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Revision of the Phyllophaga of Hispaniola (Coleoptera: Scarabaeidae: Melolonthinae) – PART 3

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Abdomen. Venter shiny, pruinose only on sides. Setae barely noticeable, size and shape as on pygidium. Penultimate sternite more heavily punctured medially, with a slight depression. Ultimate sternite with a narrow central depression, and coarsely punctate.

Legs. Protibiae tridentate, basal tooth well developed, nearly equal to middle tooth. Apical spur reaching beyond base of first tarsal segment. Protarsal segments 1 through 4 subequal; fifth 1.5X longer; claws elongate, C-shaped, terminal tooth bent sharply inward, middle tooth near center, longer than tip of apical tooth; base expanded, forming a large cup between it and middle tooth. Mesotibiae without transverse carina, its location marked by large teeth with stiff spines. Longitudinal carina complete. Apical spurs sharp, nearly parallel sided; inner spur about half first tarsal segment length; outer 25% shorter than inner. Mesotarsal segments 1 through 4 progressively shorter; first tarsal segment with spines prominent on both sides, outside spines better developed; fifth tarsal segment 1.5X longer than fourth; claws same as protarsi. Metatibia without transverse carina, indications as in mesotibiae; longitudinal carina complete. Metatibial apex expanded, inner spur longer than first tarsal segment, outer spur shorter than first tarsal segment. First tarsal segment shorter and broader at tip than that of mesotibia; inner spur parallel sided, not explanate, but concave on inner surface; inner spur barely curved; apical fringe with 16 short, narrow, straight spines. Metatarsal segments 1 through 4 nearly equal; fifth 1.5X longer than fourth; claws as in protarsi.

Genitalia, male (Fig. 191-194). Genital capsule relatively simple, of *hogardi* type; opening oval; parameres elongate, projecting downward into 2 terminal lobes, tips projecting well beyond medial projections; not fused medially. Dorsally, phallobase with smooth curve, not notched. Aedeagus plug-like and spinose at tip, which is "sock-shaped" (Fig. 193), similar to *permagna*, but paramere tips distinct. Cylinder behind spinose tip heavily sclerotized, twisted somewhat.

Allotype female. Data same as holotype, except 3-VII-1993, R.E. Woodruff [FSCA]. Similar to male, except elytra more expanded (wider) posteriorly. Antennal club about length of previous 4 segments. Elytral setae less noticeable. Metatibial spurs both broader, more sickle-shaped, ventrally flattened, and more curved than male. Apical fringe about 16 spines

as in male (often females of other species have many more than males). **Female genitalia** (Fig. 195-198) with inferior plates large, broader than long, loosely connected medially; tips barely projecting, somewhat wrinkled, with few short microsetae; no triangular basal plate. Margin of superior plates gently curved medially, lateral tips each side terminating in about 9 long setae (3 on ventral surface and about 6 on dorsal face), not fused to inferior plates.

Ecology. The type locality is located at the Larimar Mine (a unique Dominican gemstone), and specifically the finca of Sr. Ramón Ortiz. It is a volcanic deposit of Cretaceous age in the Baoruco Mountain range (a part of the "South Island"), at about 3300 ft elevation. The site is a disturbed cloud forest, with coffee as an understory. Shade grown coffee requires that mature trees are conserved. Collecting dates were over a 3 week period in 1992. Rain was continuous for the first week, and daily thereafter. Several blacklight traps and a mercury vapor light were operated at the Ortiz house.

Other species collected at the same time and place were: *kenscoffi*, *larimar*, *leptosica*, *mali*, *ortizi*, *panicula*, and *toni*. The geology of the Baorucos has been detailed by DeLeon (1989).

Specimens examined. Total 59, including holotype and allotype (all DOMINICAN REPUBLIC). Paratypes as follows: (26) same data as holotype [FSCA, INHS, MCZC, USNM, MHND]; (2) same data as allotype [FSCA]. **Prov. Pedernales:** (1) km 24 N. of Cabo Rojo, 11-VI-1998, 3000 ft, R.E. Woodruff and P.H. Freytag, blacklight trap [FSCA]; (1) nr. Cabo Rojo, 300-700 m, 12-IX-1973, T.J. Walker and J.C. Schuster, Coll. #1 [FSCA]; (1) 25.5 km N. Cabo Rojo, 20-V-1992, M.C. Thomas [FSCA]; (1) 25 km N. Cabo Rojo, 12-VII-1996, R. Turnbow [RHTC]; (1 female) La Abeja [Las Abejas], 38 km NNW Cabo Rojo, 18-09N, 71-38W, 11-17-VII-1987, K. Johnson, D. Matusik, 1250-1340 m [CMNH]; (1 male) 23.5 km N. Cabo Rojo, 18-06, 71-38W, 26-27-IX-1991, Young, Davidson, Thompson, Rawlins, wet deciduous forest [CMNH]; (3) 37 km N. Cabo Rojo, 18-09N, 71-35W, 11-VII-1987, R. Davidson, J. Rawlins [CMNH]; (4) 13 km N. Pedernales, along Rio Mulito, 18-09, 71-46W, 17-VII-1992, Young, Davidson, Thompson, Rawlins, 230 m, riparian woodland [CMNH]; (3) 5 km N. Mercedes, 24-VI-1999, R.E. Woodruff, feeding on *Inga* leaves at night. **Prov. Barahona:** (4) 4.5 km S. Barahona, 4 km W. Hwy. 2, 17-V-1992, M.C. Thomas [FSCA]; (3), 4.5 km S and 5 km W Barahona, 17-V-1992, mv+uv, R. Turnbow [TAMU, EGRC]. **Prov. Azua:** (4) Sierra Martin

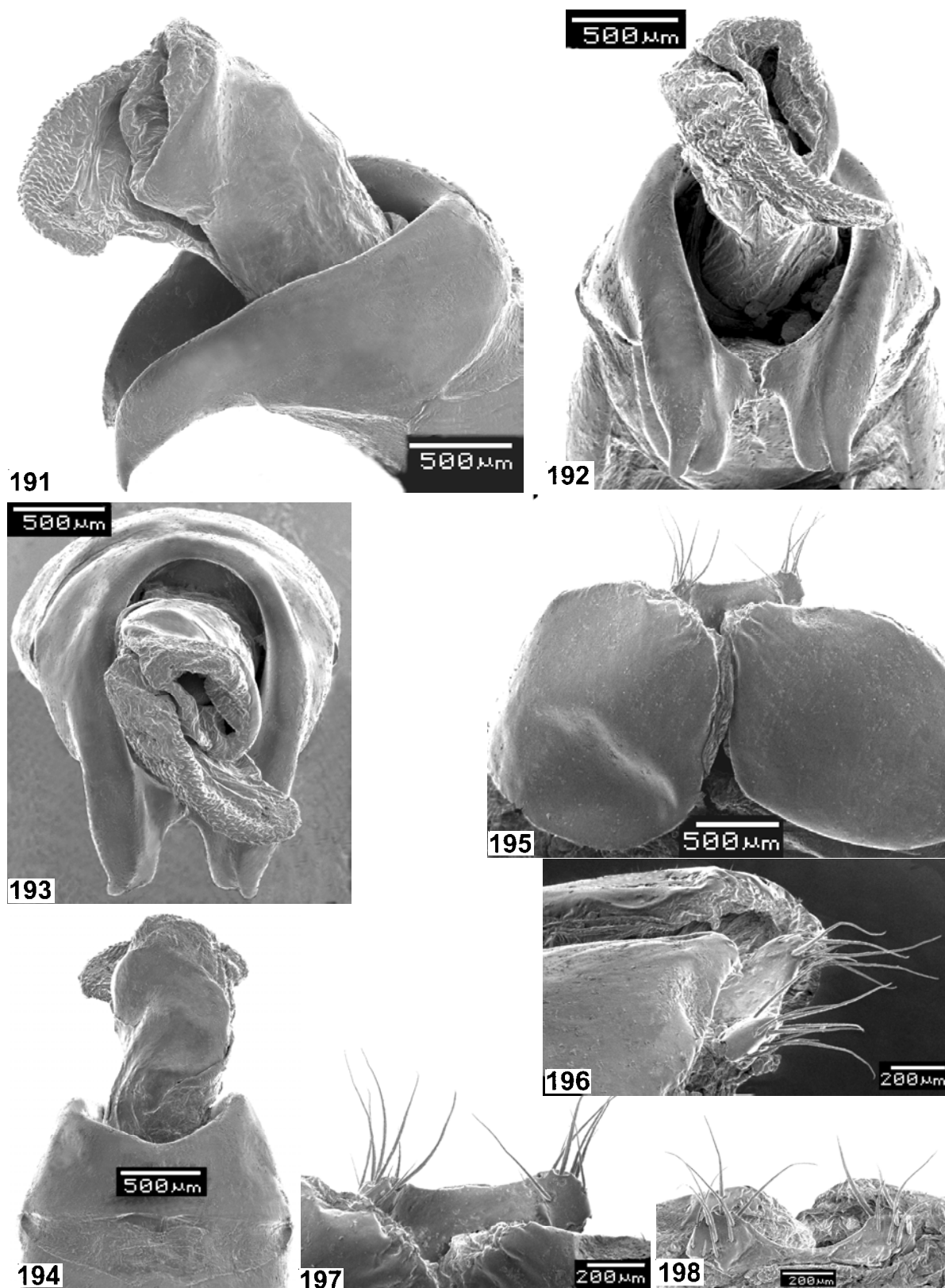


Fig. 191-198. *Phyllophaga baoruco* Woodruff. 191-194 Male genitalia: 191) lateral; 192) ventral; 193) caudal; 194) dorsal; 195-198 female genitalia: 195) ventral; 196) lateral; 197) superior plates, ventral; 198) superior plates, dorsal.

Garcia, km 7 WNW Barrero, Eastside Crest, 18-21N, 70-58W, 25-26-VII-1992, Young, Davidson, Thompson, Rawlins, 860 m, cloud forest adj. disturbed forest [CMNH].

Comparison. Similar to others in the *hogardi* group, by the presence of distinct curved spines at elytral sutural apices. It is most similar in appearance to *leptospica*, *toni*, and *permagna*, from which it can be separated easily by the distinctive genitalia. The pygidium of *leptospica* is shiny, not pruinose, punctures larger and nearly glabrous, whereas in *baoruco* it is pruinose and covered with short, stiff, golden setae (best viewed laterally) and the pronotum is much shinier, the shiny area extending partially onto the elytra. In *toni* the pronotum is shiny, but also hirsute (glabrous in *baoruco*) and it is larger (L. 27 vs. 23 mm). The genitalia are closest to *permagna*, but the paramere tips are distinctive, and the body of *permagna* is also larger (L. 27 vs. 23 mm).

Etymology. Named for the mountain range in which it occurs, not to be confused with the small town of the same name on the coast. On maps and documents the name is spelled both “Baoruco” and “Bahoruco”, but the “h” is silent in Spanish. I have chosen the simpler spelling, which reflects the pronunciation. The Baoruco were a part of the paleo “South Island” and which contain a relictual fauna, often having “sister species” to the north of the Enriquillo basin.

Phyllophaga barrosa Sanderson
(Fig. 69, 199-209)

Phyllophaga barrosa Sanderson (1951: 280; Fig. 76).

This species was one of 3 described from unique females (Sanderson, 1951), from Fond de Negres, HAITI in 1927. It is now the only one remaining for which the matching male still is pending. It is a large species (L. 19, W. 10 mm), reddish, pruinose, related to *mali*, *haitiensis*, and *rustica*. The female genitalia illustrated here (Fig. 207-209) are of the holotype, and they are easily distinguished from female *mali* (Fig. 457-460) and *haitiensis* (Fig. 346-352); the latter much more heavily sclerotized, inferior plates fused and truncate, without basal median plate of *barrosa* (Fig. 204). The other related species, *rustica*, is known only from 2 males. Although a possibility exists that *rustica* represents the male of *barrosa*, there is currently no way to associate them. This can only be clarified when a mating pair or associated large series has been collected. Originally I suspected

that *haitiensis* was the missing male, but an associated female confirmed that it was distinct.

The head (Fig. 199) was described by Sanderson as having the “Clypeo-frontal suture deeply triangularly impressed on each side toward eye.” Except for this character and the female genitalia, little was recorded for this species. Therefore, the following brief description was made from the holotype [USNM, but without number]. The metatarsi and right mesotarsus are broken off.

Dorsal surface ferruginous, pruinose, iridescent, glabrous except marginal setae. Clypeus emarginate, margin reflexed, frontal suture impressed, more so at eye. Antenna (Fig. 201) 9-segmented, club 3-segmented, club ovoid, about as long as preceding 3 antennomeres, receptors barely visible at 40X. Pronotum convex, lateral margin crenulate at setal origins; widest at lateral angles, which are behind middle; anterior angles only slightly produced, not acute or projecting; lateral angles rounded; posterior angles nearly quadrate, tip rounded; posterior marginal line obsolete medially. Scutellum (Fig. 206) wider than long, glabrous, pruinose, coarse punctures scattered on lateral thirds. Pygidium (Fig. 205) glabrous, pruinose, punctures fine, but obscured by surface sculpture. Meso- and metatibia with well developed longitudinal carina, accompanied by 4 sharp tooth-like spines (only 2 teeth, carina less developed on *mali*); transverse carina absent, barely indicated by spines on inner and outer surface. Metatibial apical fringe of 30 spinules (Fig. 202, some broken); inner spur longer than first tarsal segment, flattened, widest about middle, curved on inner face, not sharp pointed; outer spur 2/3 length of inner, slightly curved, flattened. Metatarsal claws (Fig. 203) with teeth sharp, middle tooth median, extending straight and slightly longer than apical tooth.

The female genitalia were stored in a glycerine vial, from which they were dried, photographed with the SEM, and returned to the vial. Shape closer to Fig. 207, but Fig. 208, although showing superior plates clearer, is slightly widened due to distortion during photography. Angle from medial tip toward posterior angle of inferior plate an acute diagonal (compare *mali*, Fig. 457-460). Suture of inferior plates fused in basal half, divided in narrow V in anterior half. Superior plates nearly truncate, apically with about 8 long, stiff setae, with 3 or 4 shorter from below at lateral angles. The most diagnostic feature (Fig. 204) is the crescent-shaped basal, median closure (none in *mali*).

No additional specimens have been taken since it was collected 77 years ago (by A. Whetmore, an

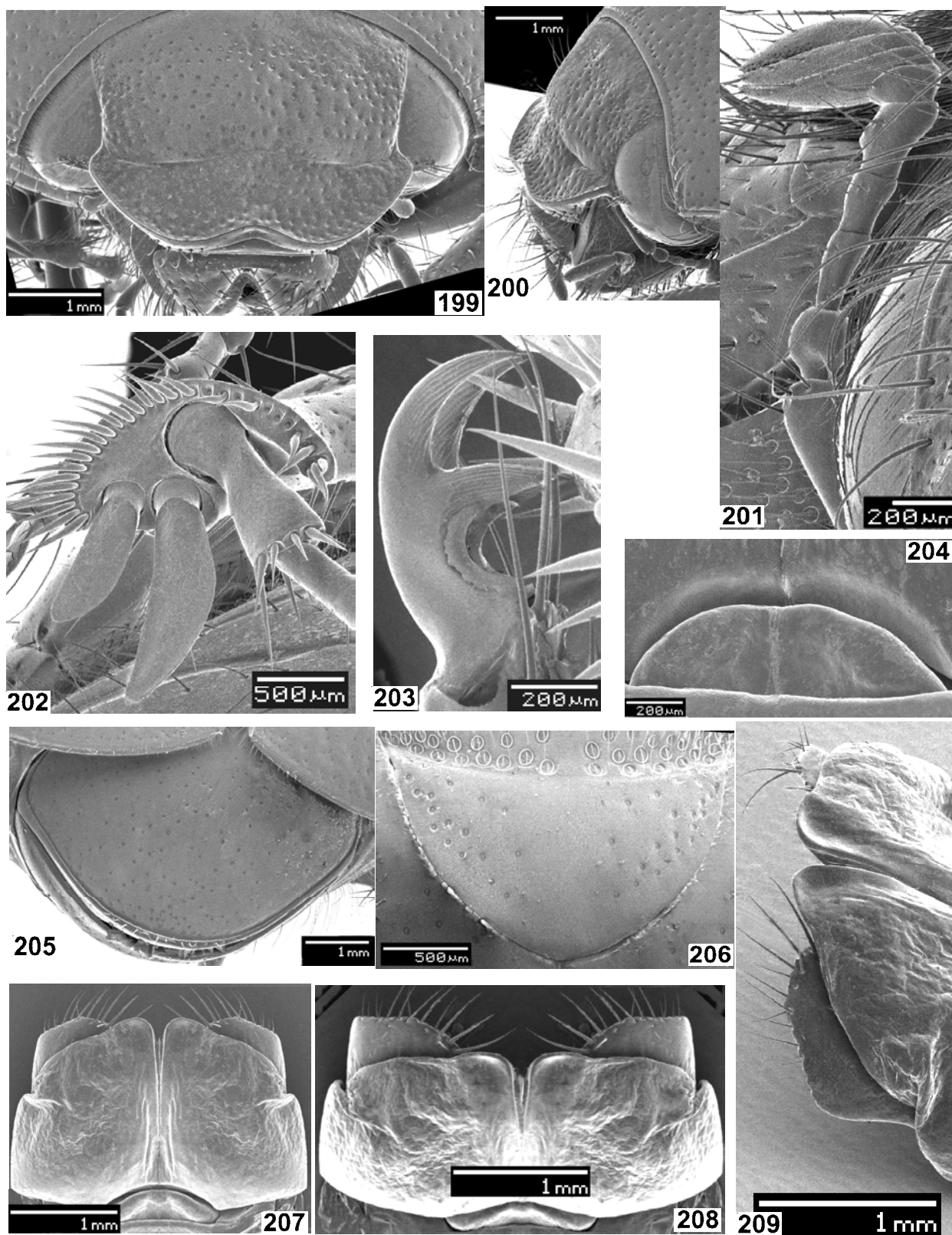


Fig. 199-209. *Phyllophaga barrosa* Sanderson. Unique female holotype: 199) head, frontal; 200) head, lateral; 201) antenna; 202) metatibial apex; 203) mesotarsal claw; 204) base center of basal plates; 205) pygidium; 206) scutellum; 207) female genitalia, ventral; 208) same, caudo/ventral (lateral distortion due to angle of SEM photo); 209) same, lateral.

ornithologist), and in over 50 years since it was described, during which there has been fairly intensive collecting in Hispaniola. However, few specimens of *Phyllophaga* have been seen from this part of Haiti, indicating that the species may be very localized, have specialized hosts, or possibly extinct. Recent floods in Gonaïve indicate the precarious nature of the Haitian landscape where trees have been cut and erosion is uncontrolled. Additional collecting is needed in Haiti to clarify several species problems and to determine which species have survived under the severe environmental destruction there.

Phyllophaga bonfils Woodruff and Sanderson,
new species
(Fig. 70, 210-222)

Holotype male: HAITI: Dept. de l'Ouest, Furcy, 15-V-1959, M.W. Sanderson, et al., H59-3 (2). [aedeagus dissected, originally in glycerine vial Acc. #50274; now mounted on card point, along with genital capsule] [INHS].

General description. (Habitus, Fig. 70). Large (L. 27 mm, W. 12 mm), narrow and nearly parallel sided, not expanded apically. Color uniformly dark chocolate brown; surface shiny, glabrous except pronotum, not pruinose. The long, fine, reddish hairs of pronotum are the most distinctive dorsal external feature. Genitalia distinct, aedeagus asymmetrical (Fig. 210-218).

Head. Clypeus broadly emarginate, shiny, without setae, punctures irregularly spaced but coarse and dense, denser medially, some coalescing, at most separated by a diameter; lateral angles rounded, obtusely joined to frontal suture; anterior margin reflexed. Frontal suture impressed on sides, slightly elevated in center; frons densely punctate as clypeus, one-third longer than clypeus; row of punctures paralleling eye, extending to posterior posterior band, all punctures nonsetiferous. **Antenna** 9-segmented, club 3-segmented, slightly longer (1.2X) than funicle, 1.8X longer than clypeus medially.

Pronotum. Wider (1.9X) than long, widest at anterior third, sides parallel behind posterior angles, smoothly rounded, margined with long (some half length of pronotum), fine, erect, reddish hair, few additional hairs medially behind anterior margin, but disc of pronotum glabrous; lateral margin somewhat crenulate anteriorly, where marginal setae arise. Surface unevenly punctate similar to head, punctures separated at most by 2 diameters, somewhat less

dense medially. Sides nearly parallel in basal half, before broadly rounded posterior angles; convergent in front of middle to angulate anterior angles.

Scutellum. Surface shiny, without setae, punctate except for small central line, punctures small on outside, growing larger toward that line, more or less flat, not depressed or raised above elytra.

Elytra. Surface shining, more shallowly and less densely punctate than head and pronotum, punctures mostly separated by a diameter or more; lateral margin barely reflexed; sutural margin ending in a very tiny spine (not produced as in *hogardi*), overall shining, glabrous except very fine golden setae below lateral margin.

Pygidium. Large, wider than long; color as in elytra; coarsely punctate as pronotum, slightly wrinkled, exceptionally convex, shining, glabrous except marginal fringe.

Legs. Protibiae tridentate, middle tooth nearer proximal tooth than basal one; tibial spur reaching beyond base of first tarsal segment, cylindrical, not finely pointed; tarsal segments 2-4 subequal, 1 longer than 2, fifth longest, nearly equal to 2 preceding; apices of first 3 segments slightly produced, all 5 carinate on lower surface. Protarsal claw sturdy, middle tooth nearly central and sharply pointed, with a U-shaped notch formed with basal rectangular area. Mesotibia with incomplete transverse carina, its presence marked by 2 groups of elongate setae in clusters (holotype without portions of both mesotarsi). No longitudinal carina. Mesotibial apex with spurs nearly equal in length, inner slightly more flattened than outer, but both nearly parallel sided. Metatibia similar to mesotibia, apex broadly expanded; apical spurs unequal, both concave and drastically curved, spatulate-shaped. Long spur longer than first tarsal segment; metatibial apical fringe of 21 coarse setae. Metatarsal segments 2, 3, 4 progressively shorter, fifth 1.5X longer than 4; segments 2-4 each with fine carina on lower surface, opposite of which is a row of coarse setae. Metatarsal claws nearly identical to protarsi.

Abdomen. Ventral surface shiny, convex medially, with a depression on both penultimate and ultimate sternites, punctation very light, lighter medially. Fine, golden setae on sternites in rows, prostrate, less noticeable medially. A cluster of fine setae (finer than pygidial fringe) in front of depression on penultimate sternite. Ultimate sternite as long as penultimate.

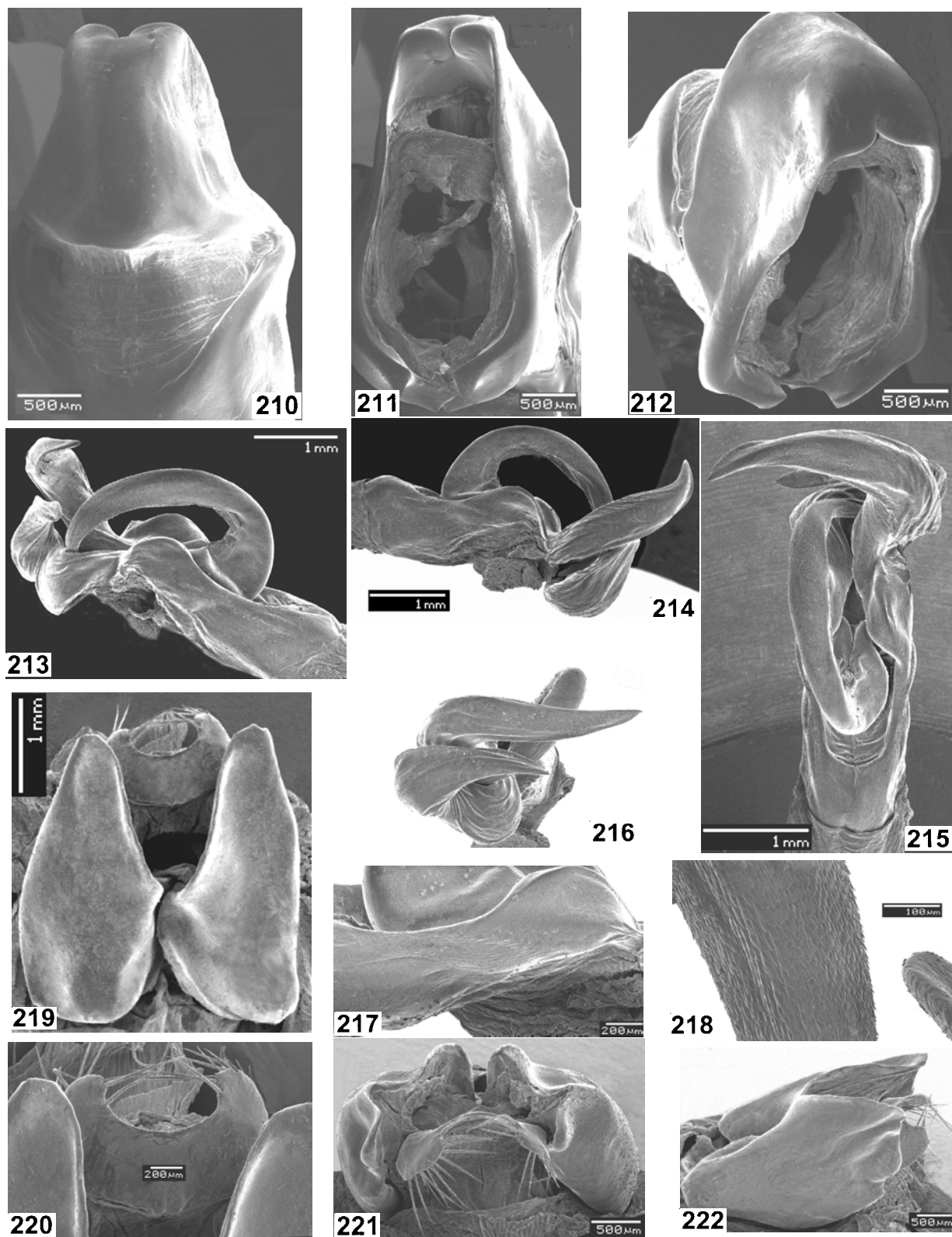


Fig. 210-222. *Phyllophaga bonfils* Woodruff and Sanderson. 210-216 Male genitalia (210-212 with aedeagus removed): 210) dorsal; 211) caudo/ventral; 212) caudo/lateral; 213-218 aedeagus: 213) right lateral; 214) left lateral; 215) dorsal; 216) left caudo/lateral; 217) right aedeagal paramere; 218) enlarged dorsal projection; 219-222 female genitalia: 219) ventral; 220) superior plates, ventral; 221) caudal; 222) lateral.

Genitalia, Male (Fig. 210-218). Phallobase large, with huge opening, wider at apex; dorsally, shallowly notched. Entire clasper structures projecting backward with sharp angle, terminating below in doubly lobed, appressed, but not fused, parameres. Basal piece strongly attached at articulation; dorsal membrane long (nearly as long as parameres dorsally), latter appearing to allow for great up and down flexibility between phallobase and basal piece. Aedeagus asymmetrical (Fig. 215-216), exceptionally sturdy and heavily sclerotized; with 2 large, pointed, elongate lobes (both twisted, but in different plane), above which arises a hinged, curved process (enlarged in Fig. 215), point lying to side of one lateral lobe.

Allotype female. Label data same as holotype, except "INHS Insect Collection 44293" [genitalia formerly in glycerin vial (Acc.#50277), now mounted on card point below specimen; missing left anterior tibia and tarsus]. Antennal club similar to male, but shorter; antennomeres 5 and 6 projecting forward, wider than long. Antennal club about equal in length to preceding 4 antennomeres, longer than clypeus medially. Color uniformly dark chocolate brown. Metatibial apex more broadly expanded, outer spur tightly appressed and forming an extension of carinate edge of tibial margin; both spurs extremely flattened, broad, concave; inner spur bent at nearly right angles and longer than first tarsal segment; outer spur subequal in length to first tarsal segment; metatibial apical fringe of 33 and 36 closely spaced setae. Tarsal segments 2, 3, and 4 subequal; claws as in male. Penultimate and ultimate sternites more convex. **Genitalia** (Fig. 219-222). In ventral view, inferior plates large, butterfly-like, attached loosely at about middle, tips diverging, but not sharply pointed and without setae; internal margin grooved in line paralleling central connection to near apex, plate convex laterally to groove. Base not sealed with triangular plate. Superior plate (Fig. 220) uniquely shaped, not fused to inferior plate, extending slightly beyond apex of inferior plates in a crescent collar, medially with smooth, deep curve, tips broadly terminating with spines (about 12) pointed inwardly toward each other.

Specimens examined. Only the holotype and allotype from Haiti are known.

Ecology. Nothing is known about the habits of this species. Both specimens were collected at night (mat-ing?), but field notes on the host and altitude were not available. Other species collected at the same locality

and time included (numbers in parentheses): *recorta* Sanderson (46), *mali* Wolcott (81), *permagna* Moser (5), *panicula* Sanderson (5), *hogardi* (Blanchard) (1). From the topographic map, the locality appears to be above 1000 m and about 10 miles directly south of Port-au-Prince, and about 5 miles south of Kenscoff, in the Massif la Selle.

Etymology. The name was chosen by Sanderson to honor the late J. Bonfils, who hosted him in 1959, one of few Haitian entomologists, and who published several papers on the insects of the French Antilles.

Phyllophaga canoa Sanderson
(Fig. 71-72, 223-234)

Phyllophaga canoa Sanderson (1951: 279; Fig. 60).

This is another of the 3 that were described by Sanderson (1951) from unique females. It has taken over 50 years to find the associated male, described as the allotype below. The first male seen was so distinctive that it was being described as a new species (manuscript name *casabito*). However, the 4 specimens in the Carnegie Museum of Natural History from the same site, with both sexes, provided the first association. Not only is it a rare species, but it is one of the few in which there is great sexual dimorphism.

Allotype male (here designated). DOMINICAN REPUBLIC: Prov. La Vega-Monseñor Nouel, Loma Casabito summit, 19-13N, 70-31W, 1390 m, 19-23-XI-1992, J. Rawlins, H. Klinger, R. Davidson, S. Thompson, cloud forest, Specimen Number CMNH 305,026 [CMNH].

General description (Habitus, male Fig. 72, female Fig. 71). Large (L. 20, W. 9 mm). General shape as in female holotype, narrowed in front and widest near elytral declivity. Distinctly different from female by its pruinose coating, uneven surface producing a patch-like or mottled iridescence on elytra similar to *mella*. **Head.** Clypeus produced or swollen above frontal suture, but much smoother, less densely punctate than female; clypeus noticeably emarginate. Eye canthus carinate, well-developed with 8 long setae. Frons pruinose as pronotum, basal band impunctate. **Antenna** with antennomeres 3 and 4 elongate, subparallel, weakly constricted between, 5 longer than wide but slightly produced anteriorly, 6 reduced and wider than long. Club length subequal to previous 5 antennomeres, lighter colored, with noticeable receptors, including small yellow spots arranged

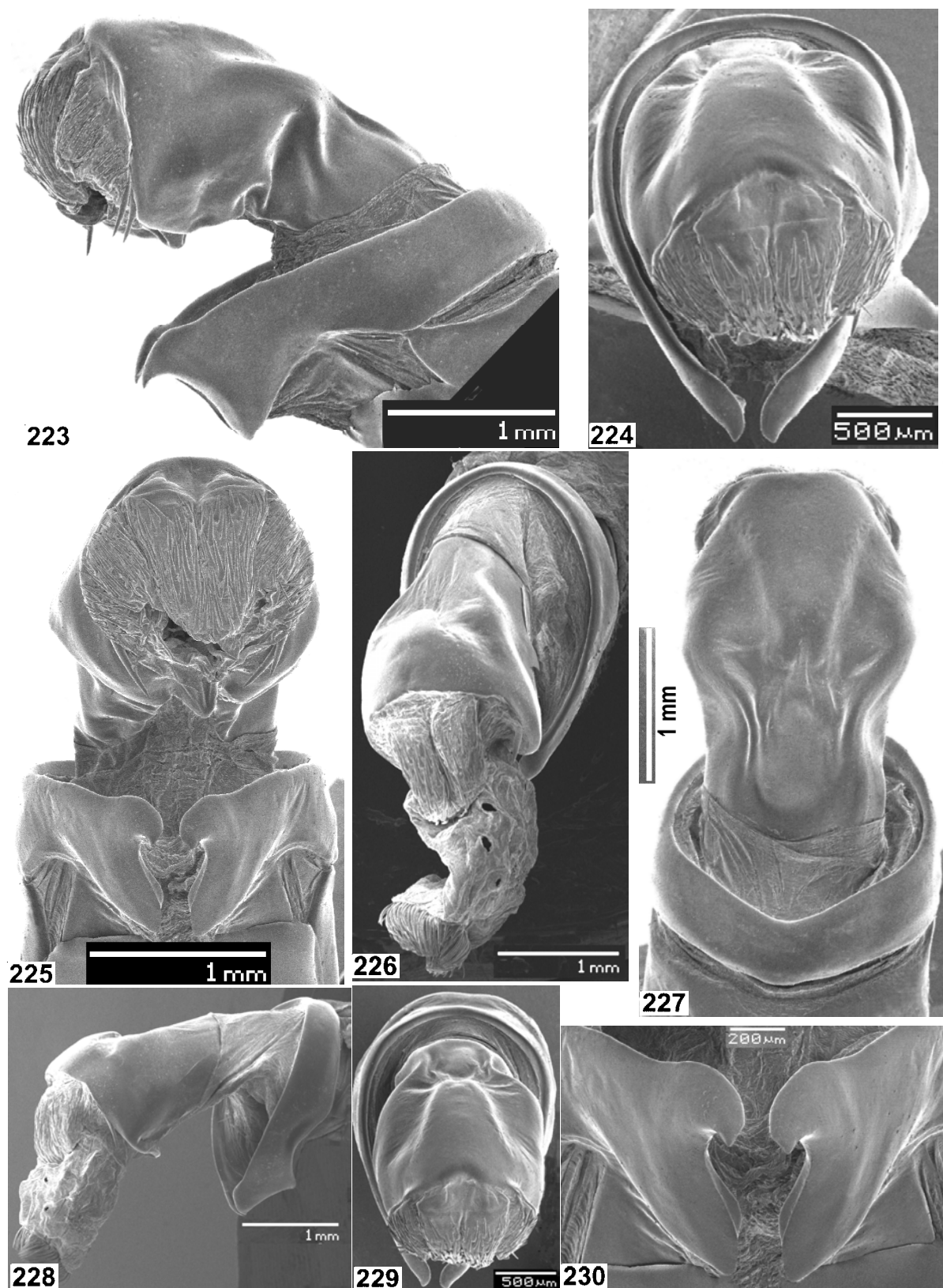


Fig. 223-230. *Phyllophaga canoa* Sanderson. Male genitalia: 223) lateral; 224) caudal; 225) ventral; 226) caudo/lateral; 227) dorsal; 228) lateral (aedeagus extended); 229) dorso/caudal; 230) paramere tips, ventral.

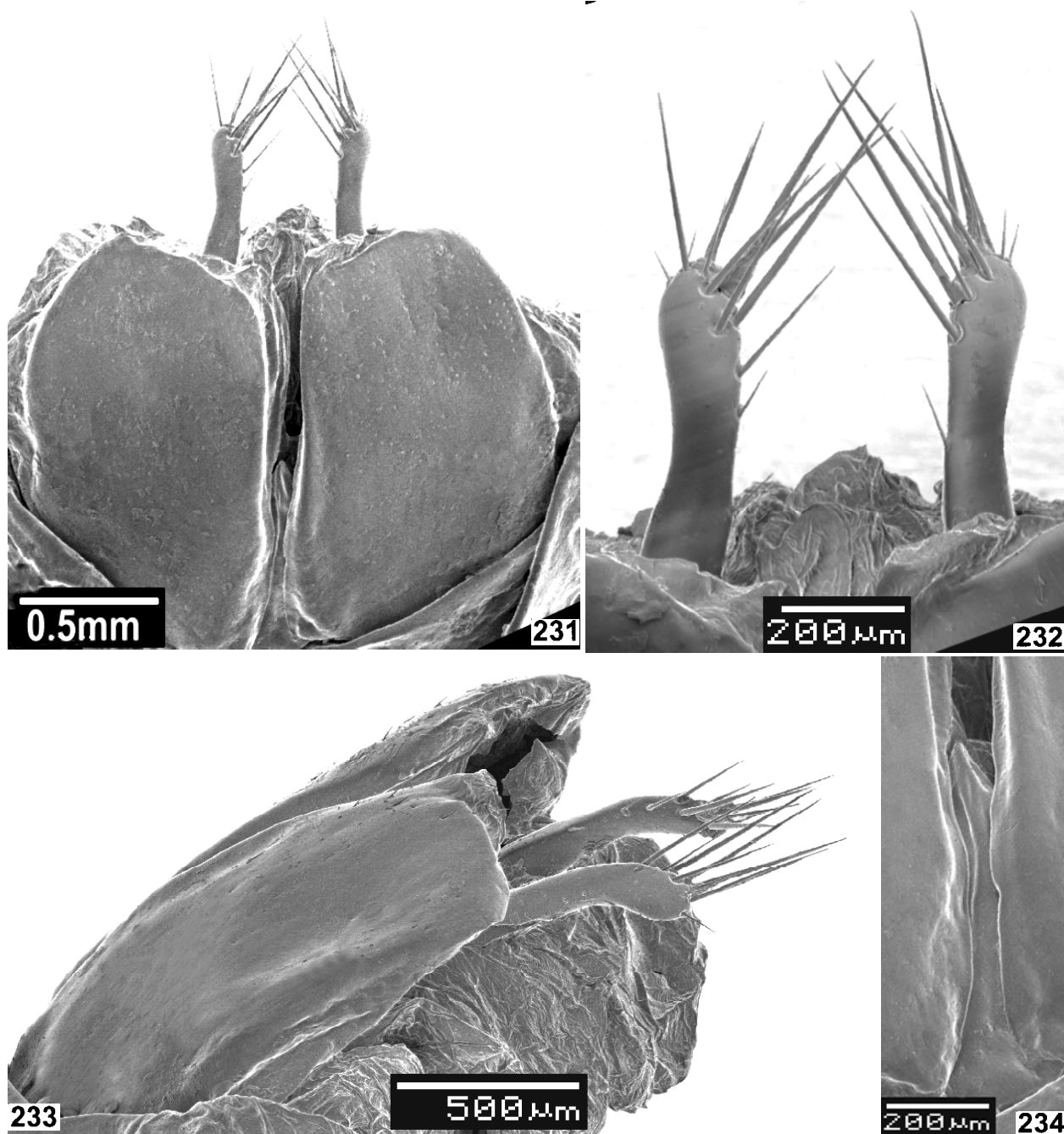


Fig. 231-234. *Phyllophaga canoa* Sanderson. Female genitalia: 231) ventral; 232) enlarged superior plates (pubic process?), ventral; 233) lateral; 234) junction of inferior plates (note narrow plate between).

in irregular longitudinal rows. **Pronotal** posterior angles slightly more pronounced. Surface entirely pruinose, glabrous. **Scutellum** lightly punctate at sides. **Elytra** regularly punctate near humeral angles, but punctures coalescing into wrinkles on posterior 80%, wrinkles causing light refraction in distinctive pattern. Humeral angles shiny, without pruinosity. **Pygidium** pruinose, glabrous, except for termi-

nal fringe. Venter of abdomen entirely pruinose; evenly punctured, except penultimate sternite more densely punctate with slight longitudinal depression medially and more coarsely punctate. Penultimate sternite laterally with large patch of darker pruinosity accompanied by long golden setae. Ultimate sternite with very shallow transverse groove, apically margined with a few golden setae, shorter than

pygidial fringe. **Genitalia:** Male parameres (in lateral view, Fig. 223) similar to many species, aedeagus (Fig. 225-229) distinctive, heavily sclerotized tube, with 2 spinose areas, one terminating in a "mop-like" tip. **Legs:** Male apical metatibial fringe of 16 spines (female 18); apical spurs long, narrow, and little modified, inner 30% longer than first tarsal segment; outer shorter than first tarsal segment (more flattened and spatulate in female). First protarsal segment much narrower at tip than in female. All tarsal claws nearly cleft, angle between fairly acute, but deeply divided, middle tooth curved as terminal; basal notch quite pronounced.

Comparison. The female is shiny and glabrous, whereas the male is matte and distinctly pruinose. The genitalia of both sexes are unique (Fig. 223-234). The female is the only known Hispaniolan species which has the superior plate elongated into a process that may be homologous to the pubic process of others; the junction of the inferior plate is joined by an extremely elongate (half their length) triangular plate. Although the male parameres are similar to many species, the aedeagus (Fig. 225-229) is distinctive for its heavily sclerotized tube, with 2 spinose areas, one of which constitutes the "mop-like" tip.

The deeply emarginate clypeus, making it appear somewhat bilobed, shows similarity to *hogardi*. Although the female is glabrous and shiny like *hogardi*, it lacks the terminal spine at the elytral suture, and the genitalia are of different types. The male, in its pruinosity and genital type, appears related to *mella*, but that species has no "mop-like" terminus, and the lateral border of the aedeagus has a saw-like ventral edge (Fig. 487). The size is larger in *cano*a (20 vs. 13.5-15 mm).

Specimens examined. Total 9 (6 females, 3 males; all DOMINICAN REPUBLIC): The holotype female: [Prov. La Vega] vicinity Valle Nuevo, cloud forest 6000 ft, August 1938, Darlington [MCZC]. (3 females) same data as allotype. (1 male) Prov. La Vega, Cordillera Central, Loma Casabito, 15.8 km NW Bonao, 19.02.12N, 70.31.08W, 28-V-2003, J. Rawlins, C. Young, R. Davidson, C. Nuñez, P. Acevedo, evergreen cloud forest, east slope, 1455 m, UV light, Sample 21212, CMNH 310.300 [FSCA]. (1 female) Prov. Duarte[?], Casabito, 24-XII-1970, E.J. Marcano #9384 [FSCA]. (1 female) Prov. La Vega, Yaquecillo, VIII-1958, E.J. Marcano #152 [FSCA]. (1 male, 1 female) [Distrito Nacional] Santo Domingo, 14-VII-1974, 30 m, J. and S. Klapperich [NHMB, FSCA].

Ecology. Most Hispaniola species which have been collected at higher altitudes (above 3000 ft) are rarely found at lower elevations. Because most specimens of *cano*a were collected in the Cordillera Central near Casabito (from 4-6000 ft), the Santo Domingo records at 30 m remain questionable. The habitat appears to be cloud forest. Dates include November and December, suggesting the species is more active in a cooler climate.

Etymology. Sanderson (1951) did not give a source for this name, although "cano" means canoe in Spanish. There is a town by that name in the Province of Barahona (near Vicente Noble), but no specimens have been collected there, and it is low elevation.

Phyllophaga carnegie Woodruff, **new species**
(Fig. 73, 235-240)

Holotype male. DOMINICAN REPUBLIC: Prov. Elias Piña, Sierra de Neiba, 9.3 km WSW Hondo Valle, 18-41-31N, 71-47-03W, 1901m, 25-VI-2003, J. Rawlins, C. Young, R. Davidson, C. Nuñez, P. Acevedo, M. de la Cruz, montane forest with Podocarpus, UV light, Sample 31112, CMNH 309, 985 [CMNH].

General description. (Habitus, Fig. 73). Medium sized (L. 13, W. 6 mm). Dorsally glabrous, head and pronotum shiny, elytra dull, slightly pruinose. Nearly bicolored, elytra with dark brown longitudinal median area, bordered by lighter, straw-colored stripes; lateral margin with a dark border. Superficially similar to *davidsoni*. Genitalia distinctive (Fig. 235-240), parameres simple, aedeagus heavily sclerotized, with a large up-turned spine dorsally, intromittent portion with 5 large conical spines.

Head. Clypeus emarginate in gentle curve, anterior angles rounded, sides nearly parallel, barely constricted at frontal suture; surface irregularly punctate, punctures shallow, ill-defined, separated by about 1 diameter. Anterior clypeal margin noticeably reflexed; frontal suture deeply impressed, mimicking shape of clypeal margin in outline. Frons densely, coarsely punctate, more so than clypeus. Eye canthus relatively short with 4 long setae. Posterior band impunctate. **Antenna** 9-segmented, club 3-segmented, club longer than preceding 5 antennomeres, 3 and 4 elongate, nearly parallel, 5 with a small projection but longer than wide, 6 wider than long; antennal club with noticeable receptors.

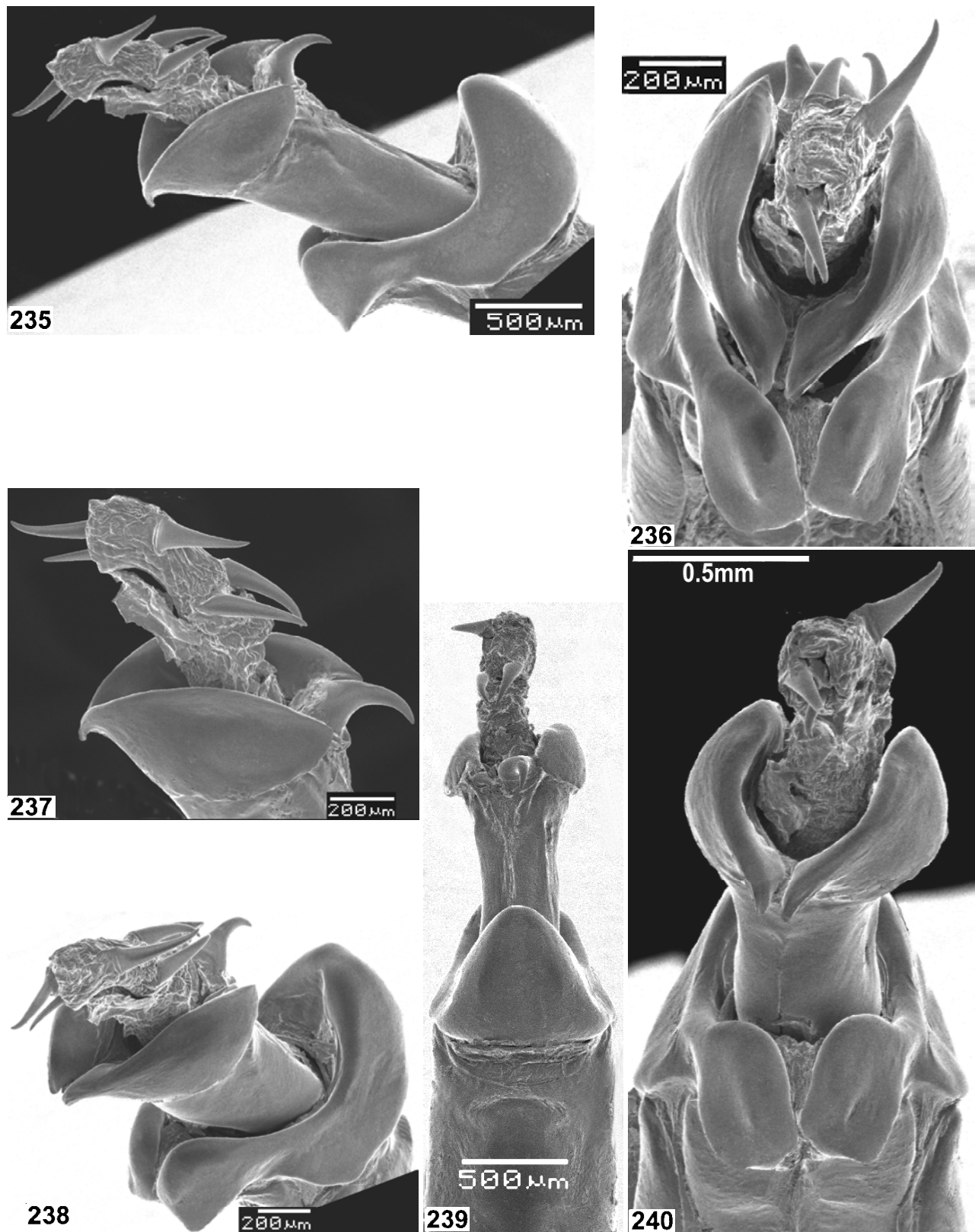


Fig. 235-240. *Phyllophaga carnegie* Woodruff. Male genitalia: 235) lateral; 236) caudal; 237) aedeagal tip; 238) caudo/dorsal; 239) dorsal; 240) ventral.

Pronotum. Wider than long, shiny; lateral margin nearly parallel from lateral to posterior angles; frontal angles obtuse, posterior angles nearly 90 degrees; lateral margin with long setae, but not crenulate. Punctuation irregular, fairly coarse, most punctures on disc 2 or more diameters apart, denser in anterior angles; color dark (darker than elytra) brown with lighter lateral angles.

Scutellum. Nearly flat, slightly wider than long, glabrous, punctures mostly on lateral areas, center impunctate.

Elytra. Surface completely glabrous, nearly bicolored with longitudinal dark band paralleling suture, lighter on sides until lateral margin which is dark as on pronotum, surface barely iridescent. Surface punctate, punctures shallow, some in rows, barely indicating vague costae. Sutural margin barely carinate until apical declivity. Elytra terminating abruptly, nearly truncate, suture not ending in an obvious spine; lateral elytral margin slightly reflexed, more so below humeral angles.

Pygidium. Glabrous, dark colored as in dark area of elytra, contrasting to yellowish abdomen, punctures finer than elytra and irregular, most separated by more than 1 diameter, a few coalescing into shallow wrinkles; apical fringe with normal long setae.

Legs. Protibia tridentate, basal tooth well developed, middle tooth closer to proximal than basal tooth; spur acuminate, sharp pointed, reaching beyond base of first tarsal segment; tarsal segments subequal, fifth slightly longer; claws not cleft, middle tooth pointing somewhat forward, nearly as long as sharp apical tooth. Mesotibia with longitudinal carina, transverse carina indicated by 2 large teeth and setae on external margin; terminal spurs acuminate, sharp pointed, less than half length of first tarsal segment, mesotarsi similar to protarsi, including claws. Metatibia with longitudinal carina, transverse carina indicated weakly by external teeth and spines; inner spur longer than first tarsal segment, outer subequal to first tarsal segment; apical fringe of 12 spines; metatarsal segments 2, 3, and 4 progressively shorter, 2 and 5 subequal; outer edge somewhat wrinkled and alutaceous; tarsal claws as on other legs.

Abdomen. Metasternum hairy and shallowly punctate. Penultimate sternite with a dark pruinose patch on sides anteriorly, remainder of abdominal venter

straw colored, and fairly uniformly, shallowly punctate, surface nearly glabrous.

Genitalia. (Fig.). Phallobase of simple type, paramere labia rounded on dorsal angle, projecting abruptly backwards, acute, but not sharply pointed at posterior angle; caudal face broad, each paramere with median tumosity. Phallobase dorsum produced as a hood (Fig. 235) over aedeagus. Aedeagus of 2 parts: 1) long, heavily sclerotized, ending in flanged opening, divided ventrally, dorsum with enlarged, backward projecting, hook-like spine; 2) internal protrusible portion fleshy, with 5 large, conical spines, similar in size to dorsal hook.

Female. Unknown.

Specimens examined. Total: 4 males (all DOMINICAN REPUBLIC), including holotype and 3 paratypes: (1) same data as holotype [CMNH]. (1) same except 9.0 km WSW Hondo Valle, 18-41-34N, 71-46-52W, 1843 m, disturbed montane woodland w/pine, Malaise trap, Sample 31382, CMNH 310,560 [FSCA]. (1) Prov. San Juan, Sierra de Neiba, 9.4 km SSW El Cercado, 18-39-18N, 71-32-51W, 1973m., 22-VI-2003, J. Rawlins, C. Young, R. Davidson, C. Nuñez, P. Acevedo, M. de la Cruz, meadow near mature pine, hand collected. Sample 32242, CMNH 307,897 [CMNH].

Ecology. Apparently another species restricted to the Sierra de Neiba at high altitudes (1843 to 1973 meters). Only 2 specimens were collected at UV light, the others may have been in daytime. One was captured in a Malaise trap and the other hand collected. The noticeable receptors on the antennal club, and the lack of females, suggests that males of this species may be primarily diurnal. Such activity (as is known in *garrota*, *probaporra*, and *costura*) would be advantageous because of the lower night time temperatures and stronger winds at such elevations. All were taken within a week, near the end of June. Because pine or *Podocarpus* are mentioned on all specimens, it suggests that adults may be conifer feeding species.

Comparisons. In color, size, and habitus, adults are externally most similar to *davidsoni* (known only from 2 specimens from the Bahoruco [Baoruco] Mountains). However, that species has scattered setae on the elytra and is somewhat lighter in color. The genitalia are of the same basic form, but distinctive (compare Fig. 235-240 vs. 255-260). The large conical setae on the aedeagus of *carnegie* and the "pollinia-

shape" of the phallobase cap of *davidsoni* will easily distinguish them.

Etymology. It is with great pleasure that I name this species after Andrew Carnegie, as well as the Carnegie Museum of Natural History. This and 6 other new species were discovered in material collected during the faunal surveys being conducted in Hispaniola by the staff of this institution. Their specimens were instrumental in documenting distributions of known species, as well as permitting description of these new ones. Many of their collecting localities are remote, interesting, cloud forest sites, which are difficult to access and require considerable personal sacrifices to do so.

Phyllophaga cartaba Sanderson
(Fig. 74, 241-247)

Phyllophaga cartaba Sanderson (1951: 274-275; Fig. 46, 47, 70).

This small species (L. 8-10 mm) was described from a series of 7 specimens, merely labelled "S. Dom." Early specimens often carried that label for any place in Hispaniola, not just the Dominican Republic or Santo Domingo. I have seen the following 13 specimens (all DOMINICAN REPUBLIC): (3) paratypes, S. Dom. [INHS]. (6) Prov. Santiago, St. Thomas de Jánico (Jánico), 8-V-1959, [M.W.] Sanderson, [T.H.] Farr, RD59-13 (1) [INHS, FSCA]. (4) [Prov. Samana], Samana, 2-V-1973, J. and S. Klapperich [NHMB, FSCA].

This species is one of the smaller pruinose ones, along with *latiungula* (429-432), *panicula* (569-575), and *imprima* (368-378) [genitalia Fig. in parentheses]. It is most similar in both external and genitalic characters to *latiungula*, known only from Haiti ("South Island" species?). The above records seem inconsistent, the peninsula of Samana being mostly low elevation (although having a central ridge), and an area of endemism for other animals (especially land snails). The other locality, Jánico, is on the other side of the Cordillera Septentrional, near the Rio Bao, more than 80 miles to the northwest, and at much higher altitude. Additional specimens will be required to determine if the 2 populations are conspecific.

Phyllophaga costura Sanderson
(Fig. 75, 248-254)

Phyllophaga costura Sanderson (1951: 264; Fig. 20-21)

This medium sized species (L. 14-16 mm) was described from 2 males from "Dominican Republic, Loma Rucilla and mountains north, 5000-8000 ft, June, 1938, P.J. Darlington". I have seen only 1 additional male from: DOMINICAN REPUBLIC, Prov. San Juan, Piquito del Yaqui, 26-III-1964, E.J. Marciano #410 [FSCA]. The road map shows "La Rucillo" or "Pico del Yaque" at 3045 m, in the route from La Cienega to Pico Duarte (highest Hispaniola peak at 3175 m). The Darlington and Marciano specimens were probably collected en route to the peak, so exact locations would be difficult to record without modern equipment. It may be a very localized species, especially if the females are flightless.

Adults are unique in having the frontal suture raised instead of impressed (Fig. 253-254, arrow). It is related to *probaporra* and *garrota*, in having the 6th antennomere enlarged and forming a partial lamella. All 3 have noticeable receptors on the antennal lamellae, and all 3 are known from males only. In *garrota* the club has 4 complete lamellae (Fig. 328, 330, unique in Hispaniola), and it has been collected flying in the daytime. I suggest that the unusual antennal receptors are an adaptation for locating the female, which may be flightless and subterranean. Diurnal activity would also be an advantage to species occurring at such high altitudes, where nights are cold and winds are strong. The March collection would seem an early date for such high altitudes, but perhaps reflecting its relictual nature.

The genitalia of the 3 are similar (compare Fig. 248-250, 323-326, 603-606). In *costura* the parameres (caudal view) are expanded laterally, the labia nearly triangular-shaped, also extended inwardly as a recessed, narrow, finger-like projection, not meeting medially. In *probaporra* the outer labia of the parameres (caudal view) are pointed downward, as are the internal teat-like projections, with a wider gap between.

Phyllophaga davidsoni Woodruff, **new species**
(Fig. 76, 255-260)

Holotype male. DOMINICAN REPUBLIC: Prov. Pedernales, La Abeja [Las Abejas], 38 km N. Cabo Rojo, 18-90N, 71-38W, 1250 m, 15-VII-1987, J. Rawlins, R. Davidson, CMNH 308,594 [CMNH].

General description. (Habitus, Fig. 76). Medium sized (L. 13, W. 6.5 mm). Somewhat bicolored (resembling *carnegie*), elytra longitudinally with dark central area and lighter lateral third, margin darker on posterior half. Head and pronotum shining, but elytra

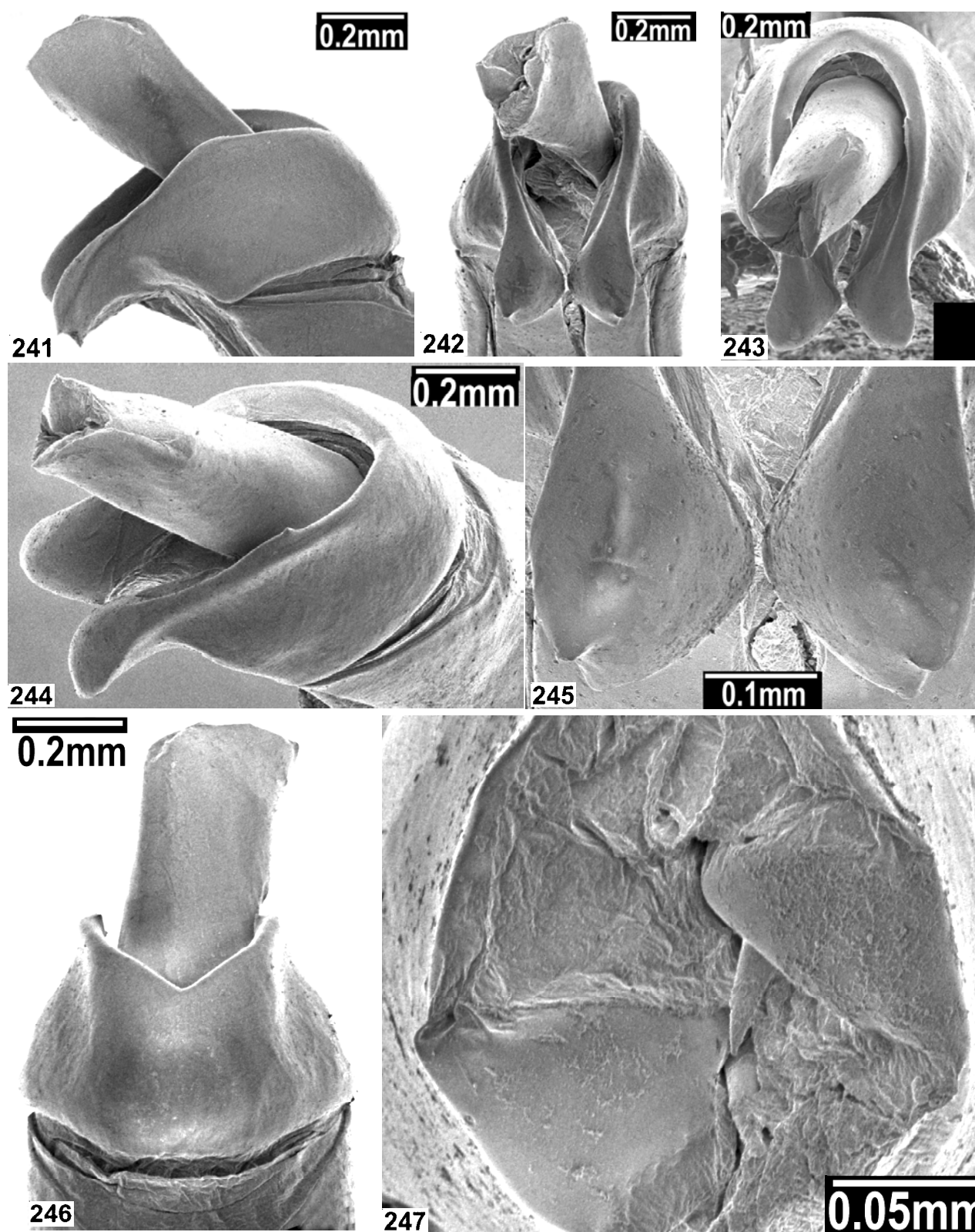


Fig. 241-247. *Phyllophaga cartaba* Sanderson. Male genitalia: 241) lateral; 242) caudo/ventral; 243) caudal; 244) caudo/lateral; 245) paramere tips enlarged, caudal; 246) dorsal; 247) aedeagal tip, caudal.

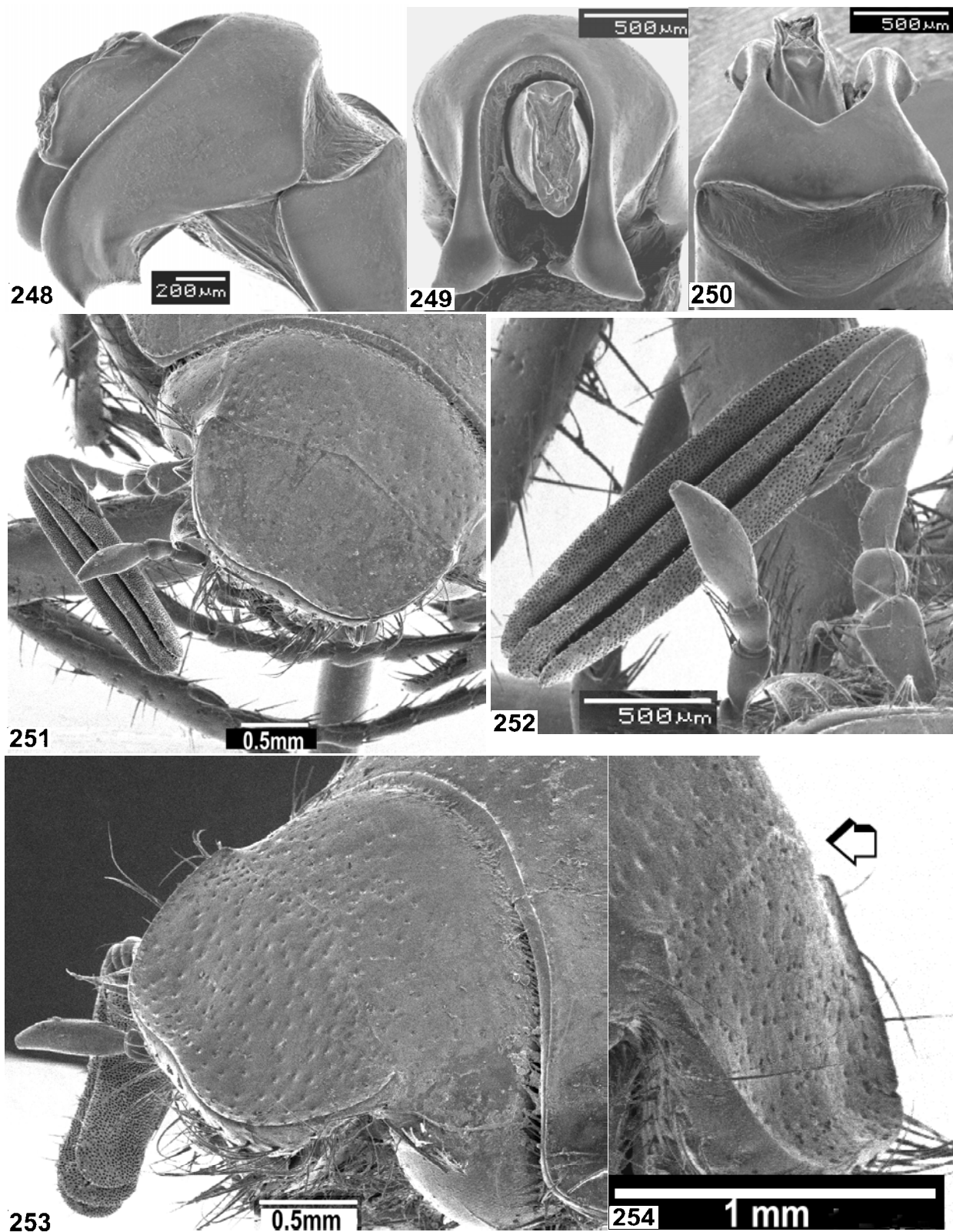


Fig. 248-254. *Phyllophaga costura* Sanderson. 248-250 Male genitalia: 248) lateral; 249) caudal; 250) dorsal; 251-254 head: 251) dorsal; 252) antenna (note antennomere 6 enlarged); 253) dorso/lateral; 254) lateral (note raised clypeal suture, arrow).

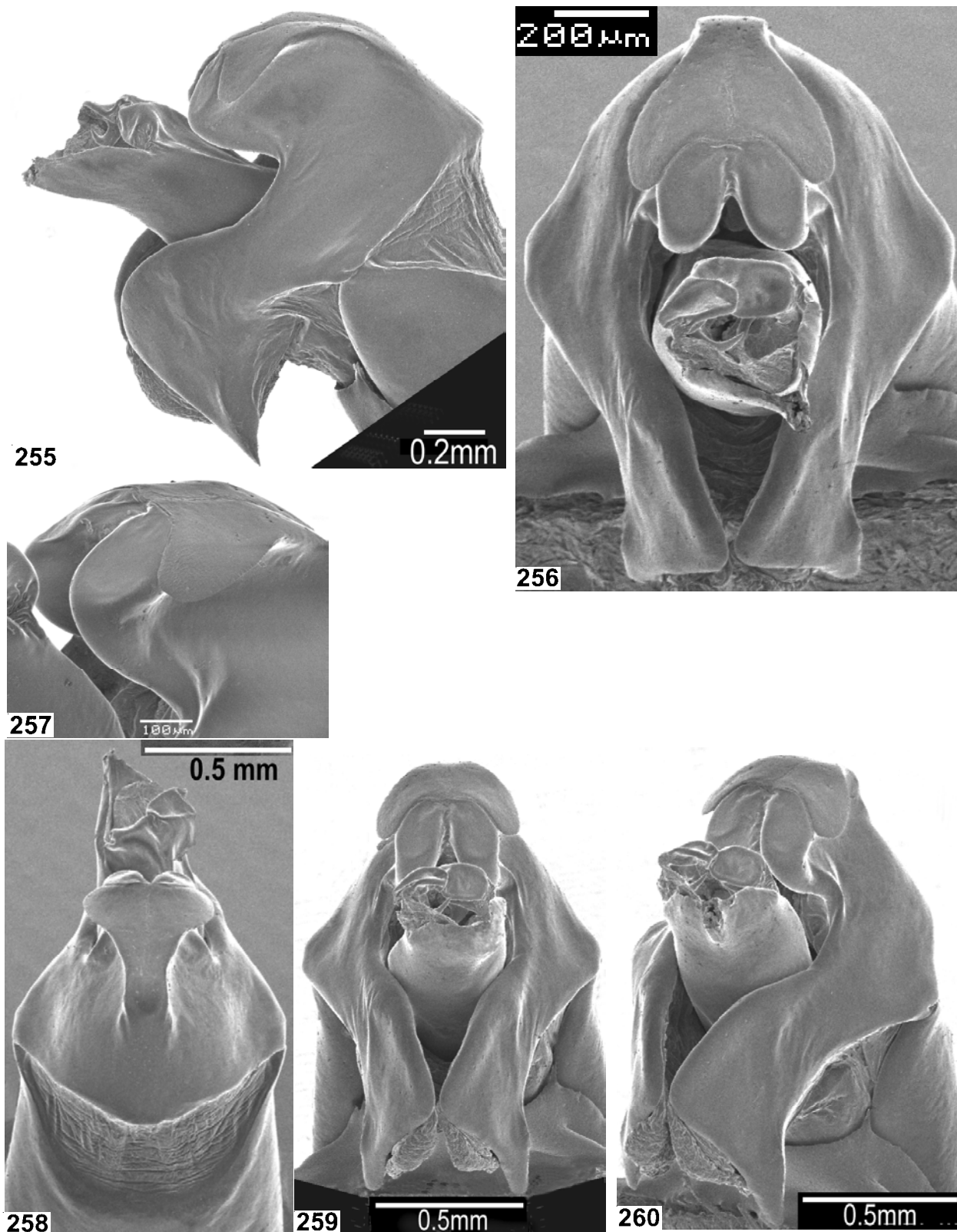


Fig. 255-260. *Phyllophaga davidsoni* Woodruff. Male Genitalia: 255) lateral; 256) caudal; 257) dorsal apex of phallobase; 258) dorsal; 259) caudo/ventral; 260) caudo/lateral.

dull, lightly pruinose, with fine scattered microsetae. Genitalia distinctive, phallobase cap in caudal view (Fig. 256), resembling pollinia of an orchid, aedeagus without large, pointed spines.

Head. Clypeus emarginate, anterior angles rounded, joining frontal suture at nearly right angles, margin highly reflexed, punctation irregular but mostly coalescing, especially in center; frontal suture deeply impressed, slightly emarginate medially, relatively straight across. Frons punctate densely and slightly depressed in medial longitudinal band, punctures coarse and separated by about 1 diameter in most of remainder; posterior band impunctate. Eye canthus carinate with 4-5 long setae. **Antennae** 9-segmented, club 3-segmented, subequal in length to previous 5 antennomeres, 3 and 4 elongate, parallel-sided, 5 slightly produced forward, about as long as wide, 6 reduced, wider than long, club yellowish; receptors noticeable but not large, lamellae nearly equal in length.

Pronotum. Color dark brown, slightly lighter at lateral angles, posterior angles obtuse; lateral angles nearly medial, evenly rounded; anterior angles not produced. Punctation less dense than frons, punctures irregular, denser and coalescing in lateral third, disc with a slight medial depression anteriorly, punctures more elongated; lateral margin with normal long setae, not extending to posterior margin which is indicated by row of punctures with short setae, but not carinate.

Scutellum. Slightly wider than long, barely convex, punctate only on sides, punctures similar to those of elytra but about 1 diameter apart.

Elytra. Surface noticeably pruinose, iridescent, with fine short setae scattered; color darker in central third along sutural margin, likewise on posterior two-thirds of lateral margin. Suture barely carinate except in declivity, not terminating in obvious spine. Punctation fairly regular, denser below humeral angles, otherwise nearly in rows, with costae barely raised, sutural one more so; punctation also denser below scutellum and sutural margin. Elytra terminating truncately; lateral margin with scattered setae, similar to those on pronotum.

Pygidium. Color dark, as in pronotum, relatively flat, punctate coarsely and forming wrinkles in central two-thirds, glabrous except terminal fringe.

Legs. Protibia tridentate, basal tooth well-developed, middle tooth somewhat closer to proximal than basal, anterior spur acuminate, barely reaching base of protarsal segment; dorsal face of protibia noticeably setate and punctate. Protarsal segments 1 through 4 subequal, fifth 1.5X longer than 4th; tarsal claws elongate, terminal tooth sharply pointed, middle tooth directed at right angle and located near middle. Mesotibia with a longitudinal carina, transverse carina not developed, but location indicated by teeth and spines on external margin; terminal spurs acuminate, inner spur two-thirds length of first tarsal segment, outer about half this length; tarsal segments 2, 3, and 4 progressively shorter, fifth 1.5X longer than 4th; claws as in protarsi. Metatibia with distinct longitudinal carina, transverse carina not developed, but location indicated by large teeth and spines on external margin; terminal spurs similar to mesotibial spurs, inner spur barely curved, longer than first tarsal segment, inner face convex, flattened; outer spur subequal in length to first tarsal segment; apical fringe of 12 spines. Metatarsal segments 2, 3, and 4, progressively shorter, fifth slightly shorter than second.

Abdomen. Venter mostly straw colored, sternites uniformly punctate, nearly glabrous except for an elongate pruinose patch at anterior and lateral margin of penultimate sternite, this patch with appressed setae, penultimate and ultimate sternites effeminate, not distinctly modified.

Genitalia, male (Fig. 255-260). Laterally parameres are of a simple type, but phallobase cap distinctly modified unlike any other known species. A hood-like projection extends over aedeagus, with 2 ovate structures below (resembling orchid pollinia in caudal view, Fig. 256). Aedeagus heavily sclerotized, asymmetrically terminating into lateral plates and fingers, but no large spines.

Female. Unknown; known from only 2 male specimens.

Specimens examined. Total 2 (all DOMINICAN REPUBLIC): In addition to the holotype, (1 paratype) Prov. Pedernales, 26 km N. Cabo Rojo, 18-06N, 71-38W, 730 m, 26-27-IX-1991, R. Davidson, C. Young, S. Thompson, J. Rawlins, wet deciduous forest, CMNH 306,658 [CMNH].

Ecology. The type locality (actually Las Abejas, not La Abeja as labeled) is known for many rare and

unusual species, and it was once a pristine cloud forest. Unfortunately it was destroyed by fire several years after the type specimen was collected. It has not been accessible by road for many years, and my attempts to collect there have failed. The single paratype was collected in "wet deciduous forest" on the same road (km 26) above the Alcoa headquarters at 730 m elevation. My collections at km 24 and km 30 have not yielded specimens. The Carnegie expeditions collected many times in this area, but found only a single specimen. There is no label indication that specimens were collected at light. Its rarity, coupled with the receptors on the antennal club, suggest that it is another of the higher altitude diurnal species. It appears to be a "South Island" sister species to *carnegie* of the Sierra de Neiba to the north.

Comparisons. Externally similar to *carnegie*, but genitalia distinct, the differences discussed under that species (compare Fig. 255-260 vs. 235-240).

Etymology. This species is named for Dr. Robert Davidson, who was one of the collectors for many of the Carnegie Museum specimens, and who graciously arranged the loan of that material. It is especially fitting that it is a close relative to *P. carnegie*, named above for his host institution.

Phyllophaga eladio Woodruff, **new species**
(Fig. 77-78, 261-269)

Holotype male. DOMINICAN REPUBLIC: Prov. La Vega, 5 km W. Manabao, Finca Eladio Fernandez, Paso de la Perra, along Rio Yaque del Norte, 15-V-2001, 3050 ft elev., R.E. Woodruff, blacklight trap [FSCA].

General Description. (Habitus, Fig. 78). Exceptionally large (L. 29, W. 15 mm). Dorsally glabrous, elytra pruinose, pronotum densely punctate, but shining, scutellum impunctate; color reddish brown, venter yellow, contrasting to darker dorsum. Body heavy, abdomen large and convex.

Head. Surface glabrous, shiny. Clypeus emarginate, anterior angles rounded, abruptly angled posteriorly to frontal suture (creating a lobed appearance); margin reflexed, more so at anterior angles; densely, coarsely punctate, punctures smaller medially, rarely separated by a diameter; clypeus shorter than frons. Frontal suture deeply impressed, not emarginate, smoothly, gently curved to eye junction. Frons punctate as clypeus, some punctures forming longitu-

dinal wrinkles; posterior band with scattered punctures, posterior area of head with band of smaller punctures, denser at sides near eye. Eye canthus prominent, with 7 reddish setae. **Antenna** 9-segmented, club 3-segmented, orange; antennomeres 3 and 4 elongate, subequal, 5 wider than long, projecting anteriorly, 6 reduced, wider than long; clubovate, outside lamella shorter than inside, receptors not obvious; antenna exceptionally small for such a huge species.

Pronotum. Widest at posterior angles. Surface glabrous, shiny, coarsely punctate, usually more than a diameter apart medially, but coalescing and denser on sides and anterior angles; vestige of a median impunctate longitudinal line. Anterior margin raised, posteriorly with a depressed groove; pronotum narrow in front, broadest behind; lateral margin raised, posterior margin with a row of chevron-shaped punctures except medially; lateral pronotal angles smoothly rounded, slightly anterior of median, anterior angles acutely produced, posterior angle sharply quadrate; lateral margin with short setae, slightly crenulate at setal origin, more so behind median.

Scutellum. Wider than long; surface shiny, glabrous, impunctate, with a slight median longitudinal impression, barely convex.

Elytra. Widest in posterior fourth; uniformly pruinose, except humeral tumosity, surface shallowly, fairly uniformly punctate, with costae slightly raised, including sutural ones; some punctures with tiny microsetae, especially near lateral margin; lateral margin slightly reflexed along entire length. Suture barely impressed for most of length, more carinate in posterior fourth and terminating in a sharp spine; elytral apices nearly truncate, with a slight curve from apical spine.

Pygidium. Surface uniformly punctate, each puncture with a fine straight golden seta, finely alutaceous, but appearing somewhat shiny, color yellowish as remainder of abdomen.

Legs. Protibia tridentate, teeth sharp, basal tooth well-developed, terminal spur acuminate, sharply pointed, extending well beyond base of first tarsal segment; protarsal segments 1-4 subequal, fifth 1.5X longer; interior of each segment terminating in a short spine-like projection; protarsal claws (Fig. 267) C-shaped, teeth very sharp pointed, middle tooth located medially, tip curved slightly posteriorly, reach-

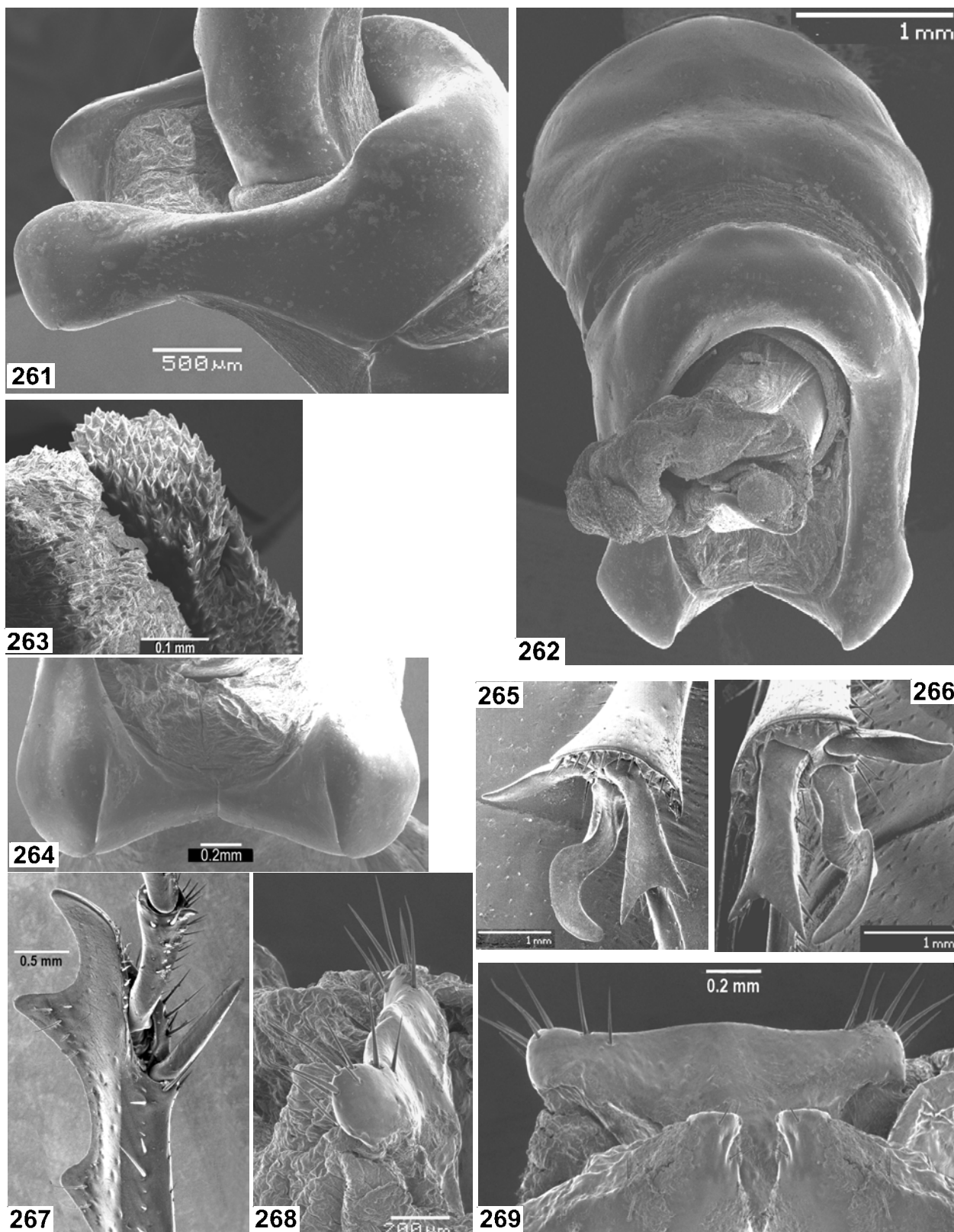


Fig. 261-269. *Phyllophaga eladio* Woodruff. 261-264 Male genitalia: 261) lateral; 262) dorso/caudal; 263) aedeagal tip spines; 264) paramere tips (caudo/ventral); 265-266: Male metatibial apex: 265) right; 266) left; 267) protibia, right, ventral; 268-269: Female genitalia: 268) lateral; 269) ventral.

ing beyond tip of terminal tooth, forming a large U-shaped notch with base. Mesotibia without complete longitudinal carina (vestiges present), transverse carina indicated by teeth in diagonal pattern, but not complete; terminal spurs elongate, narrow, acuminate; inner spur two-thirds length of first tarsal segment; outer spur less than half its length. First mesotarsal segment enlarged, terminal spines obvious, internally and externally; segments 2-4 gradually shorter, fifth 1.5X longer than 4; claws as in protarsi. Metatibia similar to mesotibia, inner terminus of incomplete transverse carina marked by an exceptionally large tooth with 3 setae; tibial apex expanded, outer angles sharp, spine-like; apical fringe with 12 spines; inner spur drastically curved, S-like (Fig. 265-266), longer than first tarsal segment; outer spur narrow, slightly curved, convex, regular. First metatarsal segment sharply spined inside and out, terminus expanded, segments 3 - 5 subequal, fifth slightly longer; tarsal claws as on other legs.

Abdomen. Venter light straw-colored, robust, convex, shiny, setae arising from shallow punctures; second sternite with setae appressed, other sternites with scattered setae; penultimate sternite depressed medially with scattered setae and a group of microtubercles, otherwise little modified.

Genitalia, male (Fig. 261-264). Of simple type near *hogardi*, the parameres appearing fused medially at inner apex. Labia with strong carina or ridge medially. Phallobase dorsally rounded, not notched. Aedeagus a sclerotized tube, ending in spongy, spinose tip (Fig. 263).

Allotype female. DOMINICAN REPUBLIC: same data as holotype, except 23-IV-2000, R.E. Woodruff, T.J. Henry [FSCA]. Similar to male except bulkier (L. 30, W. 15 mm), elytra slightly inflated posteriorly; pronotum broader, more densely punctate, median impunctate line more noticeable. Metatibial apical fringe with 17 spines (12 in male, widely spaced), terminal spurs broad, spatulate-shaped, inner face flat to concave, inner curved, outer nearly straight. Elytral margin nearly as male (not smooth as in *marcano* females), but pruinosity less developed and elytra smoother at apical tumosity.

Genitalia, female (Fig. 268-269). Inferior plates not fused, easily displaced, apex with slight inward direction, with a few fine setae. Superior plate (Fig. 268) large, fused medially, the outline ventrally slightly wavy, barely longer medially, mildly projecting at

lateral tips, with 7 large stiff spines; *marcano* has these tips projecting forward, with the line between recessed, nearly straight (Fig. 478).

Specimens examined. Total 18, including holotype and allotype (all DOMINICAN REPUBLIC): 16 paratypes as follows: (1) same data as holotype; (3) same as allotype; (2) same as holotype, except 19-23-IV-2000, R.E. Woodruff, T.J. Henry; (9) Prov. La Vega, La Cienega de Manabao [Parque Nacional Armando Bermudez], 20-21-IV-2000, 3000 ft, R.E. Woodruff, T.J. Henry [FSCA, MHND, CMNH, INHS, USNM]; (1) Prov. Monseñor Nouel, Rio Blanco Viviero Forestal [Nature Conservancy and Fundación Moscoso Puello], 11-13-V-2001, 613 m, 18-52-40N, 70-30W, R.E. Woodruff, C. and F. Nuñez, blacklight trap [FSCA].

Comparisons. This huge species is similar in external habitus and genitalia to *marcano*. They may be immediately separated by the impunctate scutellum of *eladio*, coarsely punctate in *marcano* (Fig. 474). The male metatibial inner spur in *eladio* is drastically twisted into an S-shape (Fig. 265-266), whereas it is more C-shaped in *marcano* (Fig. 475). Male genitalia are similar, but in *eladio* the ventral, internal gap of labia (caudal view) are a smooth inverted crescent curve (Fig. 264), whereas it is a more inverted V-shape (Fig. 464) in *marcano*. Female genitalia are compared above.

Ecology. All specimens were collected at blacklight at relatively high altitudes (613 m to 3050 ft), in April and May. Many appeared freshly emerged, indicating that the species may be more common later in the season. No information is available on adult host plants. The type locality is in a disturbed setting along the Rio Yaque del Norte, which was flooded during a recent hurricane (Andrew). The area is under consideration for a major hydroelectric plant. The locality at the headquarters of the Parque Nacional Armando Bermudez is also along the Rio Yaque del Norte, several kilometers upstream from the type locality. It is also somewhat modified by activities of the park; especially the guides and mule trains going to Pico Duarte, a popular tourist activity. Perhaps the host trees are associated with large river floodplains.

Etymology. It is my pleasure to name this species for bird photographer and naturalist, Eladio Fernandez, the owner of the finca at the type locality, and who graciously provided accommodations for us on several occasions. Although we have never met, his continued

support for our studies is greatly appreciated. We are also grateful for assistance provided by his staff, Felipe and Ramona, and to Francisco Nuñez who assisted with this contact and for many other favors. Latinizing the name would sound peculiar in Spanish, so it is treated as a noun in apposition.

Phyllophaga espina Sanderson
(Fig. 79, 270-274)

Phyllophaga espina Sanderson (1951: 264-5; Fig. 22-3)

Little can be added to the original description, based on 2 specimens from DOMINICAN REPUBLIC: [Prov. Santiago or La Vega?] "foothills Cordillera Central south of Santiago, June 1938, [P.J.] Darlington" [MCZC]. I have examined the holotype and single paratype (from which the genitalia figures here were made). The female remains unknown, and no additional specimens have been seen.

It is medium sized (L. 15-16, W. 7.5 mm) and resembles *mella* (Fig. 94) superficially, but the long elytral hairs and spinose first metatarsal segment, and genitalia will easily distinguish it. The unique male genitalia (Fig. 270-274), with 2 elongate, flexible projections at the aedeagal tip and the gill-like structures at their base, are unique features, obscuring relationships to any other known Hispaniolan *Phyllophaga*.

Phyllophaga esquinda Sanderson
(Fig. 80, 275-287)

Phyllophaga esquinda Sanderson (1951: 268; Fig. 28,29).

This medium sized species (L. 9.5, W. 4.5 mm) was described from a unique male from HAITI: La Visite and vicinity, La Selle Range, 5000-7000 ft, 16-23-IX-1934, [P.J.] Darlington [MCZC].

Female allotype (here designated). HAITI: Department Sud-Oueste, Parc Nat'l La Visite, Morne de Fe Noire, 17-V-1984, M.C. Thomas [FSCA].

Generally similar to male, except pronotum more convex, shiny, glabrous. Antennal club very small, oval, unlike enlarged lamellae of male (Fig. 283). Metatibial apical spurs exceptionally widened, spatulate-shaped and rounded (Fig. 281); terminal fringe of 14 spines. Pygidium more elongate than male. Genitalia distinct (Fig. 284-286) [lost during SEM preparation,

after illustrations were made]. The only female specimen seen.

Specimens examined. Total 7 (all from HAITI). In addition to the holotype and allotype, I have seen 5 additional males from the same locality (topotypes), except Morne La Visite, 12-V-1984, M.C. Thomas, 2100M. These specimens were collected during studies conducted by the Florida Museum of Natural History under contract with USAID (for additional details see: Sergile, et al., 1992; Woods and Ottenwalder, 1992; Woods, et al., 1992).

Comparisons. The large eyes, deeply concave clypeus, with highly reflexed margin (Fig. 80); exceptionally long antennal club (Fig. 283) equal to all previous 6 antennomeres combined, with obvious receptors on lamellae; short, round, curved inner metatibial spurs in both sexes (Fig. 281-282); wrinkled dorsal elytral surface (Fig. 80), all serve to identify this species. The genitalia are simple, but distinct (Fig. 275-279, 284-286).

Phyllophaga fossoria Sanderson
(Fig. 81, 288-310)

Phyllophaga fossoria Sanderson (1951: 258-259; Fig. 5,6).

Sanderson saw only 3 male specimens (all DOMINICAN REPUBLIC, collected by P.J. Darlington): holotype from "Constanza to Valle Nuevo, 3000-7000 ft, August, 1938 [MCZC, examined]. The paratypes were from Loma Rucillo and mountains north, 5000-8000 ft, June 1938, and vicinity of Valle Nuevo, 6000 ft, cloud forest, August, 1938. [L. 12.5-14, W. 5.5-6 mm].

Allotype female (here designated). (Genitalia Fig. 299-304). DOMINICAN REPUBLIC: Prov. La Vega/ Monseñor Nouel, 6 mi NW (9.2 km) of Rt. 1, on Rd. to Constanza, El Chorro [19°01'59.2"N, 070°29'40.5"W], 27-VI-1998, R.E. Woodruff, R.M. Baranowski, black-light trap, 1034m elev. [FSCA].

Similar to male, except broader behind and bulkier. Antennal club much shorter, subequal to 4 preceding antennomeres. Clypeal margin less reflexed. Posterior tibial spurs wider, more curved. First metatarsal segment reduced. Metatibial apical fringe of 24 spines (10-18 in males). Elytra wider in posterior third, not subparallel as in male. Protibia with lower spur poorly developed. Tarsal claws all distinctly cleft (Fig. 35). Female genitalia with superior plates joined

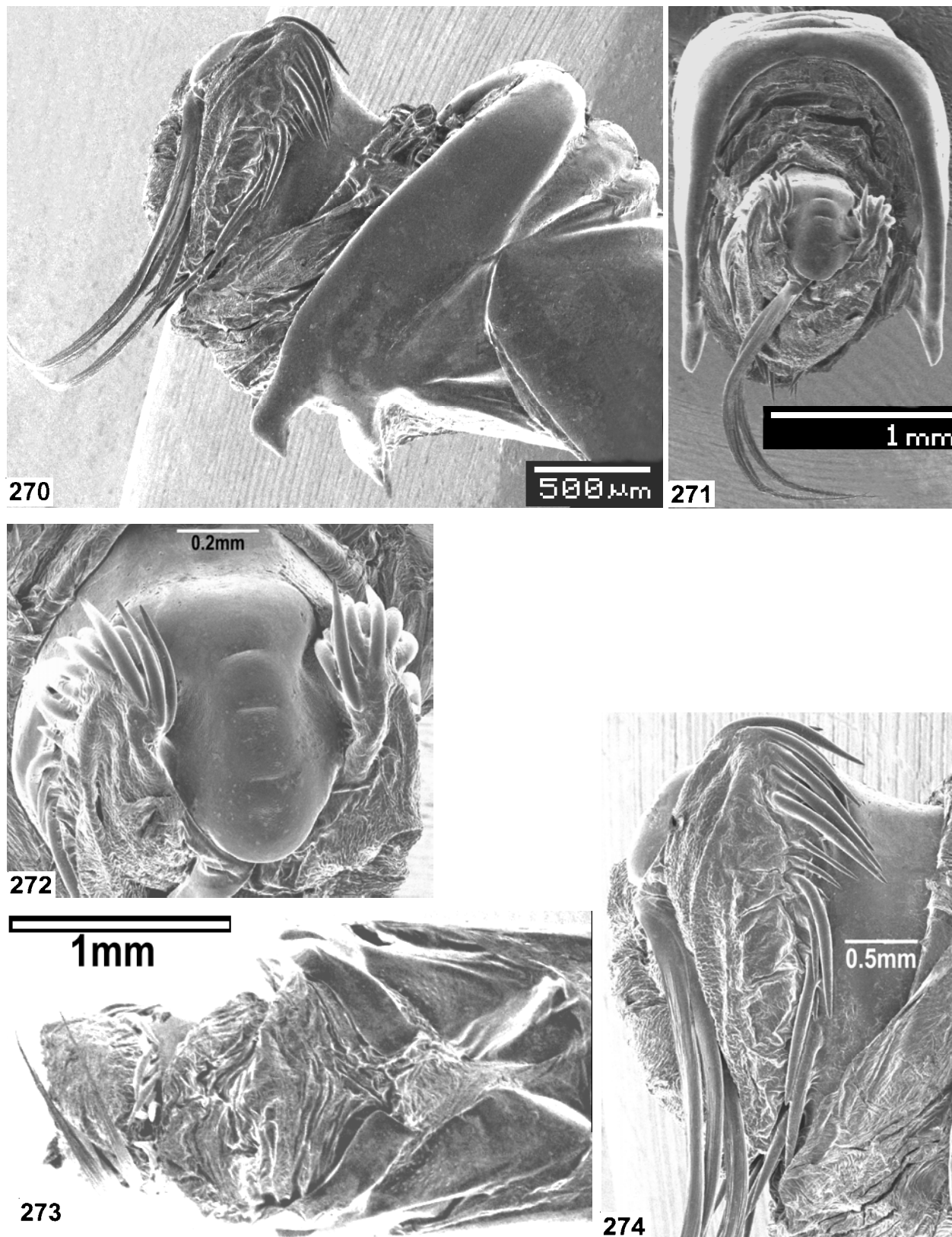


Fig. 270-274. *Phyllophaga espina* Sanderson. Male genitalia: 270) lateral; 271) caudal; 272) aedeagal tip at base of terminal spines, caudal; 273) ventral; 274) aedeagal tip, lateral.

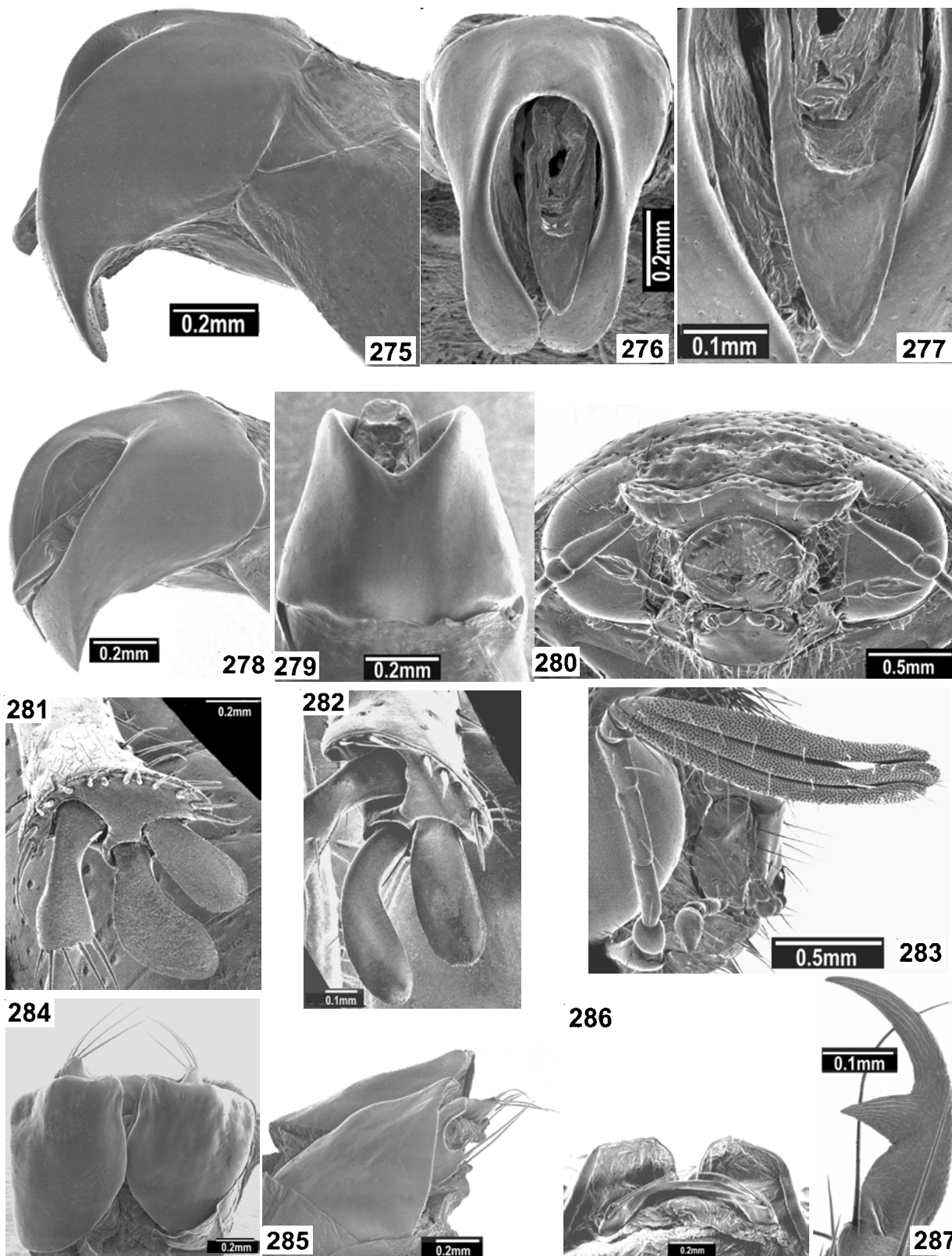


Fig. 275-287. *Phyllophaga esquinada* Sanderson. 275-279 Male genitalia: 275) lateral; 276) caudal; 277) aedeagal tip; 278) caudo/dorsal; 279) dorsal; 280) head, frontal, male; 281-282 metatibial spurs: 281) female; 282) male; 283) antenna, male; 284-286: female genitalia: 284) ventral; 285) lateral; 286) caudo/dorsal; 287) protarsal claw, male.

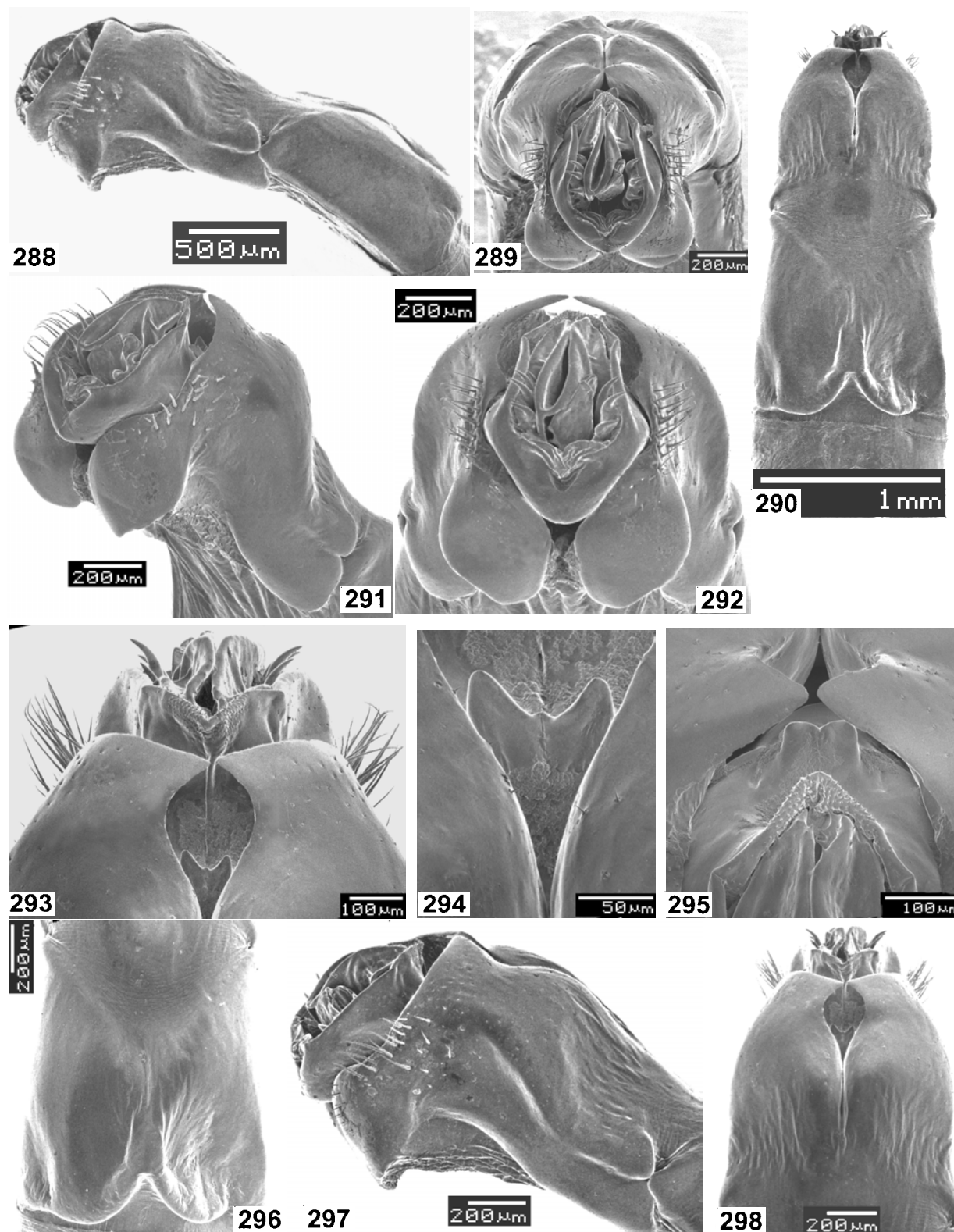


Fig. 288-298. *Phyllophaga fossoria* Sanderson. Male genitalia: 288) lateral; 289) caudal; 290) dorsal [291) caudo/lateral; 292) caudo/ventral; 293) phallobase and aedeagal tip (dorsal); 294) plate at base of phallobase division (dorsal); 295) aedeagal tip; 296) protuberances on tectum, dorsal; 297) phallobase, lateral; 298) phallobase, dorsal. Note setae projecting forward on sides of parameres.

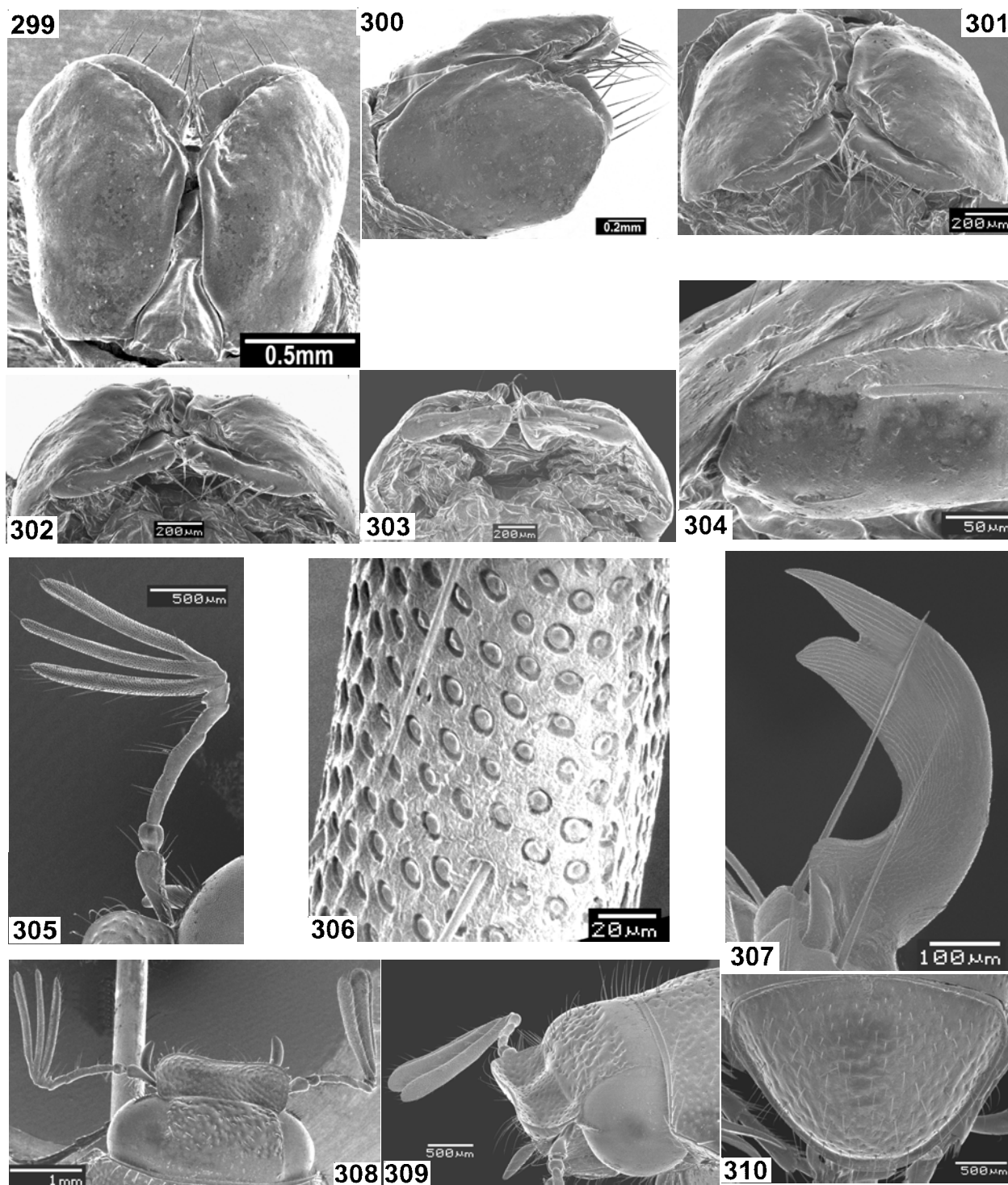


Fig. 299-310. *Phyllophaga fossoria* Sanderson. 299-304 Female genitalia: 299) ventral; 300) lateral; 301) caudo/ventral; 302) caudal; 303) ventral; 304) enlarged junction of superior plate and inferior plates [Note triangular plate dividing inferior plates, and attachment of superior plates]; 305-310 Male: 305) antenna; 306) sensory receptors on lamella; 307) tarsal claw; 308) head and clypeus, dorsal; 309) head and clypeus diagonal/lateral; 310) pygidium.

or fused laterally to inferior plates (Fig. 299-304); similar only to *androw* Woodruff.

Comparisons. Extremely similar to its “sister species”, *androw*, but that species is exceptionally hairy (Fig. 161, 163), has a complete transverse carina on both meso- and metatibiae, whereas *fossoria* has few hairs on pronotum and transverse carina incomplete. Male genitalia are extremely similar, with forward projecting setae on outside of the parameres (see discussion under *androw*; compare Fig. 149-157, 288-298). They occupy separate mountain ranges, *fossoria* in the Cordillera Central and *androw* in the Sierra de Neiba. Sanderson compared it with *aliada* (female only known then) because both had cleft tarsal claws. Several other species have now been discovered with such claws (see key). The dorsal surface of *aliada* is pruinose and matte, whereas *fossoria* is shiny. The genitalia of all the species with cleft tarsal claws are distinct from others in the genus. It is also related to and near the new species following (to be described elsewhere, see text and genitalia Fig. 311-322).

Specimens examined. Total 90. In addition to the holotype and allotype above, I have seen the following (all DOMINICAN REPUBLIC): **Prov. La Vega:** (3) Cazabita [Casabita], Cordill. Centr., 20-VI-1974, 1250m, J. and S. Klapperich [NHMB]; (1) same, except 15-VIII-1972; (39) Loma Casabito, 15.8km NW Bonao, 19-02-12N, 70-31-08W, 28-V-2003, 1455 m, Rawlins, Young, Davidson, Nuñez, Acevedo, evergreen cloud forest, UV light [CMNH]; (19) same, except 15.4km NW Bonao, 19-02-00N, 70-30-58W, 1385m [CMNH]; (1) same, except 19-03N, 70-13W, 3-IX-2002, 1390m, W.A. Zanol, C. Young, C. Staresinic, J. Rawlins, wet cloud forest [CMNH]; (1) Valle Nuevo, 16-VIII-1972, 2400 m, J. and S. Klapperich [NHMB]. **Prov. Monseñor Nouel:** (6) 1 km E. Paso Alto de Casabito, 7 km NW La Ceiba, 28-VI-1992, 1130m, Davidson, Rawlins, Thompson, Young, cloud forest [CMNH]; (5) 8 km NW La Ceiba, 19-02N, 70-29W, 28-VI-1992, 1280 m, Davidson, Rawlins, Thompson, Young, cloud forest [CMNH]; (1) 9.2 km W. Rt. 1 on Rd. to Constanza, El Chorro [19-01-59.3N, 70-29-40.5W, 1034 m], 28-VI-1999, R.E. Woodruff, R.M. Baranowski, blacklight trap [FSCA].

There are 2 specimens labeled Santo Domingo, 14-VII-1974, J. and S. Klapperich, 30m [NHMB]; because this appears to be a high altitude species (above 1000 m), these records are likely labeling errors.

n.sp., near *fossoria* Sanderson
(Fig. 104, 311-322)

I had given this species a manuscript name, and included in the first draft of this manuscript. However, a request was made by a Dominican graduate student at Montana State University to reserve it for description in her Master's thesis. I have agreed to defer it for that purpose. It is included without name here, solely for recognition purposes, and so that it can be distinguished from others in the *fossoria* group. It is medium sized (L. 10-13 mm), has cleft claws (Fig. 318), quadrate clypeus (Fig. 319) deeply emarginate, exceptionally long antennal club (Fig. 320-32), with noticeable receptors (Fig. 322), and mesotibial transverse carina complete (Fig. 317). It has the external lateral hairs of the parameres exceptionally numerous and long (Fig. 311-313), and the unusual “bumps” on the dorsum of the tectum (Fig. 314-315), also present on *fossoria*.

Specimens examined. Total 9. DOMINICAN REPUBLIC: Prov. La Vega, La Cienega de Manabao, Pk. Hdq. [Parque Nacional Armando Bermudez], (8) on 3-5-VII-1999, (1) on 11-V-2001, R.E. Woodruff, blacklight trap, 3000 ft [FSCA].

Phyllophaga garrota Sanderson
(Fig. 82, 323-332)

Phyllophaga garrota Sanderson (1951: 262-263; Fig. 16-17)

This unusual species was described from the single male holotype: DOMINICAN REPUBLIC: “Loma Rucilla and mountains north, 5000-8000 ft, June, 1938, [P.J.] Darlington” [MCZC, examined]. It is the only known Hispaniolan species with 4 complete lamellae in the antennal club (Fig. 330). The female remains unknown. Along with *costura* and *probaporra* it forms a group, all of which have an enlarged sixth lamella (Fig. 7-9), obvious receptors on the large antennae (Fig. 331), and the clypeus more quadrate, nearly flat with frontal suture raised (Fig. 253-254) or barely impressed (Fig. 329). All occur at high altitudes, are known only from males, and at least *garrota* is sometimes diurnal. Because no females have been seen (even in the large series of males from La Nevera), coupled with the enlarged male antennae, with obvious receptors, and partial extra or full lamella, I believe the female may be flightless. Diurnal flight activity would seem a natural adaptation to low night temperatures at high altitude; the extra sensory pits (Fig. 331) may assist in locating the

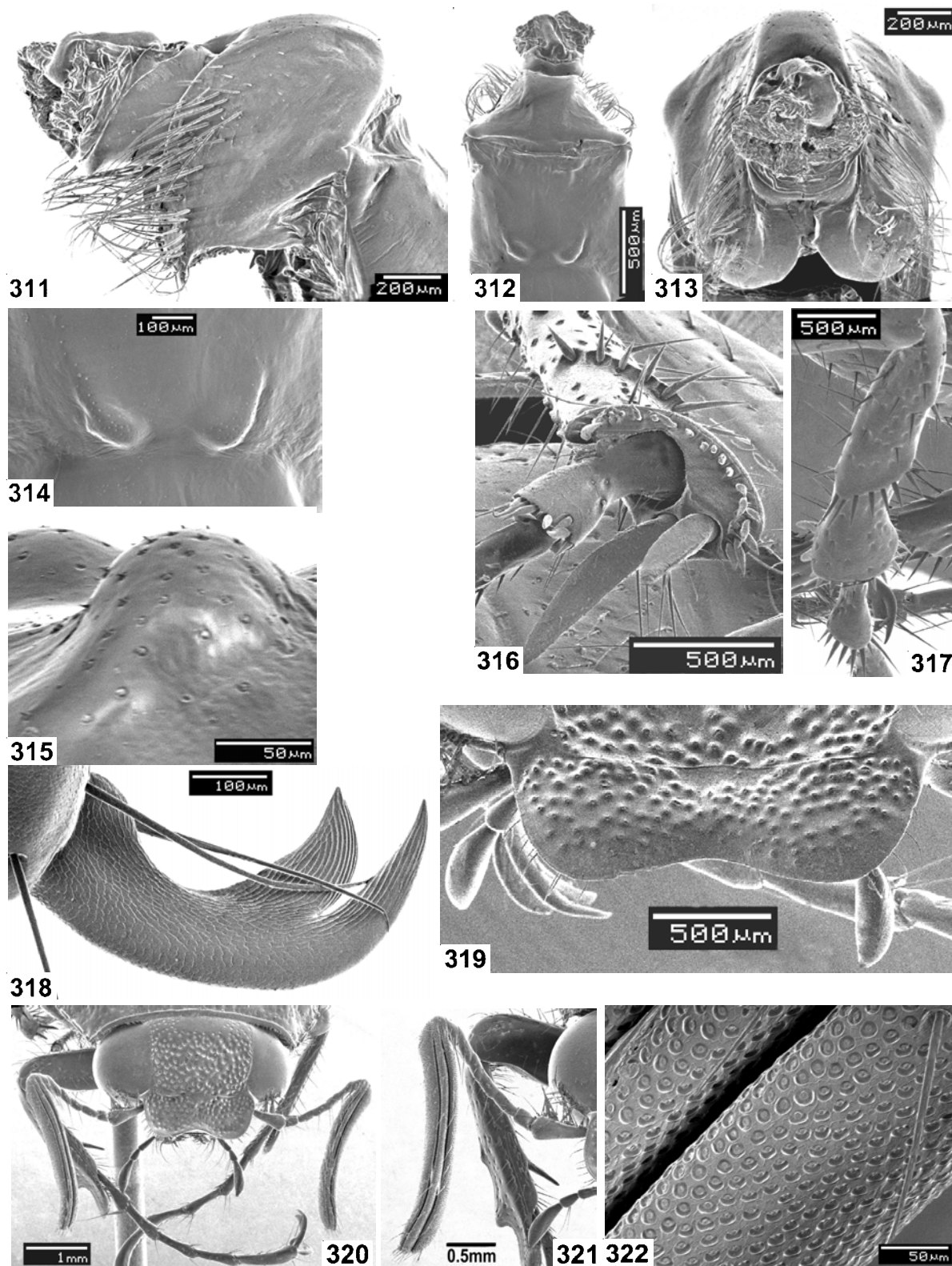


Fig. 311-322. *Phyllophaga* n. sp., near *fossoria* (see text for explanation). Male. 311-315 Genitalia: 311) lateral; 312) dorsal; 313) caudal; 314) dorsal protuberances of tectum; 315) enlargement of same; 316) metatibial apex; 317) mesotibia, ventral; 318) metatarsal claw, lateral; 319) clypeus, dorsal; 320) head, antennae, and legs, frontal; 321) antenna; 322) sensors of antennal club lamellae.

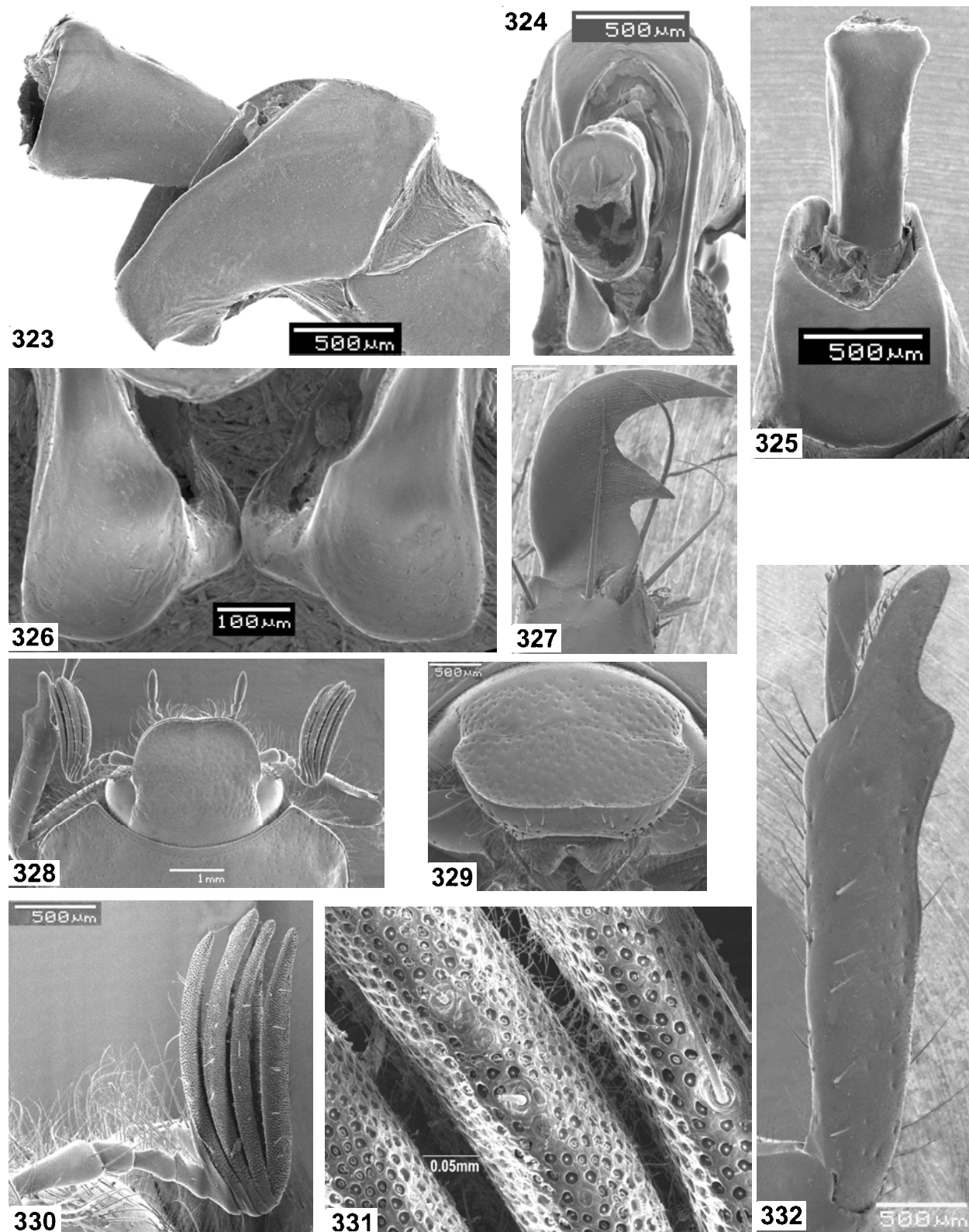


Fig. 323-332. *Phyllophaga garrota* Sanderson. 323-326 Male genitalia: 323) lateral; 324) caudal; 325) dorsal; 326) paramere tips; 327-332: Male: 327) protarsal claw; 328) head and clypeus, dorsal; 329) same, frontal; 330) antenna (note 4 segmented club); 331) enlarged sensory pits on antennal lamellae; 332) protibia, ventral.

female. In species occurring at lower altitudes and normal female flight, such sensory pits are rare, and the sexes congregate on and are attracted to host plants to feed at night.

Specimens examined. Total 33. All DOMINICAN REPUBLIC: **Prov. La Vega:** (6) Valle Nuevo, La Nevera, 4-IV-1965, E.J. Marcano # 1079-1081 [FSCA]; (5) same, except 12-IV-1969, Marcano # 5118-5122 [FSCA]; (8) Valle Nuevo, La Pirámide, 24-III-1985, E.J. Marcano, "capturado en día en vuelo 12-3p.m." [FSCA]; (6) Cordillera Central, Reserva Valle Nuevo, La Nevera, 15.1 km SE Valle Nuevo, 18-41-47N, 70-35-30W, 3-VI-2003, 2252 m, Davidson, Young, Nuñez, Rawlins, Acevedo, De la Cruz, montane meadow in cloud forest, pine, malaise trap (1), UV light (4), hand catch (1) [CMNH]; (14) same, except 15.3 km SE Valle Nuevo, 18-41-39N, 70-35-28W, 25-V-2003, 2244 m, wet montane forest with pine, UV light [CMNH, FSCA].

Taxonomic notes. All specimens were from a very small area around La Nevera (above 6000 ft). Specimens from the latter 2 series are much larger and more similar to the holotype (L. 17-22, W. 9-10mm) than those collected by Marcano (L. 14-17, W. 7-8mm) from the same area almost 40 years earlier. I have examined them closely, but can find no differences in the genitalia or in external characters, except all structures are enlarged. Obviously larval food and favorable climatic conditions may influence size of adults.

Other characters, not mentioned by Sanderson, are listed here: The pronotum in all my specimens is dull and obviously but not strongly pruinose, the head and elytra are contrastingly shiny and without pruinosity. The anterior tibiae (Fig. 332) have the lower tooth quite reduced, compared with other species (e.g., Fig. 267). The metatibial spurs are straight, acuminate, but with flattened to slightly concave inner surfaces. The fifth antennomere is flattened, extended forward, and compressed to the sixth, resembling a partial fifth lamella. All tarsal claws (Fig. 327) have middle tooth short, nearer base than apex, and there is no obvious notch between it and the base. The transverse carina is usually well developed in both meso- and metatibia, although sometimes not well marked in the metatibia.

Although easily separated from all other Hispaniolan species by the 4-segmented antennal club, it is most similar to *costura*. That species has a partial fourth lamella, the frontal suture is raised, and the genitalia are distinct. Compare genitalia of 3 species

in the group (Fig. in parentheses): *costura* (248-250); *garrota* (323-326); *probaporra* (603-606).

Phyllophaga haitiensis Woodruff, **new species**
(Fig. 83, 333-352)

Holotype male. HAITI: Department du Sud, Ville Formon, 31 km NW les Cayes, S. Slope Morne Formon, Massif de La Hotte, 18-20N, 74-01W, 1405 m, 7-8-IX-1995, R. Davidson, G. Onore, J. Rawlins, disturbed forest and fields, CMNH 305,937 [CMNH].

General Description (Habitus, Fig. 83). Large (L. 24, W. 11.5 mm). Color reddish brown, pruinose, iridescent (similar to *malí*). Surface appearing smooth, punctures not obvious. Elytra nearly parallel sided, gently rounded apically and suture not terminating in a spine.

Head (Fig. 343). Clypeus deeply emarginate, somewhat lobed, anterior margin rounded but constricted diagonally to posterior angle at frontal suture, margin reflexed, more so medially. Surface glabrous, pruinose, and lightly, shallowly punctate, punctures irregularly spaced but most 1 to 2 diameters apart. Frontal suture impressed, barely emarginate medially, slightly curved to lateral margin. Frons punctate as head, except finer and denser line above, pruinose as clypeus, posterior band impunctate, except lateral area of head. Eye canthus prominent with 6 long setae. **Antenna** (Fig. 341-342) effeminate, 9-segmented, club 3-segmented, club ovate, sensors not obvious, club subequal to preceding 4 antennomeres, 3 longer than 4, fifth longer than wide, obtusely projected anteriorly, sixth smaller and wider than long.

Pronotum. Wider than long, lateral margin crenulate at origin of long reddish-yellow setae; slightly wider at lateral angles but nearly evenly rounded to rounded posterior angles; anterior angles obtuse, not produced; anterior margin slightly raised impunctate, with a row of very fine punctures behind it. Surface pruinose, reddish, darker in central two thirds, finely punctate, punctures always separated by 2 diameters. Posterior margin barely indicated, except at lateral thirds, not reflexed, barely carinate.

Scutellum (Fig. 340). Slightly wider than long, barely convex, somewhat flattened with translucent edge, punctures shallow, irregular on sides, pruinose as pronotum,