

## A Taxonomic Study of the Genus *Algarobius* (Coleoptera: Bruchidae)

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**ABSTRACT.** — Descriptions, habitus and genitalic illustrations, host lists, and geographical distribution are included for the six known species, four of them new, in the genus *Algarobius*. Included are *Algarobius prosopis* (LeConte), from southwestern United States and northwestern Mexico; *A. bottimeri* Kingsolver from Texas, Oklahoma, New Mexico, and northeastern Mexico; *A. johnsoni*, new species, and *A. atratus*, new species, from central Mexico, *A. nicoya*, new species, from Sonora, Mexico, along Pacific coast to Costa Rica; and *A. riachama*, new species from Colombia and Venezuela. *Algarobius* spp. apparently obligatorily breed in seeds of *Prosopis* spp.

A conspicuous plant in the more xeric portions of our Southwestern United States and extending into South America is the mesquite (*Prosopis* spp.) which has for centuries provided man with a valuable source of food, firewood, medicine, honey, gums, and building materials (Forbes, 1895; Felger, 1977). Although the foliage is of some value as forage for grazing animals, the pods are a more valuable source of protein for both man and animal. Great quantities of pods are gathered by various tribes of Indians who use them to make flour and fermented drinks. The wood makes excellent charcoal; roots, trunks, and branches are sought for firewood. Standley (1922) and Felger (1977) and Fisher (1977) list other uses of the plant.

On the other hand, mesquite is considered an undesirable plant from a range management point of view, because it spreads quickly, is difficult to eradicate because it sprouts readily, and uses water that would otherwise contribute to growth of grasses and other plants more palatable to livestock (Glendening and Paulsen, 1955).

Bruchids in the genus *Algarobius* are among the most common beetles associated with mesquite on the North American continent. By their internal seed feeding, they can destroy a large percentage of the seed crop produced by any one tree, often sharing it with bruchids in other genera. Despite these depredations, the propagation and spread of mesquite does not seem to be slowed by the loss of seed potential due to activities of native bruchids. The invasion by mesquite of large areas of range in Texas has prompted a concerted effort by ecologists and

range management specialists to develop biological methods of control, since mechanical methods such as cutting and burning have essentially failed (Fisher, 1977).

The present study was initiated partly to provide workers in the field with a means of accurately identifying bruchids, but it is also one of a series of studies of Western Hemisphere bruchids affecting *Prosopis*.

#### TAXONOMY

Bridwell (1946) proposed *Algarobius* for LeConte's *Bruchus prosopis*, and in a footnote listed in synonymy *Bruchus desertorum* LeConte and *B. uniformis* LeConte following Fall (1910). Fall had correctly concluded that LeConte's three specific names applied to one variable species and had selected *prosopis* as the most appropriate name, although *uniformis* appeared first in LeConte's paper (1858). No other species names were described in or transferred to *Algarobius* until *A. bottimeri* was described from Texas by Kingsolver in 1972. Four additional species are described in this paper from Mexico, Central America, Colombia, and Venezuela.

The original description of *Algarobius* was distributed piecemeal in at least two-thirds of Bridwell's key to bruchid genera (1946). Most of the characters used were negative, in that they were contrasted with characters of another genus. Others were simply higher category characters. The following description incorporates the pertinent features Bridwell listed for the genus, with additional characters discovered during this study.

#### *Algarobius* Bridwell, 1946

Bruchidae with characteristics of the Bruchinae and Acanthoscelidini. Small to medium sized beetles (2.2-5.0 mm). Body elongate-ovate (2× as long as wide), subfusiform, strongly convex above (Fig. 1). Head turbiniform, frontal carina barely indicated as an impunctate line; eyes laterally protuberant, ocular sinus one-half length of eye, postocular fringe narrow; antenna subserrate from fifth segment, terminal segment subovate (Fig. 32), antenna reaching middle of metepimeron in both sexes, not sexually dimorphic. Pronotum campaniform, strongly convex above, lateral carina obsolete, represented only by a faint ridge, cervical sulcus short, nearly concealed by vestiture, cervical boss with two slender bristles; prosternum short, triangular, with apex not separating apices of procoxae. Scutellum 2× as long as wide, bidentate apically (Figs. 1 & 33). Elytra convex, each elytron 2× as long as wide, striae regular in course, striae 2, 3, 4, 5, and sometimes 6 each with small basal denticle, apices of striae usually free, intervals 2, 4, 6, and 8 wider than alternate intervals. Abdomen with basisternum equal to the next three combined, terminal sternum in male strongly emarginate caudally to receive reflexed apex of pygidium, in female only slightly

emarginate; pygidium oblique basally in male (Fig. 19), strongly convex and reflexed apically, some species with perceptible median longitudinal sulcus; female pygidium oblique in basal one-half (Fig. 6), vertical in apical one-half, apex with two short, polished sulci (Figs. 10, 15, 23, 27, 31). Metafemur moderately incrassate, caudoventral margin with threadlike carina bearing several minute denticles in basal three-fourths, lamellar subapical denticle followed by two smaller distal denticles (Fig. 34); metatibia with lateral, ventral and dorsomedial carina distinct and complete, lateroventral carina variable in development; mucro slender, acute (Fig. 34). Male genitalia with bicrescentic clerite always present in basal one-half of sac (Figs. 35, 36, 38, 40, 42, 44).

Type-species. — *Bruchus prosopis* LeConte by original designation.

*Algarobius* appears to be most closely related to the South American genus *Scutobruchus* Kingsolver, also a *Prosopis* feeder (Kingsolver, 1983). In dorsal aspect, representatives of the two genera are very similar in color, body shape, and elongated scutellum. Male genitalia, however, are strikingly different (cf. *ibid.*, Fig 6 and Fig. 35 in this paper). In *Algarobius*, the ventral valve is typically acanthoscelidine (short, subtriangular), whereas, in *Scutobruchus*, the valve is lacking and in its place is a vertical, ventral keel. The bicrescentic sclerite in the internal sac armature is unique in the Bruchidae. *Scutobruchus* males are marked with a deep sensory pit on the first abdominal segment, whereas, *Algarobius* males lack this structure; *Scutobruchus* females lack the pygidial sulci found in *Algarobius* females.

*Algarobius* and *Scutobruchus* appear to be related to certain segments of the large, composite genus *Acanthoscelides* but appear to be only remotely related to other genera in the Acanthoscelidini.

Available host plant data indicate an exclusive feeding association of larvae of species of *Algarobius* with species of *Prosopis*. Reliable host data are scarce for the species south of the Rio Grande, probably because voucher specimens are seldom taken with the beetles, and species of *Prosopis* are difficult to identify even for the trained botanist. *Algarobius* adults may feed on pollen of any species of plants in the area but not necessarily on *Prosopis*.

*Algarobius* can be divided into three groups based on characters of the male genitalia and on the position of the sulci on the female pygidium.

**Bottimeri Group.** Pygidial sulci on the face of the pygidium, not on the vertical apex (Fig. 15); male genitalia (Figs. 40, 42, 44) with ventral valve not keeled, apical orifice without dorsal hood, membrane above ventral valve with cluster of short spines, lateral frame of apical orifice thickened, internal sac at orifice with a pair of sclerotized plates (*bottimeri*; *nicoya*, new species; and *riochama*, new species).

**Prosopis Group.** Pygidial sulci on vertical face of pygidium adjacent to apical margin (Figs. 9 & 10); male genitalia (Figs. 35 & 36) with ventral valve keeled, apical orifice with rounded dorsal hood and with-

out cluster of spines or paired sclerotized plates, lateral frame around apical orifice not prominently thickened (*prosopis*; *johnsoni*, new species).

**Atratus Group.** Pygidial sulci on vertical face of pygidium but broader and more prominent than those in *Prosopis* Group (Fig. 23); male genitalia (Fig. 38) with ventral valve not keeled, apical orifice with rounded or somewhat angulate dorsal hood, small cluster of minute spines above ventral valve, lateral frame not prominently thickened (*atratus*, new species).

The *Prosopis* and *Bottimeri* Groups are well defined. The *Atratus* Group exhibits characters of both groups but appears to be more closely related to the *Prosopis* Group.

#### KEY TO THE SPECIES OF *ALGAROBIVUS*

1. With pair of polished sulci on pygidium (females) ..... **2**  
 — Without sulci on pygidium (males) ..... **6**
2. With pygidium slightly convex, sulci centered  $\frac{1}{3}$  from apex (Fig. 15) (*Bottimeri* Group) ..... **3**  
 — With pygidium strongly convex in apical  $\frac{1}{2}$ , sulci centered  $\frac{1}{4}$  from apex extending nearly confluent with apical margin (Figs. 9 & 23), *Prosopis* and *Atratus* Groups ..... **4**
3. Distribution: Sonora, Mexico to Costa Rica along Pacific Coast (Map 1) ..... *nicoya*  
 — Distribution: Texas, Oklahoma, New Mexico, northeastern corner Mexico (Map 1), Hawaiian Is. .... *bottimeri*
4. Pygidial sulcus broad (Fig. 23), elongated prescutellar spot yellowish, prominent (Fig. 20) ..... *atratus*  
 — Pygidial sulci narrow (Fig. 9), prescutellar spot white, well-marked, indistinct or absent (Fig. 1-5) ..... **5**
5. Distribution: Western Texas to California, Baja California, Sonora, Sinaloa (Map 1) ..... *prosopis*  
 — Distribution: Sonora to Oaxaca, principally in central mesa (Map 1) ..... *johnsoni*
6. Dorsum with strongly contrasting dark pattern, prescutellar spot yellowish, prominent (Fig. 21); male genitalic armature with hooked sclerites (Fig. 38), ventral valve not keeled, sclerotized plates present ..... *atratus*  
 — Dorsum with contrasting pattern or not, prescutellar spot indistinct or absent; internal sac lacking hooked sclerites, ventral valve keeled or not, sclerotized plates present or not ..... **7**
7. Ventral valve not keeled (Fig. 42), sclerotized plates present, dorsal hood absent, lateral frame of apex of apical orifice thickened .. **8**  
 — Ventral valve keeled (Fig. 36), sclerotized plates at orifice absent, dorsal hood rounded, lateral frame of apical orifice not thickened ..... **10**

8. Internal sac armature (Fig. 42, arrow) with a pair of thornlike sclerites near apex of sac ..... *bottimeri*  
 — Internal sac armature with a pair of straight spines near apex ..... 9
9. Spines slender with enlarged, knoblike base (Fig. 40, arrow). Venezuela and Colombia ..... *riochama*  
 — Spines gradually tapered (Fig. 44, arrow). Sonora to Costa Rica on Pacific coast ..... *nicoya*
10. Internal sac armature with one large median and two flanking spines near base, and two spines, usually crossed, in middle of sac (Fig. 36) ..... *prosopis*  
 — Internal sac armature with elongated median and two flanking spines near base, paired spines in middle of sac lacking (Fig. 35) ..... *johnsoni*

#### PROSOPIS GROUP

##### *Algarobius prosopis* (LeConte) (Figs. 1-10, 32-34, 36; Map 1)\*

*Bruchus prosopis* LeConte, 1858:77 (Colorado Desert); Horn, 1873:331; Sharp, 1885:475; Fall, 1901:160; Schaeffer, 1907:299; Fall, 1910:174; Cushman, 1911:497 and 507; Ful-laway, 1913:24; Bridwell, 1918:475, 1919:17, 1920a:267, 1920b:403, 1920c:337; Zacher, 1952:462.

*Mylabris prosopis*: Leng, 1920:305.

*Acanthoscelides prosopis*: Blackwelder, 1946:760.

*Algarobius prosopis*: Bridwell, 1946:54; Blackwelder and Blackwelder, 1948:45; Werner and Butler, 1958:7; Arnett, 1962:957; Johnson, 1968:1268; Bottimer, 1968:1021; Kingsolver, 1972:119; Swier, 1974:5 et seq.; Center and Johnson, 1974:1101, 1976:196; Smith and Ueckert, 1974:61; Pfaffenberger and Johnson, 1976:31; Kingsolver et al., 1977:114 et seq.; Ward et al., 1977:5; Johnson and Kingsolver, 1982:416; Johnson, 1983:27.

*Bruchus uniformis* LeConte, 1858:77 (Colorado Desert); Horn, 1873:333; Fall, 1901:160, 1910:174; Cushman, 1911:508; Zacher, 1952:463.

*Mylabris uniformis*: Leng, 1920:305.

*Algarobius uniformis*: Blackwelder and Blackwelder, 1948:45; Johnson, 1968:1268.

*Bruchus desertorum*: LeConte, 1858:77 (Colorado Desert); Horn, 1873:328, 1894:345; Schaeffer, 1907:292; Fall, 1910:174; Cushman, 1911:508; Zacher, 1952:462.

*Mylabris desertorum*: Leng, 1920:305.

*Acanthoscelides desertorum*: Blackwelder, 1946:759.

*Algarobius desertorum*: Blackwelder and Blackwelder, 1948:45; Johnson, 1968:1268.

**Measurements.** Body length: 2.1-4.1 mm; width: 1.0-2.2 mm. Pronotal length: 0.5-1.1 mm; width: 0.7-2.2 mm.

**Color.** Integument brownish yellow to dark brown, eyes and female pygidial sulci piceous; antenna brownish yellow, sometimes with apical segments darker; legs uniformly brownish yellow except coronal denticles of metatibia piceous; elytral humerus with piceous spot even in pale specimens. Vestiture of fine, pale yellow, light brown, dark

\*For maps see pp. 133 and 134.

brown, and white hairs in varying patterns densely set over surface of body; pale specimens with only pale yellow and white hairs (Fig. 1), darkest specimens with dark brown hairs on pronotal disk divided by interrupted white median stripe and vague basal and lateral spots, flanks pale (Figs. 4 & 5); elytra mottled with pale yellow, light and dark brown, and white hairs, humerus piceous, often denuded, each elytron with large, irregular lateral spot extending from margin to fourth or fifth stria, apex usually with dark spot near suture; female pygidium (Fig. 4) usually more contrastingly mottled than male (Figs. 1 & 2), basal margin with white triangle, paired apical sulci piceous; vestiture of venter whitish, uniformly distributed except condensed into lateral spots on abdominal sterna.

**Structure.** As for genus and group. Male genitalia (Figs. 36 & 37) with median lobe moderately broad, apex expanded into hoodlike structure above ventral valve; ventral valve subtriangular, bluntly rounded apically, keeled; armature of internal sac consisting of bicrescentic sclerite near ventral valve, one large median and two smaller flanking spines, a pair of spines, usually crossed, at middle of sac, and a lightly sclerotized, somewhat tubular spiny structure near apex, extreme apex with ringlike closure valve surrounding ejaculatory duct. Lateral lobes flat, apices rounded, sensitive.

**Host plants.** *Prosopis glandulosa* var. *torreyana* (L. Benson) M.C. Johnston, *P. palmeri* S. Wats., *P. velutina* Woot., *P. pubescens* Benth., *P. reptans* var. *cinerascens* (A. Gray) Burkart.

**Location of types.** Museum of Comparative Zoology, Harvard University.

Lectotypes here designated: *Bruchus uniformis* LeConte, Type #4471 with gold disc (California), male. *Bruchus prosopis* LeConte, Type #4470 with gold disc (California), female, one paralectotype with gold disc, female. *Bruchus desertorum* LeConte, Type #4468 with gold disc (California), female, three paralectotypes with gold discs, one male, two females.

**Geographical distribution.** (Map 1, open circles) Western Texas (also Brownsville) to southern California, Baja California, Sonora, Chihuahua, and Sinaloa.

**Discussion.** Specimens reared from *Prosopis pubescens* (screwbean) average 0.66× the size of those reared from straight bean *P. glandulosa*, *torreyana*, and *velutina* and are usually uniformly yellowish with little or no pattern; some specimens, however, display a faint mottling of brown on the elytra. The lectotype of *desertorum* represents this form, but male genitalia are identical with those of larger specimens of *prosopis*. Apparently, the smaller screwbean seeds simply produce a smaller beetle. *Algarobius prosopis*, especially the larger specimens, exhibits a wide variation in the intensity of color pattern, some specimens being uniformly pale (Figs. 1 & 3) with only the humeri darker,

whereas, others grade to a very dark form of mottled dark brown (Figs. 2, 4, 5). Females tend to be darker brown than males. Some series are composed of all dark specimens, other series pale, and still others show a range of intensity. *Algarobius bottimeri* is almost indistinguishable from *prosopis* in the range of color intensity, and male genitalia must be extracted and cleared in the overlapping distributional areas to be certain of identification; female pygidia, however, are diagnostic for these two species in those areas (cf. Figs. 10 & 15).

*Algarobius prosopis* is most closely related to *A. johnsoni*, new species, and males are impossible at present to separate without dissection, although geographical distribution of the two species is nearly discrete. I am unable to separate females of the two species unless they are associated with known males, or they are in the exclusive portions of the respective distributions (see Map 1).

A disjunct record at Brownsville has been associated with *Prosopis reptans cinerascens*. The species was also reared at Tucson from two *Prosopis alba* trees introduced from Argentina.

*Algarobius prosopis* is the most common *Prosopis* bruchid in its range, and to list every locality would be redundant. The open circles on Map 1 indicate the general range.

*Algarobius johnsoni* Kingsolver, new species  
(Figs. 16-19, 35; Map 1)

*Algarobius* sp. C: Kingsolver et al., 1977:115.

**Measurements.** Body length: 2.9-4.3 mm, width: 1.6-2.3 mm. Pronotal length: 0.5-1.2 mm, width: 1.1-1.5 mm.

**Color.** Integumental and vestitural colors identical to those of *A. prosopis* but *A. johnsoni* tends toward a more intense dorsal pattern with fewer individuals uniformly yellowish (Figs. 16-18).

**Structure.** Females indistinguishable from *A. prosopis*; armature of internal sac of male genitalia (cf. Figs. 35 & 362) with median single spine longer and with more bulbous base than in *prosopis*; crossed spines of *prosopis* lacking in *johnsoni*. Lateral lobes as in *prosopis*.

**Types.** Holotype male. MEXICO: Aguascalientes, 2 mi N Rincon de Romos, 8-VII-1964, reared from seeds *Prosopis juliflora*, C.D. Johnson. Allotype female and 75 male and female paratypes, same data. (The host is more likely *P. laevigata*). Other paratypes. Mexico, SONORA: Hermosillo, 13-VII-1949, on mesquite (15); Valle del Yaqui, 22-IV-1956, Pacheco (1). COAHUILA: 23 mi W Saltillo, 20-VIII-1971, 4200', O'Brien and Marshall (2). NUEVO LEON: 79 mi S Linares, Hwy. 57, 23-VI-1971, 6700', O'Brien and Marshall, on *Prosopis laevigata* (85). DURANGO: desert S of Tlahualilo, mesquite plain, 20-VII-1952, Kerating (1); 2 mi N Cerro Gordo, 1-VII-1971, 6600', L.B. O'Brien, on *Prosopis* (11); Boca Mesquital, 1-IX-1978 (2); Mesquital, 2-IX-1978, ex *Prosopis*

sp. (4); 6 mi E Vicente Guerrero, 9-VII-1964, C.D. Johnson (4); Durango, 3-V-1961, Howden and Martin (8); 6 mi E Durango, 9-VII-1964, C.D. Johnson, on mesquite (50+); 5 mi SW Cuencame, 10-VII-1964, C.D. Johnson, on mesquite (50+); 5 mi NW Nombre de Dios, 9-VII-1964, C.D. Johnson, on mesquite (25). ZACATECAS: 31 mi SE Guadalupe, 30-VI-1971, 7200' O'Brien and Marshal, on *Prosopis laevigata* (27); 5 mi S Rio Grande, 8-VI-1967 (1); 2 mi SE Fresnillo, 8-VII-1964, C.D. Johnson, on mesquite (13); 32 mi NW Fresnillo, 9-VII-1964, C.D. Johnson, on mesquite (15). TAMAULIPAS: Ciudad Mante, 3-I-1975, in bromeliads, El Paso border station (1); Ciudad Mante, 27-VII-1960, Howden, at light (2). NAYARIT: Tepic, 29-VI-1939, in mesquite beans (13); 2 mi S Jala, 10-VII-1968, 3300', C.D. Johnson #261-68, ex seeds *Prosopis laevigata* (1). AGUASCALIENTES: Aguascalientes (no date) (1); Aguascalientes 1-XII-1909, F.C. Bishopp (7); 1 mi N Rincon de Romos, 6-VI-1968, C.D. Johnson #50-68, ex seeds *Prosopis laevigata* (4); 5.3 mi N Aguascalientes, 7-IX-1967, 6100', Ball et al. (2); 5 mi N Rincon de Romos, 6-VI-1968, 6700', C.D. Johnson (2); Aguascalientes (no date), Wickham (1). SAN LUIS POTOSI: San Luis Potosi, 24-VI-1953, Vaurie (1); 65 mi NW San Luis Potosi, 30-VI-1971, Ward and Brothers (1); 45 mi S Matehuala, 30-VIII-1974, Bohart and Hanson (7); 18 mi NE San Luis Potosi, 16-VIII-1971, 6100', O'Brien and Marshall (2); 18 mi NW San Luis Potosi, 30-VI-1971, Ward and Brothers (2); 46 mi N San Luis Potosi, 1-IX-1958, Howden (1); El Refugio, 2-IX-1958, Howden (2); El Salto de Agua, 28-VII-1960, Howden, at light (2); 10 mi NE San Luis Potosi, 22-VIII-1954, Chilcott (1). JALISCO: Arroyo Plano, 5-VI-1962, Martell (2); 4 mi SE Jocotepec, 10-VIII-1968, C.D. Johnson #260-68, ex seeds *Prosopis laevigata* (3); Chapala, 16-VIII-1949, Bottimer (2). GUANAJUATO: 9 mi SE San Luis de la Paz, 7-VII-1964, C.D. Johnson (60); San Miguel Allende, 7-IX-1949, Bottimer (1). QUERETARO: 1 mi NW San Juan del Rio, 6-VII-1964, C.D. Johnson, on mesquite (23); 12 mi N Vizarro, Rte., 4200', 9-V-1971, Howden (1); Tequisquiapan, 29-VI-1971, Ward and Brothers, on mesquite (19); Pena Blanca, 3-II-1979, R Murillo (1); 20 mi N Queretaro, 31-VIII-1958, Howden (1). HIDALGO: 3 mi E Zimapan, 6400', 31-VII-1963, Duckworth and Davis (3); Zimapan, 16-VIII-1956, Vasquez, ex seeds *Prosopis* sp. (2); 3 mi S Zimapan, 30-VI-1971, 7750', Ward & Brothers (1); 11 mi S Zimapan, 25-VI-1971, 5500', Ward & Brothers, on mesquite (2); 18 mi NW Pachuca, 25-VI-1971, 6400', Ward & Brothers (2). VERACRUZ: Fortin de las Flores, 17-I-1973, in bromeliad (35); Fortin de las Flores, 15-III-1971 (5). MEXICO: Chapingo, (no date) Pacheco (1). MEXICO D.F.: Mexico City, 27-V-1962, ex *Prosopis* seed (6). PUEBLA: 4 mi S Petlalcingo, 28-VI-1971, 5150', Ward & Brothers (1); 5 mi SE Tecamachalco, 27-VI-1964, C.D. Johnson (33); 3 mi NW Tehuacan, 27-VI-1964, C.D. Johnson (17); 1 mi N Tehuacan, 17-VI-1964, C.D. Johnson, in mesquite (1); 5 mi S Tecamachalco, 12-VI-1968, 6000', C.D. Johnson 73-68, ex seeds *Prosopis laevigata* (5); 7 mi S Petlalcingo, 7-VII-1968, 5600', C.D.



Johnson 237-68, ex seeds *Prosopis laevigata* (2). OAXACA: 6 mi SE Tamazulapan, 4-VII-1964, C.D. Johnson, on mesquite (30); 10 mi E Tlacolula, 3-VII-1964, C.D. Johnson ex seeds *Prosopis juliflora* (16); Huajuapán de León, 28-VI-1971, O'Brien & Marshall (12); 3 km S Huajuapán de León 9-V-1957, W. Gibson (1); 62 mi SE Oaxaca, 11-III-1979, 2800', C.D. Johnson, 761-69, ex seeds *Prosopis* sp. (16); 1 mi W Matatlán, 3-VII-1964, C.D. Johnson, on mesquite (25); 9 mi E El Cameron, 27-VI-1971, O'Brien & Marshall (1); 2 mi W Tehuantepec, 2-VII-1964, C.D. Johnson (1).

**Type depository.** Holotype, allotype and many paratypes in National Museum of Natural History, Washington, D.C. Paratypes in C.D. Johnson Collection, Flagstaff, Arizona; Canadian National Collections, Ottawa; H.F. Howden Collection, Ottawa; Texas Tech University, Lubbock; American Museum of Natural History, New York; Utah State University, Logan; Museum of Comparative Zoology, Harvard University; Colegio de Postgraduados, Chapingo, Mexico.

**Geographical distribution.** (Map 1, solid circles) Mexico: Sonora to Oaxaca mostly on central mesa.

**Discussion.** Characters of the male genitalia are consistent and are sufficient to distinguish this species from *A. prosopis*, its nearest relative. Females, however, cannot be separated from those of *prosopis* at present. Geographic distribution of the two species is almost exclusive (Map 1). Although no records of association with *Prosopis glandulosa* var. *torreyana* are known, the distribution of *A. johnsoni* corresponds closely to the combined ranges of *torreyana* and *laevigata*. The type locality is outside the range of *Prosopis juliflora* (Johnston, 1962).

This species is named to honor C.D. Johnson, Northern Arizona University, Flagstaff, doughty peregrinator and student of the Bruchidae, who collected the type-series and supplied many specimens for the study.

#### ATRATUS GROUP

*Algarobius atratus* Kingsolver, new species  
(Figs. 20-23, 38-39; Map 1)

**Measurements.** Body length: 2.9-4.5 mm, width: 1.5-2.3 mm. Pronotal length: 0.8-1.1 mm, width: 1.2-1.9 mm.

**Color.** Integument mostly dark red on venter, dark red with piceous pattern dorsally (Figs. 20 & 21). Vestiture of yellowish gray, reddish brown, and black hairs; pronotum with flanks yellowish gray, disk with mostly black hairs, some scattered yellowish patches, antescutellar patch yellowish or dirty white, prominent. Scutellum likewise clothed. Elytra as illustrated. Pygidia of male and female as illustrated (Figs. 22 & 23). Darker areas of elytra and pygidia somewhat variable in intensity. Legs uniformly yellowish gray.

**Structure.** Body elongate-oval, strongly convex dorsally. Head with prominent frontal carina; antenna short, reaching humerus of elytron. Pronotum strongly convex with shallow, transverse depression at middle and shallow, elongate sulcus beneath antescutellar spot. Scutellum elongate. Pygidium oblique in both sexes, that of male reflexed at apex, strongly convex in apical  $\frac{1}{2}$ ; female with paired apical sulci longer and broader than in *prosopis* or *johnsoni* (cf. Figs. 9 & 23). Male genitalia (Figs. 38 & 39) as illustrated. Median lobe (Fig. 38) with small cluster of fine denticles and paired, flat sclerites at apical orifice, other internal sac sclerites as illustrated, hooked sclerites unique in this genus. Lateral lobes as illustrated (Fig. 39).

**Types.** Holotype male: Mexico, ZACATECAS: 2 mi SE Fresnillo, 8-VII-1964, C.D. Johnson, on mesquite. Allotype female and 21 male and female paratypes, same data. Other paratypes: Mexico, DURANGO: 2 mi N Cerro Gordo, 1-VII-1971, 6600', O'Brien & Marshall (2). SAN LUIS POTOSI: 12 mi N San Luis Potosi, 30-VI-1971, 6900', O'Brien & Marshall (3). JALISCO: Guadalajara, 1900', L. Diguët, Museum Paris (77); Lagos de Moreno, intercepted El Paso, Tex., 29-IX-1972, in *Prosopis* sp. (19); Guadalajara, 30-VII-1945, in mesquite beans (10). ZACATECAS: Zacatecas, VI-1974, D. Chandler (1). GUANAJUATO: Leon, intercepted, 18-II-1966, Calexico, in *Prosopis juliflora* (8). HIDALGO: 18 mi NW Pachuca, 25-VI-1971, 6400', O'Brien & Marshall, on *Prosopis laevigata* (1). PUEBLA: 5 mi SE Tecamachalco, 27-VI-1964, C.D. Johnson (1); 5 mi S Tecamachalco, 12-VI-1968, 6000', C.D. Johnson 73-68, ex seeds *Prosopis laevigata*. Other specimens from Michoacan and Guanajuato are not paratypes because of insufficient data.

**Type depository.** Holotype, allotype, and paratypes in the National Museum of Natural History, Washington, D.C. Paratypes also deposited in the C.D. Johnson Collection, Flagstaff, Arizona; the Museum National d'Histoire Naturelle, Paris; Texas Tech University, Lubbock.

**Host plants.** *Prosopis laevigata*, *P. juliflora*. The latter record (Guanajuato) is probably a misidentification since Johnston (1962) shows the range of *juliflora* to be along the Pacific coast.

**Geographical distribution.** Mexico: (Map 1, triangles) Durango to Puebla on the central mesa.

**Discussion.** This species is fairly easily recognized by the boldly contrasted pattern and the more prominent female pygidial sulci. It superficially resembles *A. prosopis* and *johnsoni* but is sufficiently distinct in details of the male genitalia and female pygidium to justify placing it in a separate group.

## BOTTIMERI GROUP

*Algarobius bottimeri* Kingsolver

(Figs. 11-15, 42, 45; Map 1)

*Algarobius prosopis*, of authors: Fullaway, 1913:24; Bridwell, 1918:468, 191, 9:17, 1920a: 267, 1920b:403, 1920c:337, 1929:43; Swezey, 1925:3; Krauss, 1945:315; Fullaway, 1947:52; Hinckley, 1960:261.

*Algarobius bottimeri* Kingsolver, 1972:116; Kingsolver et al., 1977:115; Ward, et al., 1977:5; Johnson, 1983:27.

**Measurements.** Body length: 2.7-4.25 mm, width: 1.5-2.25 mm. Pronotal length: 0.6-1.2 mm, width: 0.8-1.6 mm.

[With characters of genus and species group.]

**Color.** Integument dark red to piceous, eyes and elytral humeri black. Vestiture of yellowish gray, brassy, and piceous hairs; dorsal pattern of elytra mottled, more contrasting in female than in male, extent of pattern development shown in Figs. 11-13.

**Structure.** Virtually indistinguishable from *A. prosopis* except sulci of female pygidium on face of pygidium (cf. Figs. 10 & 17); male genitalia (Figs. 36 & 41) with lateral frame of apex of median lobe thickened, ventral valve not keeled, membrane above apical orifice with cluster of sharp denticles, internal sac as illustrated with median thornlike spine strongly curvate, lateral spines short, spines in middle of sac long, slightly curvate, apical spines thornlike, hookline portion short; apex of sac also with paired, lightly sclerotized, spinose plates, closure valve ringlike. Lateral lobes as illustrated (Fig. 45).

**Type locality.** Texas, Bentsen State Park, Hidalgo Co.

**Host plants.** *Prosopis glandulosa glandulosa* J. Torrey, *P. reptans cinerascens* (A. Gray) Burkart, *P. pallida* (Willd.) H.B.K. (Hawaii).

**Location of Type.** National Museum of Natural History, Washington, D.C.

**Geographical distribution.** (Map 1, open stars). New county records since original description. United States, HAWAIIAN IS.: Oahu, Kolekole Pass. TEXAS: Cottle, Culberson, Gilliland, Gonzales, Randall, Stonewall, Upton, Winkler. OKLAHOMA: Caddo, Comanche. Mexico, COAHUILA: 10 mi E Saltillo, 25 mi NE Monclova, 22 mi N Sabinas, Guerrero, Piedras Nigras. NUEVO LEON: 10 mi S Nuevo Laredo, Hidalgo. TAMAULIPAS: Villagran. For old records see Kingsolver (1972). Old records incorporated into Map 1, this paper.

**Discussion.** This species is closely related to *nicoya*, new species, and *riochama*, new species. The trio can only definitely be separated by examining the male genitalia (apical spines) (cf. Figs. 40, 42, 44), and at present by geographical distribution (cf. Maps 1 & 2). Specimens with dark maculations on the elytra are more common, and the pattern is more consistent in *nicoya*, new species, and *riochama*, new species,

than in *bottimeri*. The seemingly trivial character — the form of the apical sclerites — appears to be constant, and bears out the disjunct distribution pattern of the three species.

The presence of *bottimeri* in the Hawaiian Islands dates to the early part of the Twentieth Century when *Prosopis* was introduced into the Islands in an attempt to initiate a cattle feed industry. Bruchids were also introduced with *Prosopis* but without parasites to control their numbers. Later efforts to introduce parasites failed and the industry died out. *Algarobius bottimeri* was first identified by Bridwell as *A. prosopis*; he, however, recognized in 1929 (p. 43) that it was a separate species but never described it.

A puzzling facet of the Hawaiian Islands experience is that the preferred host on the mainland of *A. bottimeri* is *P. glandulosa glandulosa*, but this species is not now in the Islands. Instead, the authorities on *Prosopis* (Burkart and Simpson, 1977; Johnston, 1962; and Fosberg, 1966) agree that the Hawaiian species is *P. pallida* (Willd.) H.B.K. and probably originated in northern South America. The species has been variously identified in the past as *juliflora*, *chilensis*, *inermis* or *pallida* but never *glandulosa*. Since *bottimeri* is not found in South America, its entry into the Islands must have been in seeds from the North American mainland, perhaps to be planted as an ornamental.

The species was named for L.J. Bottimer, a long time student of the Bruchidae.

***Algarobius nicoya* Kingsolver, new species**  
(Figs. 24-27, 43-44; Map 1)

*Algarobius* sp. B: Kingsolver, et al., 1977:115.

*Algarobius bottimeri*: Janzen, 1980:946.

**Measurements.** Body length: 3.3-4.1 mm, width: 2.1-2.3 mm. Pronotal length: 0.9-1.3 mm, width: 1.3-1.7 mm.

[With characters of genus and group.]

**Color.** Integument reddish brown to piceous, humeri and eyes black, legs and antennae dark red. Pronotum with piceous median stripe divided in part by narrow white stripe of setae (Figs. 24 & 25); elytra with dark, reddish brown subbasal spot, a subapical spot on third interval, a lateral median maculation, and transverse spot on apex, extent of dark areas variable. Vestiture of yellowish gray, white, and dark brown hairs, the brown hairs generally confined to piceous integumental spots. Pronotal flanks grayish. Scutellum grayish white. Pygidium mottled yellowish gray and dark brown with vague dark brown median spots (Figs. 26 & 27).

**Structure.** As for *A. bottimeri* except for male genitalia. Compare Figs. 42 and 44 for the differences in the apical spines in the internal sac (arrow). Lateral lobes as in Fig. 43.

**Types.** Holotype male: Costa Rica, PUNTARENAS PROV., Boca Baranca, 1-III-1975, D.H. Janzen 12, ex seeds *Prosopis juliflora*. Allotype female and ca. 750 male and female paratypes, same data. Other paratypes: Costa Rica, Same data as type except 14-III-1976, ca. (50); same data as type except 6-III-1972, Janzen VI-19-1972-XXXIII; GUANACASTE PROV., Santa Rosa National Park, El Naranjo, 9-III-1972, Janzen VI-19-1972-III, ex seeds *Prosopis juliflora*, (ca. 500); same data except 12-III-1976 (1000). Mexico, SONORA: nr San Jose Beach, 40 mi SW Ciudad Obregon, 16-23-V-1961, Howden & Martin at light (1); San Vicente nr. Santa Ana, 24-I-1963, Burrue!l, in cotton field trash (4); Navajoa, 22-VII-1959, Evans (1). SINALOA: 38 km W Los Mochis, 13-III-1975, W.L. Johnson (1); Valle del Carizzo, Carranza R., 15-VIII-1973, Pacheco #829 (1). JALISCO: 52 mi NW Barra de Navidad, 8-III-1973, C.D. Johnson 441-73 (2). COLIMA: 4 mi NW Manzanillo, 8-III-1973, C.D. Johnson 410-73 (4). MICHOACAN: 20 mi S Nueva Italia, 6-III-1979, 800', C.D. Johnson 634-79, ex *Prosopis* seeds (85). GUERRERO: 24 km W Tecpan, 28-XII-1979, C.D. Johnson 1151, ex *Prosopis velutina* (12); Acapulco, Chittenden (no date) (2). OAXACA: Tehuantepec, 15-VII-1964, Spangler (1); Mitla, 27-VI-1963, 5600', on *Baccharis glutinosa* (1); 25 mi SE Oaxaca, 27-VI-1963, 5600', Scullen & Bolinger (2); 10 mi E Tlacolula, 3-VII-1964, C.D. Johnson, ex seeds *Prosopis juliflora* (14); 37 mi W Zanatepec, 5-VII-1968, 500', C.D. Johnson (1); 2 mi W Tehuantepec, 6-VII-1968, 200', C.D. Johnson (1); same as preceding except 2-VII-1964 (21); Huajuapán de León, 28-VI-1971, O'Brien & Marshall (6); OAXACA: (no locality) (1). Nicaragua, GRANADA: Granada, 30-VI-1963, Bottimer 115a, on *Prosopis juliflora* (5).

**Type depository.** Holotype, allotype, and many paratypes deposited in the National Museum of Natural History, Washington, D.C. Paratypes also deposited in the Canadian National Collections, Ottawa; the C.D. Johnson Collection, Flagstaff, Arizona; the Boll Weevil Research Laboratory, Mississippi State; Cornell University, Ithaca, New York; Oregon State University, Corvallis; Philadelphia Academy of Sciences; Florida Department of Agriculture Collections, Gainesville; British Museum (Natural History) London; Instituto de Biología, UNAM, Mexico, D.F.; Texas Tech University, Lubbock.

**Host plants.** *Prosopis juliflora*, *P. velutina* (probably *juliflora*, since the locality is out of the range of *velutina*), *Baccharis glutinosa* (probably an adult on flower).

**Geographical distribution.** (Map 1, star in circle) Sonora to Costa Rica along Pacific Coast following distribution of *Prosopis juliflora*.

**Discussion.** This species is in the Bottimeri group and is most closely related to *riochama*, new species (see discussion under *bottimeri*). At no point does its geographical range approach either of the other two species in the group.

The southernmost record for *nicoya* is its type-locality at Boca Baranca near the city of Puntarenas. Mesquite is found in Panama but I have seen no specimens of either *nicoya* or *riochama* from that country.

The specific name is a noun in apposition for the Bay of Nicoya into which the Rio Barranca flows. The type-locality is at its mouth.

*Algarobius riochama* Kingsolver, new species

(Figs. 28-31, 40-41; Map 2)

**Measurements.** Body length: 2.6-3.5 mm, width: 1.4-2.1 mm. Pronotal length: 0.7-1.1 mm, width: 0.7-1.4 mm.

**Color.** Integumental and vestitural colors similar to those of *nicoya*, new species (see previous discussion).

**Structure.** Similar to that of *nicoya* except apical pair of spines in internal sac (Fig. 40, arrow) more slender and with base enlarged and knob-like.

**Type.** Holotype male: Venezuela, MERIDA: 14 km W Merida, along Rio Chama, 25-X-1973, D.H. Janzen 607, ex seeds *Prosopis* sp. Allotype and 31 male and female paratypes, same data. Other paratypes: Venezuela, SUCRE: 5 mi S Cumana, 8-X-1965, D.H. Janzen, ex seeds *Prosopis juliflora* (12); 4 km S Cumana, 3-X-1983, C.D. Johnson 2969-83, ex seeds *Prosopis juliflora* (10); San Juan, 23-VI-1968, J. Maldonado (1). MIRANDA: 14 km E Cupira, 30-IX-1983, C.D. Johnson 2948-83, ex seeds *Prosopis juliflora* (10). FALCON: Coro, 21-IX-1983, C.D. Johnson 2852-83, ex seeds *Prosopis juliflora* (10); 1 km S Pueblo Nuevo, Peninsula de Paraguana, 19-IX-1983, C.D. Johnson 2844-83 (10); 2 km W Churuguara, 19-IX-1983, C.D. Johnson 2839-83, ex seeds *Prosopis juliflora* (10); 15 km S La Cruz de Taratara, 19-IX-1983, *Prosopis juliflora* (10); 40 km S La Cruz de Taratara, 19-IX-1983, C.D. Johnson 2835-83, ex seeds *Prosopis juliflora* (9); 33 km S Coro, 19-IX-1983, C.D. Johnson, 1818-83, ex seeds *Prosopis juliflora* (6); Guaibacoa, 18-IX-1983, C.D. Johnson 2818-83, ex seeds *Prosopis juliflora* (4). CARABOBO: Puerto Cabello, 12-VII-1982, C.D. Johnson 2416-82, ex seed pods on ground (110). Colombia, MAGDALENA: Santa Marta, VII-1980, G. Manley, ex seeds mesquite (5); Santa Marta (no date), Darlington (1); 49 km W Puebloviejo, 30-X-1983, C.D. Johnson 3168-83, ex seeds *Prosopis juliflora* (3); 9 km S Santa Marta, 31-X-1983, C.D. Johnson 3171-83, ex seeds *Prosopis juliflora* (10).

**Type depository.** Holotype, allotype, and paratypes deposited in the National Museum of Natural History, Washington, D.C. Paratypes also deposited in the C.D. Johnson Collection, Flagstaff, Arizona; Gary Manley Collection; and the Collection of the Universidad Central de Venezuela, Maracay.

**Host plants.** Although some Venezuelan labels read "*Prosopis*" or "*mesquite*," I assume that the species is *Prosopis juliflora* since that is the only species recorded from Venezuela. The record from Colombia possibly could be *Prosopis pallida*, known from western Colombia (Burkart and Simpson, 1977).

**Geographical distribution.** (Map 2, solid stars) Records seen so far indicate that this species is restricted to the north coast of Venezuela and Colombia.

**Discussion.** This species is in the Bottimeri Group. Refer to the discussion under *bottimeri*.

The name *riochama* is a noun in apposition for the type-locality.

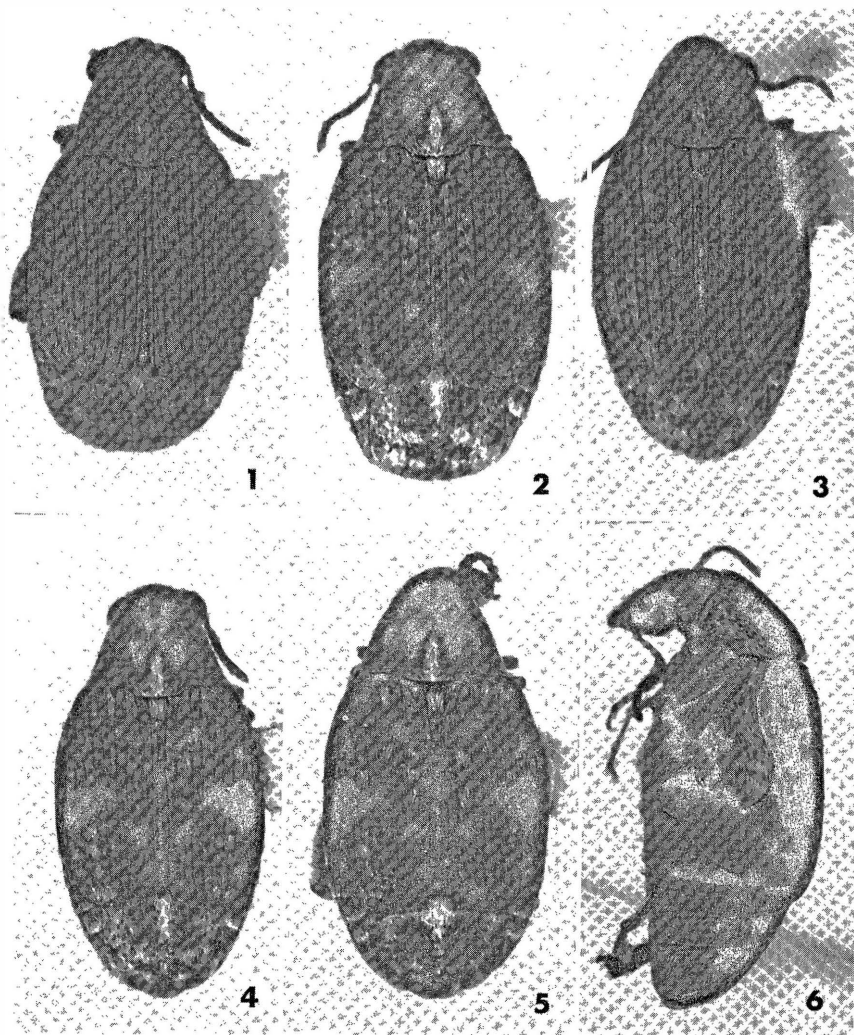
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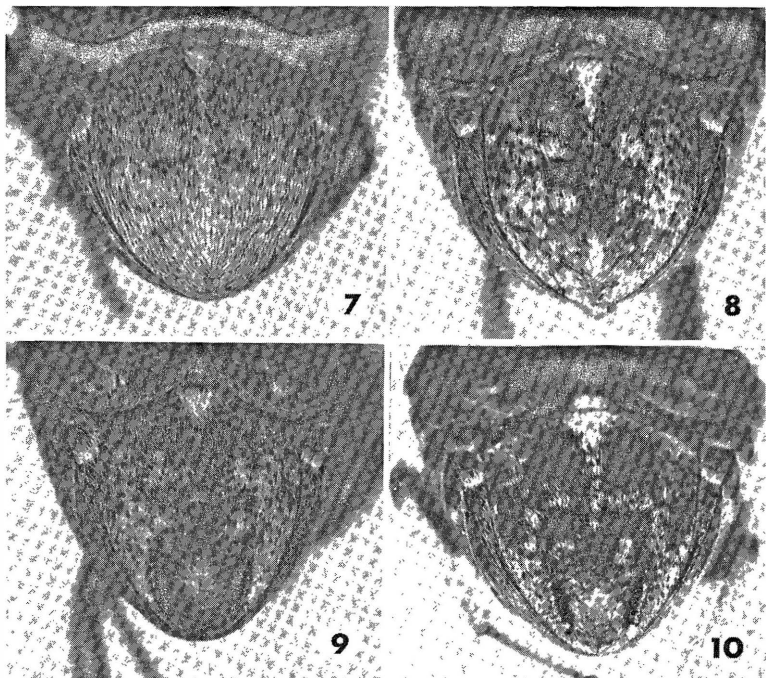
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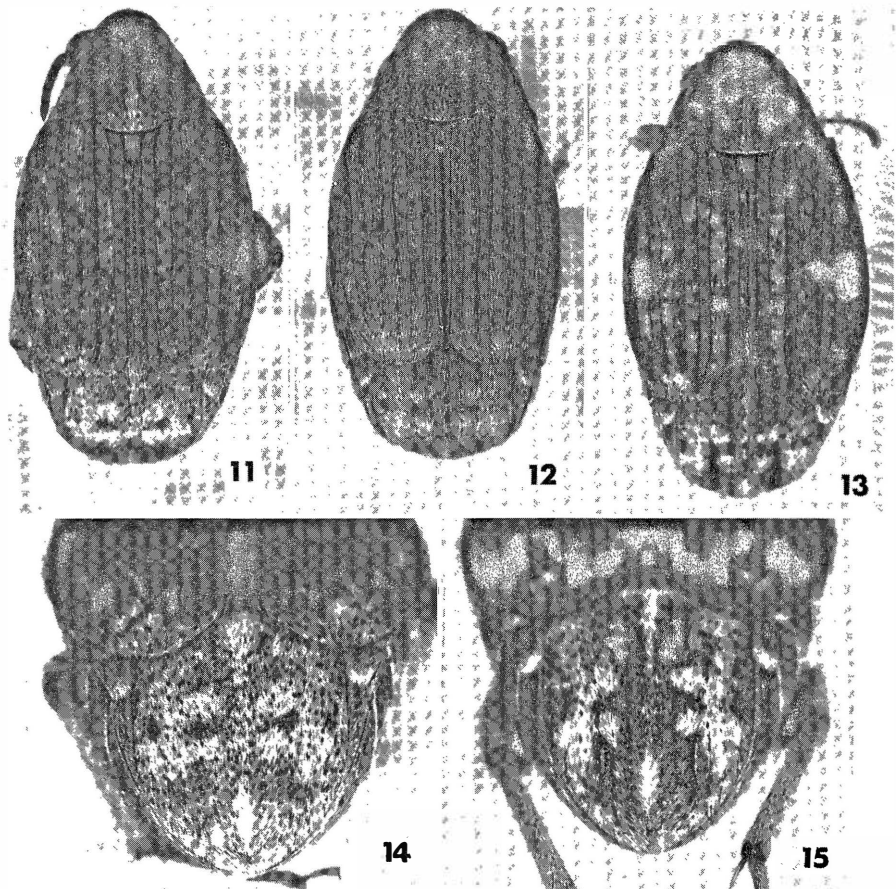
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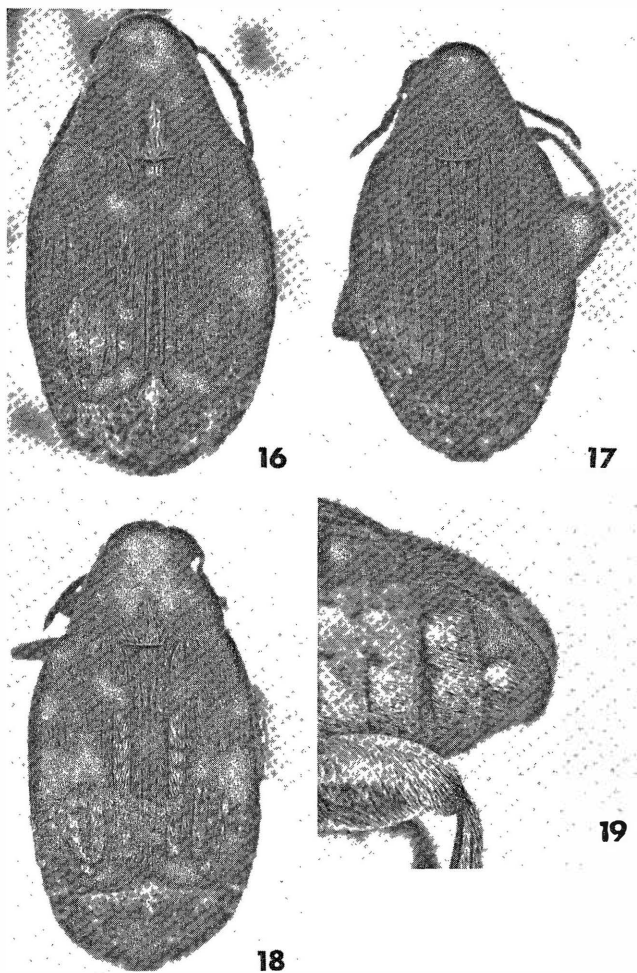
Figs. 1-6. *Algarobius prosopis*. 1, pale form, male; 2, dark form, male; 3, pale form, female; 4, and 5, dark form, female; 6, lateral aspect, female.



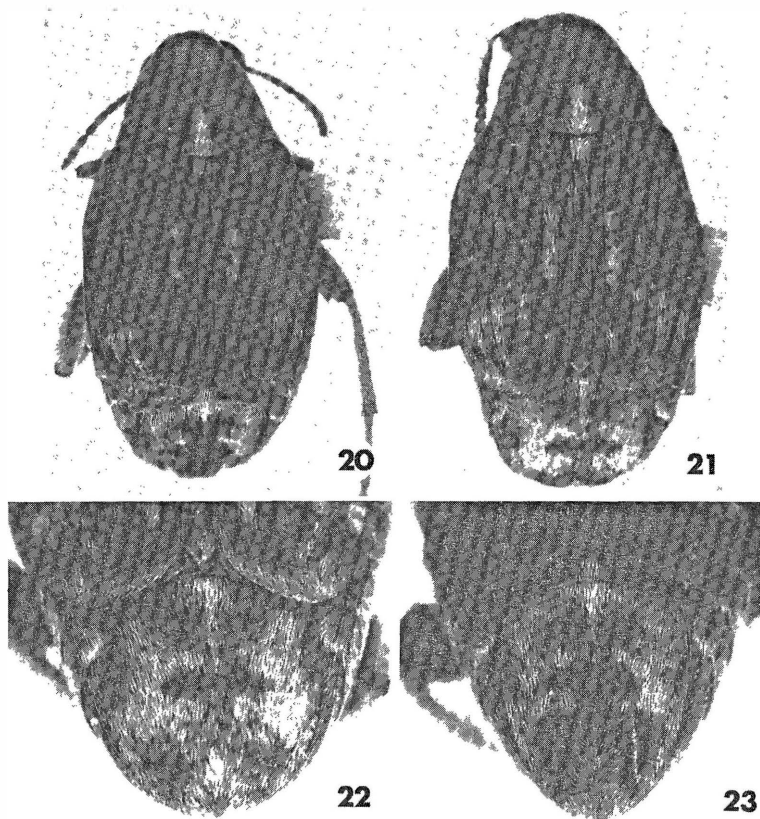
Figs. 7-10. *Algorobius prosopis*. 7, pygidium, pale form, male; 8, pygidium, pale form, male; 9, pygidium, pale form, female; 10, pygidium dark form, female.



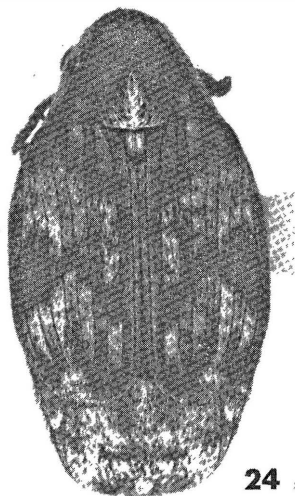
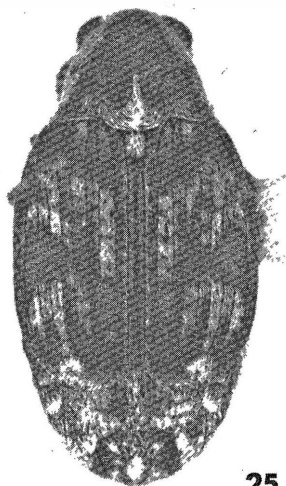
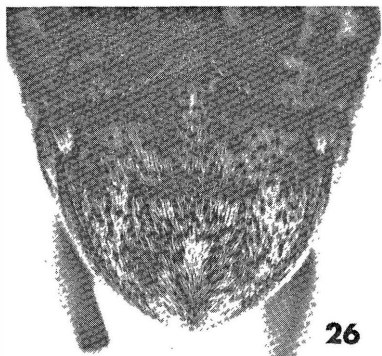
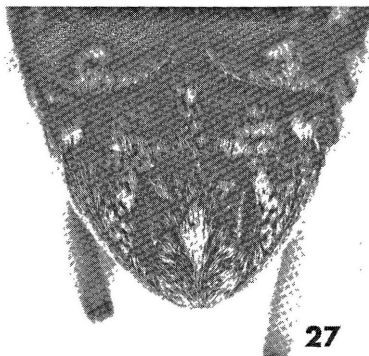
Figs. 11-15. *Algarobius bottimeri*. 11, dark form, male; 12, pale form, male; 13, dark form, female; 14, pygidium, male; 15, pygidium, female.



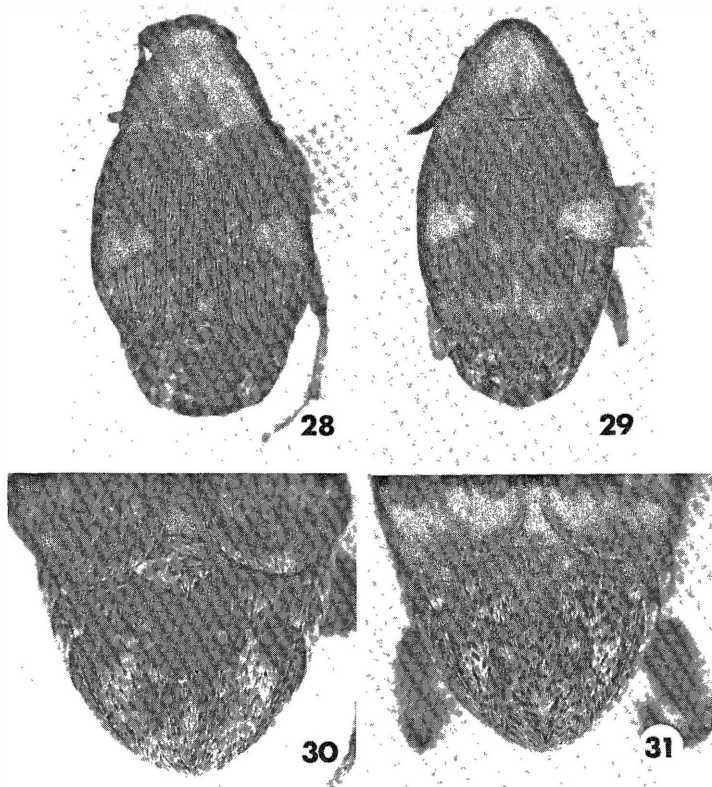
Figs. 16-19. *Algarobius johnsoni*. 16, male; 17 and 18, extent of pattern intensity, females; 19, lateral aspect, male abdomen.



Figs. 20-23. *Algarobius atratus*. 20, female; 21, male; 22, pygidium, male; 23, pygidium, female.

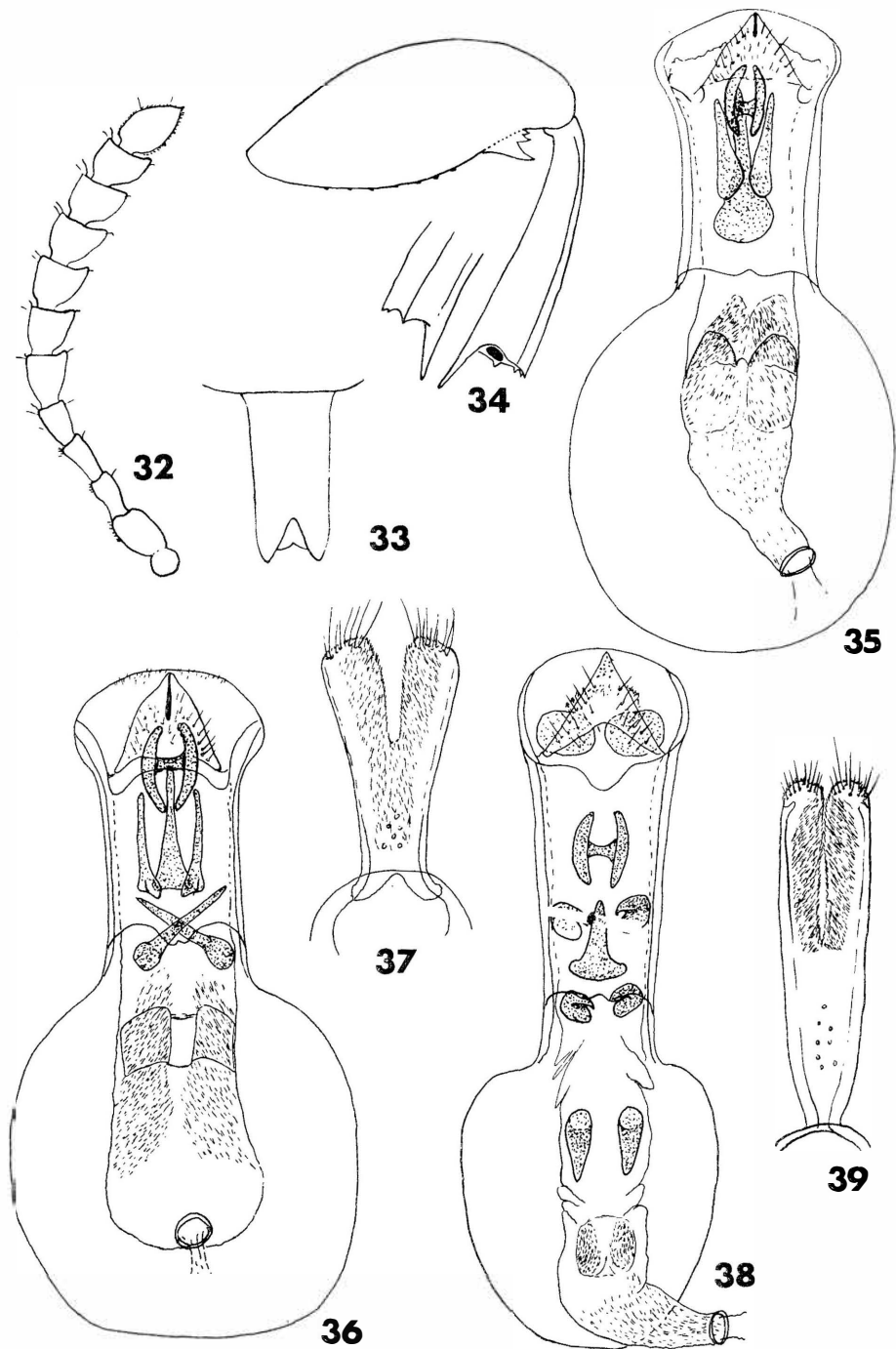
**24****25****26****27**

Figs. 24-27. *Algarobius nicoya*. 24, male; 25, female; 26, pygidium, male; 27, pygidium, female.

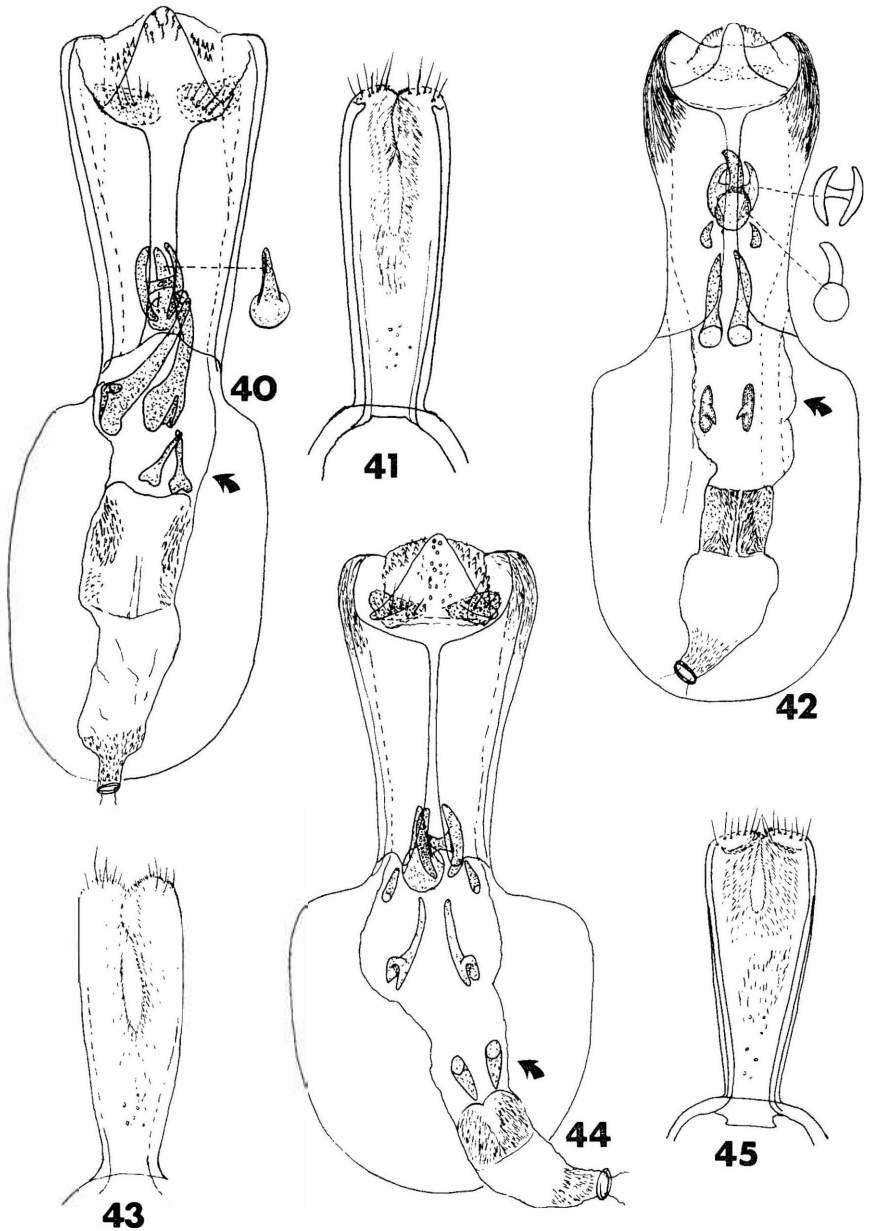


Figs. 28-31. *Algarobius riochama*. 28, male; 29, female; 30, pygidium, male; 31, pygidium, female.

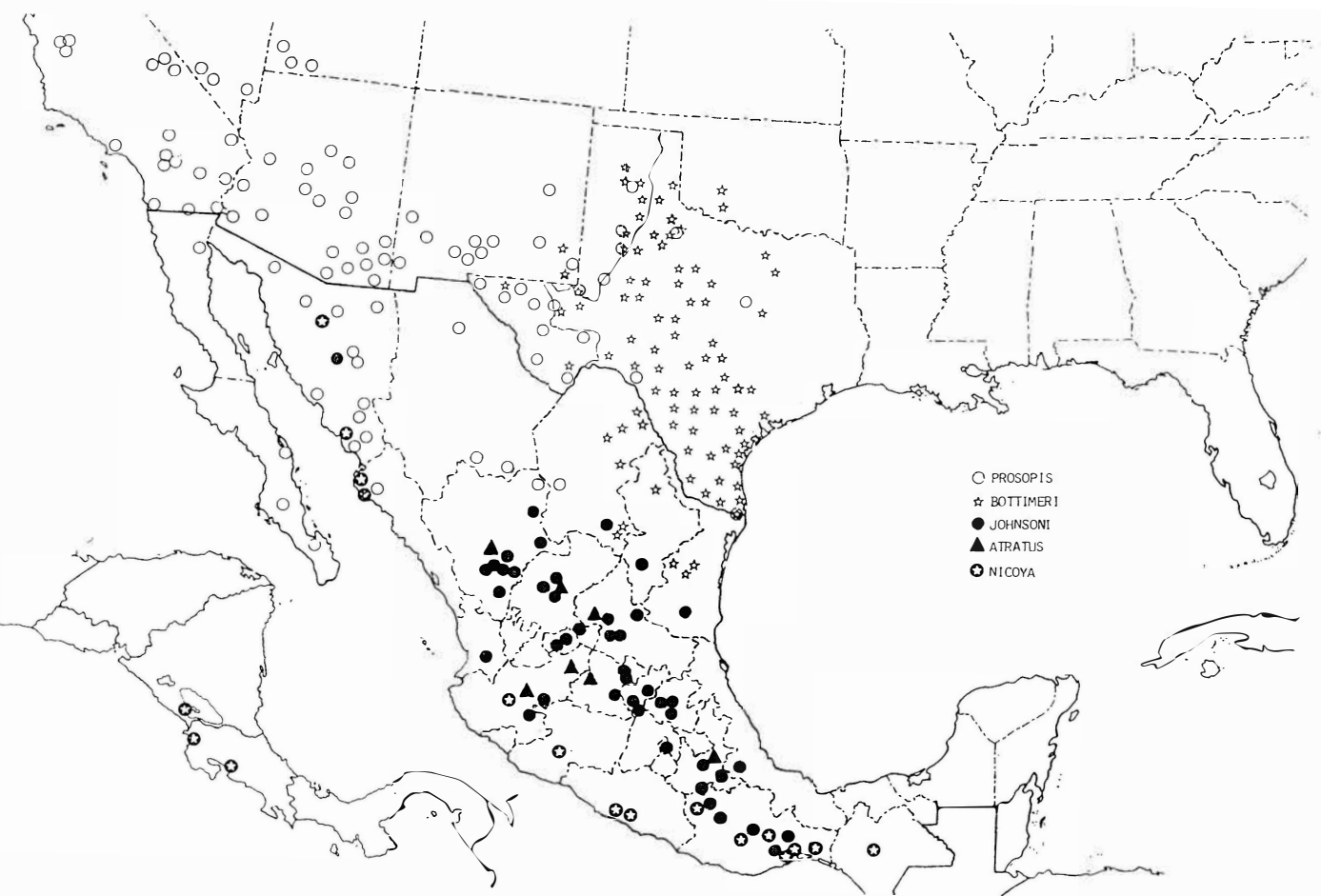




Figs. 32-39. *Algarobius* spp. 32, antenna; 33, scutellum; 34, metaleg, mesal face, (inset-lateral face, metatibia). 35, *A. johnsoni*, median lobe. 36, *A. prosopis*, median lobe; 37, same, lateral lobes. 38, *A. atratus*, median lobe; 39, same, lateral lobes.



Figs. 40-49. *Alagarobius* spp. 40, *A. riochama*, median lobe; 41, same, lateral lobes. 42, *A. bottimeri*, median lobe; 45, same, lateral lobes. 43, *A. nicoya*, lateral lobes; 44, same, median lobe.



Map I. Geographical distribution of *Algarobius* spp.



Map 2. Geographical distribution of *Algarobius riochama*, new species, in Colombia and Venezuela.