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Description of a new species of coffee stem and root borer
of the genus *Plagiohammus* Dillon and Dillon from Colombia
(Coleoptera: Cerambycidae: Lamiinae),
with a key to the Neotropical species

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Description of a new species of coffee stem and root borer of the genus *Plagiohammus* Dillon and Dillon from Colombia (Coleoptera: Cerambycidae: Lamiinae), with a key to the Neotropical species

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Abstract. A new species of coffee stem and root borer from Colombia is described: *Plagiohammus colombiensis*, **sp. nov.** (Coleoptera: Cerambycidae: Lamiinae). The new species differs from other species of the genus *Plagiohammus* Dillon and Dillon by the yellow pattern of spots on the elytra, the morphology of the antenna and pronotum as well as characters of the male genitalia. A key to species of *Plagiohammus* is provided. This study examines the current situation of the new species of coffee stem and root borer in Colombia. Information on its biology and damage to the coffee plantations is presented.

Key words. *Plagiohammus*, Neotropical region, *Coffea arabica*, Central America, South America.

Resumen. Se describe una nueva especie de barrenador del tallo y la raíz del cafeto de Colombia: *Plagiohammus colombiensis*, **sp. nov.** (Coleoptera: Cerambycidae: Lamiinae). La nueva especie difiere de otras especies del género *Plagiohammus* Dillon y Dillon por el patrón de manchas amarillas sobre los élitros, la morfología de su antena y el pronoto y también en los caracteres de la genitalia del macho. Se proporciona una clave para las especies de *Plagiohammus*. Este estudio examina la situación actual de la nueva especie de barrenador del tallo y la raíz del cafeto en Colombia. Se presenta información acerca de su biología y daño en las plantaciones de café.

Palabras clave. *Plagiohammus*, región Neotropical, *Coffea arabica*, Centro América, Sur América.

Introduction

The genus *Plagiohammus* Dillon and Dillon, 1941 contains some of the most strikingly colored and patterned Cerambycidae in the new world. This genus includes 31 known species (Monné 2005, Bezark 2008, Monné and Bezark 2011) distributed in the Neotropical region from Mexico to Brazil. This small group of rare and uncommon beetles of medium size appears to occur in their greatest profusion of species in Central America and Mexico with 24 species, with minor extension southward into South America with 9 species (Monné and Bezark 2011).

The general aspect of the adults is cylindrical, elongate-ovate, moderately robust, subcylindrical. Head with front coarsely, densely clothed with appressed pubescence. Antennae elongate, two or more

times the length of body in male, one and one-third times in female. Pronotum feebly transverse, usually with two apical and basal transverse sulci; laterally with a distinct tubercle, which ends in a long, robust spine. The pronotal disk is less roughly sculptured than the base of the elytra; elytra covered by a very fine pubescence, and the apices of the elytra form a distinct though stout spine in the majority of species. The elytra are very scantily and faintly punctured; with granulations near the base. On each elytron there are usually 5–6 large irregular yellowish, white or orange ochraceous spots accompanied with many smaller ones scattered over the surface (Dillon and Dillon 1941) (Figures 15–44 and 45–56).

In Colombia the reports of *Plagiohammus* are very few and poorly documented. Monné and Bezark (2011) in a checklist of the Cerambycidae of the Neotropical region (Subfamily Lamiinae) report for Colombia only three species of the genus *Plagiohammus*: *P. elatus* (Bates 1872), *P. blairi* (Breuning, 1936) and *P. spinipennis* (Thomson 1860), without specifying the locations of collection and hosts plants. Martínez (2000) in a checklist of longhorn beetles of Colombia reported only two species belonging to the genus *Plagiohammus* deposited in the Instituto Alexander Von Humboldt collection in Villa de Leyva, Colombia without mentioning the name of the species or the localities.

There are few hostplant records for *Plagiohammus* reported in the literature. *Tectona grandis* Linnaeus (Lamiaceae), *Vernonia patens* Lessing (Asteraceae), and *Lantana camara* Linnaeus (Verbenaceae) are the host plants of *P. spinipennis* in Costa Rica and Mexico (Arguedas and Chaverri 1997). The lantana stem borer *P. spinipennis* was introduced to Hawaii and Australia from Jalapa, Mexico as a part of a biological control program of the weed *Lantana camara* during 1966 and 1973 (Harley 1969, 1973). The larvae of this cerambycid girdle the stems of *Lantana* causing a swollen area, and then bore down the stems and roots, killing the plants. The adults feed on the leaves (Krauss 1961). In *Tectona grandis*, the larvae of *P. spinipennis* feed in the phloem, which obstructs the flow of nutrients; as a result the stem bulges in the point of attack and buds appear below that point, thus giving rise to lateral branches (Arguedas and Chaverri 1997).

Of all known species of *Plagiohammus* only three have been reported attacking coffee plantations in the Neotropical region (Figure 57). Barrera et al. (2004) report from Mexico three species of coffee stem and root borers: *P. maculosus* (Bates 1880) in the region of Chiapas, *P. spinipennis* (Thomson, 1860) in the state of Veracruz and Chiapas and *P. mexicanus* Breuning, 1950 in the state of Hidalgo. In the coffee region of Mexico on the Pacific slope of Chiapas, the stem borer infestation is at a height of 1000 meters above sea level. A recent study in this region reported that 34.8% of 23 sampling sites were infested with infestation levels between 0.8% and 24.5%. The producers of the highlands of this region consider the stem borer as one of the most important pests of coffee in Mexico. Avila (2005) indicates that *P. maculosus* has been reported attacking coffee plants in Mexico and several countries of Central America including Costa Rica, El Salvador, Guatemala, and Honduras. The same author reported *P. maculosus* as coffee pest since 1935 in Guatemala with infestation levels between 5% and 25% in the municipality of Santa Cruz. Muñoz (2000) cited by Bigger (2012) in a list of insects associated with coffee, recorded *P. maculosus* and *P. spinipennis* from El Salvador, Guatemala, Honduras and Mexico. Cárdenas and Posada (2001) recorded in Colombia the species *P. maculosus* in the locality of El Carmen (Santander), the first known historical record of an attack on coffee plantations in Colombia of this Central American species. Unfortunately no samples of adult specimens were deposited in collections in the country to confirm the taxonomic identity of this species.

In the progress of our research project on the collection and identification of the arthropod pests associated with coffee plantations in Colombia we obtained reports by the extension service of the Colombian Coffee Growers Federation (FNC) of attacks of an undetermined coffee stem borer during the years 2012 and 2013. In the evaluation of damage to stems and roots of coffee plants we found a remarkable new species of *Plagiohammus* from Serranía de Perijá (Cesar) and Maripí, Boyacá in localities placed between 900–1300 m in the western slope of the eastern Andes in the middle Magdalena river basin. Additional records of attacks of the coffee stem and root borer in Colombia reported by the extension service of FNC but without confirming the species occurred in the localities of El Playón (Santander) at 1400 m, Rio Negro, Vereda Honduras (Santander) at 1200 m, Girón, Vereda Altamira (Santander) at 1400 m and El Carmen (Norte de Santander) at 1200 m in dry and wet premontane forests between 1100 to 1400 m in elevation.

Material and methods

Type specimens of *Plagiohammus* were studied from the following public museums and private collections and compared with illustrations in Bezark (2008):

- AMNH — American Museum of Natural History, New York, NY, United States.
ANSP — Academy of Natural Sciences, Philadelphia, PA, United States.
BMNH — The Natural History Museum, London, United Kingdom.
CASC — California Academy of Sciences, San Francisco, CA, United States.
CJED — Collection José Esteban Durán, INIA, Madrid, Spain.
FMNH — Field Museum of Natural History, Chicago, IL, United States.
IAVH — Instituto Alexander Von Humboldt, Villa de Leyva, Colombia.
ISNB — Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium.
MCZN — Museum of Comparative Zoology, Harvard University, Cambridge, MA, United States.
MEMB — Museo Entomológico Marcial Benavides, Cenicafé, Chinchiná, Colombia.
MNHL — Musée d'Histoire Naturelle de Lyon, Lyon, France.
MNHN — Muséum National d'Histoire Naturelle, Paris, France.
NMB — Natuhistorisches Museum Basel, Switzerland.
SMNS — Staatliches Museum für Naturkunde, Stuttgart, Germany.
USNM — National Museum of Natural History, Washington, D.C., United States.
ZSMC — Zoologische Staatssammlung des Bayerischen Staates, Munich, Germany.

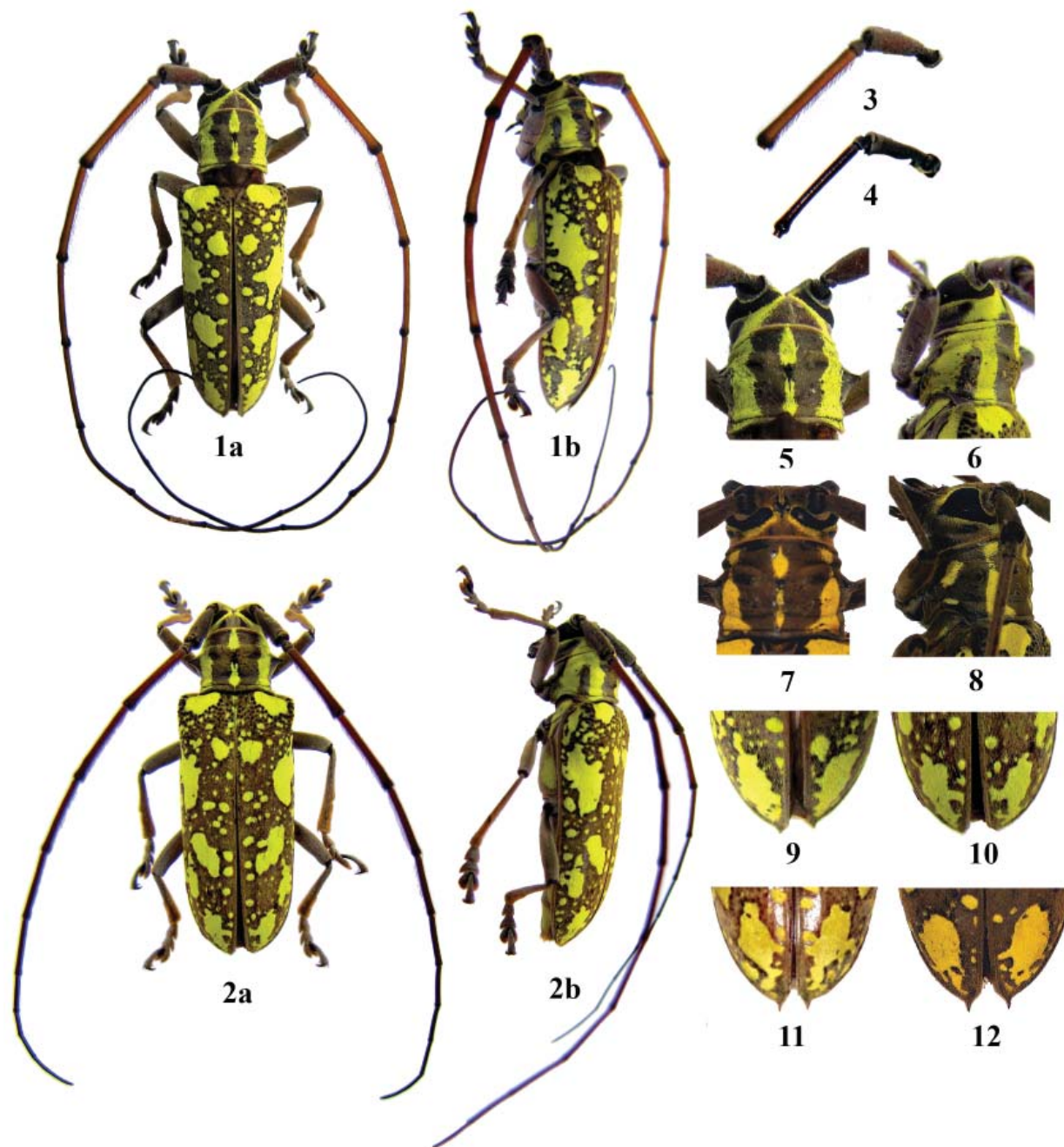
Adult specimens of *Plagiohammus* were obtained from infested stems of coffee (*Coffea arabica* Linnaeus (Rubiaceae)) with mature larva collected from various parts of Colombia located in the departments of Boyacá, Cesar and Santander. Infested trees of coffee were recognized by the presence of piles of white sawdust present at the base of coffee plants, at the soil level. Infested plants of coffee were uprooted with a shovel. The main root and the central stem were cut into pieces of approximately 40 cm in length with a machete and the stem pieces were kept in plastic rearing containers under laboratory conditions at room temperature (26°C, 80% RH) for 12–18 months. To maintain high the humidity, the stems were sprayed with distilled water once a week.

Abdomens were soaked in hot 10% KOH solution for 24 hours and subsequently stored in glycerol for study of the genitalia under a binocular microscope. The genitalia were mounted on concave glass slides with glycerol and pictures were taken under a light microscope Nikon SM2 model 1500, equipped with a white light illumination device (Digital Sight DS-U1), using the software (NIS-Elements-BR-Nikon Corporation, Tokyo). All the genitalia materials were preserved in glass or polyethylene genitalia vials filled with glycerin upon completion of the study. Morphological terms for genitalia largely follows Ehara (1954) and Lin et al. (2009). The adults (Holotype) and (Paratypes) once emerged from the coffee stems were mounted and preserved in the “Museo Entomológico Marcial Benavides” (MEMB) in the National Coffee Research Center (Cenicafé) in Chinchiná, Colombia.

Results

Plagiohammus colombiensis Constantino, Benavides and Esteban, sp. nov. (Figures 1–10, 13a, 14, 15, 45, 57, 58)

Description. Male (Figure 1): length: 25.0 mm.; width: 7.5 mm. Female (Figure 2): length: 26.0 mm.; width: 7.8 mm. Sexes similar, antennae elongate, 6.5–7.0 cm long (two or more times the length of body in males), and 5.0–5.5 cm long (one and one-third times in females), head with frons coarsely, densely clothed with appressed golden yellow pubescence, except light brown spot on middle of frons, vertex area and antennal tubercles. Gena with golden yellow band behind the upper eye lobe. Postgena golden yellow (Figure 5 and 6). Eyes black large, lower lobes rounded; upper lobes separated by little more than width of lobes. Clypeus densely clothed with light brown pubescence. Labrum and mandibles black. Labium and maxilla black glabrous. Antennal tubercles prominent. Scape and pedicel light brown with gray



Figures 1-12. *Plagiohammus colombiensis* sp. nov. **1a**, Holotype male dorsal view, **1b**, *idem*, lateral view; **2a**, Allotype female dorsal view, **2b**, *idem*, lateral view; **3**, View of scape, pedicel, and first flagellomere on the left antenna of *P. colombiensis*; **4**, *Idem*, *P. thiodes*; **5-6**, head and pronotum of *P. colombiensis*; **7-8**, *idem*, *P. thiodes*; **9-10**, Apices of the elytra of *P. colombiensis* male and female; **11-12**, *idem*, *P. thiodes*, male and female.

pubescence; antennomeres III-XI reddish orange, darker at apices; antennomeres III-V with fine fringe of suberect setae beneath (Figure 3); antennomere III longer than IV; antennomeres X-XI in males 1.5 times longer than IX, gradually decreasing in thickness. Pronotum longer than broad with conspicuous golden yellow pubescence except at base of lateral tubercle, dorsum with two longitudinal parallel light brown lines, sides with large, acute spines; disk with three rugose calluses, one median and one on each side before middle. Elytra elongate-ovate, sides almost straight, subcylindrical, entirely covered with dense gray to light brown pubescence; very scantily faintly punctured; with granulations near base;

each elytron with six larger golden yellow spots, first one at middle of base, elongate-ovate; second at dorsal one-third, from margin; third extends from basal fourth to about middle, large splash-shaped, horizontal from lateral edge; fourth and fifth at apical one-quarter (the fourth is on middle between elytral suture and lateral edge; the fifth is near lateral edge); sixth near apex; there are 50–55 small and very small golden yellow spots scattered over the surface between the six large ovate ones; apex slightly narrower than base, lacking stout apical spine (Figures 9–10). Legs stout, light brown covered with gray pubescence. Claws simple.

Male genitalia (Figure 14): Tegmen approximately 6.5 mm long; lateral lobes can be divided into two parts, basal 2/3rds wider, apical 1/3rd thinner, with apex obliquely rounded with fine long setae along lateral and apical margin (Fig. 14c); ringed part elbowed in widest portion, with notch and lateral spine converging; basal piece distally bifurcated; median lobe plus median struts slightly curved rounded at apex (Fig. 14d), shorter than tegmen in length; median struts less than half of whole length of median lobe and aedeagus; apical part of median orifice strongly projected; roof and median foramen (Fig. 14f) slightly curved and rounded; aedeagus curved upward, pointed and bifurcated at apex; Tergite VIII (Fig. 14a,b) broader than long, apical margin bi-lobed; setae around sides slightly longer than middle ones. Spiculum ventrale long and straight, approximately 5.3 mm in length (Fig. 14a).

Type material. Holotype male, COLOMBIA, CESAR: Serranía de Perijá, Municipio La Gloria, at 1200 m, 21-III-2013, Héctor A. Rivero *leg.* (MEMB 19.693). Allotype female, COLOMBIA, CESAR: Serranía de Perijá, Municipio de Aguachica, Finca Villanueva, Vereda La Yegüera, at 1200 m, 29-V-2012, Luis M. Constantino *leg.* (MEMB 19.689). Paratypes - 1 female, COLOMBIA, CESAR: Serranía de Perijá, Municipio de Aguachica, Finca Villanueva, Vereda La Yegüera, at 1200 m, 29-V-2012, Luis M. Constantino *leg.* (MEMB 19.690); 1 male, 1 female, COLOMBIA, CESAR: Serranía de Perijá, Municipio de Aguachica, Finca El Porvenir, Vereda La Yegüera, at 1100 m, 22-V-2013, Luis M. Constantino *leg.* (MEMB 19.694, MEMB 19.695); 2 males, 1 female, COLOMBIA, BOYACA: Maripí, at 900 m, 17-I-2013, Henry Corrales *leg.* (MEMB 19.696, MEMB 19.697, MEMB 19.698).

Diagnosis. *Plagiohammus colombiensis* is most similar to *P. thiodes* from which it differs by its smaller body size (25–26 mm in *P. colombiensis* and 31–32 mm in *P. thiodes*), apices of elytra lacking the stout spines (present in *P. thiodes*) (Figures 9–12). Antennae orange and more pubescent antennomeres (antennomere III-V with a fine fringe of suberect hairs beneath (glabrous and black in *P. thiodes*) (Figure 3 and 4); Gena with golden yellow band behind the upper eye lobe (absent in *P. thiodes*). Postgena golden yellow (dark brown in *P. thiodes*). Pronotum with conspicuous lateral golden yellow band (very reduced in *P. thiodes*). Elytra elongate-ovate, sides almost straight (gradually narrowing apically in *P. thiodes*), covered entirely with dense gray to light brown pubescence (dark reddish brown in *P. thiodes*); elytra each with six larger golden yellow spots (five mustard yellow spots in *P. thiodes*); elytra with more numerous golden yellow spots (50–55 small and very small golden yellow spots scattered over the surface between the six large ovate ones, in *P. thiodes* with very few, no more than 15 small mustard yellow spots, there being no spots of intermediate size between the five large ovate ones). The third large spot on the basal one-third, large splash-shaped and horizontal from lateral edge (oblique in *P. thiodes*). The fourth and fifth large ovate spot, at apical one-quarter, one near lateral edge beneath and one near lateral edge above separated (fused in *P. thiodes*).

Etymology. The specific epithet refers to the country of Colombia in which this species is found.

Distribution and habitat: Departments of Cesar and Boyacá, in localities situated on the western slopes of Cordillera Oriental in the Magdalena River basin in central and north of Colombia. This species is found in dry and wet premontane forests at altitudes from 900 to 1400 m. Apparently, it is a rarely collected and possibly local species, since it has escaped recognition until now despite its unique appearance. Other localities in Central Colombia with reports of attacks by the coffee stem borer that require confirmation include: El Carmen, Santander at 1200 m, El Playón, Santander at 1400 m, Río Negro, Vereda Honduras, Santander at 1200 m, Girón, Vereda Altamira, Santander at 1400 m and El Carmen, Norte de Santander at 1200 m.

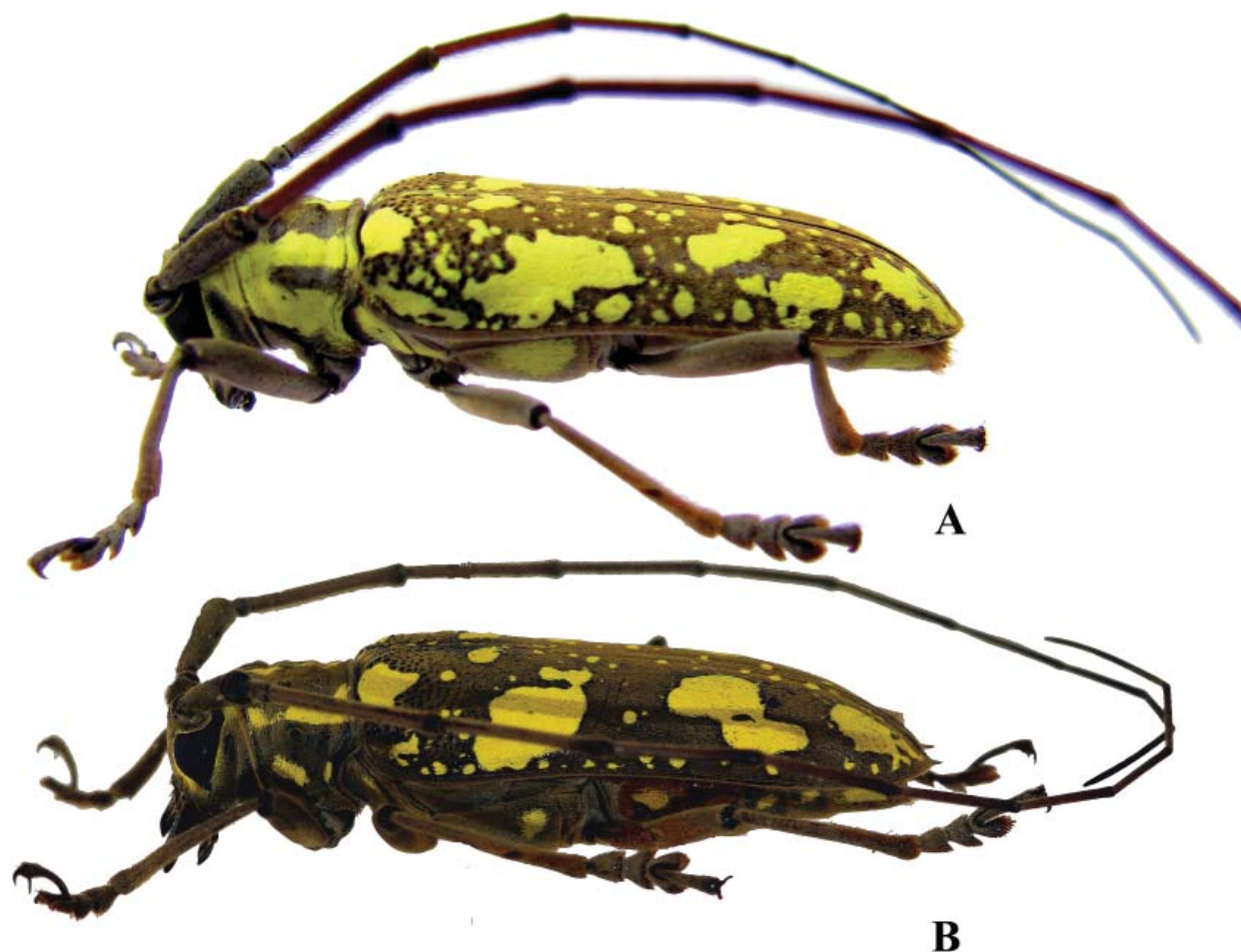


Figure 13. *Plagiohammus* species. **A**, *P. colombiensis* sp. nov., Allotype female lateral view; **B**, *P. thiodes* female, from Costa Rica, lateral view.

Host plant. *Coffea arabica* Linnaeus (Rubiaceae) in Colombia.

Biology. Egg- unknown but based on field observations of damage on coffee plants it could be determined that the female lays its eggs on the bark of the main stem at the base of the soil. When larva emerges it makes a hole and begins to bore the central portion of the stem toward the main root (Figure 58f). Affected trees are recognized by the piles of white sawdust accumulated at the base of the stem that are removed by the larva out of the gallery when it is boring the main root and stem (Figure 58e). The larvae are creamy white, very elongated, with 3 thoracic and 8 abdominal segments slightly depressed, cuticula firm, shining, without setae; head depressed elongated, black, heavily sclerotized with a pair of strong mandibles. Prothorax depressed and rectangular; pronotum with caudal area velvety asperate spotted with two yellowish sclerotized plates laterally. Depressed abdomen, heavily constrained, shaped as screw. The mature larva reaches a length of up to 5.5 cm (Figure 58d). When the larva reaches the main root it moves back up from the central stem to a height of about 10–30 cm above the soil, where pupation takes place in a chamber built inside the gallery with fiber filaments (Figure 58g). The pupa is dark cream and resembles in morphology the future adult. The life cycle takes 18 months from egg to adult.

The adults are nocturnal. The flight period under natural conditions is unknown. But based on breeding records of *P. colombiensis* larvae maintained in laboratory conditions at Cenicafé, the largest amounts of adult emergence occurred in May.

Attempts to capture adults with black and white light traps in the departments of Cesar and Santander in the months of May and December failed. According to Avila (2005), Barrera (2008) and Esteban et al. (2010) the flight period of *P. maculosus* and *P. spinipennis* in Guatemala, Costa Rica and Mexico occurs at the beginning of the rainy season (April to June) the period when egg laying occurs.

Damage. The larva bores and destroys the stem medulla and vascular strands of coffee plants causing disruption of sap flow (Figure 58). The stem and root borer attacks coffee trees of all ages. When the trees are less than 18 months old are more prone to wilting.

Species accounts

The following species accounts are adapted from Monné (2005).

Genus *Plagiohammus* Dillon and Dillon, 1941

Plagiohammus Dillon and Dillon 1941: 85 (*nomen nov. pro Hammoderus* Thomson, 1860). Type-species *Hammoderus spinipennis* Thomson 1860 (original designation).

Hammoderus Thomson 1860: 98 [*nec* Thomson 1856 junior synonym of *Taeniotes* Audinet-Serville, 1835]. Type-species: *Hammoderus lacordairei* Thomson 1860 by subsequent designation of Thomson 1864: 77.

Hammatoderus Gemminger and Harold 1873: 3022 (unnecessary emendation).

1. *Plagiohammus albatu*s (Bates, 1880) (Figures 24, 57)

Type locality Costa Rica, Cartago: Cachí. (BMNH).

*Hammoderus albatu*s Bates, 1880: 100; Breuning 1943: 263, fig. 130.

*Plagiohammus albatu*s; Dillon and Dillon 1941: 93 (comb. nov.); Chemsak et al. 1992: 111. Monné 2005: 511; Esteban et al. 2010:1025, fig. 1.

Distribution. Costa Rica, Panama.

Hostplant. Unknown.

2. *Plagiohammus blairi* (Breuning, 1936) (Figure 37)

Type locality Colombia “Nueva Granada”. (BMNH).

Hammoderus blairi Breuning, 1936: 297; 1943: 258.

Plagiohammus blairi; Blackwelder 1946: 595; Monné 2005: 511.

Distribution. Colombia.

Hostplant. Unknown.

3. *Plagiohammus brasiliensis* (Breuning, 1943)

Type locality Brazil, Goiás. (MNHN).

Hammoderus brasiliensis Breuning, 1943: 259.

Plagiohammus brasiliensis; Breuning 1961: 333 (cat.); Monné 2005: 512.

Distribution. Brazil (Goiás, Santa Catarina).

Hostplant. Unknown.

4. *Plagiohammus brunneus* Dillon and Dillon, 1941 (Figure 34)

Type locality Mexico, Pacific Slope Cordilleras, El Hotzen, 800–1000 m, Chiapas. (USNM).

Plagiohammus brunneus Dillon and Dillon, 1941: 92, pl. 2, fig. 8; Monné 2005: 512.

Distribution. Mexico (Chiapas).

Hostplant. Unknown.

5. *Plagiohammus camillus* Dillon and Dillon, 1949 (Figure 38)

Type locality Peru. (FMNH).

Plagiohammus camillus Dillon and Dillon, 1949: 3; Chemsak 1977: 178 (type); Monné 2005: 512.

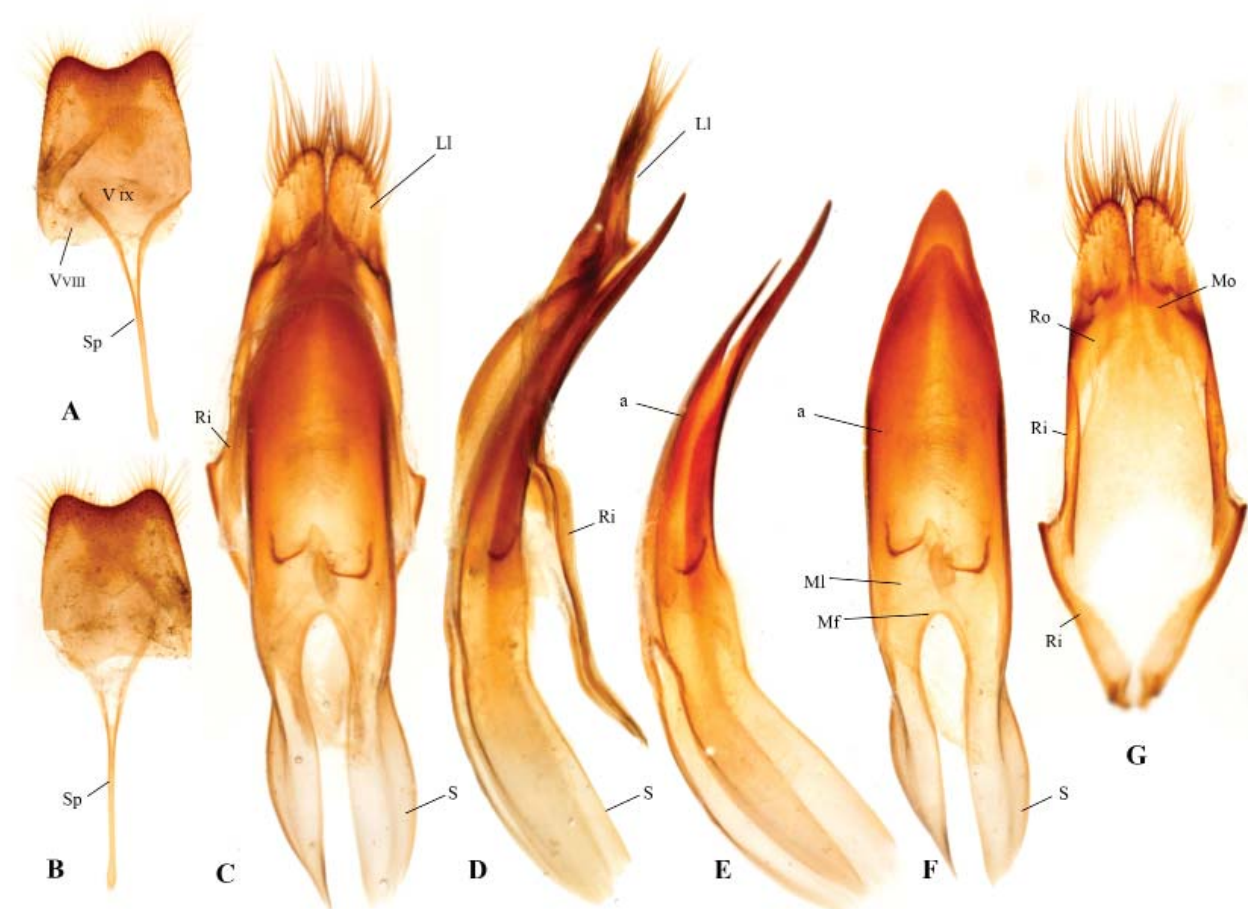


Figure 14. Genitalia of *Plagiohammus colombiensis* sp. nov., holotype, male. **A-B.** tergite VIII and ventrites VIII & IX. **A.** ventral view. **B.** dorsal view. **C.** tegmen, dorsal view with aedeagus in natural position. **D.** tegmen, lateral view with aedeagus in natural position. **E.** aedeagus removed in lateral view. **F.** aedeagus, dorsal view. **G.** tegmen, ventral view with aedeagus removed. *a.* Aedeagus. *Ll.* Lateral lobes. *Mf.* Median foramen. *Ml.* Median lobe. *Mo.* Median orifice. *Ri.* Ringed part. *Ro.* Roof. *S.* Median struts. *Sp.* Ventral spiculum.

Distribution. Peru.

Hostplant. Unknown.

6. *Plagiohammus colombiensis* Constantino, Benavides and Esteban, sp. nov.

(Figures 1–3, 5, 6, 9, 10, 13A, 14, 15, 45, 46, 57, 58)

Type locality Colombia, Cesar, Serranía de Perijá, Municipio La Gloria, at 1,200 m (MEMB).

Plagiohammus colombiensis Constantino, Benavides and Esteban (present).

Distribution. Colombia (Cesar, Boyacá, on the western slopes of Cordillera Oriental in the Magdalena River basin).

Hostplant. *Coffea arabica* (Rubiaceae) in Colombia.

7. *Plagiohammus confusor* Dillon and Dillon, 1941 (Figure 39)

Type locality Brazil, Rio Grande do Sul. (ANSP).

Plagiohammus confusor Dillon and Dillon, 1941: 95, pl. 2, fig. 10; Monné 2005: 512.

Distribution. Brazil (Rio Grande do Sul), Bolivia, Paraguay.

Hostplant. Unknown.

8. *Plagiohammus decorus* Chemsak and Linsley, 1986 (Figure 25)

Type locality Mexico, Chiapas: San Jerónimo. (CASC).

Plagiohammus decorus Chemsak and Linsley, 1986: 20, fig. 1; Monné 2005: 512.

Distribution. Mexico (Chiapas).

Hostplant. Unknown.

9. *Plagiohammus elatus* (Bates, 1872) (Figures 19, 50, 51, 57).

Type locality — Nicaragua, Chontales. (BMNH).

Hammoderus elatus Bates, 1872: 199; 1880: 101, pl. 7, fig. 5, 6;

Plagiohammus elatus; Dillon and Dillon 1941: 99, pl. 2, fig. 14 (comb. nov.); 1943: 17; Monné 2005: 512; Esteban et al. 2010:1026, fig. 2.

Distribution. Mexico to Panama, Colombia, Ecuador.

Hostplant. Unknown.

10. *Plagiohammus emanon* Dillon and Dillon, 1941 (Figures 17, 18, 52, 53)

Type locality Panama, Chiriquí. (MCZN).

Plagiohammus emanon Dillon and Dillon, 1941: 101, pl. 2, fig. 16; Monné 2005: 512; Esteban et al. 2010:1026, fig. 3a-b.

Distribution. Costa Rica, Panama.

Hostplant. Unknown.

11. *Plagiohammus granulosus* (Bates, 1885) (Figure 26)

Type locality Mexico, Oaxaca: Juquila. (BMNH).

Hammoderus granulosus Bates, 1885: 339, pl. 22, fig. 1;

Plagiohammus granulosus; Dillon and Dillon 1941: 100 (comb. nov.); Monné 2005: 512.

Distribution. Mexico (Oaxaca), Belize.

Hostplant. Unknown.

12. *Plagiohammus imperator* (Thomson, 1868) (Figure 35)

Type locality Mexico. (MNHN).

Hammoderus imperator Thomson, 1868: 100; 1878: 9 (type);

Taeniotes imperator; Gemminger and Harold 1873: 3021.

Plagiohammus imperator; Dillon and Dillon 1941: 102, pl. 2, fig. 17 (comb. nov.); Monné 2005: 512; Noguera et al. 2012: 622.

Deliathus albidus Linsley, 1935: 111 [misspelling].

Type locality Mexico: Temascaltepec (CASC).

Deliathis albida; Breuning 1943: 256; Blackwelder 1946: 595.

Deliathis albidus; Dillon and Dillon 1941: 108.

Distribution. Mexico (Oaxaca, Jalisco, Puebla). Toledo (2005) – Michoacan, Guerrero, Chiapas)

Hostplant. Unknown.

13. *Plagiohammus inermis* (Thomson, 1857) (Figure 30)

Type locality Mexico. (MNHN).

Taeniotes (Hammoderus) inermis Thomson, 1857: 173.

Hammoderus inermis; Thomson 1860: 99; 1878: 9 (type); Breuning 1943: 260, fig. 117.

Hammatoderus inermis; Gemminger and Harold 1873: 3022.

Hammoderus albiplagiatus White, 1858: 275. Type locality — Mexico. (BMNH).

Plagiohammus inermis; Dillon and Dillon 1941: 97, pl. 2, fig. 12; Monné 2005: 513.

Distribution. Mexico (Veracruz) to Nicaragua.

Hostplant. Unknown.

14. *Plagiohammus laceratus* (Bates, 1885) (Figure 33)

Type locality Mexico, Oaxaca: Juquila. (BMNH).

Hammoderus laceratus Bates, 1885: 339, pl. 22, fig. 4.

Plagiohammus laceratus; Dillon and Dillon 1941: 90, pl. 2, fig. 6; Monné 2005: 513.



Figures 15-44. Right elytra of *Plagiohammus* type species from the neotropical region. 15. *P. colombiensis* sp. nov. 16. *P. rubefactus*. 17. *P. emanon* male. 18. *P. emanon* female. 19. *P. elatus*. 20. *P. thiodes* male. 21. *P. thiodes* female. 22. *P. maculosus*. 23. *P. spinipennis*. 24. *P. albatu*s. 25. *P. decorus*. 26. *P. granulatus*. 27. *P. nitidus*. 28. *P. sticticus*. 29. *P. thoracicus*. 30. *P. inermis*. 31. *P. olivescens*. 32. *P. sargi*. 33. *P. laceratus*. 34. *P. brunneus*. 35. *P. imperator*. 36. *P. niveus*. 37. *P. blairi*. 38. *P. camillus*. 39. *P. confusor*. 40. *P. sallei*. 41. *P. lunaris*. 42. *P. lacordairei*. 43. *P. ornator*. 44. *P. pollinosus*.

Distribution. Mexico (Jalisco, Morelos, Oaxaca).

Hostplant. Unknown.

15. *Plagiohammus lacordairei* (Thomson, 1860) (Figure 42) Type locality Mexico, Veracruz. (MNHN).

Hammoderus Lacordairei Thomson, 1860: 98; 1864: 77; 1878: 9 (type).

Hammatoderus Lacordairei; Gemminger and Harold 1873: 3022.

Plagiohammus lacordairei; Dillon and Dillon 1941: 96; Monné, 2005: 513.

Distribution. Mexico (Veracruz) to Panama.

Hostplant. Unknown.

16. *Plagiohammus lunaris* (Bates, 1880) (Figure 41)

Type locality Mexico. (BMNH).

Hammoderus lunaris Bates, 1880: 102; Breuning 1943: 261, fig. 123.

Hammatoderus lunaris; Lameere 1883: 47.

Plagiohammus lunaris; Dillon and Dillon 1941: 91; Monné 2005: 513.

Distribution. Mexico.

Hostplant. Unknown.

17. *Plagiohammus maculosus* (Bates, 1880) (Figures 22, 49, 57).

Type locality Nicaragua, Chontales. (BMNH).

Hammoderus maculosus Bates, 1880: 101; Breuning 1943: 260, fig. 118.

Hammatoderus maculosus; Lameere 1883: 47.

Plagiohammus maculosus; Dillon and Dillon 1941: 98, pl. 2, fig. 13; Chemsak et al. 1992: 111. Maes et al. 1994: 51; Monné 2005: 513.

Distribution. Mexico to Nicaragua.

Hostplant. *Coffea arabica* (Avila 2005, Barrera et al. 2004, Barrera 2008) in Mexico, Guatemala, El Salvador, Honduras.

18. *Plagiohammus mexicanus* Breuning, 1950

Type locality Mexico, Hidalgo: Mineral del Monte (MNHL).

Plagiohammus mexicanus Breuning, 1950: 514; Chemsak et al. 1992: 111; Noguera and Chemsak 1996: 404; Monné 2005: 514.

Distribution. Mexico (Hidalgo).

Hostplant. *Coffea arabica* (Barrera 2008) in Mexico.

19. *Plagiohammus nitidus* (Bates, 1874) (Figure 27)

Type locality Nicaragua, Chontales. (BMNH).

Hammoderus nitidus Bates, 1874: 224; 1880: 100, pl. 7, fig. 8; Breuning 1943: 261, fig. 124;

Chemsak and Linsley 1970: 411 (lectotype).

Hammatoderus nitidus; Lameere 1883: 47.

Plagiohammus nitidus; Dillon and Dillon 1941: 96 (comb. nov.); Chemsak et al. 1992: 111; Maes et al. 1994: 51; Monné 2005: 514.

Distribution. Guatemala, Nicaragua.

Hostplant. Unknown.

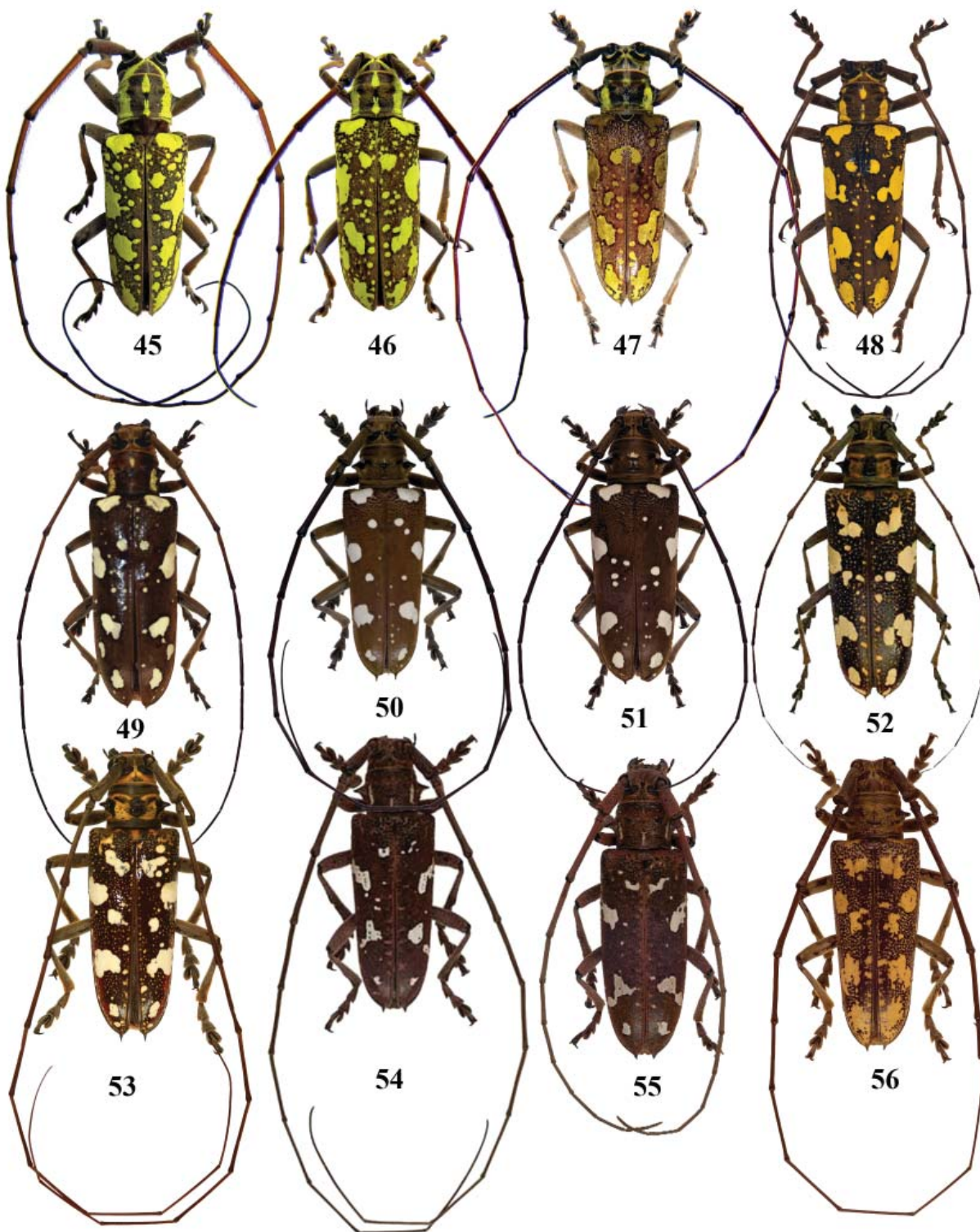
20. *Plagiohammus niveus* (Breuning, 1943) (Figure 36)

Type locality Mexico. (NMB). *Hammoderus niveus* Breuning, 1943: 258.

Plagiohammus niveus; Breuning 1961: 332; Chemsak et al. 1992: 111; Monné 2005: 514.

Distribution. Mexico.

Hostplant. Unknown.



Figures 45-56. *Plagiohammus* species. 45-46. *P. colombiensis* sp. nov. male and female; 47-48. *P. thiodes* male and female; 49. *P. maculosus* male; 50-51. *P. elatus* male and female; 52-53. *P. emanon* female and male; 54-55. *P. spinipennis* male and female; 56. *P. rubefactus* male.

21. *Plagiohammus olivescens* Dillon and Dillon, 1941 (Figure 31) Type locality Mexico, Hidalgo: Tianguistengo (5500 ft). (ANSP).

Plagiohammus olivescens Dillon and Dillon, 1941: 89, pl. 2, fig. 4; 1949: 2 (synonymy); Monné 2005: 514. *Hammoderus strandi* Breuning, 1943: 262, fig. 126. Type locality Costa Rica, Alajuela: San Carlos. (NMB). *Plagiohammus strandi*; Breuning 1961: 333.

Distribution. Mexico (Hidalgo) to Costa Rica.

Hostplant. Unknown.

22. *Plagiohammus ornator* (Bates, 1885) (Figure 43)

Type locality Mexico, Veracruz: Orizaba. (BMNH).

Hammoderus ornator Bates, 1885: 340, pl. 22, fig. 2.

Plagiohammus ornator; Dillon and Dillon 1941: 88, pl. 2, fig. 3 (comb. nov.); Chemsak et al. 1992: 111; Monné 2005: 514.

Distribution. Mexico (Veracruz).

Hostplant. Unknown.

23. *Plagiohammus pollinosus* (Bates, 1880) (Figure 44)

Type locality Costa Rica, San José: Rio Sucio. (BMNH).

Hammoderus pollinosus Bates, 1880: 102; Breuning 1943:259.

Hammatoderus pollinosus; Lameere 1883: 47.

Plagiohammus pollinosus; Dillon and Dillon 1941: 103, pl. 2, fig. 18 (comb. nov.); Chemsak et al. 1992: 111; Monné 2005: 514.

Distribution. Costa Rica

Hostplant. Unknown.

24. *Plagiohammus quadriplagiatus* (Breuning, 1943)

Type locality Venezuela, Mérida. (NMB).

Hammoderus quadriplagiatus Breuning, 1943: 262, fig. 127.

Plagiohammus quadriplagiatus; Breuning 1961: 333; Monné 2005: 514.

Distribution. Venezuela.

Hostplant. Unknown.

25. *Plagiohammus rotundipennis* Breuning, 1950

Type locality Mexico, La Palma (1600 m). (ISNB).

Plagiohammus rotundipennis Breuning, 1950: 2; Chemsak et al. 1992: 111; Monné 2005: 515.

Distribution. Mexico.

Hostplant. Unknown.

26. *Plagiohammus rubefactus* (Bates, 1872) (Figures 16, 56, 57).

Type locality Nicaragua, Chontales. (BMNH).

Hammoderus rubefactus Bates 1872: 199; Breuning 1943: 259, fig. 115.

Hammatoderus rubefactus; Gemminger and Harold 1873: 3022.

Plagiohammus rubefactus; Dillon and Dillon 1941: 100, pl. 2, fig. 15 (comb. nov.); Chemsak et al. 1992: 111; Maes et al. 1994: 51 (distr.); Monné 2005: 515; Esteban et al. 2010:1027, fig. 4.

Distribution. Mexico to Panama.

Hostplant. Unknown.

27. *Plagiohammus sallei* (Thomson, 1860) (Figure 40)

Type locality Mexico. (MNHN). *Hammoderus sallei* Thomson, 1860: 99; 1878: 9 (type).

Hammatoderus sallei; Gemminger and Harold 1873: 3022.

Plagiohammus sallei; Dillon and Dillon 1941: 87, pl. 2, fig. 2 (comb. nov.); Monné 2005: 515.

Distribution. Mexico (Oaxaca).

Hostplant. Unknown.

28. *Plagiohammus sargi* (Bates, 1885) (Figure 32)

Type locality Guatemala. (SMNS).

Hammoderus sargi Bates, 1885: 340, pl. 22, fig. 3; Breuning 1943: 263, fig. 132.

Plagiohammus sargi; Dillon and Dillon 1941: 90, pl. 2, fig. 5 (comb. nov.); Chemsak et al. 1992: 111 (cat.); Monné 2005: 515.

Distribution. Mexico (Chiapas), Guatemala.

Hostplant. Unknown.

29. *Plagiohammus spinipennis* (Thomson, 1860) (Figures 23, 54, 55, 57).

Type locality Mexico, Veracruz. (MNHN).

Hammoderus spinipennis Thomson, 1860: 100; Lacordaire 1869: 324; Breuning 1943: 262, fig. 128 (syn.).

Plagiohammus spinipennis; Dillon and Dillon 1941: 93, pl. 2, fig. 9 (comb. nov.); Chemsak et al. 1992: 111 (cat.); Maes et al. 1994: 51 (distr., hosts); Noguera and Chemsak 1996: 404; Monné 2005: 515;

Esteban et al. 2010:1027, fig. 5.

Hammatoderus jacobyi Nonfried, 1894: 141.

Hammoderus jacobyi; Aurivillius, 1922: 105.

Plagiohammus jacobyi; Dillon and Dillon 1941: 91, pl. 2, fig. 7.

Type locality — Honduras, San Pablo (Depository unknown: ex collection Nonfried).

Distribution. Mexico (Veracruz, Chiapas) to Panama, Colombia, Venezuela, Peru, Australia (introduced), Hawaii (introduced).

Hostplants. *Coffea arabica* Linnaeus (Rubiaceae) in Mexico (Barrera 2008); *Tectona grandis* Linnaeus (Lamiaceae), *Vernonia patens* Lessing (Asteraceae), and *Lantana camara* Linnaeus (Verbenaceae) in Costa Rica, Mexico, Nicaragua (Arguedas and Chaverri 1997; Maes et al. 1994, Muñoz 2000); *Lantana camara* (Verbenaceae) in Hawaii (Harley 1969); *Lantana scorta* Moldenke (Verbenaceae) in Australia (Harley 1973).

30. *Plagiohammus sticticus* (Bates, 1874) (Figure 28)

Type locality Ecuador, Macas. (MNHN).

Hammoderus sticticus Bates, 1874: 225; Breuning 1943: 261, fig. 121.

Hammatoderus sticticus; Lameere 1883: 47.

Plagiohammus sticticus; Dillon and Dillon 1941: 101 (comb. nov.); 1943: 17; Monné 2005: 515.

Distribution. Ecuador.

Hostplant. Unknown.

31. *Plagiohammus thiodes* (Bates, 1880) (Figures 4, 7, 8, 11, 12, 13b, 20, 21, 47, 48)

Type locality Panama, Chiriquí. (BMNH).

Hammoderus thiodes Bates, 1880: 101; Breuning 1943: 260.

Hammatoderus thiodes; Lameere, 1883: 47.

Plagiohammus thiodes; Dillon and Dillon 1941: 97, pl. 2, fig. 11 (comb. nov.); Chemsak et al. 1992: 111 (cat.); Monné 2005: 516.

Distribution. Costa Rica (Monteverde), Panamá (Chiriquí)

Hostplant. Unknown.

32. *Plagiohammus thoracicus* (White, 1858) (Figure 29)

Type locality South America ? (BMNH).

Hammoderus thoracicus White, 1858: 275; Breuning 1943: 263, fig. 129.

Plagiohammus thoracicus; Dillon and Dillon 1941: 95 (comb. nov.); Monné 2005: 516.

Distribution. “South America”, no data.

Hostplant. Unknown.

Key to the species of *Plagiohammus*

1. Elytra densely ochre-yellow pubescent, with small black dots *P. pollinosus* (Bates) (Fig. 44)
— Above at least indistinctly maculate, either on elytra or on pronotum 2
- 2(1). Elytra nearly uniformly white tomentose *P. imperator* (Thomson) (Fig. 35)
— Elytra not largely white..... 3
- 3(2). Elytra white with small black maculae *P. niveus* (Breuning) (Fig. 36)
— Elytra without black maculae 4
- 4(3). Elytral maculation consisting of denser patches of the same pubescence as that covering the entire upper surface; Elytra light fulvous tomentose, macula very numerous, vague and small; elytral apices strongly spined at tip, maculae pinkish
..... *P. confusor* Dillon and Dillon (Fig. 39)
— Elytral maculae more or less contrasting to rest of pubescence 5
- 5(4). Elytra light fulvous tomentose, macula very numerous, vague and small; elytral apices strongly spined at tip, maculae pinkish *P. confusor* Dillon and Dillon (Fig. 39)
— Elytra with visible pores throughout..... 6
- 6(5). Elytra with light brown maculae, apices without spine *P. sallei* (Thomson) (Fig. 40)
— Elytra polished black, with numerous transverse spots of different color 7
- 7(6). Maculae light brown with elytral apices strongly spiny.....
..... *P. camillus* Dillon and Dillon (Fig. 38)
— Maculae differently colored 8
- 8(7). Maculae with irregular pinkish spots; elytral apices unarmed *P. sargi* (Bates) (Fig. 32)
— Elytral apices strongly spiny at tip..... 9
- 9(8). Elytra with four irregular chalk-white maculae, and few small dots
..... *P. thoracicus* (White) (Fig. 29)
— Maculae chalk-white with many small dots 10
- 10(9). Maculae of elytra yellowish-white, at least five large and very irregular; elytral apices shortly spine; beneath laterally yellowish-white maculate *P. ornator* (Bates) (Fig. 43)
— Pubescence of elytra (except of maculae) in minute, reticulating patches 11
- 11(10). Elytra with four large white spots, with minute dots throughout *P. nitidus* (Bates) (Fig. 27)
— Elytra black without small spots 12
- 12(11). Four regular maculae of elytra chalk-white, beneath later immaculate, reticulating patches brown..... *P. olivescens* Dillon and Dillon (Fig. 31)
— Four regular maculae of elytra yellowish..... 13
- 13(12). White elytra spots fused in the middle forming a half-circle *P. lunaris* (Bates) (Fig. 41)
— Spots not fused in the middle..... 14
- 14(13). Elytra nearly uniformly brown tomentose *P. blairi* (Breuning) (Fig. 37)
— Elytra with yellowish, white or orange ochraceous spots..... 15

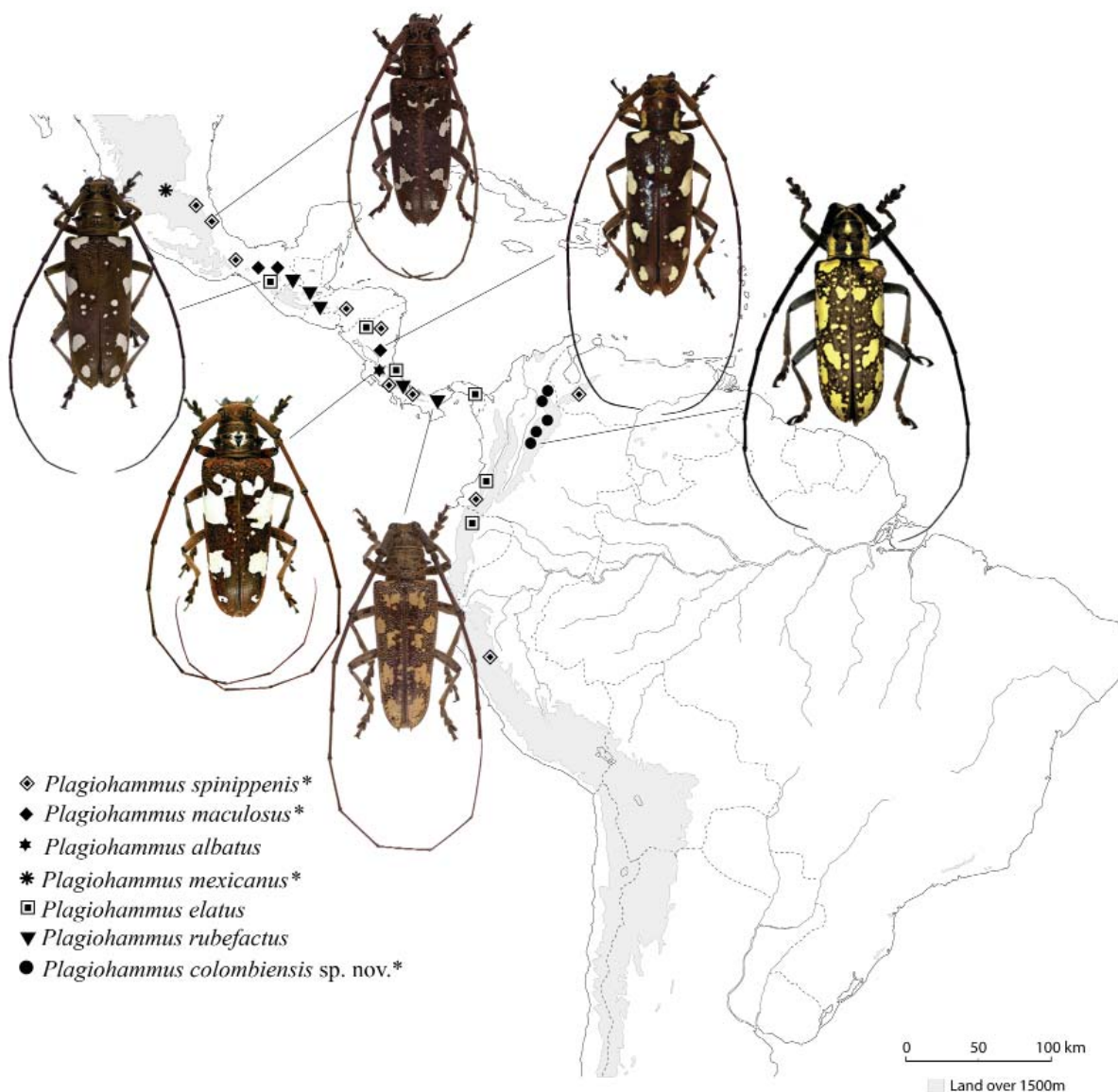


Figure 57. Distribution of coffee* stem borers of the genus *Plagiohammus* in the Neotropical region, showing collection localities.

- 15(14). Elytra with five orange ochraceous spots *P. rubefactus* (Bates) (Fig. 16)
- Elytra with white spots, extreme base of elytra immaculate 16

- 16(15). Elytra with three large white spots *P. albatus* (Bates) (Fig. 24)
- Elytra with four white medium size spots 17

- 17(16). Elytra with two yellowish maculae; elytra brown tomentose.....
- *P. brunneus* Dillon and Dillon (Fig. 34)
- Elytral maculae white, usually more abundant; elytra brown tomentose 18

- 18(17). Pronotum only feebly transversely rugose; each elytron with three to four white maculae
- *P. spinipennis* (Thomson) (Fig. 23, 54, 55)
- Elytra with five to six medium size maculae..... 19

- 19(18). Lunule of elytra ashy; elytra unarmed at apex, beneath immaculate.....
 *P. granulosis* (Bates) (Fig. 26)
 — Lunule of elytra white 20
- 20(19). Elytra dark brown, uniform, clean white spots on sternite rounded and small.....1
 *P. elatus* (Bates) (Fig. 19, 50, 51)
 — Elytra black with small brown-grayish maculae 21
- 21(20). Elytra with white irregular spots, immaculate at base and apex.....
 *P. laceratus* (Bates) (Fig. 33)
 — Elytra with yellow irregular spots 22
- 22(21). Elytra with six regular yellowish spots; elytra dark brown *P. maculosus* (Bates) (Fig. 22)
 — Pubescence of elytra (except of maculae) in minute, reticulating patches 23
- 23(22). Two large irregular white spots fused in the middle; minute brown dots scattered between the
 white spots *P. decorus* Chemsak and Linsley (Fig. 25)
 — Elytra with five or six large irregular spots contrasting to rest of pubescence 24
- 24(23). Elytral apices unarmed, four basal grayish-white dots, spots more distinctly lateral
 *P. lacordairei* (Thomson) (Fig. 42)
 — Elytral apices armed..... 25
- 25(24). Maculae sulfur yellow, with many small dots; elytra polished purplish brown.....
 *P. emanon* Dillon and Dillon (Fig. 17, 18)
 — Elytra brown, maculated at base and apex 26
- 26(25). Maculae mustard yellow in females, or whitish-yellow in males with four large ovate spots;
 elytra dark brown *P. thiodes* (Bates) (Fig. 20, 21, 47)
 — Maculae white, elytra black or reddish ochre 27
- 27(26). Maculae golden yellow, with six large irregular spots; elytra grayish-brown with many small
 golden yellow dots covering the elytra..... *P. colombiensis* n. sp. (Fig. 1, 2, 15)
 — Elytra with white spots 28
- 28(27). Elytra reddish-ochre with several small white dots *P. sticticus* (Bates) (Fig. 28)
 — Elytra black with few large white spots 29
- 29(28). Elytra very densely dotted with white throughout, each elytron with large white spot forming
 two transverse bands, one situated a little before the middle, the other at the beginning of
 the apical third..... *P. mexicanus* Breuning (not illustrated)
 — Elytra light brown with five large white dots; white small dots absent
 *P. inermis* (Thomson) (Fig. 30)

Discussion

The description of this new species of coffee stem borer from Colombia raise to 32 the number of known species of *Plagiohammus* and to four the number of known species that attack coffee plantations in the Neotropical region. This description provides sufficient information to allow identification and differentiation from similar species. The morphological details of male genitalia and high quality figures presented here support the identification of the species. These borers are one of the most destructive coffee plant pests in several countries in Central America (Barrera et.al. 2004). Since coffee is one of the major agricultural commodities in many countries in South America and Central America, the coffee stem borers could become a pest of economic importance in lowland coffee growing areas.

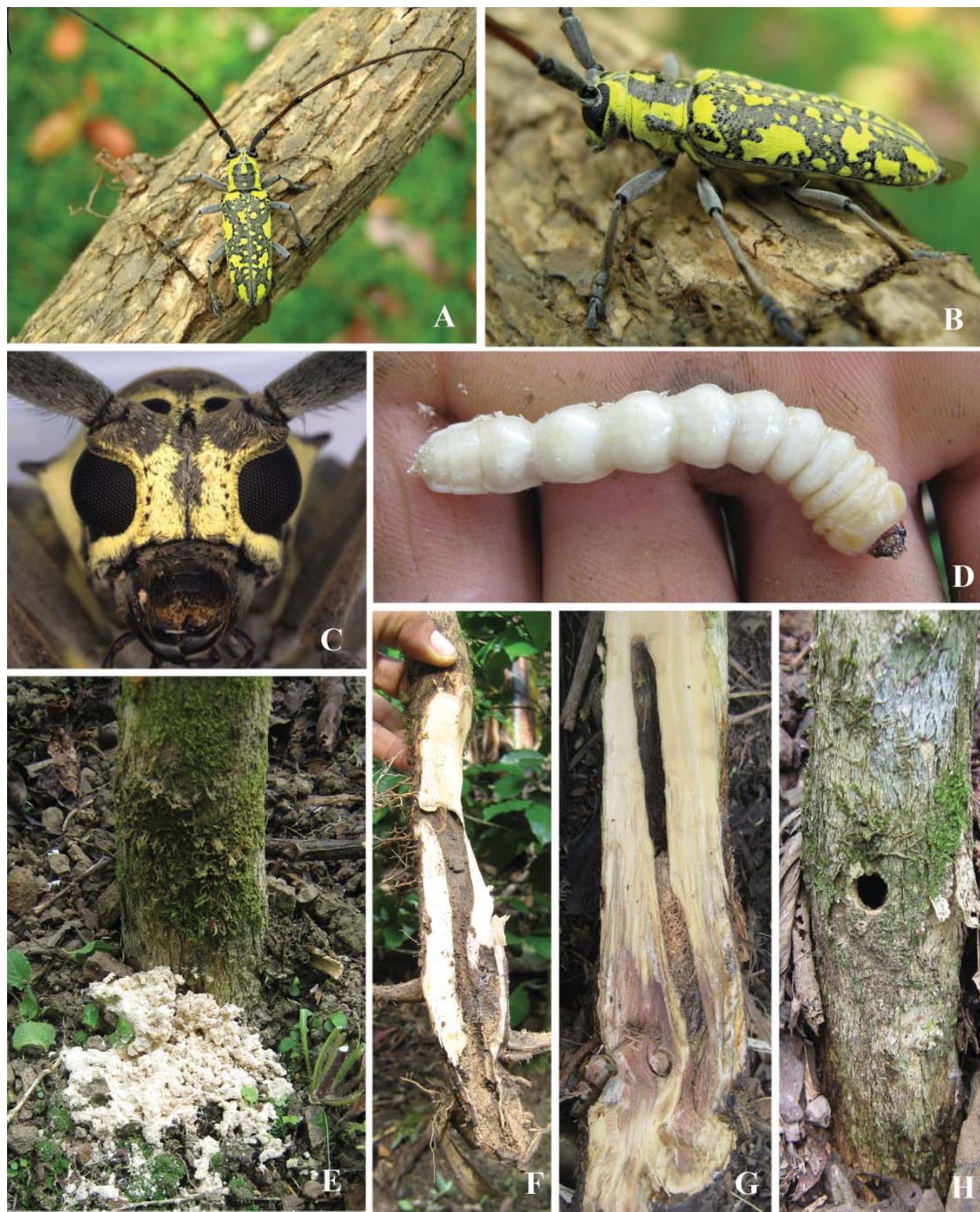


Figure 58. *Plagiohammus colombiensis* sp. nov. **A-B.** adult male. **C.** frontal view of head. **D.** full grown larva. **E.** Damage on coffee plants. Sawdust at the base of a stem attacked by a larva. **F.** gallery in the main root. **G.** gallery and pupal chamber in the stem. **H.** adult exit hole in a coffee stem 8 cm above the ground.

The primary host plant of *P. colombiensis* is presumed to be a native forest species, as the main stem borer attacks have occurred in Colombia in coffee plantations that were before forests. The destruction and removal of native forest species seems to be the main cause of adaptation of this kind of borer in coffee plantations.

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