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THREE NEW SPECIES OF *PHYLLOPHAGA* FROM MEXICO (COLEOPTERA: SCARABAEIDAE: MELOLONTHINAE)

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ABSTRACT

Three new species of *Phyllophaga* from Mexico are described: *P. (Phytalus) balli*, **new species** collected in pine and oak forests toward the northwest of Oaxaca valley; *P. (Phyllophaga) navidad*, **new species** obtained in tropical deciduous forests in the Pacific coast of Jalisco; and *P. (Phyllophaga) potosisalta*, **new species** collected in tropical subdeciduous forest of eastern San Luis Potosi. Illustrations of diagnostic characters are included.

Key Words: May beetles, taxonomy, tropical forests, oak forests, Mexico

RESUMEN

Se describen tres especies nuevas de *Phyllophaga* de México: *P. (Phytalus) balli* **nueva especie** colectada en bosques de pinos y encinos situados al noroeste del valle de Oaxaca; *P. (Phyllophaga) navidad* **nueva especie** capturada en bosques tropicales caducifolios localizados en la costa de Jalisco; y *P. (Phyllophaga) potosisalta* **nueva especie** encontrada en bosque tropical subcaducifolio ubicado en la Huasteca Potosina. Se incluyen ilustraciones de algunos caracteres diagnósticos.

Translation provided by the authors.

Curatorial work of Mexican May beetles deposited in the Florida State Collection of Arthropods, provided specimens of a number of undescribed species. Many of these possess sets of external morphological characters and male genital capsules that are different from the groups of species proposed by Morón (1986, 2003). Some of these may support new groups of species, but others remain isolated, or with uncertain position in the subgenus *Phyllophaga* (*sensu stricto*). In this paper we describe 1 new species of *Phyllophaga* (*Phytalus*) and 2 new species of *Phyllophaga* (*s.str.*).

MATERIALS AND METHODS

The characters and terms used in the descriptions are those of Sanderson (1958), Saylor (1942), Morón (1986), and Woodruff & Beck (1989). Illustrations were made with JEOL:JSM-5510LV Scanning Electron Microscope and with the Auto-Montage Pro© located at FSCA. Measurements were obtained with an ocular micrometer on a Zeiss stereomicroscope or with digital calipers. Specimens are deposited in the following collections: Florida State Collection of Arthropods (FSCA); Instituto de Ecología, Xalapa, México (IEXA); M. A. Morón, Xalapa (MXAL); Universidad Autónoma del Estado de Hidalgo, Pachuca (UAEH); and United States National Museum, Washington, D.C. (USNM).

Phyllophaga (Phytalus) balli, **new species** (Figs. 1-7)

Description

Holotype male. Body and legs yellowish brown, shiny. Clypeus with numerous slender, erect, long setae, 3.2 times wider than long, borders moderately elevated, anterior margin briefly sinuate at middle, disk surface widely convex, with many uniformly distributed, round punctures. Frontoclypeal suture briefly sinuate and clearly impressed. Frons 1.6 times wider than long, convex, punctate rugose, with many slender, erect, long setae. Frons 4.3 times wider than dorsal diameter of eye. Eye canthi long and narrow, with 13-15 setae. Antenna 10-segmented, with 3-segmented club, lamellae 1.3 times longer than length of preceding 6 segments combined; segments 3 or 4 shorter than 5; segments 6 and 7 wider than long, with short flattened prominences on anterior sides. Labrum bilobed, deeply notched, with many slender, long setae along the borders. Mentum widely concave, impunctate, with scarce, slender setae at sides, anterior border broadly notched.

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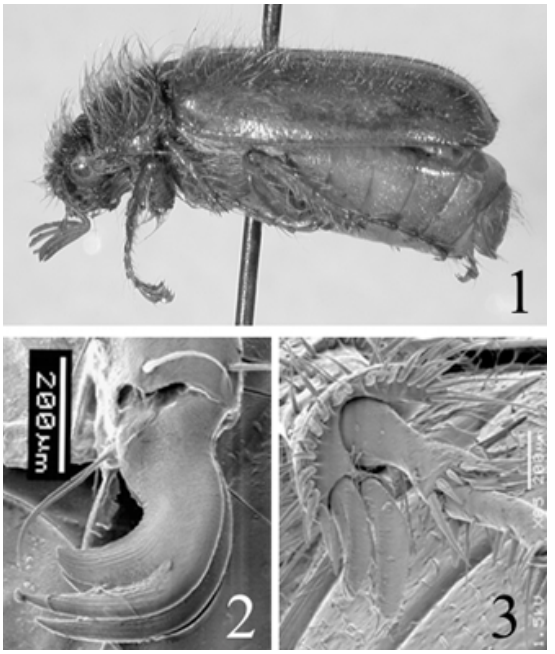


Fig. 1-3. *Phyllophaga balli*, **new species**. 1. Male, lateral view. 2. Male tarsal claws. 3. Male metatibial spurs.

Pronotum 1.8 times wider than long and 2.1 times wider than frons. Pronotal disk slightly shiny, with numerous slender, erect, long setae (Fig. 1) and shallow, round punctures regularly separated by 0.5-1 diameters; lateral borders strongly angulate, lateral marginal bead crenulate, with long, curved setae; basal bead indicated by punctures on most of it extension; anterior angles obtuse, slightly prominent; posterior angles obtuse, clearly prominent. Scutellum 1.3 times wider than long, with 17 punctures and anterior border widely sinuate. Elytron 2.3 times longer than wide, shiny, densely and irregularly punctate, with slender, erect, long setae near the base and scutellum (Fig. 1), and some scattered, short setae all along disc; epipleural border progressively narrowed toward the apex, with slender, long setae; humeral calla rounded, prominent; apical calla rounded. Metathoracic wings completely developed. Pterosterna with long, dense, yellowish setae. Visible abdominal sternites 2° to 4° slightly depressed at middle; 5th sternite widely convex, shiny, with scattered setiferous punctures; anal plate long, weakly concave, with a central, moderate prominence covered by setigerous granules (Fig. 4). Propygidium shiny, with numerous punctures. Pygidium shiny, widely convex, densely rugose, with scattered slender, long setae mainly at sides, and lateral deep fovea; apical margin with 20 long, slender setae; basal margin weakly defined at middle.

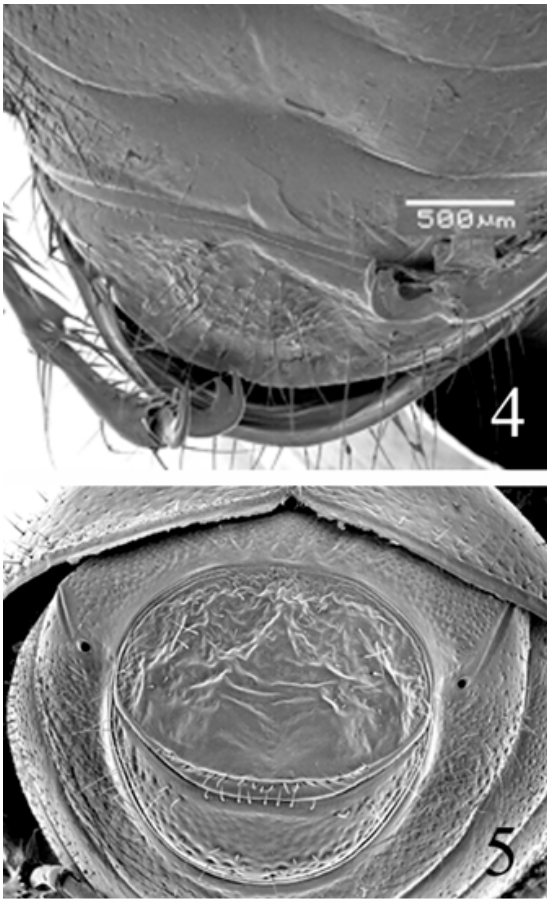


Fig. 4-5. *Phyllophaga balli*, **new species**. 4. Male anal plate, ventral view. 5. Female pigidium and anal plate, distal view.

Protibia slightly shorter than protarsus (0.8:1), with 2 large teeth and a basal small tooth on external border, preapical spur acute, straight, 1.8 times longer than 2nd protarsomerus. Mesotibia with one oblique, well marked, setiferous carina on external side, and curved, short spines along dorsal border; upper apical spur slender, with acute apex, 0.2 times longer than lower slender spur, with acute apex. Metatibia slightly shorter than metatarsus (0.9:1), with one oblique setiferous carina on external side, and curved, short spines along dorsal border; upper apical spur articulated (Fig. 3), slightly curved, round pointed, 1.3 times longer than basal metatarsomere, and 1.1 times longer than lower spur; lower apical spur articulated, apex rounded. Tarsomeres semicylindrical, elongate, with enlarged apex, some setae apically, and one line of short setae along ventral side, especially on metatarsomeres. Tarsal claws similar in all legs, deeply cleft, upper tooth slightly longer than lower tooth (Fig. 2).

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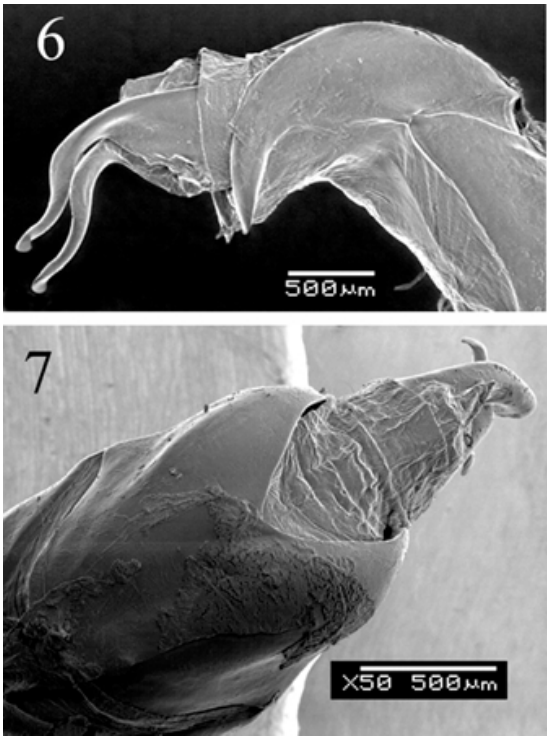


Fig. 6-7. *Phyllophaga balli*, **new species**. 6. Male genital capsule, lateral view. 7. Male genital capsule, dorsal view.

Genital capsule with long, strongly curved parameres not fused along ventral surface, dorsally fused at phallobase, apex rounded, slightly flattened, with scattered short setae (Figs. 6-7). Tectum with narrow, shallow depression on midline. Aedeagus with sclerotized support, provided with preapical, long sinuose projections at each side. Length of genital capsule from apex of parameres to border of basal piece: 4.2 mm. Total body length: 14.1 mm. Humeral width: 6.0 mm.

Allotype Female. Similar to the male except as follows: antennal club as long as preceding 4 segments combined. Visible abdominal sternites 2° to 5° convex, with scattered, setiferous punctures; anal plate longer than in male, strongly convex, punctate, with scattered long setae near the basal border and row of 8 slender setae on apical border. Pygidium densely rugose, with scattered long setae on disc and preapical depression (Fig. 5). Both apical spurs of metatibia widened, curved, with rounded apex. Tarsal claws widely cleft, with lower tooth slightly shorter than upper tooth. Ventral genital plates moderately sclerotized, nearly symmetrical, ovate, with few short setae near distal border; dorsal genital plates with rounded process directed mesially, each with a tuft of setae at the apex. Total body length: 13.2 mm. Humeral width: 5.7 mm.

Variation

Total body length: 14.3-13.5 mm, humeral width: 6.0-5.7 mm. Metatibial spurs of male from Zaachila-San Miguel Peras with acute apex.

Type Materials

Described from 3 males and 5 females. Holotype male; MEXICO: Oaxaca, Rte. 190, 33.0 mi NW Oaxaca, oak forest, 4/5-V-1967, G. Ball, T. L. Erwin, R. E. Leech (FSCA). Allotype and 2 female paratypes with same data as holotype (FSCA, MXAL). Two males and two females paratypes: MEXICO: Oaxaca, km 22 Zaachila-San Miguel Peras, bosq. Pino-encino, alt. 2580 m, 28-VIII-1991, P. Rojas (MXAL, IEXA).

Type Locality

Mazaltepec environs, 33.0 mi NW Oaxaca city, state of Oaxaca, México (approx. 17°25'-10°34'N; 96°55'W).

Biological Data

This species inhabits dry pine-oak forests located at 2500-2600 m altitude. Specimens were collected during May (4) and Aug (4). Other species flying at the same time and place were *P. (Phyllophaga) nisuens* Saylor and *(Phytalus) solavegana* Morón.

Taxonomic Remarks

Phyllophaga (Phytalus) balli belongs to the species group "*senicula*" (*sensu* Morón 1986). It is similar to *P. (Phytalus) bolacoides* (Bates), a rare species known only from 2 localities in the south of the state of Guerrero, Mexico, but the body shape in both sexes of *P. balli* is more elongate, the male antennal club is larger and the dorsal vestiture in both sexes is much longer and denser than in the new species, the male anal plate of *P. bolacoides* is nearly convex, and the parameres of *P. balli* are longer with downward curved apex.

Etymology

This species is dedicated to Dr. George E. Ball, well known master professor of coleopterists, dedicated specialist on the Mexican Carabidae, and who collected part of the type series of this interesting new species.

Phyllophaga (Phyllophaga) navidad, **new species**
(Figs. 8-11)

Description

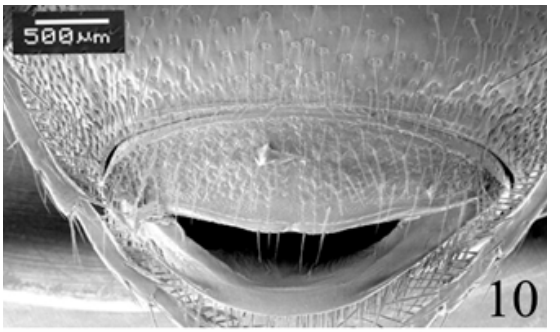
Holotype Male. All body surfaces shiny; head dark brown; pronotum reddish brown; elytra, sternites, pygidium and legs yellowish brown.

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Fig. 8-9. *Phyllophaga navidad*, **new species**. 8. Male, lateral view. 9. Male tarsal claws.



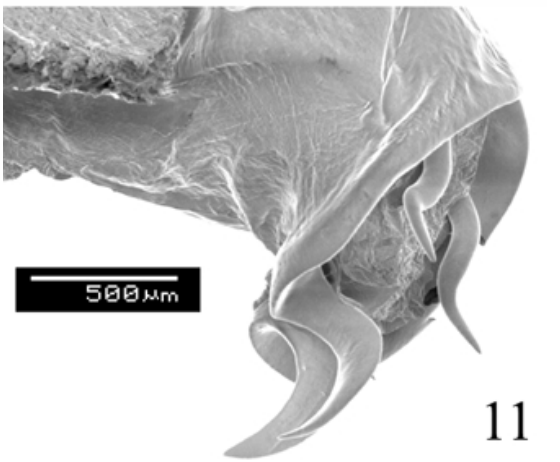


Fig. 10-11. *Phyllophaga navidad*, **new species**. 10. Male anal plate, ventral view. 11. Male genital capsule, lateral view.

Clypeus 3.2 times wider than long, borders noticeably elevated, anterior margin briefly sinuate, disk surface convex, with deep, irregular, round punctures, and scarce, erect setae. Frontoclypeal suture nearly straight, weakly impressed. Frons 2.3 times wider than long, widely convex, coarsely rugo-punctate with scarce, erect setae. Frons 3.6 times wider than dorsal diameter of eye. Eye canthi long and narrow, with 9 setae. Antenna 10-segmented, with 3-segmented club, lamellae as long as preceeding 6 segments combined; segment 4 as long as 3; segments 5 and 6 progressively wider than long, with rounded prominences on anterior sides; segment 7 much wider than long, with flattened, acute prominence on anterior side. Labrum bilobed, deeply notched, with scattered slender setae along the borders. Mentum widely concave, impunctate, with scarce, slender setae at sides, anterior border briefly notched.

Pronotum 2.1 times wider than long and 2.3 times wider than frons. Pronotal disk with scattered setae of different sizes (Fig. 8) and with deep, round punctures irregularly separated by 1-5 diameters; lateral borders strongly angulate, lateral marginal bead crenulate, with slender, long setae; basal bead indicated by punctures on middle third; anterior angles acute, prominent; posterior angles obtuse, rounded. Scutellum 1.5 times wider than long, with 4 punctures and anterior border widely sinuate. Elytron 2.5 times longer than wide, with scattered setae of different size on all the surface (Fig. 8), densely and regularly punctate; epipleural border progressively narrowed toward the apex, with long setae; humeral calla rounded, prominent; apical calla rounded. Metathoracic wings completely developed. Pterosternum with moderate number of yellowish, long setae. Visible abdominal sternites 2° to 4° convex at middle, with many short setae on complete surface; 5th sternite widely convex, shiny, with numerous short setae; anal plate large, weakly furrowed at middle, shiny, granulose-punctate with mixture of long and short setae (Fig. 10). Propygidium moderately shiny, densely granulose-punctate, with abundant short setae. Pygidium moderately shiny, widely convex, densely granulose-punctate, with abundant short setae; apical margin with 14 medium sized, slender setae; basal margin effaced at middle.

Protibia slightly shorter than protarsus (0.9:1), with 2 large teeth and one basal small tooth on external border, preapical spur acute, straight, shorter than 2nd protarsomere. Mesotibia with an oblique, well-marked, setiferous carina on external side; upper apical spur with

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acute apex, shorter than lower spur (0.7:1) lower spur with round apex. Metatibia nearly as long as metatarsus, with an oblique, weakly marked, setiferous carina on external side; upper apical spur articulated, curved, round pointed, slightly longer than basal metatarsomere (1.2:1), and 1.3 times longer than lower spur; lower apical spur articulated, wider than upper spur, curved, with round apex. Basal 4 protarsomeres slightly shortened, with subapical tufts of setae. Meso- and metatarsomeres semicylindrical, elongate, with enlarged setose apex, and with a line of stout setae along ventral side, best developed in metatarsus. All tarsal claws widely cleft, lower tooth wide and slightly shorter than upper tooth (Fig. 9). Genital capsule with long, narrow parameres dorsally fused with phallobase, ventrally convergent and distally projected as strongly curved, acute knives (Fig. 11). Aedeagus with strongly sclerotized tube-like support with lateral, preapical, asymmetrical long spines (Fig. 11). Tectum widely convex. Length of genital capsule from apex of parameres to border of basal piece: 3.2 mm. Total body length: 15.1 mm. Humeral width: 6.5 mm.

Female. Unknown.

Variation

Male Paratype. Pronotal and elytral setae less abundant. Total body length: 14.9 mm, humeral width: 6.3 mm.

Type Series

Described from 2 males. Holotype male; MEXICO: Jalisco, 25 mi NW Barra de Navidad, 22-VII-1974, blacklight, P. D. Perkins (FSCA). Paratype; MEXICO: Jalisco, Est. de Biología Chamela, 9-XI-1985, M. Sánchez (MXAL).

Type Locality

Barra de Navidad, Melaque municipality, state of Jalisco, México (approx. 19°18'N; 104°49'W).

Biological Data

This species inhabits the tropical deciduous forest located between 30 to 180 m of altitude in the central part of the Pacific slopes of the state of Jalisco. Specimens were collected during Jul (1) and Nov (1). Another species flying at the same time and place was *P. (Phyllophaga) multipora* (Bates).

Taxonomic Remarks

Phyllophaga navidad does not belong to any species group defined by Morón (1986; 2003). Body surface, tarsal claws and general structure of parameres are similar to *P. pilula* (Moser) known from the northern mountains of Chiapas (Morón 2001), but the shape of phallobase, distal part of the parameres and details of the apex of tube-like structure of aedeagus are clearly different. The form of the parameres and phallobase of *P. navidad* is similar to *P. nisuens* Saylor and *P. tsajumiana* Morón from the wet forests in northern Oaxaca mountains (Morón 2001), but the body surface and shape of tarsal claws are much different.

Etymology

Specific epithet derived from the name of type locality, Barra de Navidad.

Phyllophaga (Phyllophaga) potosisalta, **new species**
(Figs. 12-15)

Description

Holotype Male. All body surfaces shiny; head and pronotum reddish brown; elytra, sternites, pygidium and legs yellowish brown. Clypeus 2.3 times wider than long, borders noticeably elevated, anterior margin deeply notched, disk surface progressively convex towards midline, with deep, irregular, round punctures, and scarce, erect, long setae. Frontoclypeal suture nearly straight, weakly impressed. Frons 2.9 times wider than long, widely convex, coarsely rugopunctate with sparse, erect long setae. Frons 6 times wider than dorsal diameter of eye. Eye canthi long and narrow, with 12 setae. Antenna

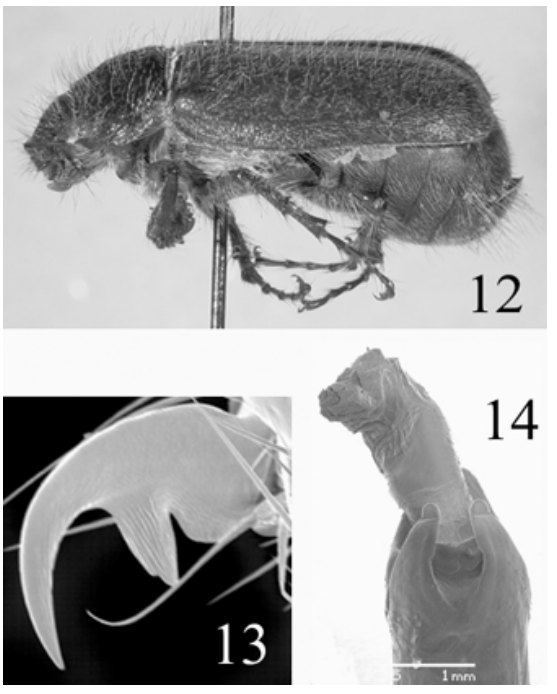


Fig. 12-14. *Phyllophaga potosisalta*, **new species**. 12. Male, lateral view. 13. Male tarsal claw. 14. Male genital capsule, dorsal view.

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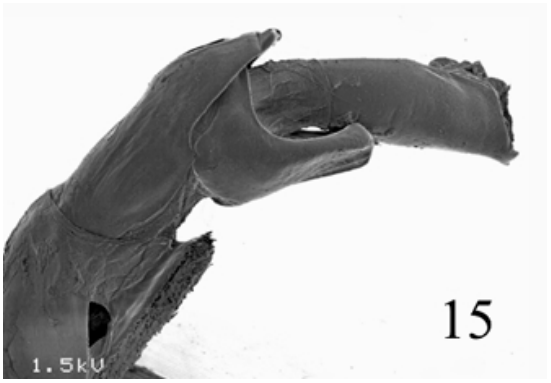


Fig. 15. *Phyllophaga potosisalta*, **new species**. Male genital capsule, lateral view.

10-segmented, with 3-segmented club, lamellae nearly as long as preceeding 5 segments combined; segment 4 as long as 3; segments 5 and 6 progressively wider than long, with rounded prominences on anterior sides; segment 7 much wider than long, with large, rounded prominence on anterior side. Labrum deeply bilobed, with scattered slender setae along borders. Mentum widely concave, impunctate, with scarce, slender setae at sides, anterior border briefly notched.

Pronotum 1.6 times wider than long and 1.9 times wider than frons. Pronotal disk with scattered erect setae of different sizes (Fig. 12) and with deep, round punctures irregularly separated by 1-3 diameters; lateral borders moderately angulate, lateral marginal bead strongly crenulate-dentate, with slender, long setae; basal bead replaced by an irregular line of round punctures from side to side; anterior angles strongly acute, prominent; posterior angles obtuse, prominent.

Scutellum 1.5 times wider than long, with 4 punctures irregularly placed and anterior border widely sinuate. Elytron 2.4 times longer than wide, surface regularly punctate with abundant setae of different sizes on all the surface (Fig. 12), erect long setae less abundant than short decumbent setae; epipleural border progressively narrowed toward apex, with long setae; humeral calla rounded, prominent; apical calla rounded. Metathoracic wings completely developed. Pterosternum with numerous yellowish, long setae. Visible abdominal sternites 2° to 4° convex at middle, with many short setae on all surface; 5th sternite widely convex, shiny, with numerous short setae; anal plate short, weakly excavated with basal transverse ridge and scattered erect setae. Propygidium shiny, densely with abundant short setae. Pygidium shiny, widely convex, densely punctate, with abundant decumbent short setae and numerous erect, long setae; apical margin with 12 medium sized, slender setae; basal margin nearly effaced from side to side.

Protibia nearly as long as protarsus, with 2 large teeth and a basal small tooth on external border, preapical spur acute, straight, as long as 2nd protarsomere. Mesotibia with an oblique, well marked, setiferous carina near the middle of external side and other short setiferous carina on basal third of external side; both apical spurs with acute apex and similar length. Metatibia slightly shorter than metatarsus (0.9:1), with an oblique, strong, setiferous carina near the middle of external side, and 2 spines on basal third of dorso-external side; upper apical spur articulated, slightly curved, round pointed, longer than basal metatarsomere (1.3:1), and 1.3 times longer than lower spur; lower apical spur articulated, curved, with round apex. Basal 4 protarsomeres progressively shortened, with subapical tufts of setae. Mesotarsomeres semicylindrical, elongate, with enlarged setose apex. Metatarsomeres semicylindrical, elongate, with enlarged setose apex and with a line of stout setae along ventral side. All tarsal claws dentate, lower tooth narrowed and acute, placed near their bases (Fig. 13). Genital capsule with short, narrowed parameres dorsally fused with phallobase, ventrally closely parallel with rounded apex (Figs. 14-15). Aedeagus with sclerotized, curved, symmetrical support (Fig. 15). Tectum strongly projected over phallobase, wide and deeply bifurcate (Fig. 14). Length of genital capsule from apex of parameres to border of basal piece: 4.5 mm. Total body length: 16.4 mm. Humeral width: 6.6 mm.

Allotype Female. Similar to the male except as follows: anal plate slightly longer, convex, punctate, with transverse row of long setae across middle and row of 10 slender setae on apical border. Pygidium more convex, densely punctate, with numerous short setae on all disk and scattered very long, erect setae on distal half of disk. Both apical spurs of metatibia widened, curved, with rounded apex. Ventral genital plates moderately sclerotized, nearly symmetrical, ovate, with round process on the inner apical margin and long process on the outer apical margin angled toward midline; dorsal genital plates small, weakly sclerotized, partially covered by ventral plates. Total body length: 19.3 mm. Humeral width: 7.1 mm.

Variation

Body color dark brown. Pronotum, elytra and pygidium with more long setae. Lateral marginal bead of pronotum deeply dentate. Total body length: 16.4-19.3 mm, humeral width: 6.6-7.9 mm.

Type Series

Described from 4 males and 3 females. Holotype male; MEXICO: San Luis Potosí, El Salto falls, 14-VI-1963, blacklight trap, R. E. Woodruff (FSCA). Allotype and male paratype with same data as holotype (FSCA, MXAL). One female

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paratype: MEXICO: San Luis Potosí, Salto de Agua, 1-V-1971, Blacklight trap, A. Newton (FSCA). One female paratype: MEXICO: San Luis Potosí, El Naranjo, 29-VI-1965, P. J. Spangler (USNM). Two male paratypes: MEXICO: San Luis Potosí, El Naranjo, Cascada El Salto, 407 m, 17-VIII-2004, trampa-luz, J. Márquez, J. Asiain, J. Canales (UAEH, MXAL).

Type Locality

El Salto, El Naranjo municipality, state of San Luis Potosí, México (22°35'0.9.9"N; 99°22'54.4"W).

Biological Data

This species inhabits the tropical subdeciduous forest located at 350 to 470 m of altitude in the eastern part of the state of San Luis Potosí. Specimens were collected during May (1), Jun (4) and Aug (4). Other species flying at the same time and place were *P. (Phyllophaga) temora* (Saylor), *P. (P.) setifera* (Burmeister), *P. (Phytalus) trichodes* (Bates) and *P. (Chlaenobia) vexata* (Horn).

Taxonomic Remarks

Phyllophaga potosisalta does not belong to any species group defined by Morón (1986, 2003). Tarsal claws are similar to the species in the group "*scissa*" (Morón 2003b) and the structure of the phallobase is similar to some species in the group "*schizorhina*" (e.g., *P. necaxa* Saylor, *P. saylori* Sanderson) known from the mountains of Nuevo León, Tamaulipas, Hidalgo and Puebla (Morón 2003a), but the shape of clypeus and pronotum, the abundant setae on all the body parts and legs, and details of the tube-like structure of aedeagus are clearly different.

Etymology

The specific epithet is formed with an anagram of the name of the type locality, El Salto, San Luis Potosí.

ACKNOWLEDGMENTS

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