9th segments shorter than the length of five preceding ones (1:1.2). The longitudinal depression at the anterior part of the midline deeper than male; and also with coarser punctures. Visible abdominal sternites V convex, densely setiferous punctuated mainly toward the sides; anal plate 1.3× longer than male anal plate, convex, punctate setiferous, with 16 long slender setae near the posterior border. Meso- and metatibiae each with one oblique, sharp, setiferous carina on external side. Both apical spurs of metatibia articulated, wide, lanceolate and slightly curved. Ventral genital plates slightly sclerotized, symmetrical, widened, ovate, without setae; dorsal genital plates narrowed, with short setae on the rounded apex (Fig. 13). Total body length: 16.2 mm. Humeral width: 7.0 mm.

Paratype Variation. Males. Similar to holotype except in total body length:

11.4–16.2 mm, humeral width: 4.9–6.0 mm, pronotum of some specimens darker or lighter than holotype, other specimens with antennal club 1.0–1.2× longer than length of preceding five segments combined. Females similar to allotype except as follows: anterior border of frons less prominent, body punctation coarser or finer, total body length: 12.9–16.1 mm; humeral width: 5.1–6.5 mm.

Type Series. Described from 67 males and 25 females. Holotype male (INBIO): “COSTA RICA: Alajuela, San Ramón, Río San Lorencito, 800 m, 4-V-87, A. Solís, INBIO CR 1001 115762.” Allotype female (INBIO): “COSTA RICA: Cartago, Turrialba, Chirripó, Area de Conservación Amistad, Grano de Oro, 1,120 m, 19/30-VI-93, P. Campos INBIO CR 1001 848913.” Paratypes: same data as holotype (2 males); same data as allotype (39 males, 14 females); Alajuela, San Ramón, Río San Lorencito, 800 m, 10-VII-89, A. Solís (25 males, 10 females). Paratypes deposited in CASC, CNC, INBIO, MXAL, TAMU, and ZMHU.

Type Locality. Río San Lorencito, San Ramón, province of Alajuela, Costa Rica (approx. 10°21'N; 84°25'W).

Biological Data. Males and females of *P. lorencita* n. sp. were collected at lights at two sites separated by 130 km, near San Lorencito river, located on Tilaran ridge, between 800–900 m of altitude, and Grano de Oro, on the Talamanca ridge, at 1,120 m of altitude. Phenology: May (3), June (54), July (35). Other species of *Phyllophaga* flying at the same time and places were: *P. caraga* Saylor, *P. chiriquina* Bates, *P. densata* Moser, *P. gigantea* Bates, *P. guapiles* Saylor, *P. guapilesea* Saylor, *P. nevermanni* Saylor, *P. orosina* Moser, *P. prolixa* Bates, *P. pruinosa* Blanchard, *P. setidorsis* Bates, and another two new species under description.

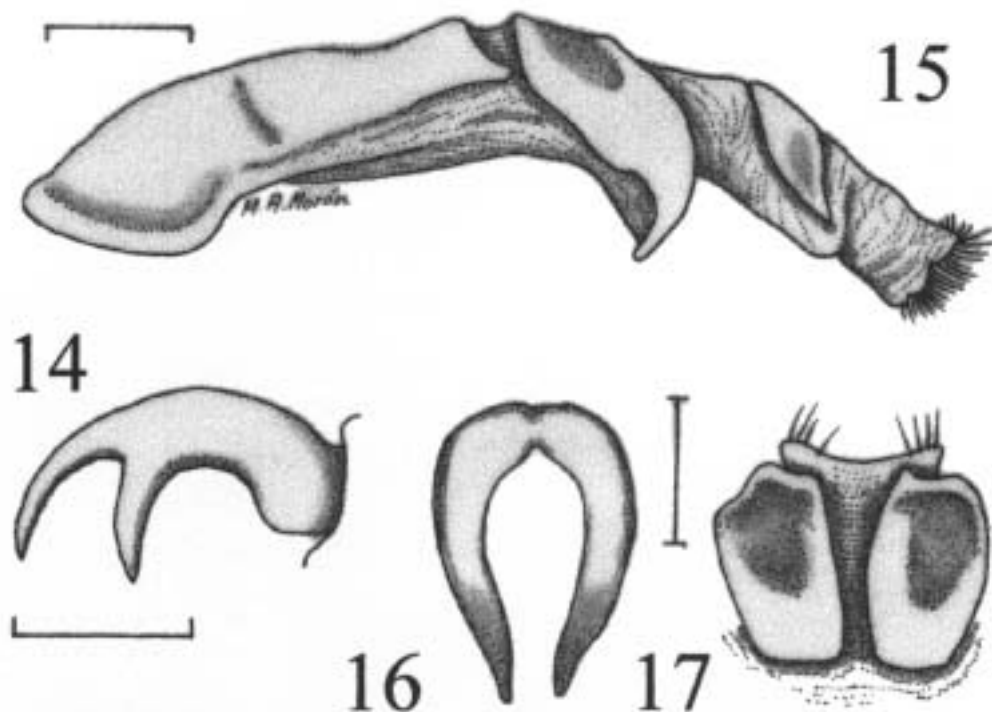
Remarks. Is not possible to include *Phyllophaga (Phyllophaga) lorencita* n. sp. in any known species group (*sensu* Morón 1986). This new species may be related to *Phyllophaga reventazona* Saylor (Atlantic lowlands, Costa Rica) by the number and proportions of antennomeres, as well as the shape of the parameres and the dorsal vestiture of aedeagus, but the dense and erect pronotal vestiture, the absence of shallow longitudinal depression on the anterior half of the pronotum, the dark reddish brown body color of *P. reventazona*, will aid in the separation of both species.

Etymology. Derived from Río San Lorencito, at the eastern Cordillera de Tilarán.

Phyllophaga (Phyllophaga) puntarenosa Morón and Solís, **new species**

Figs. 14–17

Holotype. Male. Clypeus, frons, pronotum and basal sixth of elytra, shiny dark reddish brown; remaining surface of elytra shiny reddish brown, without macroscopic vestiture; mouthparts, sterna, pygidium and legs shiny dark reddish brown. Clypeus 3.5× wider than long, anterior border widely sinuate, with elevated margin, surface slightly concave toward sides, with many uniformly distributed, shallow, round punctures and without setae. Frontoclypeal suture sinuate and shallowly impressed. Frons 2.1× wider than long, convex, densely punctate, slightly rugose at center of disk, without setae. Antenna 10-segmented, with 3-segmented club, lamellae of 8th to 10th segments 1.8× longer than length of preceding 6 segments combined. Frons 2.4× wider than dorsal diameter of eye. Eye canthus long and narrow, with 10–11 setae. Labrum bilobed, widely sinuate, with scattered slender setae. Mentum slightly concave, impunctate, with scarce slender setae at sides, anterior border narrowly notched. Pronotum 1.8× wider than long and 3.0× wider than frons. Pronotal disk shiny, with shallow, round punctures irregularly separated from one another by 0.3–2 diameters; lateral borders widely angled, lateral



Figs. 14–17. *Phyllophaga puntarenosa*. 14) protarsal claw, male; 15) genital capsule, lateral view; 16) paramera, distal view; 17) genital plates, female. Scale lines = 1 mm, except Fig. 14 = 0.5 mm.

marginal bead irregularly crenulate, with scattered, short, slender setae; basal bead clearly indicated, reinforced with punctures throughout; anterior angles obtuse, not prominent; posterior angles widely obtuse, not prominent. Scutellum 1.5× wider than long, with some small punctures. Elytron 2.3× longer than wide, shiny, densely punctate; epipleural border very narrow, extended along complete margin, provided with very short, scattered, slender setae; humeral callus rounded, prominent; apical callus rounded. Metathoracic wings completely developed. Propygidium shiny, densely punctate with sparse short setae. Pygidium scarcely convex, shiny, punctate-rugose with round punctures, glabrous; apical margin with 12 long, slender setae; basal margin effaced medially. Pterosterna with long, moderately dense, yellowish setae. Visible abdominal sternites II and IV slightly depressed, polished and with scarce short setae near the midline; sternite V convex, shiny, with sparse punctures and some scattered setae toward the sides; anal plate narrow, slightly prominent, irregularly punctate, with transverse carina and 24 slender setae near the posterior border. Protibia slightly shorter than protarsus (0.8:1), with external border tridentate, basal tooth small, preapical spur slightly curved with rounded apex, as long as 2th protarsomere. Mesotibia with one oblique, sharp, setiferous carina on external side; upper apical spur straight, narrow, and 1.4× longer than lower spur. Metatibia as long as metatarsus, with one oblique, sharp, setiferous carina on external side; upper apical spur articulated, curved, apex rounded, as long as basal metatarsomere, and 2.6× longer than lower spur; lower apical spur fused with tibial border, acute apex. Tarsomeres semicylindrical, elongate, with enlarged apices, some setae apically and two longitudinal fine carinae usually with lines of scattered, stout setae. Protarsomeres 1–4 with subapical tooth-like or rounded process. Tarsal claws symmetrical, similar on all legs, with long tooth at middle of ventral border directed slightly towards apex (Fig. 14). Genital capsule with short parameres, dorsally fused, apices ventrally curved, sharply pointed. Aedeagus long, with preapical dorsal patches of spinules and wide sclerotized support (Figs. 15–16). Tectum uniformly convex. Length of genital capsule from apex

of parameres to border of basal piece: 4.0 mm. Total body length: 17.2 mm. Humeral width: 7.8 mm.

Allotype. Female. Similar to the male except as follows: anterior border of clypeus more sinuate; antennae with lamellae of 8th to 10th segments shorter than the length of six preceding one (0.9:1). Pygidium moderately convex, 1.2× longer than in male, distal half nearly flattened, the center of disk shiny and sides slightly pruinose. Visible abdominal sternites II to V convex, with scattered, setiferous punctures; anal plate 1.6× longer than male anal plate, convex, moderately punctate setiferous, with 26 slender setae near the posterior border. Meso- and metatibiae each with one oblique, strong, setiferous carina on external side. Both apical spurs of metatibia articulated, wide, lanceolate and curved. Ventral genital plates slightly sclerotized, slightly asymmetrical, elongated and vaguely angulate, with scarce short setae at mesodistal angle; dorsal genital plates slightly sclerotized, completely fused to each other, distal border widely sinuate with five stout, long setae at each side (Fig. 17). Total body length: 19.5 mm. Humeral width: 9.2 mm.

Paratype Variation. Males. Similar to holotype except in total body length: 14.9–21.4 mm, humeral width: 6.3–9.0 mm, anterior dorsal surface of some specimens darker or lighter than holotype, other specimens with antennal club 1.5–1.6× longer than length of preceding six segments combined. Female similar to allotype except as follows: total body length: 17.8–24.0 mm; humeral width: 7.8–10.7 mm, some specimens do not have the pruinosity on the pygidium, but others have the pygidial disk completely pruinose. Anterior dorsal surface of some specimens darker or lighter than allotype.

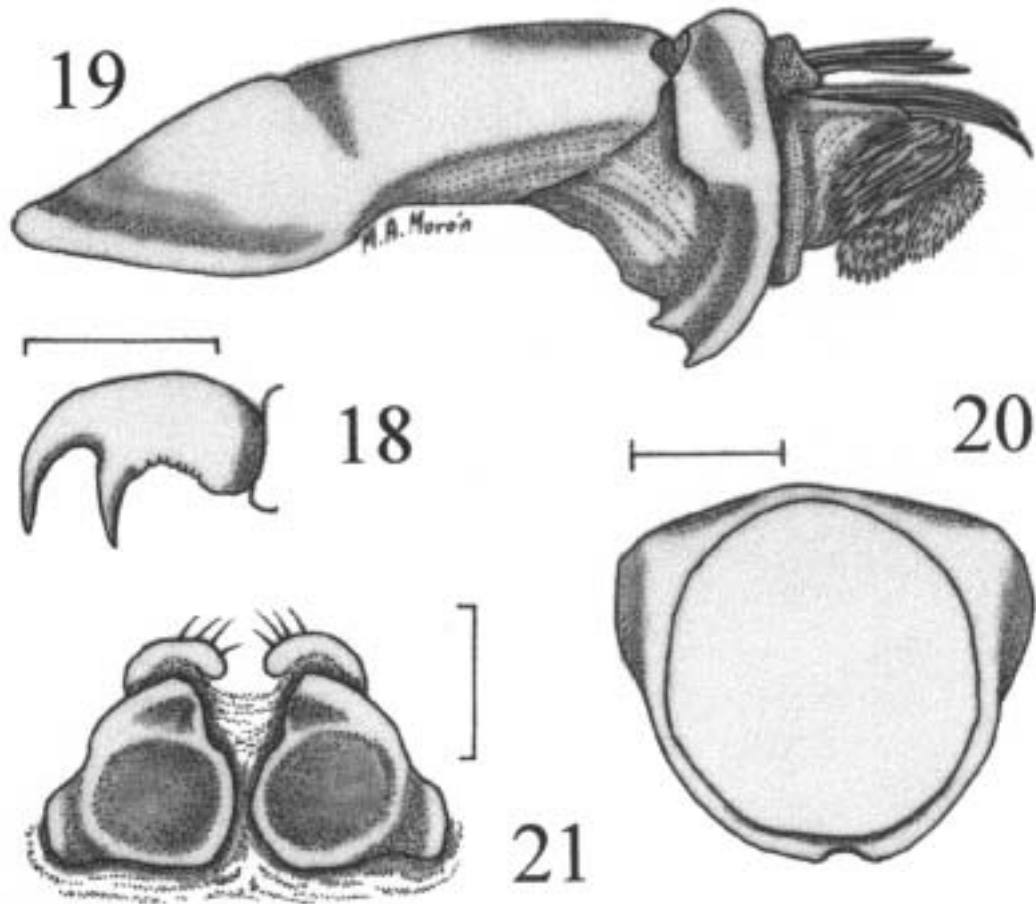
Type Series. Described from 30 males and 24 females. Holotype male (INBIO): “COSTA RICA: Puntarenas, Península Osa, Rancho Quemado, II-91, F. Quezada, INBIO CR 292500 511000.” Allotype female (INBIO): same data as holotype. Paratypes: same data as holotype (8 males, 10 females); “Puntarenas, P.N. Amistad, Est. Las Mellizas, Finca Cafosa, IV-91, G. Mora, INBIO CR 1000 659021” (21 males, 13 females). Paratypes deposited in CASC, CNC, INBIO, MXAL, TAMU and ZMHU.

Type Locality. Rancho Quemado, Península de Osa, province of Puntarenas, Costa Rica (approx. 8°34'N; 83°35'W).

Biological Data. Males and females of *Phyllophaga puntarenosa* n. sp. were collected at lights at localities between 50–1,200 m of altitude, including disturbed habitat as well as tropical deciduous forests. Phenology: February (18), April (34). Other species of *Phyllophaga* flying at the same time and places were: *P. favosa* Saylor, *P. gigantea* Bates, *P. hemilissa* Bates, *P. morganella* Saylor, *P. menetriesi* Blanchard, *P. schizorhina* Bates, *P. vicina* Moser, one new species under description and four unidentified species.

Remarks. *Phyllophaga (Phyllophaga) puntarenosa* n.sp. belongs to the species group “*rorulenta*” (*sensu* Morón 1986). It may be related to *P. (Phyllophaga) chiriquina* (Bates) (Nicaragua to Colombia; Saylor 1943), by the general shape of the apical half of parameres, but the bicolorate dorsum, length of male antennal club, the flattened female pygidial disk, the length of the lower male metatibial spur, and the apex of parameres sharply pointed, will aid in the recognition of this new species.

Etymology. Derived from combination of words “Puntarenas” province and “Osa” peninsula, that comprise the geographic range where this species lives.



Figs. 18–21. *Phyllophaga talamancana*. 18) protarsal claw, male; 19) genital capsule, lateral view; 20) paramera, distal view; 21) genital plates, female. Scale lines = 1 mm, except Fig. 18 = 0.5 mm.

Phyllophaga (Phyllophaga) talamancana Morón and Solís, **new species**
Figs. 18–21

Holotype. Male. Clypeus, frons and pronotum shiny dark reddish brown; elytra light brown with iridescent luster, head and pronotum with abundant, erect, long setae; elytra with abundant, erect, long setae around scutellum and toward the apex, near suture, and vestiture of uniformly distributed short setae on rest of surface; mouthparts, sterna, pygidium and legs shiny reddish brown. Clypeus 4.2× wider than long, anterior border very scarcely sinuate, with poorly elevated margin, surface shallowly concave, with scarce irregularly distributed, deep, round shaped punctures, each with short setae. Frontoclypeal suture sinuate and deeply impressed. Frons 2.3× wider than long, convex, with reduced number of coarse wide punctures, with long slender setae at sides and on disk. Antenna 10-segmented, with 3-segmented club, lamellae of 8th to 10th segments 1.1× longer than length of preceding 6 segments combined. Frons 4.0× wider than dorsal diameter of eye. Eye canthus long and wide, with 6–7 setae. Labrum bilobed, widely sinuate, with scattered slender setae. Mentum slightly convex, with 4 punctures in a transverse row, and long slender setae near the borders; anterior border briefly sinuate. Pronotum 1.4× wider than long and 2.7× wider than frons. Pronotal disk shiny, with deep, round punctures irregularly separated from one another by 1–7 diameters; lateral borders widely angled, lateral marginal bead crenulate, with regularly located, long, slender setae; basal bead indicated by punctures mainly toward the sides; anterior angles acute, clearly prominent; posterior angles obtuse, slightly prominent. Scutellum 1.5×

wider than long, with some deep punctures each with short setae. Elytron 3.0× longer than wider, shiny, densely punctate; epipleural border very narrow, extended along the complete margin, provided with setae along first half, setae diminishing in size antero-posteriorly from long to minute; humeral callus rounded, prominent; apical callus rounded. Metathoracic wings completely developed. Propygidium shiny, densely punctate, setose. Pygidium moderately convex, shiny, shallowly punctate rugose with scattered erect setae; apical margin with 19 long, slender setae; basal margin effaced medially. Pterosternon with long, dense, yellowish setae. Visible abdominal sternites II–IV convex, smooth and glabrous near midline; sternite V convex, shiny, densely punctate with short setae at midline and sparse punctures with mixed long and short setae toward sides; anal plate narrowed, with a transverse shallow concavity and longitudinal furrow at midline, anterior and posterior borders slightly elevated, near the posterior border with 23 erect setae. Protibia slightly shorter than protarsus (0.9:1), with external border tridentate, basal tooth short, preapical spur acute, nearly straight, as long as 2nd protarsomere. Mesotibia with one oblique, sharp, setiferous carina on external side; upper apical spur straight, narrow, and 1.1× longer than lower spur. Metatibia 0.9× shorter than metatarsus, with one oblique, sharp, setiferous carina on external side; upper apical spur articulated, curved, with apex rounded, 1.1× longer than basal metatarsomere, and 1.4× longer than lower spur; lower apical spur articulated with tibial border, with rounded apex. Tarsomeres semicylindrical, not much elongate, with enlarged apex, some setae apically and ventrally one longitudinal carina with a line of short setae at each side. Protaromeres 1–4 with poorly developed subapical tubercles. Tarsal claws symmetrical, similar on all legs, each with large acute tooth at middle of ventral border and with finely serrate border toward the base (Fig. 18). Genital capsule with short parameres, dorsally and ventrally fused, ring-shaped, apex widely notched, ventrally with preapical minute, tooth-like projections. Aedeagus long, with large preapical patches of spinules and strong sclerotized support with dorsal brush of long setae directed to the apex; basally with a pair of dorsal rounded, membranous sac-like structures (Figs. 19–20). Tectum uniformly convex. Length of genital capsule from apex of parameres to border of basal piece: 5 mm. Total body length: 19.1 mm. Humeral width: 8.0 mm.

Allotype. Female. Similar to the male except as follows: visible abdominal sternites II to V less convex; anal plate 1.5× longer than male anal plate, convex, punctate, with 60 scattered slender setae. Metafemur 1.3× wider than femur of male. Metatibia at the apex 1.4× wider than male metatibia. Both apical spurs of metatibia articulated, wider than in the male. Pygidium less convex. Ventral genital plates moderately sclerotized, nearly symmetrical, ovate; dorsal plates narrowed, curved, with scattered setae at apex and distal border, apparently articulated baso-laterally with ventral plates (Fig. 21). Total body length: 19.3 mm. Humeral width: 8.3 mm.

Paratype Variation. Male. Similar to holotype except in total body length: 18.2 mm, humeral width: 8.0 mm. Female. Similar to allotype except in total body length: 18.7 mm, humeral width: 8.0 mm, elytra of some specimens darker than allotype.

Type Series. Described from 4 males and 4 females. Holotype male (IN-BIO): "COSTA RICA: Puntarenas, Sendero a Cerro Pittier, 600 m al Noroeste de la Estación Pittier, 1,750 m, 15-VII-96, M. Moraga." Allotype female (IN-BIO): "COSTA RICA: Puntarenas, Buenos Aires, Sector Altamira, 1 km Sur-oeste del Cerro Biolley, 1,150–1,350 m, X-1994, Z. Fuentes." Paratypes: same data as allotype except "1,300–1,450 m, XI-94, M. Segura" (1 male, 1 female); Puntarenas, NO Estación Pittier, Sendero Altamira, 4-X-95, 1,700–1,740 m, M. Moraga, INBIO CR 1002 468647 (1 male); Puntarenas, PILA-ACLA, Estación Pittier, 5/18-I-95, 1,670 m, R. Villalobos, INBIO CR 1002 183335 (1 female); "COSTA RICA: Cartago, Refugio Nacional de Fauna Sil-

vestre Tapantí, Quebrada Segunda, 1,250 m, IV-92, G. Mora" (1 male, 1 female). Paratypes deposited in INBIO and MXAL.

Type Locality. Falda Sur del Cerro Pittier, Cordillera de Talamanca, Costa Rica (9°01'45"N; 82°57'55"W).

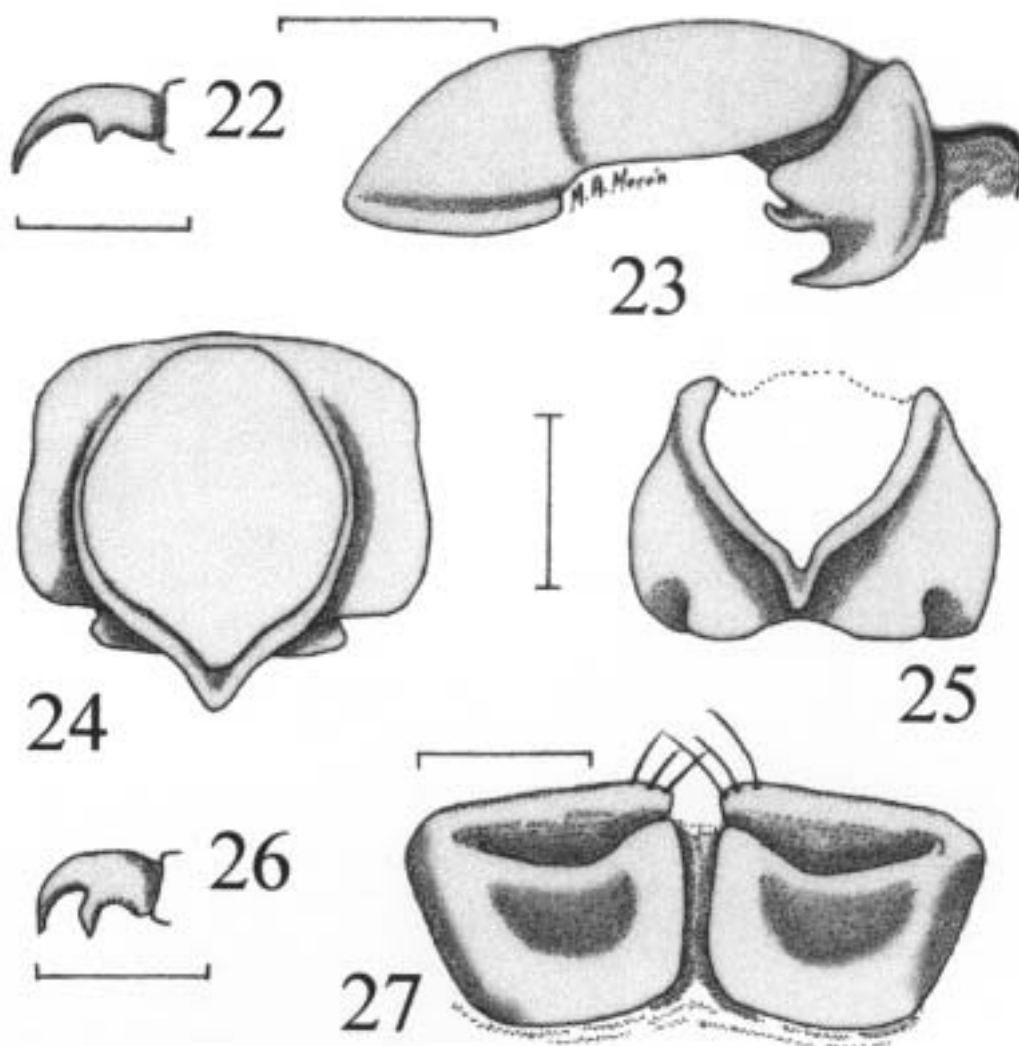
Biological Data. Four males and three females of *P. talamancana* n.sp. were collected at lights in grasslands, near the forest, and one female was collected at lights in premontane rain forest, located between 1,250–1,750 m of altitude. Phenology: January (1), April (2), July (1), October (2), November (2). Other species of *Phyllophaga* flying at the same time and places were: *P. nevermannea* Saylor, *P. orosina* Moser, *P. tapantina* n. sp.

Remarks. *Phyllophaga (Phyllophaga) talamancana* n. sp. is not closely related with any known species group (*sensu* Morón 1986). The general structure of the last sternites, shape of tarsal claws and the length of antennal club in the males suggest a vague relation with some species in the "*schizorhina*" group, and the sculpture of the head and pronotum resemble some species in the "*blanchardi*" group. The shape and details of the male genital capsule, sculpture of the pronotum, pygidium and sternites, body luster and color will aid to separate this species from other Costarican *Phyllophaga*.

Etymology. Derived from "Cordillera de Talamanca" that comprises the majority of the geographic range where this species lives.

Phyllophaga (Phyllophaga) naranjina Morón and Solís, **new species**
Figs. 22–27

Holotype. Male. Clypeus, frons and pronotum shiny reddish testaceous; elytra light yellowish testaceous, head with erect, short setae; pronotum shiny, with short setae around the margins and very scarce short setae on the disk; elytra shiny, nearly glabrous with scattered setae along the suture and toward the posterior half; mouthparts, sterna, pygidium and legs shiny reddish testaceous. Clypeus 5.0× wider than long, anterior border widely rounded, with clearly elevated margin, surface concave, with irregularly distributed, shallow, round punctures, glabrous. Frontoclypeal suture sinuate and effaced at the median third. Frons 1.3× wider than long, convex, coarsely rugo-punctate, with short slender setae on entire surface. Antenna 9-segmented, with 3-segmented club, lamellae of 7th to 9th segments 1.5× longer than length of preceding 5 segments combined. Frons 2.4× wider than dorsal diameter of eye. Eye canthus long and wide, with 12 setae. Labrum bilobed, shallow and widely sinuate, with scattered slender setae. Mentum slightly convex, with slender setae on each side, anterior border nearly straight. Pronotum 1.6× wider than long and 2.9× wider than frons. Pronotal disk shiny, with deep, round punctures irregularly separated from one another by 1–6 diameters; lateral borders strongly angled, lateral marginal bead crenulate with regularly located, long, slender setae; basal bead indicated by punctures, mainly toward the sides; anterior angles right, clearly prominent; posterior angles obtuse, slightly prominent. Scutellum 1.6× wider than long, with some deep punctures, glabrous. Elytron 2.9× longer than wider, shiny, densely punctate; epipleural border very narrowed, extended along the complete margin, provided with dense fringe of short setae all along; humeral callus rounded, prominent; apical callus rounded. Metathoracic wings completely developed. Propygidium shiny, densely punctate rugose with scattered short setae. Pygidium moderately convex, shiny, deeply punctate rugose toward the midline with scattered erect short setae; apical margin with 12 long, slender setae; basal margin effaced medially. Pterosterna with long, dense, yellowish setae. Visible abdominal sternites II–IV concave, with scattered setiferous granules toward the midline; sternite V nearly flat, shiny, moderately granulose setiferous at the middle, with fine ridge on the posterior border; anal plate moderately narrowed, slightly punctate, convex, with coarse setiferous punctures, a vague longitudinal furrow at midline, anterior border slightly elevated at sides, posterior border not elevated, without setae. Protibia slightly shorter than protarsus (0.7:1), with external border tridentate, ---



Figs. 22–27. *Phyllophaga naranjina*. 22) protarsal claw, male; 23) genital capsule, lateral view; 24) paramera, distal view; 25) paramera, ventro-distal view; 26) protarsal claw, female; 27) genital plates, female. Scale lines = 0.5 mm, except Fig. 23 = 1 mm.

basal tooth short, preapical spur acute, slightly curved, shorter than 2nd protarsomere. Mesotibia with one oblique, sharp, setiferous carina on external side; upper apical spur straight, narrow, and as long as lower spur. Metatibia 0.6× shorter than metatarsus, with one oblique, sharp, setiferous carina on external side; upper apical spur articulated, curved, with apex acute, 0.6× shorter than basal metatarsomere, and 1.6× longer than lower spur; lower apical spur articulated with tibial border, with acute apex. Tarsomeres semicylindrical, not much elongate, with enlarged apices and some setae apically; meso- and metatarsomeres 2–4 each with two longitudinal carinae with lines of short setae on ventral side; protarsomeres 1–3 each with subapical small hook-like tubercle. Tarsal claws symmetrical, similar on all legs, with a small acute tooth near the middle of ventral border (Fig. 22). Genital capsule with short and wide parameres, dorsally and ventrally fused, ring shaped, apex curved, progressively narrowed to acute apex, ventrally with a transverse strongly sclerotized wide blade with sinuate border directed backward. Aedeagus short, with a long curved bristle and tuft of yellowish setae on the dorso-apical area of the sclerotized support (Figs. 23–25). Tectum with two vague tumosities toward the base. Length of genital capsule from apex of parameres to border of basal piece: 2.7 mm. Total body length: 11.8 mm. Humeral width: 4.6 mm.

Allotype. Female. Similar to the male except as follows: antennal club as long as the preceding 5 segments; visible abdominal sternites II to V convex; anal plate 1.2× longer than male anal plate, convex, punctate, with 25 scattered slender setae. Protarsomeres with subapical hook-like tubercles reduced. Metafemur 1.1× wider than metafemur of male. Metatibia at apex 1.2× wider than male metatibia. Both apical spurs of metatibia articulated, wider than in male. Tarsal claws each with large tooth near middle of ventral border (Fig. 26). Pygidium less convex. Ventral genital plates slightly sclerotized, nearly symmetrical, round with elongate apex; dorsal genital plates articulated with lateral borders of ventral plates, apices rounded with 3 setae on each side (Fig. 27). Total body length: 12.9 mm. Humeral width: 4.5 mm.

Paratype Variation. Males. Similar to holotype except in total body length: 10.0–13.1 mm, humeral width: 4.8–5.9 mm; antennal club 1.3–1.5× preceding 5 segments; two males with scattered short, erect setae at the sides of scutellum. Females. Similar to allotype except in total body length: 11.9–13.0 mm, humeral width: 4.9–5.2 mm; three females with scattered short, erect setae at the sides of scutellum.

Type Series. Described from 9 males and 7 females. Holotype male (INBIO): “Costa Rica, Prov. Alajuela, El Rosario de Naranjo, Estac. de Peaje. LN 226000, 496700, 6-IV-98, A. Solís.” Allotype female: (INBIO) same data as holotype. Paratypes: same data as holotype (8 males, 6 females). Paratypes deposited in INBIO and MXAL.

Type Locality. El Rosario de Naranjo, 3 km N Naranjo, province of Alajuela, Costa Rica (approx. 10°10'N; 84°22'W).

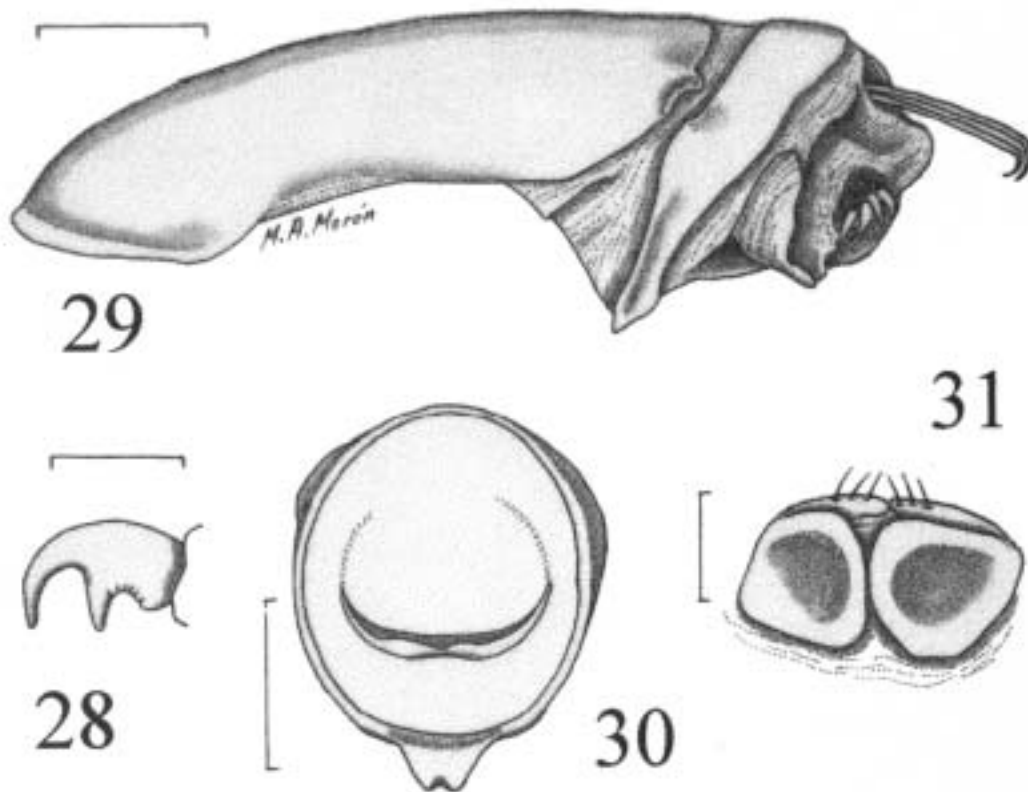
Biological Data. All males and females of *P. naranjina* n. sp. were collected at lights at the border of coffee plantations located at 1,050 m of altitude. Phenology: April (16).

Remarks. *Phyllophaga (Phyllophaga) naranjina* n. sp. does not belong to any known species group (*sensu* Morón 1986), but the nine segmented antenna may related it with the “*porodera*” group, and the shape of tarsal claws, male anal plate and protarsal spurs are similar to some species in the “*anodentata*” group. The very short clypeus, number of antennal segments, scattered granules near the middle line of the sternites, shape and details of the male genital capsule, and small body size will aid in the recognition of this new species.

Etymology. Derived from the name of type locality “El Rosario de Naranjo.”

Phyllophaga (Phyllophaga) guapiloides Morón and Solís, **new species**
Figs. 28–31

Holotype. Male. Clypeus, frons and pronotum shiny dark brown; elytra shiny dark brown, head and pronotum with erect, mixed long and short setae on entire surface; elytra with abundant decumbent short setae on entire surface and some scattered erect setae along the suture and toward the sides of scutellum; mouth parts, sterna, pygidium and legs shiny reddish brown. Clypeus 3.8× wider than long, anterior border slightly sinuate, with clearly elevated margin, surface slightly concave, densely rugopunctate, with many short erect setae. Frontoclypeal suture sinuate and partially hidden by punctures. Frons 1.7× wider than long, convex, densely rugopunctate, with mixed short and long setae on entire surface. Antenna 10-segmented, with 3-segmented club, lamellae of 8th to 10th segments 1.2× longer than length of preceding 6 segments combined. Frons 5.0× wider than dorsal diameter of eye. Eye canthus long and wide, with 12–15 setae. Labrum bilobed, deeply notched, with abundant slender setae. Mentum slightly convex, with slender setae on each side, moderately sinuate anteriorly. Pronotum 1.8× wider than long and 2.2× wider than frons. Pronotal disk shiny, with deep, round punctures irreg-



Figs. 28–31. *Phyllophaga guapiloides*. 28) Protarsal claw, male; 29) genital capsule, lateral view; 30) paramera, distal view; 31) genital plates, female. Scale lines = 1 mm, except Fig. 28 = 0.5 mm.

ularly separated from one another by less than 1 diameter; lateral borders strongly angled, lateral marginal bead crenulate and progressively dentate toward posterior corner, with regularly located, long, slender setae; basal bead indicated by punctures, mainly toward the sides; anterior angles right, clearly prominent; posterior angles obtuse, clearly prominent. Scutellum 1.7× wider than long, with numerous shallow setiferous punctures. Elytron 2.4× longer than wider, shiny, densely setiferous punctate; epipleural border very narrow, extended along the complete margin, provided with dense fringe of short setae for entire length; humeral callus rounded, prominent; apical callus rounded. Metathoracic wings completely developed. Propygidium shiny, with fine punctures densely placed and setiferous punctures. Pygidium moderately convex, shiny, with fine punctures densely placed and setiferous punctures, with scattered long erect setae on distal half of disk; apical margin with 16 long, slender setae; basal margin effaced medially. Pterosterna with long, dense, yellowish setae. Visible abdominal sternites II–IV convex, with scattered fine setiferous punctures; sternite V convex, finely rugose with setiferous punctures on the middle, with a shallow transverse sulcus before the posterior border; anal plate moderately narrowed, slightly concave, with scattered setiferous punctures, anterior and posterior border clearly elevated nearly all along the complete width, with 14 long setae near the posterior border. Protibia slightly shorter than protarsus (0.8:1), with external border tridentate, basal tooth short, preapical spur acute, straight, as long as 2nd protarsomere. Mesotibia with one oblique, sharp, setiferous carina on external side; upper apical spur straight, narrow, and as long as lower spur. Metatibia 0.8× shorter than metatarsus, with one oblique, feeble, setiferous carina on external side; upper apical spur articulated, slightly curved, with apex acute, 0.9× shorter than basal metatarsomere, and 1.6× longer than lower spur; lower apical spur articulated with tibial border, slightly curved, with rounded apex. Tarsomeres semicylindrical, not much elongate, with en-

larged apex and some setae apically; meso- and metatarsomeres 2–4 ventrally with a serrulate longitudinal carina and one line of short setae at each side; protarsomeres 1–3 each with subapical small tooth-like blade. Tarsal claws symmetrical, similar on all legs, each with a large acute tooth near the middle of ventral border with some minute incisions before the base (Fig. 28). Genital capsule with short and narrowed parameres, dorsally and ventrally fused, ring-shaped, apex straight, progressively narrowed, with tooth-like apex finely notched. Aedeagus long with preapical patches of strongly sclerotized short spines and one tuft of 7–8 very long setae on the dorso-apical area of sclerotized support, this support is a canaliculated wide structure with the base articulated with membranous parts of trema; ventral border of the apex slightly bisinuate (Figs. 29–30). Tectum convex. Length of genital capsule from apex of parameres to border of basal piece: 4.7 mm. Total body length: 19.2 mm. Humeral width: 8.9 mm.

Allotype. Female. Similar to the male except as follows: antennal club $0.8\times$ shorter than the preceding 6 segments; visible abdominal sternites II to V convex with more setae; anal plate convex. Metafemur $1.4\times$ wider than femur of male. Metatibia at apex $1.4\times$ wider than male metatibia. Both apical spurs of metatibia wider than in male. Pygidium less convex. Ventral genital plates strongly sclerotized, nearly symmetrical, round with wide, slightly elongated, setiferous apex; dorsal genital plates sclerotized, shortened, with wide setiferous apex (Fig. 31). Total body length: 21.9 mm. Humeral width: 9.2 mm.

Paratype Variation. Males. Similar to holotype except in total body length: 18.0–21.2 mm, humeral width: 8.0–9.5 mm; some specimens slightly darker or lighter than holotype. Females. Similar to allotype except in total body length: 18.2–21.0 mm, humeral width: 8.3–9.1 mm.

Type Series. Described from 19 males and 13 females. Holotype male (IN-BIO): “Costa Rica, Puntarenas, Coto Brus, Estación Biológica Las Alturas, 23-III to 2-V-92, 1,500 m, F. Araya LS 322500, 591300/INBIO CR 1000 909226.” Allotype female (INBIO): same data as holotype except INBIO CR 1000 909233. Paratypes: same data as holotype (18 males, 12 females). Paratypes deposited in CASC, CNC, INBIO, MXAL and ZMHU.

Type Locality. Estación Biológica Las Alturas, Coto Brus, province of Puntarenas, Costa Rica (approx. $8^{\circ}58'N$; $83^{\circ}6'W$).

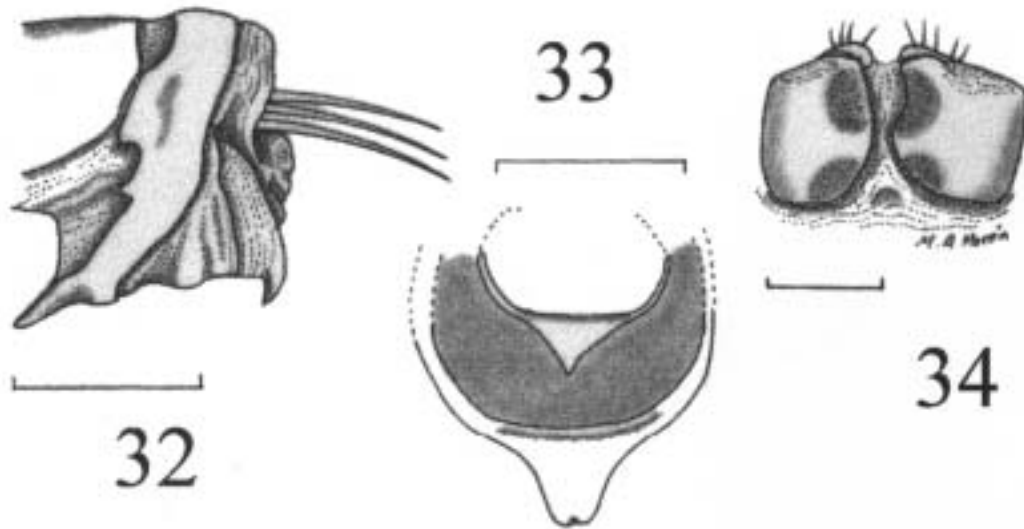
Biological Data. All males and females of *P. guapiloides* n. sp. were collected at lights on the border of coffee plantations located at 1,500 m of altitude. Phenology: March–May (22).

Remarks. *Phyllophaga* (*Phyllophaga*) *guapiloides* n. sp. probably belong to “*setidorsis*” species group (*sensu* Morón 1986), but the structure of the aedeagus is much different from that species. It is closely related to *Phyllophaga* (*Phyllophaga*) *guapiles* Saylor from Guanacaste area and is without external differences, but the structure of parameres and the sclerotized support of aedeagus are clearly different (Figs. 32–33). Female genital plates are also slightly different from *P. guapiles* (Fig. 34). Density, size and shape of the punctures on the head, pronotum, elytra and pygidium; body vestiture; shape of hind tibial spurs, and tarsal claws; structure of tarsomeres and general pattern of aedeagus, will aid to separate this pair of sister species from other species in the “*setidorsis*” group.

Etymology. Derived from latin suffix *-oides*, similar, false (Jaeger 1955), meaning “similar to *guapiles*.” In the popular Spanish language of Costa Rica, the term “*guapil*” is applied to paired things.

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Figs. 32–34. *Phyllophaga guapiles*. 32) apex of genital capsule, lateral view; 33) apex of paramera and sclerotized support of aedeagus, ventro-distal view; 34) genital plates, female. Scale lines = 1 mm.

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Literature Cited

- Boza, M. 1988.** Costa Rica National Parks. Heliconia. San José, Costa Rica. 323 pp.
- Jaeger, E. C. 1978.** A source book of biological names and terms. 3rd ed. Charles C. Thomas Publisher. Springfield, Illinois. 323 pp.
- Morón, M. A. 1986.** El género *Phyllophaga* en México. Morfología, distribución y sistemática supraespecífica (Insecta: Coleoptera). Publ. 20, Instituto de Ecología, México, D.F. 341 pp.
- Saylor, L. W. 1935.** New neotropical Scarabaeidae of the genus *Phyllophaga* (Col.). Revista de Entomología (Rio de Janeiro) 5:496–501.
- Saylor, L. W. 1943.** Revision of the *rorulenta* group of the scarab beetle genus *Phyllophaga*. Proceedings Biological Society Washington, 56:129–142.
- Solís, A., and M. A. Morón. 1998.** Distribución, diversidad e importancia de las especies de *Phyllophaga* Harris en Costa Rica (Coleoptera: Melolonthidae) [pp.19–28]. In: Avances en el estudio de la diversidad, importancia y manejo de los coleópteros edáficos americanos (M.A. Morón y A. Aragón, editores). Publicación Especial de la Benemérita Universidad Autónoma de Puebla y la Sociedad Mexicana de Entomología, A.C. Puebla, México.

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