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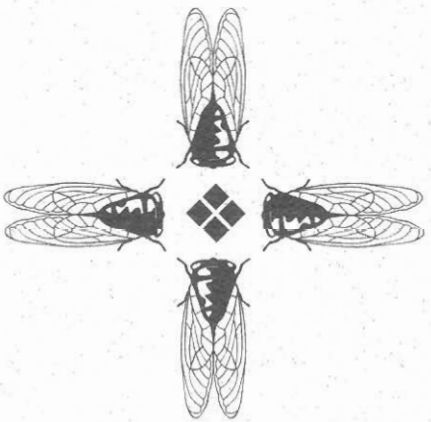

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Revision of the Genus *Zabrotes* Horn of Mexico (Coleoptera: Bruchidae: Amblycerinae)

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ABSTRACT

There are 18 species of *Zabrotes* Horn in Mexico. Of these we described the following seven species as new: *Z. achiote*, *Z. californiensis*, *Z. flemingia*, *Z. guerrerensis*, *Z. ixtapan*, *Z. moctezuma*, and *Z. sinaloensis*. The other 11 species we redescribed and discussed were *Z. amplissimus* Kingsolver, *Z. bexarensis* Kingsolver, *Z. chavesi* Kingsolver, *Z. densus* Horn, *Z. interstitialis* (Chevrolat), *Z. obliteratus* Horn, *Z. planifrons* Horn, *Z. spectabilis* Horn, *Z. subfasciatus* (Boheman), *Z. sylvestris* Romero and Johnson, and *Z. victoriensis* Kingsolver. We provided a key to the genera of Amblycerinae and to the species of *Zabrotes* of Mexico. The host plants of the three genera of Amblycerinae (*Amblycerus*, *Spermophagus*, *Zabrotes*) are discussed. There are 35 species of *Zabrotes*, all native to the New World. Of these, 12 have known hosts. All the known hosts of *Zabrotes* are in the Fabaceae with a questionable record in the Bixaceae. *Zabrotes subfasciatus*, the Mexican bean weevil, is thought to have originally fed in seeds of New World beans but due to commerce it has become a tropicopolitan pest of stored legumes and expanded its host range due to its proximity to other legume seeds in storage. There are approximately 90 species of *Spermophagus* that have been described in the Old World, about 35 are reported to have hosts. Twenty-four species of *Spermophagus* have been reported to feed in species of Convolvulaceae. Only five species have been reported from the Malvaceae and three species from the Fabaceae. Because seeds of species of Convolvulaceae are fed upon freely by bruchids in the genus *Megacerus* (Bruchinae) in the New World, we believe that reports of *Spermophagus* larvae feeding in these seeds in the Old World to be at least in part accurate. Most species of *Amblycerus* feed in seeds of the Fabaceae but species of *Amblycerus* may have the most extensive scope of host plants of any genus of bruchids. Species in this genus have been reliably reported to feed in seeds of the families Fabaceae, Malpighiaceae, Rhamnaceae, Boraginaceae, Sterculiaceae, Tiliaceae, Vitaceae, Euphorbiaceae, Combretaceae, and Anacardiaceae.

Key Words: *Zabrotes*, bruchids, new species, *Amblycerus*, *Spermophagus*.

The name *Zabrotes* Horn is usually recognized by entomologists because it contains the infamous tropicopolitan, economic pest of mostly stored legumes, *Z. subfasciatus*, the Mexican bean weevil (Romero 1992,

many authors). As we shall see below, most species of *Zabrotes* feed in seeds that are not of commercial importance.

Horn (1885) included six species in his new genus when he described *Zabrotes*. Horn (1886, 1894) pointed out that the species he had studied (now in *Amblycerus* Thunberg and *Zabrotes*) were not *Spermophagus* Schoenherr. Therefore, Horn expressed his annoyance in these papers when Sharp (1885) subsequently recognized *Zabrotes* only as a subgenus of *Spermophagus*. Later workers soon recognized that *Zabrotes* was a distinct New World genus.

In his revision of *Zabrotes* of America north of Mexico, Kingsolver (1990a) stated that "The taxonomy of *Zabrotes* in the United States has been virtually ignored since the genus was described (Horn, 1885)". Kingsolver's statement could apply equally to the New World. Thus, Kingsolver was the first to do any significant revisionary research on species of *Zabrotes*. He found there were 17 species in the United States after he described new species and redescribed others from America north of Mexico and included information about host plants, geographic distribution and a key to species.

In this paper we continue with this work — we describe seven new species of *Zabrotes*, consider the relationships of the new *Zabrotes* with the 11 other species of *Zabrotes* of Mexico, and discuss their host plant preferences.

Species of the family Bruchidae feed only in the seeds of approximately 33 families of plants (Johnson 1981a, 1989, Romero 1992). According to our estimates, there are about 1600 species of bruchids in the world; of these about 750 are known from the New World (Kingsolver 1990b). According to Arnett (1973), 10% of the species have a worldwide distribution and feed in legumes of economic importance. We disagree with this estimate. This figure at the most is perhaps 5% and probably about 3-4%, but this, of course, depends on one's definition of what is of economic importance.

The family Bruchidae is composed of the subfamilies Amblycerinae, Bruchinae, Eubaptinae, Kytorhininae, Rhaebinae and Pachymerinae (Kingsolver 1990b). Amblycerinae is a distinct subfamily because all species included in the subfamily have two movable, apical, metatibial spurs; the metacoxal face is broader than the metafemur; there are visible trochantins in the pro- and mesocoxal cavities; the mesepimeron and mesepisternum are subequal in width; and the common base of the male genitalic lateral lobes are straplike (Kingsolver 1990a). Amblycerinae is composed of the genera *Amblycerus*, *Zabrotes* and *Spermophagus*; the first two genera occur naturally in the New World and *Spermophagus* occurs naturally in the Old World. The body size of most species of *Amblycerus* (2.3 to 10 mm in length) is frequently larger than most bruchid beetles and they are certainly larger than the much smaller *Spermophagus* (1.0 to 4.1 mm) and *Zabrotes* (1.0 to 3.7 mm). *Amblycerus* occupies the tribe Amblycerini while *Spermophagus* and *Zabrotes* occupy the tribe Spermophagini. Species of *Zabrotes* are distributed from the United States to Brazil and, including the new species described here, there are approximately 35 described species of *Zabrotes*. *Amblycerus* has 106 species but the number may increase to 250 when all species are described (Kingsolver, 1990b, Romero et al., 1996). Borowiec (1991) considered *Spermophagus* to contain 90 species. But with the landmass of the Old World, however, there must be many more species yet to be described.

The systematic papers of Johnson (e.g., 1970, 1983, 1990) and Kingsolver

(e.g., 1986, 1988, 1990a) and their various coauthors (e.g., Johnson, et al., 1989) contain analyses of data that pertain to the evolution of various groups of bruchids but no overall analysis has been made on the evolution of taxa in the Bruchidae nor has there been a rigorous cladistic analysis of any taxon in the family.

HOST PLANTS

Of the genera of Amblycerinae, only *Amblycerus* has had its host plants analyzed to any extent (Romero et al., 1996). The host plants of *Zabrotes* and *Spermophagus* has been listed in the literature but have not been analyzed. We present a brief analysis of the hosts of the latter two genera here. We have also compiled a list of their hosts in appendices. We also synopsize the hosts of *Amblycerus*. We consider a host plant of bruchids to be those in which the larvae develop in their seeds.

Zabrotes

This is a discussion of the 12 species of *Zabrotes* (Appendix 1 compiled from C. D. Johnson Database) whose hosts are known. Not all of these species are treated taxonomically in this paper. All of these species except *Z. achiote* n. sp. have been reported to feed in the seeds of the Fabaceae. Four species (*Z. chavesi* Kingsolver, *Z. interstitialis* (Chevrolat) [also reported to feed in *Mimosa* quadrivalvis L.], *Z. planifrons* Horn, and *Z. spectabilis* Horn) have only been reliably reported to feed in the seeds of *Cassia, Chamaechrista* or *Senna* (subfamily Caesalpinioideae). Six species feed only in the fabaceous subfamily Papilionoideae: *Z. amplissimus* Kingsolver(in *Phaseolus* spp.), *Z. bexarensis* Kingsolver (in *Vicia*), *Z. flemingia* n. sp. (in *Flemingia*), *Z. obliteratus* Horn (in *Rhynchosia*), *Z. subfasciatus* (Boheman) (in many genera of Papilionoideae) and *Z. sylvestris* Romero and Johnson (in *Phaseolus*). Only *Z. propinquus* Kingsolver has been reliably reported to feed in seeds of a species of Fabaceae not in the above two subfamilies, in a *Mimosa* which is in the subfamily Mimosoideae. The host records of *Z. achiote* n. sp. are a problem. This species has been reported to feed in *Rhynchosia phaseoloides* DC., a papilionoid legume, *Acacia angustissima* (Mill.) Kuntze, a mimosoid legume, and *Bixa orellana* L., a member of the family Bixaceae. *Stator bixae* (Drapiez) and *S. championi* (Sharp)have been reported to feed in seeds of *B. orellana*, but no other bruchids have.

Thus it would appear that species of *Zabrotes* have evolved to feed in seeds of the Fabaceae, especially the seeds of *Cassia* (s. l.) and the Papilionoideae. The reports of them feeding in the seeds of the subfamily Mimosoideae and the family Bixaceae should be verified.

The host plants of *Z. subfasciatus* are especially problematic to decipher. This species is of tropical American origin and in the field in the American tropics it most often has been found to feed in seeds of species of *Phaseolus*. Because this species is tropicopolitan, probably most hosts other than *Phaseolus* were from their proximity to seeds of *Phaseolus* in storehouses around the world. In the lab we have experimented with non-economic bruchids in non-host seeds (Johnson, 1981c). We have found that it is not unusual for bruchids to feed and develop in non-host seeds when they are accessible in the lab, but then they do not feed in them in the wild. Another problem is with names of hosts. It appears from our list gathered from the literature, that some of the plants were not identified

correctly and specific epithets of plants are reported in more than one genus. In any event, we hypothesize that most hosts reported for Z. *subfasciatus* are those acquired in storage.

Because relatively few species of *Zabrotes* have known hosts and in most seeds they are not abundant, we suggest that perhaps some species of *Zabrotes* oviposit on seeds only on the ground. This was the case with rare species of *Stator* Bridwell and we have circumstantial evidence that this may be true in *Zabrotes* as well.

Spermophagus

There are approximately 90 species of *Spermophagus* that have been described in the Old World (Borowiec, 1991). About 35 are reported to have hosts (Appendix 2 compiled from C. D. Johnson Database).

Unfortunately, as in other parts of the world, the literature on Old World host plants of bruchids is often unreliable. Too often hosts are reported to be those on which the adults are taken. This is also likely too often the case with *Spermophagus*. We do believe that probably more than 50% of the host records refer to seeds, especially when the plant families are known hosts of other bruchids.

Twenty-four species of *Spermophagus* have been reported from species of Convolvulaceae (Appendix 2). Only five species have been reported from the Malvaceae and three species from the Fabaceae. Because seeds of species of Convolvulaceae are fed upon freely by bruchids in the genus *Megacerus* (Bruchinae) in the New World, we believe that reports of *Spermophagus* larvae feeding in these seeds in the Old World to be at least in part accurate. The same can be said about the family Malvaceae and, of course, the Fabaceae, the preferred host of most bruchids. Most of the hosts should be verified, without a doubt. The reports of *Spermophagus* feeding in seeds of the families Verbenaceae, Asteraceae, and Caryophyllaceae are most likely in error. Also doubtful is one species of bruchid feeding in seeds of both the Malvaceae and the Convolvulaceae and in *Gossypium* sp. (cotton).

Amblycerus

Hosts of *Amblycerus* were recently discussed by Romero, et al. (1996). They noted that most species of *Amblycerus* feed in seeds of the Fabaceae. They also confirmed that species of *Amblycerus* might have the most extensive scope of host plants of any genus of bruchids. Species in this genus have been reliably reported to feed in seeds of the families Fabaceae, Malpighiaceae, Rhamnaceae, Boraginaceae, Sterculiaceae, Tiliaceae, Vitaceae, Euphorbiaceae, Combretaceae, and Anacardiaceae. Another host family has been discovered and it will be published in the near future. Reports of species of *Amblycerus* feeding in the Verbenaceae, Malvaceae, and Poaceae may be accurate but these must be verified.

MATERIALS AND METHODS

We use the term ocular index as the ratio of the width across the eyes over the narrowest distance between the eyes (Kingsolver 1990a).

In the preparation of the genitalia for study we used the techniques and nomenclature described by Kingsolver (1970a) and modified by Romero and Johnson (1999). The genitalia were stored in genitalia vials.

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KEY TO GENERA OF AMBLYCERINAE

In order to understand better the morphological relationships between the genera of the Amblycerinae and for ease of separation, we present a key to the genera of Amblycerinae below.

1 Emargination of eye shallow, depth less than one-third of diameter of eye; procoxae well separated by prosternal process; metatibia lacking lateral carina. Amblycerini ***Amblycerus***

— Emargination of eye deep, one-half or more diameter of eye; procoxae contiguous or separated by a thin, vertical lamella; metatibia with prominent carinae. Spermophagini 2

2 Apical end of lateral pronotal carina meeting or nearly meeting short, horizontal supracoxal carina on an angulate lobe partly concealing posterior margin of eye when head is in repose; tenth stria reaching nearly to apex of elytron; apex of metafemur minutely incised ***Spermophagus***

— Supracoxal carina lacking, eye free of apical margin of pronotum; tenth stria extending only one-half length of elytron; apex of metafemur angulate, not incised ***Zabrotes***

Genus **ZABROTES** Horn

Zabrotes Horn, 1885:156. Type species : Bruchus cruciger Horn, 1885, subsequent designation by Zacher, 1930. Sharp, 1885: 492; Horn, 1886: xi; Leng, 1920:306; Pic, 1913: 58; Bridwell, 1932:106; Bridwell, 1946: 53, 56; Blackwelder, 1946: 763; Blackwelder and Blackwelder, 1948: 44; Decelle, 1951: 190; Decelle, 1958: 83; Hinckley, 1960:260; Teran, 1967: 308; Kingsolver, 1970c: 487; Bottimer, 1968: 1012; Johnson, 1968: 1271; Whitehead and

Kingsolver, 1975a: 154; Kingsolver, 1980: 243; Borowiec, 1980: 43; Johnson and Kingsolver, 1981: 411; Udayagiri and Wadhi, 1982: 6; Egorov and Ter-Minasian, 1983: 53; Borowiec, 1987: 7, 62; Borowiec, 1988: 200; Udayagiri and Wadhi, 1989: 31; Kingsolver 1990a: 136; Anton, 1994: 143; Romero et al., 1996:3.

We did not describe this genus because Kingsolver (1990a:136) recently described *Zabrotes*.

KEY TO THE MEXICAN SPECIES OF *ZABROTES*

1	Metacoxa with a group of punctures near the trochanteral articulation **2**
1'	Metacoxa smooth, without a group of punctures near the trochanteral articulation **7**
2(1)	Body dull black, not shiny, at least the first antennal segment reddish brown **3**
2'	Body shiny black, all antennal segments black ..... ***Z. interstitialis*** (Chevrolat)
3(2)	Elytron with a mesal, transverse, white band **4**
3'	Elytron with an indistinct mesal, transverse, white band **5**
4	Pronotum foveolate laterally; elytra densely foveolate ... ***Z. flemingia,*** new species
4'	All of surface of pronotum foveolate; elytra with inconspicuous foveolae ..... ***Z. spectabilis*** Horn
5(3')	Stria VI curved at base ..... ***Z. chavesi*** Kingsolver
5'	Stria VI straight at base **6**
6(5')	All of surface of pronotum foveolate***Z. planifrons*** (Horn)
6'	Only lateral areas of pronotum microfoveolate ..... ***Z. victoriensis*** Kingsolver
7(1')	Elytron with a mesal, transverse, white band **8**
7'	Elytron without a mesal, transverse, white band **16**
8(7)	Metasternum with a fossa **9**
8'	Metasternum without a fossa **10**
9(8)	With a pair of carinae on the external part of the metatibia, pronotum foveolate laterally, with brown spot on frons ..... ***Z. subfasciatus*** (Boheman)
9'	With only one carina on the external part of the metatibia, pronotum foveolate on entire surface, frons without spot ..... ***Z. sylvestris*** Romero and Johnson
10(8')	Elytron densely foveolate, antennal segment I equal to or greater than 2.33 times the length of antennal segment II **11**
10'	Elytron with inconspicuous foveolae, antennal segment I less than or equal to 2.3 times the length of antennal segment II **12**
11(10)	Metatarsal mucro equal to or longer than 0.25 the length of the metatarsus, stria VI curved at its apical end ..... ***Z. moctezuma,*** new species

11'	Metatarsal mucro equal to or less than 0.15 the length of the metatarsus, stria VI straight at its apical end ..... ***Z. sinaloensis***, new species
12(10')	Length of the antenna less than the length of the body ... **13**
12'	Length of the antenna equal to or greater than the length of the body ..... ***Z. bexarensis*** Kingsolver
13(12)	Pronotum scarcely foveolate or foveolate only laterally . **14**
13'	Entire surface of pronotum foveolate **15**
14(12)	Strial punctures deep, metatarsal mucro from 0.18 to 0.22 the length of the metatarsus ..... ***Z. densus*** Horn
14'	Strial punctures faint, metatarsal mucro from 0.10 to 0.14 the length of the metatarsus ..... ***Z. obliteratus*** (Horn)
15(13')	Metasternum smooth, without sulcus, ocular index 2.46-2.75, striae inconspicuous, strial punctures large and deep ..... ***Z. californiensis***, new species
15'	Metasternum with a longitudinal sulcus, ocular index 1.26, striae deep, striae VIII-IX abbreviated, strial punctures inconspicuous ..... ***Z. guerrerensis***, new species
16(7')	Length (pronotum-elytra) greater than 2.4 mm, segment I of the antenna equal to or greater than 2.4 times the length of segment II ..... ***Z. amplissimus*** Kingsolver
16'	Length (pronotum-elytra) equal to or less than 2.1 mm, segment I of the antenna equal to or less than 2.3 times the length of antennal segment II **17**
17(16')	Pronotum slightly enlarged mesally, with foveolae only laterally ..... ***Z. achiote***, new species
17'	Pronotum not enlarged mesally, foveolate on its entire surface ..... ***Z. ixtapan***, new species

TAXONOMY OF *ZABROTES* OF MEXICO

Zabrotes achiote, new species

Male

Integument color.—Body black, except first two antennal segments reddish brown, some specimens with maxillary palpi reddish.

Vestiture.—Head covered with fine white pubescence; pronotum with intermixed brown and white pubescence; scutellum and metacoxa white; elytra and pygidium brown intermixed with white; abdomen mostly covered with gray pubescence; in some specimens metacoxa brown.

Structure.—Head. Vertex and frons finely punctate, frontal carina faint, varying to line without punctations; ocular sinus 0.66 to 0.72 width of eye; antennal segment I 1.75 to 2.3 times longer than antennal segment II and segment XI 1.57 times longer than segment I. Antenna 0.57 to 0.76 the length of the body. Ocular index 1.77 to 2.1.

Prothorax.— Semicircular, slightly bulging medially, covered with micropunctations, lateral areas foveolate.

Mesothorax and Metathorax.— Scutellum small, triangular. Elytron uniformly micropunctate, 1.57 to 1.82 times as long as wide; striae deep,

strial punctures clearly marked; stria VI straight at base. Metasternum micropunctate, foveolate laterally, with a thin longitudinal sulcus, in some specimens only a small basal sulcus or indentation. Metepisternum finely micropunctate and scarcely foveolate. Surface of metacoxa strongly foveolate and setose in lateral 0.58 to 0.72 and along posterior border, the remaining 0.42 to 0.28 shiny and without punctures near the trochanteral insertion. Metatibia with ventral, lateral, and dorsal longitudinal carinae; mucro of first metatarsal segment 0.18 to 0.20 length of metatarsus.

Abdomen.— Sterna I-V finely micropunctate and foveolate; sternum V emarginate; pygidium micropunctate and foveolate.

Measurements.—Length (pronotum-elytra) 1.56-2.1 mm; width 1.2-1.74 mm; maximum thoracic depth 0.9-1.23 mm.

Genitalia.— Median lobe slightly constricted on lateral margins, base slightly wider than remainder of lobe; ventral valve acuminate at apex, with a series of pores near apex; dorsal valve slightly wider than median lobe, apex acuminate; armature of internal sac with a pair of medial sclerites of an irregular form and a pair of apical granulate elongate sclerites (Fig. 1). Lateral lobes 0.46 length of median lobe, cleft to 0.07 their length (Fig. 2).

Female

Similar to male except antenna 0.50 length of body. Length (pronotum-elytra) 1.54-2.1 mm; width 1.14-1.2 mm; maximum thoracic depth 0.9-1.26 mm.

Host plants.— *Bixa orellana* L.: MEXICO. Oaxaca: 4 mi. E Zanatepec, ca. 500', III-11-79, C.D. Johnson collector (CDJ #768-79); *Rhynchosia phaseoloides* DC., Oaxaca, I-18-1963, intercep. Laredo 63-4629. *Acacia angustissima* (P. Miller) Kuntze: VENEZUELA. Guarico: 16 km W Chaguaramas, II-9-85, C.D. Johnson collector (CDJ #3962-85).

Distribution.— Bonaire, Colombia, Curaçao, Costa Rica, El Salvador, Mexico (Chiapas, Guerrero, Morelos, Oaxaca), Venezuela.

Types.— HOLOTYPE male: MEXICO. Oaxaca: 4 mi E Zanatapec, III-11-79, C. D. Johnson collector. ALLOTYPE female: MEXICO. Morelos: 10 mi E Cuernavaca, ca. 4100', IV-4-79, C. D. Johnson collector. PARATYPES: BONAIRE: Aruba, VII-26-27-1962, J. Maldonado C. collector. CURA«AO: Zapateer, VII-5-1962, J. Maldonado C. collector. COLOMBIA: Pto. Colombia, Darlington collector; Rio Frio Mgd., Darlington collector; Cartagena, Darlington collector; Boliv. Cartagena, X-3-71, G. E. Bohart collector. COSTA RICA: 3 km N CaÒas, 90 m Hac. La Pacifica, Guan., 9-11-VIII-1987, A. Howden collector; San Antonio de Escazu, San Jose, 25-III to 6-IV-1984, Sydney A. collector. Cameron; Guanacaste Prov., I-2-1972, D. H. Janzen collector; Palo Verde, OTS Comelco, Guanacaste Prov., 5-20-VI-1971, D. H. Janzen collector; Est. Palo Verde, 10 m P.N. Palo Verde, Prov. Guanacaste, 25 m.s.n.m., 21-IV-1992, A Gutierrez collector. EL SALVADOR: 14 mi SW La Union, L.A., VI-23-68; Vol. Conchagua, V-27-29-1958, L.J. Bottimer collector. MEXICO. Oaxaca: 4 mi. E Zanatepec, ca. 500', III-11-79, reared seeds Bixa orellana, C. D. Johnson collector, 10 mi E Cuernavaca, Mor., ca. 4100', IV-4-79, C. D. Johnson collector; Canyon La Sepultura near Arriaga, Chiapas, VI-8-1989, H. Howden collector; 3.2 mi S Ocotlan, Oax., VII-20-1974, Clark, Murray, Ashe, Schaffner collectors; 3.2 mi SE Petatlan, Gro., VII-14-1984, J. B. Woolley collector; Oaxaca, I-18-1963, in Rhynchosia phaseoloides DC., intercep. Laredo 63-4629; 20 mi E Tuxtla Gutierrez, Chis., 4100', VI-4-1974, O'Brien & Marshall collectors; Xochitepec, Mor, 23-6-1973, Ginter Ekis collector. VENEZUELA: 12

km S Calabozo, Guar., II-6-12-1969, P. & P. Spangler collectors; 6 km W La Concepcion, Zulia, 18-VI-1976, A. S. Menke & D. Vincent collectors; Guarico Prov., 6-IX-1976, N. Ramirez collector; Maracay, III-5-1959, A. M. Nadler collector; Zulia, Carrasquero, 29-30-V-1976, A. S. Menke & D. Vincent collectors; 10 km E Calabozo, Guarico, 18-III-1982, G. F. & J. F. Hevel collectors; Rancho Grande, Maracay, XI-1960, G. Frey collector; 16 km W Chaguaramas, Guarico, II-9-85, C. D. Johnson collector.

HOLOTYPE deposited in the U.S. National Museum of Natural History, Washington, D.C. ALLOTYPE deposited in the C. D. Johnson collection. PARATYPES deposited in the following collections: CEIFIT, MCZC, USNM, AMNH, HFH, TAMU, KUL, CNM, INBIO.

Etymology.— The specific epithet is a noun in apposition to *Zabrotes* and refers to the common name of the host plant, *Bixa orellana.*

Discussion.— The sclerites of the internal sac of the male genitalia of this species are very similar to those of *Z. flemingia.* The external morphology, however, is different in that *Z. achiote* does not have white maculations on the elytra and lacks punctations on the metacoxa, characters that *Z. flemingia* has.

Although the collections and reports of bruchids and their host plants by Johnson are usually very reliable, this species was supposedly feeding in seeds of *Bixa orellana* (family Bixaceae) and *Acacia angustissima* (family Fabaceae) both collected by Johnson. Because they were supposedly feeding in two very different plant families, these host plants should be verified as should the supposed host *Rhynchosia phaseoloides* (Fabaceae) which we do not consider to be as reliable as the other two.

Zabrotes amplissimus Kingsolver

Zabrotes amplissimus Kingsolver, 1990a:152.

Male

Integument color.—Body black, except two basal antennal segments, third tarsomere and the two metatibial spines reddish brown.

Vestiture.—Head with white pubescence, except for a brown maculation on vertex; remainder of body white intermixed with small brown maculations; some specimens with scutellum white and pygidium with a pair of white spots.

Structure.—Head. Vertex and frons densely punctate, frontal carina faint; ocular sinus 0.54 to 0.66 width of eye; antennal segment I 2.46 to 2.66 times longer than antennal segment II and segment XI 1.27 to 1.90 times longer than segment I. Antenna 0.66 to 0.77 the length of the body. Ocular index 1.64 to 1.90.

Prothorax.— Campaniform, covered with micropunctations and densely foveolate.

Mesothorax and Metathorax.— Scutellum small, triangular. Elytron densely microfoveolate, 1.94 times as long as wide; striae 1 to 5 visible only apically and mesally, remaining striae hardly visible, strial punctures shallow; stria VI more or less straight at base. Metasternum densely foveolate, with a thin longitudinal sulcus, in some specimens only a small basal sulcus or indentation. Metepisternum densely foveolate. Surface of metacoxa with large foveolae and setose in lateral 0.60 to 0.63 and along posterior border, the remaining 0.40 to 0.37 shiny and without punctures near the trochanteral insertion. Metatibia with only lateral longitudinal carina; mucro of the first metatarsal segment 0.11 to 0.15 length of

metatarsus.

Abdomen.—Sterna I-V finely micropunctate and foveolate; sternum V emarginate; pygidium densely foveolate.

Measurements.—Length (pronotum-elytra) 2.40-3.0 mm; width 1.86-2.52 mm; maximum thoracic depth 1.44-1.92 mm.

Genitalia.— Median lobe elongate, slightly constricted on lateral margins and basal portion slightly wider than remainder; ventral valve and dorsal valve narrower than median lobe, both with apex acuminate; armature of internal sac with two apical granulate sclerites, a medial spinescent rectangular sclerite and a pair of medial sclerites of an irregular form (Fig. 3). Lateral lobes 0.56 length of median lobe, without cleft at apex (Fig. 4).

Female

Similar to male. Length (pronotum-elytra) 2.58-3.42 mm; width 2.1-2.64 mm; maximum thoracic depth 1.62-1.92 mm.

Host plants.— Old records: *Phaseolus metcalfei* Wooton and Standley (Kingsolver, 1990a). New records: *Phaseolus ritensis* M. E. Jones: MEXICO. Durango: Francisco Madero, 1979, A. Bonet and M. Jarry collectors.

Distribution.— Old records: USA (New Mexico) (Kingsolver, 1990a). New records Mexico (Durango, San Luis Potosi, Sinaloa, Tamaulipas).

Discussion.— Prior to this study only females of *Z. amplissimus* had been described. In this paper the males of the species are described and illustrated for the first time. This species is easily distinguished from other *Zabrotes* of Mexico because of its large size (2.5-3.5 mm in length). Also the sclerites of the internal sac of the male genitalia of this species are distinct, especially the medial spinescent rectangular sclerite (Fig. 3).

Zabrotes bexarensis Kingsolver

Zabrotes bexarensis Kingsolver, 1990a:153.

Male

Integument color.—Body black, except two basal antennal segments and the two metatibial spines reddish brown, some specimens with only part of the first antennal segment reddish brown; apical portion of labrum and third tarsomere reddish brown.

Vestiture.—Head covered with sparse white pubescence; pronotum with uniformly white or intermixed with brown, sometimes forming well-defined patterns; scutellum white; elytra uniformly white or white intermixed with brown or brown with white maculations, maculations generally vague; pygidium uniformly white or white with obscure, thin medial line or grayish with lateral maculations; ventral surface white, some specimens with metacoxa white or white intermixed with brown or uniformly brown.

Structure.—Head. Vertex and frons finely punctate, frontal carina present; ocular sinus 0.63 to 0.81 width of eye; antennal segment I 2.0 to 2.3 times longer than antennal segment II and segment XI 1.43 to 1.75 times longer than segment I. Length of antenna equal to or 1.1 times length of body. Ocular index 1.7 to 2.0.

Prothorax.— Campaniform, covered with micropunctations, foveolate.

Mesothorax and Metathorax.— Scutellum small, triangular. Elytron uniformly micropunctate, 1.68 to 2.0 times as long as wide; striae narrow,

well marked along border of elytron, strial punctures deep; stria VI more or less straight at base. Metasternum micropunctate, with a thin longitudinal sulcus, in some specimens with only a small basal sulcus or indentation. Metepisternum finely micropunctate, foveolate. Surface of metacoxa foveolate and setose in lateral 0.55 to 0.61 and along posterior border, remaining 0.45 to 0.39 shiny and without punctures near trochanteral insertion. Metatibia with ventral and lateral longitudinal carinae; mucro of first metatarsal segment 0.10 to 0.15 length of metatarsus.

Abdomen.— Sterna I-V finely micropunctate and foveolate; sternum V emarginate; pygidium micropunctate and foveolate.

Measurements.—Length (pronotum-elytra) 1.60-1.96 mm; width 1.10-1.60 mm; maximum thoracic depth 1.04-1.16 mm.

Genitalia.— Median lobe elongate, slightly constricted on lateral margins and basal portion slightly wider than remainder; ventral valve acuminate at apex; dorsal valve narrower than median lobe, apex acuminate; armature of internal sac with two apical, granulate sclerites, behind these a mass of small spines; two narrow medial sclerites and three groups of strong spines (Fig. 5). Lateral lobes 0.66 length of median lobe, without cleft and with a pair of transverse rows of hairs apically (Fig. 6).

Female

Similar to male except antenna shorter, only 0.81 length of body. Length (pronotum-elytra) 1.9 mm; width 1.5 mm; maximum thoracic depth 1.2 mm.

Host plants.— Old records: *Vicia leavenworthi* Torrey and Gray; *Vicia* L. sp. (Kingsolver, 1990a).

Distribution.— Old records: USA (Texas), Mexico (Kingsolver, 1990a). New records: USA (Arizona), Mexico (Michoacan, Oaxaca, Sinaloa).

Discussion.— The morphology of the male genitalia of this species is distinct. The internal sac is unique because it has two narrow medial sclerites and three groups of strong spines; two apical granulate sclerites and beneath these a mass of small spines (Fig. 5). The lateral lobes are also unique because they lack a cleft at the apex and have a pair of transverse rows of hairs apically (Fig. 6).

Zabrotes californiensis, new species

Male

Integument color.—Body black, except apex of labrum light brown.

Vestiture.—Head covered with very fine white pubescence; pronotum with white pubescence interrupted by a pair of inconspicuous longitudinal bands; scutellum white; elytra light brown except for a short, inconspicuous, transverse, white band; pygidium white with a pair of inconspicuous light brown spots; abdomen covered with white pubescence.

Structure.—Head. Vertex and frons finely punctate, frontal carina well defined; ocular sinus 0.70 to 0.71 width of eye; antennal segment I 1.66 to 1.77 times longer than antennal segment II and segment XI 1.2 to 1.44 times longer than segment I. Antenna 0.61 to 0.67 length of body. Ocular index 2.46 to 2.75.

Prothorax.— Semicircular, covered with micropunctations and foveolae.

Mesothorax and Metathorax.— Scutellum small, triangular. Elytron uniformly micropunctate, 1.7 times as long as wide; striae inconspicuous, strial punctures large and deep; stria VI straight at apex. Metasternum

micropunctate, foveolate, flat. Metepisternum finely micropunctate, foveolate. Surface of metacoxa foveolate and setose in lateral 0.66 and along posterior border, the remaining 0.34 shiny except for a group of 14 to 18 shallow punctures near trochanteral insertion. Metatibia with ventral and lateral longitudinal carinae; mucro of first metatarsal segment 0.11 length of metatarsus.

Abdomen.— Sterna I-V finely micropunctate and foveolate; sternum V emarginate; pygidium micropunctate and foveolate.

Measurements.— Length (pronotum-elytra) 1.50 mm; width 1.24 mm; maximum thoracic depth 0.90 mm.

Genitalia.— Median lobe slightly constricted on lateral margins and basal portion slightly wider than remainder; ventral valve acuminate at apex, with a series of pores near apex; dorsal valve slightly wider than median lobe, apex acuminate; armature of internal sac with a pair of medial elongate sclerites, surrounded by a mass of spines and a pair of apical granulate sclerites that are covered near their middle by small spines; base of sac lined by many minute spines (Fig. 7). Lateral lobes 0.42 length of median lobe, not cleft at apex (Fig. 8).

Female

Similar to male except maculations of pronotum, elytron and pygidium are more contrasting. Length (pronotum-elytra) 1.50 mm; width 1.23 mm; maximum thoracic depth 0.96 mm.

Host plants.— Unknown.

Distribution.— Mexico (Baja California).

Types.— HOLOTYPE male and ALLOTYPE female: MEXICO. Baja California: Isla Angel de la Guarda, Puerto Refugio, Golfo de California, 1-VIII-1985, M. Garcia collector.

HOLOTYPE and ALLOTYPE deposited in the Colección Nacional de Insectos, Instituto de Biologia, UNAM (CNIC).

Etymology.— The specific epithet refers to Baja California, the state in which these specimens were collected.

Discussion.— *Zabrotes* californiensis is similar to *Z. spectabilis* in that both have similar patterns of pubescence and a group of punctations on the metacoxa. The sclerites of the internal sac of the male genitalia of this species, however, are distinct. *Zabrotes californiensis* has a pair of granulate sclerites at the apex that are covered near their middle by small spines. *Zabrotes spectabilis* does not have similar spines.

Zabrotes chavesi Kingsolver

Zabrotes chavesi Kingsolver, 1980:243; Janzen, 1980:949.
Zabrotes vandykei Kingsolver, 1990a:150; Romero and Johnson, 1997:74

Male

Integument color.—Body black, except first two antennal segments, apex of labrum and the two metatibial spines reddish brown, some specimens with two basal antennal segments darker, but generally of a lighter color than remaining segments.

Vestiture.—Head covered with griseous pubescence, antenna with mixed gray and brown pubescence; pronotum with reddish-brown pubescence, in some specimens there are five indistinct, gray maculations; scutellum griseous; elytra and pygidium with reddish-brown pubescence with griseous maculations, maculations more distinct in some

specimens; abdomen mostly covered with gray pubescence; metacoxa and dorsal margins of abdomen with a mixture of gray, pale and brown setae; in some specimens there is a narrow, medial fringe of gray pubescence on pygidium.

Structure.—Head. Vertex and frons finely punctate, frontal carina faint; ocular sinus 0.80 width of eye; antennal segment I 1.60 times longer than antennal segment II and segment XI 1.4 times longer than segment I. Antenna 0.62 to 0.76 the length of the body. Ocular index 1.80 to 2.10.

Prothorax.— Semicircular, slightly bulging medially, covered with micropunctations, lateral areas foveolate.

Mesothorax and Metathorax.— Scutellum small, triangular. Elytron uniformly micropunctate, 1.3 times as long as wide; striae shallow, lightly marked for 0.8 their length, remainder of length thin, strial punctures lightly marked; stria VI more or less arched at base. Metasternum micropunctate, with a thin longitudinal sulcus, some specimens with only a small basal sulcus or indentation. Metepisternum finely micropunctate, with foveolae. Surface of metacoxa foveolate and setose in lateral 0.63 and along posterior border, the remaining 0.37 shiny, except for a group of punctures near the trochanteral insertion. Metatibia with ventral and lateral carinae; mucro of the first metatarsal segment 0.15 to 0.20 length of metatarsus.

Abdomen.— Sterna I-V finely micropunctate; sternum V deeply emarginate; pygidium micropunctate and with few foveolae.

Length (pronotum-elytra) 1.6-2.8 mm; width 1.2-1.7 mm; maximum thoracic depth 0.8-1.2 mm.

Genitalia.— Median lobe slightly constricted on lateral margins and basal portion much wider than remainder; ventral valve acuminate at apex, with a series of pores at lateral angles; dorsal valve smaller than median lobe, apex very acuminate; armature of internal sac with two apical granulate sclerites, two small, medial sclerites and a pair of basal pouches lined with fine spines (Fig. 9). Lateral lobes 0.36 length of median lobe, cleft to 0.06 their length (Fig. 10).

Female

Similar to male except antenna 0.62 length of body. Length (pronotum-elytra) 2.4 mm; width 1.6 mm; maximum thoracic depth 1.2 mm.

Host plants.— Old records: *Senna hirsuta leptocarpa* Bentham: (Kingsolver, 1990a); *Cassia leptocarpa* (Janzen, 1980; Kingsolver, 1980, 1990a; Romero and Johnson, 1997; Udayagiri and Wadhi, 1989)); *S. spectabilis* DC.: (Romero and Johnson, 1997). New records: *Cassia emarginata* L.: HONDURAS. 13 mi. SW Comayagua, III-18-79, ca. 1800', C. D. Johnson collector (CDJ #876-79).

Distribution.— Old records: USA (Arizona); Costa Rica, El Salvador, Mexico (Guerrero, Jalisco, Michoacan, Sinaloa) (Kingsolver, 1980). New records: Honduras, Mexico (Baja California Norte, Morelos, Nayarit, Oaxaca, Sonora), Nicaragua, Venezuela.

Discussion.— *Zabrotes chavesi* is similar to *Z. spectabilis* but they can be separated easily in that *Z. chavesi* lacks spines that surround the pair of medial sclerites of the internal sac of the male genitalia and the small spines that cover the anterior portion of the internal sac are different in both species. The basal pouches of *Z. chavesi* are lined with fine spines (Fig. 9) but the basal portion of the internal sac of *Z. spectabilis* is lined with microspinulate scales (Fig. 29).

Zabrotes densus Horn

Zabrotes densus Horn, 1885:158; Fall 1901:161; Leng, 1920:306; Bottimer, 1968:1013; Johnson, 1968:1271; Kingsolver, 1990a:154.
Spermophagus densus: Pic, 1913:59.

Male

Integument color.—Body black, except the two metatibial spines reddish brown; in some specimens first two to three antennal segments and fore and middle legs pale.

Vestiture.—Head covered with fine white pubescence; pronotum with obscure brown hairs mixed with small areas of light brown and gray hairs; some specimens vary from small white maculations to a longitudinal stripe; scutellum white or brown; elytron obscure brown intermixed with small brown and gray maculations, with a sloping white band, in some specimens band is vague; venter white except metacoxa and lateral portion of the first abdominal sternum that are light brown to obscure brown; pygidium obscure brown except for medial basal white band.

Structure.—Head. Vertex and frons finely punctate, frontal carina faint; ocular sinus 0.67 to 0.77 width of eye; antennal segment I 1.57 to 2.0 times longer than antennal segment II and segment XI 1.75 to 1.80 times longer than segment I. Antenna 0.67 to 0.76 length of body. Ocular index 1.55 to 1.70.

Prothorax.—Campaniform, covered with micropunctations, with few foveolae.

Mesothorax and Metathorax.— Scutellum micropunctate, small, triangular. Elytron uniformly micropunctate, 1.72 to 2.0 times as long as wide; striae narrow, well marked along elytra, strial punctures deep; stria VI more or less straight at base. Metasternum micropunctate, with a thin longitudinal sulcus, in some specimens only a small basal sulcus or indentation. Metepisternum finely micropunctate and foveolate. Surface of metacoxa foveolate and setose in lateral 0.53 to 0.57 and along posterior border, remaining 0.47 to 0.43 shiny, without punctures near the trochanteral insertion. Metatibia with only lateral longitudinal carina; mucro of basal metatarsal segment 0.18 to 0.22 length of metatarsus.

Abdomen.— Sterna I-V finely micropunctate and foveolate; sternum V emarginate; pygidium micropunctate and densely foveolate.

Measurements.— Length (pronotum-elytra) 1.32-2.46 mm; width 1.02-1.62 mm; maximum thoracic depth 0.78-1.26 mm.

Genitalia.— Median lobe elongate, slightly constricted on lateral margins, basal portion slightly wider basally; dorsal surface rugose; ventral valve subtriangular, acuminate at apex; dorsal valve wider than median lobe, apex blunt; armature of internal sac with one J-shaped sclerite and another smaller sclerite in the apical portion of the J-shaped sclerite like a stopper (Fig. 11). Lateral lobes 0.5 length of median lobe, without cleft at apex (Fig. 12).

Female

Similar to male except antenna shorter, 0.81 length of body. Length (pronotum-elytra) 1.56-1.80 mm; width 1.26-1.47 mm; maximum thoracic depth 0.84-1.02 mm.

Host plants.— Unknown.

Distribution.— Old records: USA (Arizona, California, Texas)

(Kingsolver, 1990a). New records: Costa Rica, Guatemala, Honduras, Mexico (Colima, Chihuahua, Guerrero, Jalisco, Puebla, Sinaloa, Veracruz), Nicaragua, Panama.

Discussion.— *Zabrotes* densus is remarkably close to *Z. propinquus* (Sharp). Of the specimens that we examined for this study, we found hardly any differences between them. We did not synonymize them because we have not examined type-specimens. The host plant of *Z. densus* is unknown but Janzen (1980) mentioned that larvae of *Z. propinquus* feed in seeds of *Mimosa albida* Humb. and Bondpl. *Zabrotes propinquus* has been collected in Guatemala, Nicaragua and Panama (Maes and Kingsolver, 1991; Sharp, 1885). We have found in the material used for this revision that *Z. propinquus* is also found in Costa Rica, El Salvador and Mexico (Chiapas, Guerrero, Morelos, Oaxaca). Z. densus and *Z. propinquus* share some of the same areas of distribution.

Another species with similar genitalia is *Z. obliteratus*. This species is distinctly different from the above two and easily recognized due to the presence of microspinules surrounding the medial sclerite of the male genitalia.

Zabrotes flemingia, new species

Male

Integument color.—Body black, except first two antennal segments reddish brown.

Vestiture.—Head covered with fine white pubescence; pronotum with intermixed brown and white pubescence; scutellum white; elytron brown intermixed with white, with a transverse, white maculation which varies from obvious to scarcely perceptible; metacoxa brown intermixed with white; abdomen mostly covered with gray pubescence, pygidium white with small brown maculations dorsally.

Structure.—Head. Vertex and frons finely punctate, frontal carina lightly marked, sometimes varying to line without punctations; ocular sinus 0.65 to 0.70 width of eye; antennal segment I 1.75 to 2.3 times longer than antennal segment II and segment XI 1.57 to 1.71 times longer than segment I. Antenna 0.57 to 0.68 length of body. Ocular index 1.43 to 1.75.

Prothorax.— Semicircular, slightly bulging medially, covered with micropunctations, lateral areas foveolate.

Mesothorax and Metathorax.— Scutellum small, triangular. Elytron uniformly micropunctate, 1.76 to 1.88 times as long as wide; striae deep and strial punctures clearly marked; stria VI straight at base. Metasternum micropunctate and densely foveolate laterally, with a thin longitudinal sulcus, in some specimens only a small basal sulcus or indentation. Metepisternum finely micropunctate and foveolate. Surface of metacoxa strongly foveolate and setose in lateral 0.60 to 0.62 and along posterior border, remaining 0.40 to 0.38 shiny and with a group of punctures near the trochanteral insertion. Metatibia with only lateral longitudinal carina; mucro of first metatarsal segment 0.19 to 0.21 length of metatarsus.

Abdomen.— Sterna I-V finely micropunctate and scarcely foveolate; sternum V emarginate; pygidium micropunctate and foveolate.

Measurements.— Length (pronotum-elytra) 1.80-2.1 mm; width 1.50-1.74 mm; maximum thoracic depth 1.08-1.20 mm.

Genitalia.— Median lobe slightly constricted on lateral margins and basal portion slightly wider than remainder; ventral valve acuminate at apex, with a series of pores near apex; dorsal valve slightly wider than

median lobe, apex acuminate; armature of internal sac with a pair of apical granulate sclerites, a pair of medial sclerites of an irregular form, and a pair of elongate sclerites flanking the latter (Fig. 13). Lateral lobes 0.45 length of median lobe, cleft to 0.07 their length (Fig. 14).

Female

Similar to male. Length (pronotum-elytra) 1.50-1.92 mm; width 1.38-1.56 mm; maximum thoracic depth 0.96-1.14 mm.

Host plants.— *Flemingia strobilifera* (L.) Ait.: PANAMA: 1 km NE Gamboa, C. Z., III-27-80, C. D. Johnson collector (CDJ #2130-80).

Distribution.— Brazil, Colombia, Costa Rica, El Salvador, Mexico (Yucatan), Panama, Venezuela.

Types.—HOLOTYPE male: PANAMA: 14 km E Tocumen, IV-3-1980, collector C. D. Johnson. ALLOTYPE female: 1 km NE Gamboa, C. Z., III-27-80, reared seeds *Flemingia* strobilifera, C. D. Johnson collector. PARATYPES: BRASIL: Fortaleza Ceara, II-5-1959, A. M. Nadler collector. COLOMBIA: Honda, Tolima, 18-VI-1965, J. A. Ramos collector; Girardot, Cund., 8-VIII-1965, J. A. Ramos collector; Rio Frio Mgd., Darlington collector; Santa Marta, Darlington collector; Cartagena, Darlington collector. COSTA RICA: Fca. Jenny, 30 km N Liberia, P. N. Guanacaste Prov., Tp. Malaise, 1990. EL SALVADOR: 14 mi SW La Union L.A., VI-23-68. MEXICO: Tixkokob, Yuc., VII-5-1, C. R. Vose Fund Explorers Club collectors. PANAMA: 2 mi SSE Gamboa, C. Z., 14-VI-1970, H. Stockwell collector; 1 km NE Gamboa, C. Z., III-27-80, reared seeds *Flemingia* strobilifera, C. D. Johnson collector; Coco Solo Hospital, C. Z. VII-2-72, W. & L. O'Brien & Marshall collectors; Paraiso, C. Z., I-20-1911, E. A. Shwarz collector; Chiriqui, Puerto Armuelles, 23-XII-1982, Felix Rodriguez & Bryce Edmonson collectors; Puerto Armuelles, 25-VI-1982, A. Castillo collector. VENEZUELA: Ciudad Bolivar, VII-3-89, E. A. Klages collector.

HOLOTYPE deposited in the U.S. National Museum of Natural History, Washington, D.C. ALLOTYPE deposited in the C. D. Johnson collection. PARATYPES deposited in the following collections: CEIFIT, MCZC, USNM, AMNH, HFH, TAMU, CNM, INBIO, JMK.

Etymology.— The specific epithet is a noun in apposition to *Zabrotes*, and is named for the host plant genus, *Flemingia*.

Discussion.— The sclerites of the internal sac of the male genitalia of *Z. flemingia* are very similar to those of *Z. achiote*. The external morphology, however, is different in that *Z. achiote* does not have white maculations on the elytra and lacks punctations on the metacoxa, characters that *Z. flemingia* has. They also feed in seeds of distinctly different host plants.

Zabrotes guerrerensis, new species

Male

Integument color.—Body black, except first two antennal segments and basal part of third pale.

Vestiture.—Head covered with fine white pubescence; pronotum with obscure brown pubescence except for medial longitudinal line and a white maculation on each corner; scutellum white; elytron obscure brown except for a mesal, short, transverse, white band; pygidium obscure brown with a mesal longitudinal band and another white, transverse, basal band; metacoxa with brown pubescence; abdomen covered with white pubescence.

Structure.—Head. Vertex and frons finely punctate, frontal carina

inconspicuous; ocular sinus 0.72 width of eye; antennal segment I 2.0 times longer than antennal segment II and segment XI 1.75 times longer than segment I. Antenna 0.84 length of the body. Ocular index 1.26.

Prothorax.— Semicircular, covered with micropunctations and foveolae.

Mesothorax and Metathorax.— Scutellum small, triangular. Elytron uniformly micropunctate, 1.93 times as long as wide; striae deep, strial punctures inconspicuous, striae VII-IX abbreviated at base, stria VI straight at base. Metasternum micropunctate, with a thin longitudinal sulcus. Metepisternum finely micropunctate with large, deep foveolae. Surface of metacoxa foveolate and setose in lateral 0.51 and along posterior border, the remaining 0.49 shiny and without punctures near the trochanteral insertion. Metatibia with ventral and lateral longitudinal carinae; mucro of the first metatarsal segment 0.13 length of metatarsus.

Abdomen.— Sterna I-V finely micropunctate and foveolate; sternum V emarginate; pygidium micropunctate and foveolate.

Measurements.— Length (pronotum-elytra) 2.22 mm; width 1.74 mm; maximum thoracic depth 1.20 mm.

Genitalia.— Median lobe slightly constricted on lateral margins and basal portion wider than remaining portion; ventral valve triangular, with a series of pores near apex; dorsal valve slightly wider than median lobe, apex very acuminate; armature of internal sac with two anterior granulate sclerites, a pair of medial plates curved medially, with rows of spines laterally and masses of spines ventrally and mesally (Fig. 15). Lateral lobes narrow, 0.59 length of median lobe, cleft to 0.08 their length (Fig. 16).

Female

Unknown.

Host plants.— Unknown.

Distribution.— Mexico (Guerrero).

Types.— HOLOTYPE male. MEXICO. 2-8 km W 95 on 200 Veintidos, Guerrero, IX-15-16-22-1989, collector J.E. Wappes.

HOLOTYPE deposited in the U.S. National Museum of Natural History, Washington, D.C.

Etymology.— The specific epithet is named after the state in which it was collected, Guerrero.

Discussion.— *Zabrotes* moctezuma, *Z. subfasciatus*, *Z. sylvestris* and *Z. guerrerensis* share similar patterns of pubescence. *Z. guerrerensis* may be easily differentiated because of the presence of a small basal sulcus or indentation on the metepisternum, which is lacking in *Z. sylvestris* and *Z. subfasciatus*. To differentiate *Z. guerrerensis* from *Z. moctezuma*, one must resort to the number of medial sclerites in the internal sac of the male genitalia. *Zabrotes guerrerensis* has a pair of sclerites and *Z. moctezuma* has one.

Zabrotes interstitialis (Chevrolat)

Spermophagus interstitialis Chevrolat, 1871:8; Zacher 1952:468
Amblycerus interstitialis: Blackwelder, 1946:762
Zabrotes interstitialis: Janzen, 1972:964; Whitehead and Kingsolver, 1975b:464; Center and Johnson, 1974:1098; Janzen, 1976:187; Baskin and Baskin, 1977:63; Janzen, 1977:417; Janzen, 1978:184; Johnson, 1979:124; Johnson, 1980:31; Kingsolver, 1980:245; Johnson and Kingsolver, 1981:411.

Male

Integument color.—Body black, lustrous.

Vestiture.—Head covered with fine white pubescence; pronotum with intermixed brown and griseous pubescence; scutellum white; elytra and pygidium brown intermixed with griseous; abdomen mostly covered with gray pubescence; in some specimens metacoxa brown.

Structure.—Head. Vertex and frons finely punctate, frontal carina faint, varying to line without punctations; ocular sinus 0.72 to 0.82 width of eye; antennal segment I 1.8 to 2.0 times longer than antennal segment II and segment XI 1.11 times longer than segment I. Antenna 0.52 to 0.56 the length of the body. Ocular index 2.0 to 2.1.

Prothorax.— Semicircular, slightly bulging medially, covered with micropunctations, lateral areas foveolate.

Mesothorax and Metathorax.— Scutellum small, triangular. Elytron uniformly micropunctate, 1.57 to 1.82 times as long as wide; striae deep, strial punctures clearly marked; stria VI straight at base. Metasternum strongly foveolate, with a thin longitudinal sulcus. Metepisternum strongly foveolate. Surface of metacoxa strongly foveolate and setose in lateral 0.61 to 0.72 and along posterior border, the remaining 0.39 to 0.28 shiny and with a group of 25 to 35 punctures near the trochanteral insertion. Metatibia with ventral and lateral longitudinal carinae; mucro of the first metatarsal segment 0.17 to 0.21 length of metatarsus.

Abdomen.— Sterna I-V finely micropunctate and foveolate; sternum V emarginate; pygidium micropunctate and foveolate.

Measurements.— Length (pronotum-elytra) 1.98-2.64 mm; width 1.74-1.86 mm; maximum thoracic depth 0.8-1.32 mm.

Genitalia.— Median lobe slightly constricted on lateral margins and basal portion slightly wider than remaining portion; apical portion of ventral valve subquadrate, apex spatulate, and a series of pores near apex; dorsal valve slightly wider than median lobe, apex acuminate; armature of internal sac with and a pair of apical granulate sclerites and a pair of medial sclerites of an irregular form (Fig. 17). Lateral lobes 0.44 length of median lobe, without cleft at apex (Fig. 18).

Female

Similar to male except antenna 0.45 length of body. Length (pronotum-elytra) 1.83-2.52 mm; width 1.44-1.92 mm; maximum thoracic depth 1.02-1.44 mm.

Host plants.— Old records: *Cassia grandis* L. (Janzen, 1977, 1978, 1980; Johnson, 1980; Kingsolver, 1970b; Udayagiri and Wadhi, 1989), *Cassia moschata* H.B.K. (Johnson, 1979; Udayagiri and Wadhi, 1989), *Hymenaea courbaril* L.:(Udayagiri and Wadhi, 1989), *Hymenaea rugosa*:(Udayagiri and Wadhi, 1989; Zacher, 1952). New records: *Mimosa quadrivalvis* L.: (CDJ #985-79): PANAMA. 3 km N Summit Gardens, C. Z., III-24-1979, C. D. Johnson collector; '*Cassia brasiliana*': Las Sabanas, Panama City, 4-'26, J. Zetek collector (2834).

Distribution.— Old records: Brazil, Costa Rica, El Salvador, Mexico, Venezuela (Kingsolver, 1970b). New record: Honduras.

Discussion.— *Zabrotes interstitialis* is distinct because it is the only species with male genitalia whose ventral valve has a spatulate apex (Fig. 17).

The host plant *Cassia grandis* and probably *C. moschata* are almost certainly reliable. The host *Mimosa quadrivalvis* is perhaps correct. The

hosts *Cassia brasiliana, Hymenaea courbaril* and *H. rugosa* are almost certainly misidentifications, probably of the plant with very large pods, *Cassia grandis*.

Zabrotes ixtapan, new species

Male

Integument color.—Body black, except first two antennal segments pale.

Vestiture.—Head covered with fine white pubescence; pronotum, elytra and pygidium with intermixed white and brown pubescence; scutellum white; abdomen mostly covered with white pubescence; metacoxa with intermixed white and brown pubescence.

Structure.—Head. Vertex and frons finely punctate, with frontal carina; ocular sinus 0.61 width of eye; antennal segment I 1.77 times longer than antennal segment II and segment XI 1.16 times longer than segment I. Antenna 0.62 length of the body. Ocular index 1.6.

Prothorax.—Semicircular, covered with micropunctations and foveolae.

Mesothorax and Metathorax.— Scutellum small, triangular. Elytron uniformly micropunctate and foveolate, 2.0 times as long as wide; striae and strial punctures deep, striae VI arched at base. Metasternum micropunctate, with a thin longitudinal sulcus. Metepisternum finely micropunctate and with deep foveolae. Surface of metacoxa foveolate and setose in lateral 0.52 and along posterior border, the remaining 0.48 shiny and without punctures near the trochanteral insertion. Metatibia with ventral and lateral longitudinal carinae; mucro of basal metatarsal segment 0.13 length of metatarsus.

Abdomen.— Sterna I-V finely micropunctate and foveolate; sternum V emarginate; pygidium micropunctate and foveolate.

Measurements.— Length (pronotum-elytra) 1.44 mm; width 1.06 mm; maximum thoracic depth 0.78 mm.

Genitalia.— Median lobe slightly constricted on lateral margins and basal portion wider than remainder; ventral valve campaniform, with a series of pores near apex; dorsal valve slightly wider than median lobe; armature of internal sac with two apical granulate sclerites, a pair of medial irregular plates, with masses of ventral spines and microspinules mesally (Fig. 19). Lateral lobes 0.46 length of median lobe, cleft to 0.06 their length (Fig. 20).

Female

Unknown.

Host plants.— Unknown.

Distribution.— Mexico (Estado de Mexico).

Types.— HOLOTYPE male. MEXICO: 4.3 mi NE Ixtapan, Edo. Mexico, July-6-1974, Clark, Murray, Ashe, and Schaffner collectors.

HOLOTYPE deposited in Texas A&M (TAMU).

Etymology.— The specific epithet is a noun in apposition to *Zabrotes* and refers to the city near where it was collected.

Discussion.— The internal sac of the male genitalia of Z. ixtapan sets this species apart from other species in this paper by having two narrow, apical granulate sclerites, a pair of medial irregular plates, with masses of ventral spines and microspinules mesally (Fig. 19).

Zabrotes moctezuma, new species

Male

Integument color.—Body black, except first antennal segments, apex of labrum and apex of last segment of maxillary palpi pale.

Vestiture.—Head covered with intermixed white and pale pubescence; pronotum covered with brown and pale spots, with a white medial longitudinal line and a white maculation on each corner; scutellum white; elytron at base with an irregular line of pale pubescence followed by a darker line, mesally there is a white line followed by a darker line, in the latter there is a small pale spot; abdomen mostly covered with white pubescence; metacoxa with intermixed white and brown pubescence; pygidium with intermixed white and brown pubescence, with two white bands, one basal longitudinal and other transversal.

Structure.—Head. Vertex and frons finely punctate, with frontal carina; ocular sinus 0.66 width of eye; antennal segment I 2.33 times longer than antennal segment II and segment XI 1.57 times longer than segment I. Antenna 0.82 length of the body. Ocular index 1.73.

Prothorax.—Semicircular, covered with micropunctations and foveolae only on posterior corners.

Mesothorax and Metathorax.—Scutellum small, triangular. Elytron uniformly micropunctate and foveolate, 1.87 times as long as wide; striae and strial punctures deep, striae VI arched and abbreviated at base. Metasternum micropunctate and foveolate, with a small basal sulcus or indentation. Metepisternum finely micropunctate and foveolae. Surface of metacoxa foveolate and setose in lateral 0.57 and along posterior border, the remaining 0.43 shiny and without punctures near the trochanteral insertion. Metatibia with lateral longitudinal carinae; mucro of the first metatarsal segment 0.25 length of metatarsus.

Abdomen.— Sterna I-V finely micropunctate and lightly foveolate; sternum V emarginate; pygidium micropunctate and foveolate.

Measurements.— Length (pronotum-elytra) 2.58 mm; width 2.28 mm; maximum thoracic depth 1.5 mm.

Genitalia.— Median lobe with lateral margins parallel and basal portion wider than remaining portion; ventral valve semicircular, with a series of pores near apex; dorsal valve slightly wider than median lobe; armature of internal sac with two apical granulate sclerites, a horseshoe-like sclerite, with rolled spines and a mass of ventral spines (Fig. 21). Lateral lobes 0.52 length of median lobe, cleft to 0.02 their length (Fig. 22).

Female

Unknown.

Host plants.— Unknown.

Distribution.— Mexico (Sonora).

Types.— HOLOTYPE male. MEXICO. 55 km SW Moctezuma, Sonora, VIII-2-1982, 1066 m, S. McCleve, G.E. & K.E. Ball collectors.

HOLOTYPE deposited in the U.S. National Museum of Natural History, Washington, D.C.

Etymology.— The specific epithet is a noun in apposition to *Zabrotes* and refers to the name of the locality, Moctezuma, Sonora, in which it was collected.

Discussion.— See *Z. guerrerensis* for a discussion of this species.

Zabrotes obliteratus Horn

Zabrotes obliteratus Horn, 1885:158; Leng, 1920:306; Johnson, 1968:1271; Bottimer, 1968:1013; Kingsolver, 1990a:157.
Spermophagus obliteratus: Pic, 1913:60.

Male

Integument color.—Body black, except the first two antennal segments and two metatibial spines reddish brown; in some specimens part of first antennal segment and apex of labrum pale.

Vestiture.—Head covered with fine white pubescence; pronotum with obscure brown hairs mixed with small areas of light brown, with a median longitudinal white band and basal corners white; scutellum white; elytron obscure brown intermixed with small brown and pale maculations, with a sinuous transversal white band; pygidium light brown except for two white bands, one basal transversal and other medial longitudinal; venter white except metacoxa and lateral portion of the first and last abdominal sternum that are light brown to obscure brown.

Structure.—Head. Vertex and frons finely punctate, frontal carina faint; ocular sinus 0.54 to 0.75 width of eye; antennal segment I 1.9 to 2.3 times longer than antennal segment II and segment XI 1.30 to 1.74 times longer than segment I. Antenna 0.63 to 0.84 length of body. Ocular index 1.33 to 1.87.

Prothorax.—Campaniform, covered with micropunctations and foveolae on basal corners.

Mesothorax and Metathorax.—Scutellum micropunctate, small, triangular. Elytron uniformly micropunctate and microfoveolate, 1.73 to 2.0 times as long as wide; striae narrow, well marked along elytra, strial punctures shallow; stria VI more or less straight at base. Metasternum micropunctate, with a thin longitudinal sulcus. Metepisternum finely micropunctate and foveolate. Surface of metacoxa foveolate and setose in lateral 0.46 to 0.62 and along posterior border, remaining 0.54 to 0.38 shiny, without punctures near the trochanteral insertion. Metatibia with ventral and lateral longitudinal carina; mucro of the first metatarsal segment 0.10 to 0.14 length of metatarsus.

Abdomen.— Sterna I-V finely micropunctate and foveolate; sternum V emarginate; pygidium micropunctate and densely foveolate.

Measurements.— Length (pronotum-elytra) 1.74-2.46 mm; width 1.26-1.62 mm; maximum thoracic depth 0.96-1.26 mm.

Genitalia.— Median lobe elongate, slightly constricted on lateral margins and wider basally; ventral valve narrow, acuminate at apex; dorsal valve as wider as median lobe, apex blunt; armature of internal sac with one J-shaped sclerite and another smaller sclerite in the apical portion of the J-shaped sclerite appearing to be like a stopper, flanked by lines of spines (Fig. 23). Lateral lobes 0.45 length of median lobe, cleft to 0.04 their length (Fig. 24).

Female

Similar to male except antenna shorter, 0.81 length of body. Length (pronotum-elytra) 2.04-2.22 mm; width 1.14-1.15 mm; maximum thoracic depth 1.46-1.56 mm.

Host plants.— Old records: *Rhynchosia* sp. (Kingsolver, 1990a). New records: None.

Distribution.—Old records: USA (Arizona, Texas) (Kingsolver, 1990a).

New records: Costa Rica, El Salvador, Mexico (Baja California, Colima, Chiapas, Chihuahua, Estado de Mexico, Jalisco, Michoacan, Morelos, Nayarit, Oaxaca, San Luis Potosi, Sinaloa, Sonora, Veracruz, Yucatan), USA (California).

Discussion.— See *Z. densus* for a discussion of this species.

Zabrotes planifrons Horn

Zabrotes planifrons Horn, 1885:158; Schaeffer, 1907:293; Leng, 1920:306; Bottimer, 1968:1013; Johnson, 1968:1271; Moldenke, 1971:108; Johnson, 1979:124; Johnson, 1980:31; Kingsolver, 1980:245; Johnson and Kingsolver, 1981:411; Kingsolver, 1990a:146.

Spermophagus planifrons Pic, 1913:61.

Male

Integument color.—Body black, except the two first antennal segments and two metatibial spines reddish brown; in some specimens the third tarsomere are lighter brown than others.

Vestiture.—Body covered with fine griseous pubescence except on apical portion of elytra where it mixes with reddish brown pubescence; on pronotum, middle and base of elytra, abdomen and metacoxa griseous pubescence may be mixed with brown; in some specimens there is a basal brown spot on pygidium.

Structure.—Head. Vertex and frons finely punctate, with frontal carina; ocular sinus 0.75 to 0.80 width of eye; antennal segment I 1.8 to 2.2 times longer than antennal segment II and segment XI 1.06 to 1.2 times longer than segment I. Antenna 0.57 to 0.71 length of body. Ocular index 2.06 to 2.57.

Prothorax.—Semicircular, covered with micropunctations and foveolae.

Mesothorax and Metathorax.—Scutellum micropunctate, small, triangular. Elytron uniformly micropunctate, 1.62 to 1.85 times as long as wide; striae shallow, well marked only on apical half of elytra, strial punctures well marked; stria VI more or less straight at base. Metasternum micropunctate, with a thin longitudinal sulcus, in some specimens only a small basal sulcus or indentation. Metepisternum finely micropunctate and foveolate. Surface of metacoxa foveolate and setose in lateral 0.61 to 0.69 and along posterior border, remaining 0.39 to 0.31 shiny, and with a group of 30 to 40 punctures near the trochanteral insertion. Metatibia with ventral and lateral longitudinal carina; mucro of the first metatarsal segment 0.14 to 0.2 length of metatarsus.

Abdomen.— Sterna I-V finely micropunctate and foveolate; sternum V emarginate; pygidium micropunctate and foveolate.

Measurements.— Length (pronotum-elytra) 1.28-1.73 mm; width 0.84-1.4 mm; maximum thoracic depth 0.4-0.92 mm.

Genitalia.— Median lobe elongate, slightly constricted on lateral margins and wider basally; ventral valve campaniform, with a series of pores near apex; dorsal valve as wide as median lobe, apex acuminate; armature of internal sac with four small elongate sclerites; internal sac lined with many microspinules, mainly on anterior portion (Fig. 25). Lateral lobes 0.31 length of median lobe, without cleft at apex but with wing-like projections apically (Fig. 26).

Female

Similar to male. Length (pronotum-elytra) 1.48-1.68 mm; width 1.0-1.6 mm; maximum thoracic depth 0.76-0.84 mm.

Host plants.— Old records. *Chamaechrista nictitans mensalis* Greenm. (= *Cassia leptadenia* Greenm.): (Johnson, 1979, 1980; Kingsolver, 1990a; Udayagiri and Wadhi, 1989).

Distribution.— Old records: USA (Arizona, New Mexico), Mexico (Kingsolver, 1990a). New records: Mexico (Estado de Mexico, Baja California Sur, Chihuahua, Colima, Durango, Jalisco, Morelos, Nayarit, Sinaloa, Sonora).

Discussion.— This species is readily discernible from other *Zabrotes* because it has wing-like projections apically on the lateral lobes of the male genitalia (Fig. 26).

Zabrotes sinaloensis, new species

Male

Integument color.—Body black, except part of first antennal segment and apex of labrum pale.

Vestiture.—Head covered with fine white pubescence; pronotum covered with brown pubescence, except for three white spots at base, one mesal and the others on corners; scutellum white; elytra dark brown, except for a mesal transversal whitish band; abdomen mostly covered with white pubescence, except for metacoxa and lateral portion of first abdominal segment brown; pygidium brown, except for two white bands one mesal longitudinal and other basal transversal.*

Structure.—Head. Vertex and frons finely punctate and foveolate, with frontal carina; ocular sinus 0.76 width of eye; antennal segment I 2.41 times longer than antennal segment II and segment XI 1.26 times longer than segment I. Antenna 0.73 length of the body. Ocular index 1.61.

Prothorax.—Semicircular, covered with micropunctations and foveolae only on lateral portions.

Mesothorax and Metathorax.—Scutellum small, triangular. Elytron uniformly micropunctate and microfoveolate, 1.77 times as long as wide; striae and strial punctures deep, striae VI more or less straight at base. Metasternum micropunctate and foveolate, with a small basal sulcus. Metepisternum finely micropunctate and foveolate. Surface of metacoxa foveolate and setose in lateral 0.56 and along posterior border, the remaining 0.46 shiny and without punctures near the trochanteral insertion. Metatibia with lateral longitudinal carinae; mucro of the first metatarsal segment 0.12 length of metatarsus.

Abdomen.— Sterna I-V finely micropunctate and lightly foveolate; sternum V emarginate; pygidium micropunctate and foveolate.

Measurements.— Length (pronotum-elytra) 1.86 mm; width 1.5 mm; maximum thoracic depth 1.14 mm.

Genitalia.— Median lobe with lateral margins parallel and basal portion wider than remaining portion; ventral valve acuminate at apex, with a series of pores near apex; dorsal valve slightly wider than median lobe; armature of internal sac with two apical granulate sclerites, a basal semicircular sclerite and a small sclerite basal to the first flanked by microspines (Fig. 27). Lateral lobes 0.46 length of median lobe, without cleft at apex (Fig. 28).

Female

Unknown.

Host plants.— Unknown.

Distribution.— Mexico (Sinaloa).

Types.— HOLOTYPE male. MEXICO. 14 km N La Capilla de Taxte, Sinaloa, Sept.-30-1990, R. Turnbow collector.

HOLOTYPE deposited in the U.S. National Museum of Natural History, Washington, D.C.

Etymology.— The specific epithet refers to the state of Sinaloa where the holotype was collected.

Discussion.— Although Z. *sinaloensis* shares a similar pattern of pubescence with other species, it is distinctly different from them because of the typical sclerites in the internal sac of the male genitalia. The armature of internal sac has a unique, basal, semicircular sclerite and a small sclerite basal to the first which is flanked by microspines (Fig. 27).

Zabrotes spectabilis Horn

Zabrotes spectabilis Horn, 1885:157; Fall, 1901:160; Schaeffer, 1907:293; Leng, 1920:306; Bottimer, 1968:1013; Johnson, 1968:1271; Johnson, 1969:55; Johnson, 1979:124; Johnson and Kingsolver, 1981:411; Kingsolver, 1980:245; Kingsolver, 1990a:147; Pic, 1913:62.

Male

Integument color.—Body black, some specimens with first antennal segment dark brown.

Vestiture.—Head, antennae, prosternum, mesosternum, metasternum, and legs covered with white pubescence; pronotum covered with brown pubescence, except for three white spots at base, one mesal and the others on corners, in some specimens the mesal spot a band and those on corners may be absent; scutellum white; elytra dark brown, except for mesal transversal and sutural whitish bands, in some specimens this latter is inconspicuous; abdomen mostly covered with white pubescence, except for a lateral irregular brown band; metacoxa dark brown, except for a marginal lateral white line; pygidium dark brown, except for a white mesal longitudinal band and two basal white spots on corners.

Structure.—Head. Vertex and frons finely punctate, frontal carina faint, in some specimens varying to a smooth line; ocular sinus 0.75 to 0.84 width of eye; antennal segment I 1.8 to 1.9 times longer than antennal segment II and segment XI 1.4 to 1.5 times longer than segment I. Antenna 0.66 to 0.73 the length of the body. Ocular index 2.50 to 2.83.

Prothorax.— Semicircular, covered with micropunctations and foveolae.

Mesothorax and Metathorax.— Scutellum small, triangular. Elytron uniformly micropunctate, 1.58 to 1.83 times as long as wide; striae very shallow, strial punctures well marked; stria VI straight at base. Metasternum micropunctate, with a thin longitudinal sulcus, in some specimens only a small basal sulcus or indentation. Metepisternum finely micropunctate, with foveolae. Surface of metacoxa foveolate and setose in lateral 0.54 to 0.62 and along posterior border, the remaining 0.46 to 0.38 shiny, except for a group of punctures near the trochanteral insertion. Metatibia with ventral and lateral carinae; mucro of first metatarsal segment 0.15 to 0.22 length of metatarsus.

Abdomen.— Sterna I-V finely micropunctate and foveolate; sternum V

emarginate; pygidium micropunctate and densely foveolate.

Measurements.— Length (pronotum-elytra) 1.16-1.68 mm; width 0.91-1.32 mm; maximum thoracic depth 0.64-0.96 mm.

Genitalia.— Median lobe slightly constricted on lateral margins, basal portion wider than remaining portion; ventral valve acuminate at apex, with a series of pores throughout; dorsal valve smaller than median lobe, apex and corners acuminate; armature of internal sac with two apical granulate sclerites, two small, medial J-shaped sclerites with a mass of spines basally and basal portion of internal sac lined with microspinulate scales (Fig. 29). Lateral lobes 0.35 length of median lobe, without cleft at apex (Fig. 30).

Female

Similar to male. Length (pronotum-elytra) 1.08-1.68 mm; width 0.78-1.32 mm; maximum thoracic depth 0.54-0.93 mm.

Host plants.— Old records: *Cassia bauhinioides* Gray; *C. covesii* A. Gray; *C. durangensis* Rose; *C. lindheimeriana* Scheele; (Kingsolver, 1990a). *C. roemeriana* Scheele; (Kingsolver, 1990a; Udayagiri and Wadhi, 1989); New records: "*Cassia crotalarioides*": MEXICO. Durango; 8 mi. NE Guadalupe Victoria, VII-10-1964, C. D. Johnson collector.

Distribution.— Old records: USA (Arizona, California, New Mexico, Nevada, Oregon, Texas) (Kingsolver, 1990a). New records: Mexico (Baja California, Durango, Sonora, Zacatecas).

Discussion.— For discussions of this species see discussions of *Z. californiensis* and *Z. chavesi*.

Zabrotes subfasciatus (Boheman)

Spermophagus subfasciatus Boheman, 1833:111; Hoffmann, 1945:104; Calderon, 1962:214.

Spermophagus semifasciatus: Boheman, 1839:137; Sharp, 1885:493; Bottimer, 1968:1015.

Spermophagus musculus: Boheman, 1833:112: Blackwelder, 1946:763.

Spermophagus pectoralis: Sharp, 1885:492; Horn, 1894:411; Cushman, 1911:505; Back and Duckett, 1918:16; Bridwell, 1919:18; Wolcott, 1936:286; Bridwell, 1942:249.

Spermophagus dorsopictus: Lepesme, 1941:201.

Spermophagus semicinctus: Horn, 1894:41

Amblycerus semifasciatus: Blackwelder, 1946:763.

Bruchus cingulatus: Suffrian, 1870:169; Sharp, 1885:493.

Zabrotes subfasciatus: Zacher, 1930; Blackwelder, 1946:763; Steffan, 1946; Decelle, 1951:173; Zacher, 1952:468, 468, 475-477; Lindagren, 1954; Pinaghi, 1955; Lukianovich and Ter-Minasian, 1957:199; Decelle, 1958:83; Ferreira, 1960; Hinckley, 1960:261; Ter-n, 1967b:307; Bottimer, 1968:1013; Kingsolver, 1970c:487; Janzen, 1972:974; Luca Y. de, 1972:103; Vats, 1972:12; Vats, 1973a:133; Vats, 1973b:168; Center and Johnson, 1974:1098; Smith and Brower, 1974:322; Vazurabu, 1975:756; Pajni and Jit, 1976:142; Vats, 1976:103; Yus Ramos, 1976:194; Pfaffenberger and Johnson, 1976:42; Arora, 1977:92; Janzen, 1977:417; Schoonhoven, 1977:691; Arora, 1978:35; Janzen, 1978:184; Schoonhoven, 1978:254; Singh, 1978:221; Southgate, et al., 1978:221; Decelle, 1979:28; Dobie, 1979:169; Pajni and Jabbal, 1979; Sharma et al., 1979:229; Sharma and Sharma, 1979a:955; Sharma and Sharma, 1979b:1197; Southgate, 1979:453; Borowiec, 1980:45; Janzen, 1980:949; Luca Y. de, 1980:3; Johnson and Kingsolver, 1981:411; Johnson, 1981b:74; Szentesi, 1981:219; Hamon et

al., 1982:328; Egorov and Ter-Minasian, 1983:57; Johnson, 1985:207; Pfaffenberger, 1985:2; Bonet, 1987:378; Johnson and Kistler, 1987:264; Borowiec, 1988: 202; Pimbert and Jarry, 1988:113; Decelle and Lodos, 1989:203; Pouzat and Nammour, 1989:319; Kingsolver, 1990a:50; Kingsolver, 1990b:158; Pfaffenberger, 1990:37; Romero and Johnson 1999: 87.

Zabrotes pectoralis: Schaeffer, 1907:292; Leng, 1920:306; Kunhikannan, 1923:26; Bridwell, 1942:249; Blackwelder, 1946:763; Romero and Johnson, 1999:87.

Zabrotes semicinctus: Leng, 1920:306; Blackwelder, 1946:763; Bottimer, 1968:1013; Johnson, 1968:1271.

Zabrotes semifasciatus: Bottimer, 1968:1015; Kingsolver, 1970c:487; Luca Y. de, 1972b:103.

Male

Integument Color.— Body black, but some specimens with the first two antennal segments and distal portion of the labrum yellowish.

Vestiture.—Head white, except for a yellowish-brown spot on vertex, spot sometimes inconspicuous; pronotum and elytra clothed with short intermixed yellow and brown pubescence, without particular pattern; scutellum white; pygidium yellowish with a longitudinal medial white stripe; metacoxa brown; abdomen clothed with white, sometimes yellowish, pubescence, lateral portion of abdominal segments brown.

Structure.—Head. Vertex and frons finely punctured, with frontal carina; length of ocular sinus 0.66 to 0.75 length of width of eye; antennal segment I 1.75 to 2.25 times as long as segment II, and segment XI 1.11 to 1.6 times as long as segment I. Length of antenna 0.83 to 0.90 of length of body. Ocular index 1.63 to 2.14.

Prothorax.—Pronotum semicircular, clothed with micropunctures, foveolate on lateral areas.

Mesothorax and Metathorax.—Scutellum triangular and minute. Elytra uniformly micropunctured and slightly microfoveolate, 1.80 to 1.93 times longer than wide; striae deep; stria six arcuate at base; strial punctures deep. Metasternum micropunctured and foveolate, with a fossa mesally and a longitudinal shallow sulcus, some specimens with only a small basal notchlike sulcus. Metepisternum finely micropunctured and foveolate. Metacoxal surface foveolate and setose on 0.44 to 0.60 of its lateral surface and length of posterior border, remaining 0.56 to 0.4 shining and without punctures near the trochanteral insertion. Metatibia with ventral carina and faint lateral carina; mucro of first metatarsal segment 0.10 to 0.15 as long as metatarsus.

Abdomen.— Sterna I-V finely micropunctured and foveolate; sternum V emarginated at apex; pygidium micropunctulate and foveolate.

Measurements.— Length (pronotum-elytra) 1.56-2.16 mm; width 1.26-1.62 mm; maximum thoracic depth 0.96-1.14 mm.

Genitalia.— Median lobe slightly constricted on its lateral margins, wider at base; ventral valve subtriangular, with some pores on its apical portion; dorsal valve slightly wider and acuminate apically; armature of the internal sac with two diffuse sclerites apically, a medial horseshoe-like sclerite, with two groups of spines, one on ventral surface and the other at apex, (Figure 31). Lateral lobes 0.52 as long as median lobe, and cleft to 0.08 their length (Figure 32).

Female

This species is sexually dimorphic. Pubescence similar to male except pronotum of female with a median white stripe, a small white spot on

each corner; elytron with a transverse white stripe. Antenna slightly shorter than male, reaching to 0.6 to 0.63 of body length. Length (pronotum-elytra) 2.28-2.46 mm; width 1.74-1.86 mm; maximum thoracic depth 1.26-1.32 mm.

Host plants.— Old records: *Cajanus cajan* (L.) Millsp., (Kingsolver 1990a), C. indicus Spreng., (Udayagiri and Wadhi, 1989), *Cicer arietinum* L., (Kingsolver, 1990a; Udayagiri and Wadhi, 1989; Zacher, 1952:475), *Dipogon lignosus* (Kingsolver, 1990a), *Dolichos lablab* L. (Udayagiri and Wadhi, 1989), *Dolichos lignosus* (Udayagiri and Wadhi, 1989; Zacher, 1952), *Dolichos sesquipedalis* (L.) Verdc. (Udayagiri and Wadhi, 1989), D. soja L. (Udayagiri and Wadhi, 1989), *Glycine hispida* (Moench) Maxim.(Lukianovich and Ter-Minasian, 1957; Udayagiri and Wadhi, 1989; Zacher, 1952), *Glycine max* (L.) Merr. (Kingsolver, 1990a), *Lablab niger* (Zacher, 1952), *Lablab purpureus* (L.) Sweet (Kingsolver, 1990a), *Phaseolus acutifolius* A. Gray (Udayagiri and Wadhi, 1989; Bridwell, 1942), *P. angularis* W.F. Wight (Kingsolver, 1990a; Southgate et al., 1978), *P. articulatus* (Lukianovich and Ter-Minasian, 1957; Udayagiri and Wadhi, 1989), *P. coccineus* L. (Kingsolver, 1990a; Bridwell, 1942), *P. lunatus* L. (Arora , 1977; Bridwell, 1942; Kingsolver, 1990a; Janzen, 1977, 1978, 1980; Leroi et al., 1990; Lukianovich and Ter-Minasian, 1957; Pimbert and Jarry, 1988; Southgate et al., 1978; Udayagiri and Wadhi, 1989; Zacher, 1952), *P. multiflorus* Willd., *P. mungo* L. (Lukianovich and Ter-Minasian, 1957; Udayagiri and Wadhi, 1989; Zacher, 1952), *P. vulgaris* L. (Bridwell, 1942; Kingsolver, 1990a; Leroi et al., 1990; Pimbert and Jarry, 1988; Sharma and Sharma, 1979; Sharma et al., 1979; Udayagiri and Wadhi, 1989; Zacher, 1952), *Pisum arvense* L. (Lukianovich and Ter-Minasian, 1957; Udayagiri and Wadhi, 1989; Zacher, 1952), *P. sativum* L., *Vicia faba* L. (Kingsolver, 1990a; Lukianovich and Ter-Minasian, 1957; Udayagiri and Wadhi, 1989; Zacher, 1952), *Vicia sebastiana* (Udayagiri and Wadhi, 1989), *Vigna mungo* (L.) Hepper (Kingsolver, 1990a), *V. sinensis* (L.) Savi ex Hassk. (Arora, 1977; Udayagiri and Wadhi, 1989), *V. subterranea* (L.) Thou. (Southgate, et al., 1978), *V. unguiculata* L. (Kingsolver, 1990a; Southgate, et al., 1978), *Voandzeia subterranea* (L.) Thou. (Udayagiri and Wadhi, 1989).

Distribution.—Origin in the New World but tropicopolitan now due to commerce.

Discussion.—This species is discussed with *Z. sylvestris*. *Zabrotes subfasciatus* is a tropicopolitan pest of stored beans, especially *Phaseolus lunatus*. This habit has allowed it to expand its host range into foreign legumes and also has led to many synonyms for the species name.

Zabrotes sylvestris Romero and Johnson

Zabrotes sylvestris Romero and Johnson, 1999: 91.

Male

Integument Color. Body black, some specimens with first two antennal segments and apical portion of labrum yellowish.

Vestiture.—Head clothed with intermixed white and yellow pubescence, without yellowish-brown spot on vertex; pronotum with minute brown and yellowish spots, without particular pattern; scutellum white; elytron with minute brown and yellow spots and a minute mesal white spot, in some specimens white spot inconspicuous and the brown and yellow spots vague; pygidium yellowish with a median longitudinal stripe of a lighter color; abdomen white, except a minute yellowish spot

on either side of first sternum; metacoxa brown; metepisternum with a minute yellowish spot; in some specimens abdomen may be clothed with mixed yellow and white pubescence.

Structure.—Head. Vertex and frons finely punctured, usually with median frontal carina but varies to an impunctate line; ocular sinus 0.5 to 0.65 length of width of eye; antennal segment I 1.5 to 2.25 times as long as segment II, and segment XI 1.27 to 1.45 times as long as segment I. Length of antenna 0.81 to 0.86 of length of body. Ocular index 1.46 to 1.83.

Prothorax.—Pronotum semicircular, slightly bulky mesally, micropunctured with foveolae scattered over entire surface.

Mesothorax and Metathorax.—Scutellum triangular and minute. Elytron 1.82 to 2.2 times longer than wide; uniformly micropunctured, foveolae minute; striae deep, strial punctures deep principally at base, stria six arcuate at base. Metasternum micropunctured and foveolate, with a small fossa mesally, some specimens with only a small basal notchlike sulcus. Metepisternum finely micropunctured and foveolate. Metacoxal surface foveolate and setose on 0.51 to 0.58 of its lateral surface and length of posterior border, remaining 0.49 to 0.42 finely striated, shining, and without punctures near the trochanteral insertion. Metatibia with only ventral carina; mucro of first metatarsal segment 0.11 to 0.13 as long as metatarsus.

Abdomen.— Sterna I-V finely micropunctured and foveolate; sternum V emarginated at apex; pygidium micropunctured and strongly foveolate.

Measurements.— Length (pronotum-elytra) 1.5-1.98 mm; width 1.2-1.5 mm; maximum thoracic depth 0.96-1.14 mm.

Genitalia.— Median lobe with lateral margins parallel, except basal portion wider; ventral valve subtriangular, with pores on apical portion; dorsal valve slightly wider, acuminate at apex; armature of internal sac with two diffuse apical sclerites, a median anvil-like sclerite, surrounded by spines, with a group of spines basally (Figure 33). Lateral lobes 0.61 as long as median lobe, and cleft to 0.05 their length (Figure 34).

Female

Similar to male except with a transverse white stripe on elytron contrasting with the remaining pubescence; ocular sinus 0.66 to 0.73 length of the eye, and ocular index 1.36 to 1.4; antenna shorter, reaching 0.6 to 0.75 of body length. Length (pronotum-elytra) 2.1-2.52 mm; width 1.5-1.86 mm; maximum thoracic depth 1.2-1.44 mm.

Host Plants.—Old records: *Phaseolus vulgaris* L. (Romero and Johnson, 1999:92).

Distribution.— Old records: USA (California) and Mexico (Morelos, Puebla, San Luis Potosi). New records: Mexico (Durango).

Discussion.—This species is very near to *Z. subfasciatus* as the external morphology is very similar. There are some external characters that can be used to separate them, however. *Zabrotes subfasciatus* has a yellowish-brown spot of hairs on the vertex, the pronotum is foveolate on its lateral areas, and the metatibia have ventral and lateral carinae. *Zabrotes sylvestris* is without a yellowish-brown spot of hairs on its vertex, the pronotum is foveolate over its entire surface, and the metatibia has only a ventral carina. The genitalia of both the male and female have distinct differences that allow these species to be distinguished from its close relative, *Z. subfasciatus* (Romero and Johnson 1999) (Fig. 33).

Zabrotes victoriensis Kingsolver

Zabrotes victoriensis Kingsolver, 1990a:151.

Male

Integument Color.—Body black.

Vestiture.—Head. Vertex with extremely fine, white setae, clypeus densely clothed with white. Dorsal vestiture mostly reddish brown but intermixed with white; white patches on basal lobe, lateral margins of pronotum, scutellum, and in middle of 6th and 7th interstices of elytra; pygidium predominantly white with some intermixed reddish brown setae on either side of narrow median white stripe; venter of body densely clothed with white setae except metacoxal face reddish brown.

Structure.—Head. Vertex finely, shallowly micropunctate, punctures slightly deeper on frons; frontal carina prominent, minutely granulose; ocular sinus three-fourths length of eye; antenna not sexually dimorphic, reaching middle of metacoxal face; ocular index 5:1.

Prothorax.—Pronotum semicircular, slightly swollen medially, minutely punctate on swelling, lateral areas microfoveolate.

Mesothorax and metathorax.—Scutellum minute, triangular; mesosternum acute and carinate. Elytron about twice as long as wide; striae shallow, distinct in basal 4/5 but becoming confused near apex, strial punctures elongated; interstices flat, each with a single row of punctures. Surface of metacoxa microfoveolate and setose in lateral 0.5 and along posterior border, the remaining 0.5 shiny and with 20-25 punctures near the trochanteral insertion.

Abdomen.—Sternum V deeply emarginate; pygidium punctulate with two sizes of punctures, strongly reflexed.

Measurements.— Length (pronotum-elytra) 1.7 mm; width 1.2-1.4 mm.

Genitalia.— Median lobe elongate, slightly constricted on lateral margins and basal portion slightly wider basally; dorsal surface rugose; ventral valve subtriangular, acuminate at apex; dorsal valve wider than median lobe, apex blunt; armature of internal sac with one J-shaped sclerite and another smaller sclerite in the apical portion of the J-shaped sclerite appearing like a stopper (Fig. 35). Lateral lobes 0.5 length of median lobe, without cleft at apex (Fig. 36).

Female

Similar to male except female with a transverse white stripe on elytron contrasting with the remaining pubescence; ocular sinus 0.66 to 0.73 length of the eye, and ocular index 1.36 to 1.4; antenna shorter, reaching 0.6 to 0.75 of body length. Length (pronotum-elytra) 2.1-2.52 mm; width 1.5-1.86 mm; maximum thoracic depth 1.2-1.44 mm.

Host Plants.—Unknown.

Distribution.— Old records: USA (Texas) and Mexico (Sinaloa).

Discussion.—This species shares with *Z. densus* and *Z. obliteratus* the J-shaped sclerite with another smaller sclerite in the apical portion of the J-shaped sclerite with the appearance of a stopper in the internal sac of male genitalia. They are distinct externally, however, because *Z. victoriensis* has 20-25 punctures near the trochanteral insertion and does not have a mesal, transversal white band on the elytron. Both *Z. densus* and *Z. obliteratus* have a mesal, transversal white band on the elytron and lack punctures near the trochanteral insertion.

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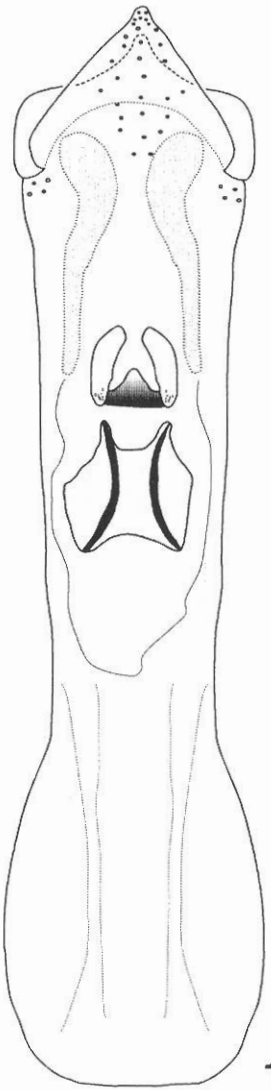
Appendix 1. Host plants of species of *Zabrotes*. Bixaceae: Bixa. All other plant taxa are in the Fabaceae.

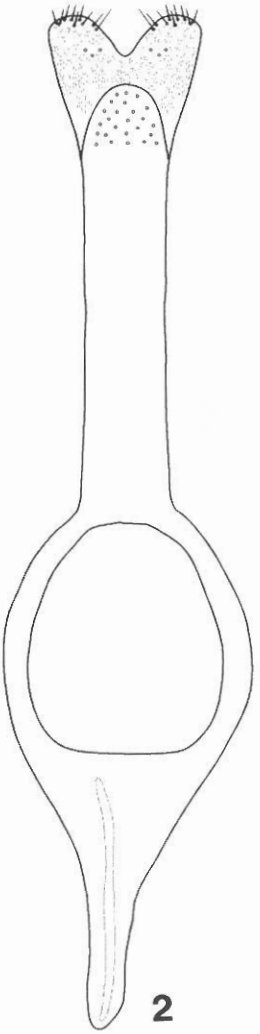
***Zabrotes* spp.**	**Host Plants**
achiote	Acacia angustissima, Bixa orellana, Rhynchosia phaseoloides
amplissimus	Phaseolus metcalfei, P. ritensis
bexarensis	Vicia leavenworthi, Vicia sp.
chavesi	Cassia leptocarpa, Senna spectabilis, S. hirsuta leptocarpa, S. emarginata
flemingia	Flemingia strobilifera
interstitialis	Cassia grandis, C. moschata, Mimosa quadrivalvis
obliteratus	Rhynchosia sp.
planifrons	Chamaechrista nictitans mensalis, C. leptadenia
propinquus	Mimosa alba
spectabilis	Cassia bauhinioides, C. covesii, C. durangensis, C. lindheimeriana, C. roemeriana, C. crotalarioides, Senna durangensis durangensis
subfasciatus	Phaseolus lunatus, P. vulgaris, P. acutifolius, P. coccineus, P. angularis, P. multiflorus, P. articulatus, Vigna sinensis, V. unguiculata, V. subterranea, V. mungo, Pisum sativum, P. arvense, Glycine max, G. hispida, Vicia faba, V. sebastiana, Lablab purpureus, L. niger, Dipogon lignosus, Cajanus cajan, C. indicus, Cicer arietinum, Voandzeia subterranea, Dolichos lablab, D. lignosus, D. sesquipedalis, D. soja, Sebastiana palmeri.
sylvestris	Phaseolus vulgaris

Appendix 2. Host Plants of species of *Spermophagus*. **Convolvulaceae**: *Ipomoea, Calystegia, Convolvulus, Porana?, Hewittia, Merremia*. **Malvaceae**: *Hibiscus, Abelmoschus, Urena, Gossypium*. **Fabaceae**: *Albizia, Vicia, Acacia, Dichrostachys, Medicago, Cassia, Dolichos, Sophora, Cajanus*. **Verbenaceae**: *Diospyros. Asteraceae: Carthamus, Centaurea, Leuzea, Caryophyllaceae: Arenaria*

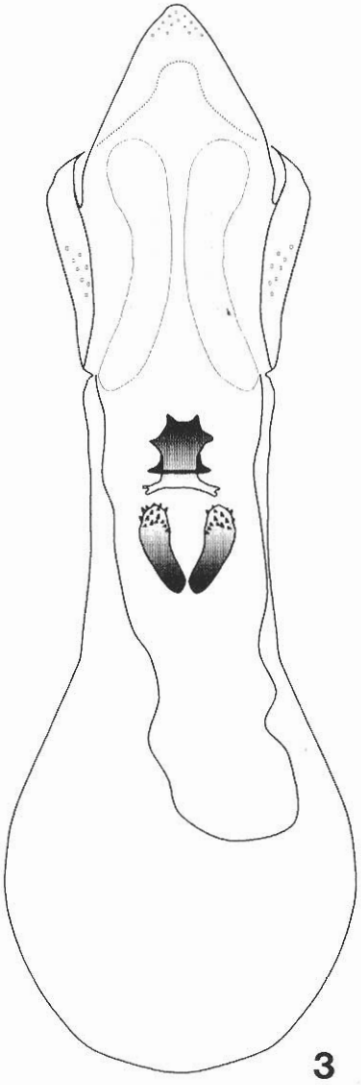
Spermophagus	**Host Plants**
abdominalis	Ipomoea coccinea, I. guamoclit, I. raptans, I. purpurea, I. hederacea, Calystegia japonica, Convolvulus capensis, Hibiscus cannabinus
aeneipennis	Ipomoea pestigridis
albosparsus	Abelmoschus esculentus, Hibiscus cannabinus, H. furcatus, H. sabdariffa, H. cannabinus, Urena lobata, Albizia lebbek
atrispinus	Porana racemosa
babaulti	Ipomoea sp.
bengalicus	Hibiscus cannabinus
bimaculatus	Ipomoea sp., Diospyros mespiliformis, Vicia sativa
calystegiae	Calystegia sepium, C. soldanella
cederholmi	Ipomoea pestigridis, Acacia modesta
ceylonicus	Hewittia bicolor
cicatricosus	Ipomoea sp.
complectus	Calystegia hederacea, C. dahurica, C. sepium, Ipomoea sp.
confusus	Calystegia sepium, Convolvulus arvensis
densepubens Decelle?	Dichrostachys cinerea
heydeni	Convolvulus sp.
hottentotus	Medicago sativa, Gossypium sp.
kuesteri	Calystegia sepium, Convolvulus althaeoides, C. arvensis, C. cantabrica, Centaurea iberica
kuskai	Abelmoschus esculentus
latithorax	Ipomoea asarifolia, I. albivenia, I. purpurea, Cassia didymobothrya, C. alata, C. podocarpa, Gossypium sp.
mannarensis	Hibiscus esculenta, Merremia chryseides
marmoreus	Carthamus tinctorius
maurus	Hibiscus cannabinus

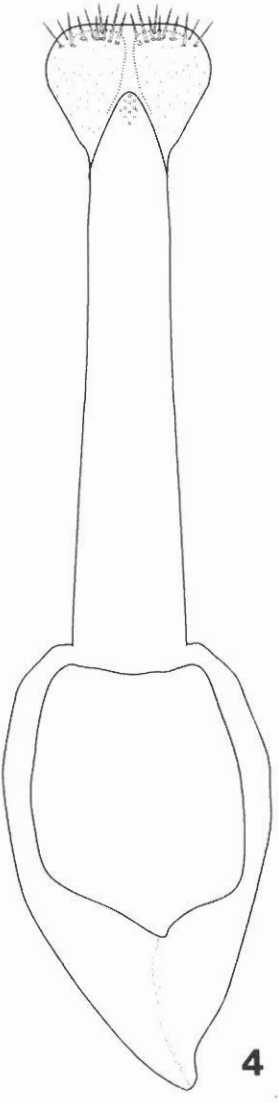
maynei	Dolichos lablab
moerens	Cajanus indicus
niger	Urena lobata, Hibiscus sp.
pfaffenbergeri	Ipomoea pestigridis
pilipes	Ipomoea cairica
pubiventris	Convolvulus dorycnium
pygopubens	Hibiscus cannabinus, H. sabdariffa
rufonotatus	Acacia tortilis, Dichrostachys cinerea
sericeus	Convolvulus althaeoides, C. arvensis, C. pseudocantabrica, C. soldanella, C. sepium, C. cantabrica, C. sericeus, Calystegia sepium, Ipomoea tricolor, Arenaria pungens, Leuzea conifera
sinensis	Porana racemosa
sophorae	Porana racemosa, Ipomoea obscura, Sophora sp.
subdenudatus	Convolvulus pseudocantabrica
variolosopunctatus	Calystegia sepium, Convolvulus arvensis



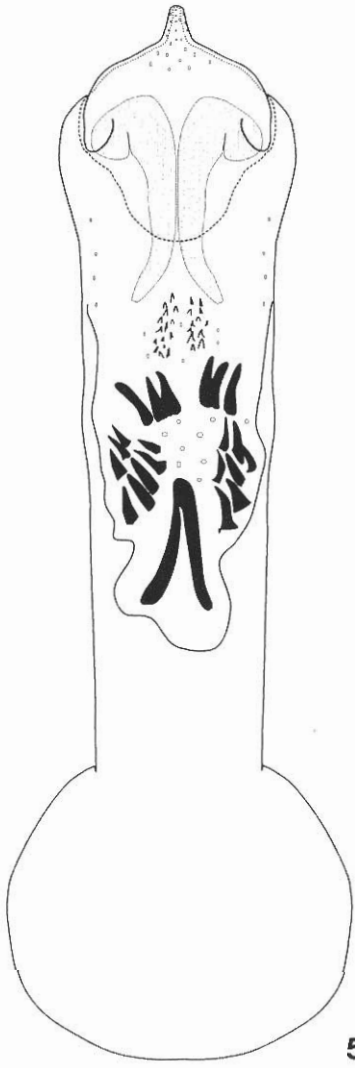


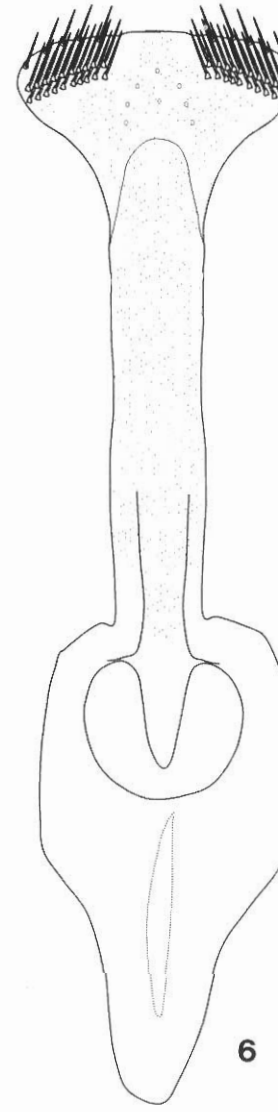
FIGS 1, 2. *Zabrotes achiote*, male genitalia. 1, median lobe, ventral view; 2, lateral lobes, ventral view.



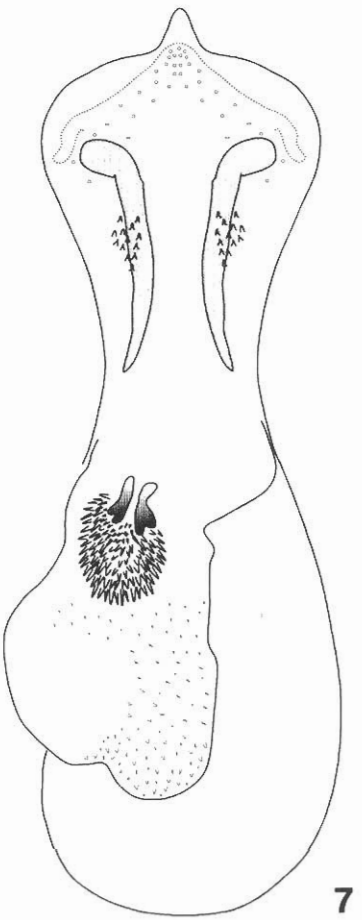


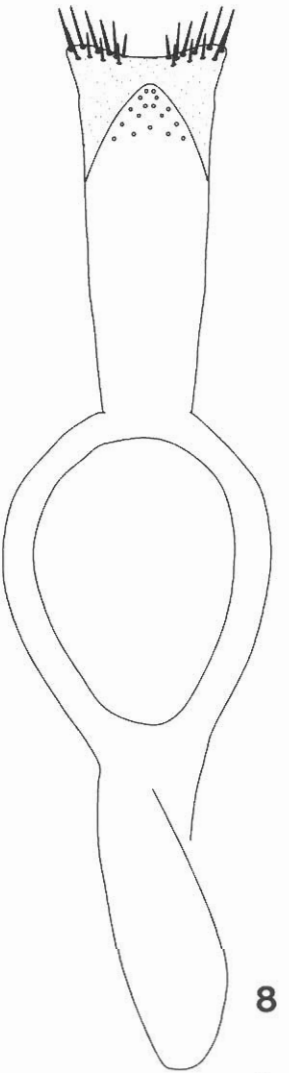
FIGS 3, 4. *Zabrotes amplissimus*, male genitalia. 3, median lobe, ventral view; 4, lateral lobes, ventral view.



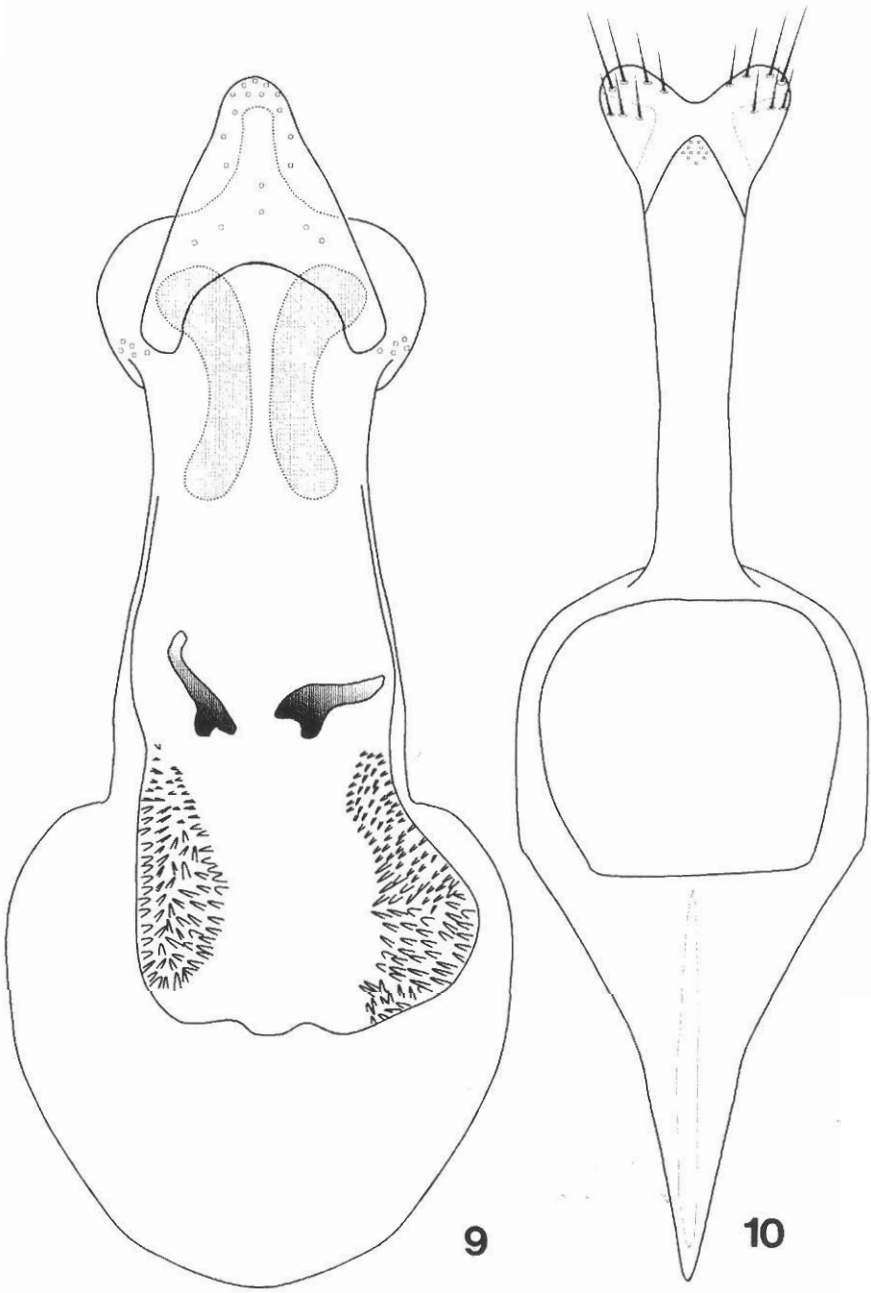


FIGS 5, 6. *Zabrotes bexarensis*, male genitalia. 5, median lobe, ventral view; 6, lateral lobes, ventral view.

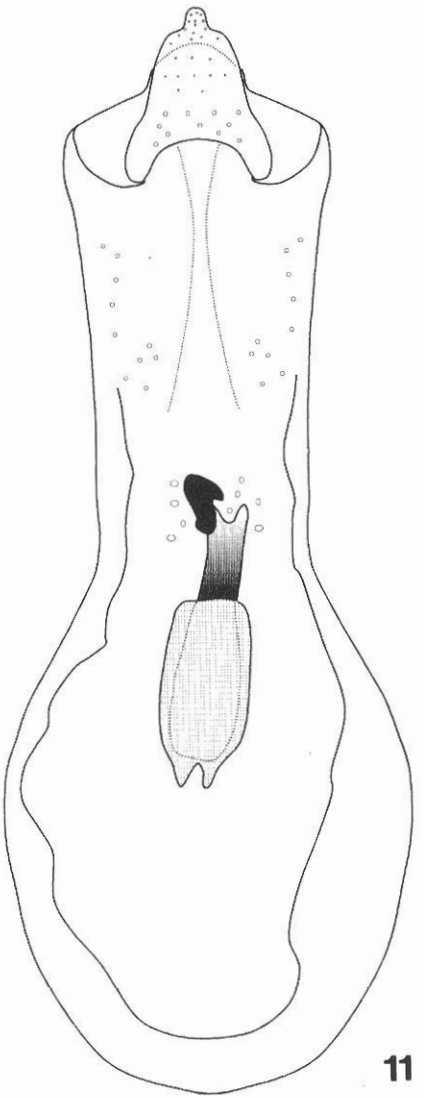


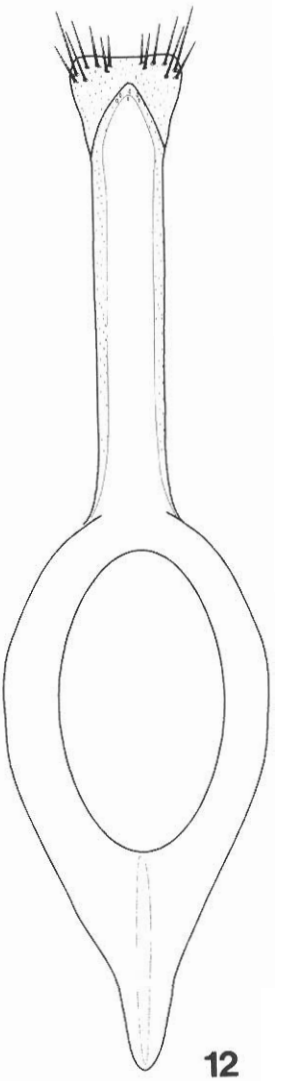


FIGS 7, 8. *Zabrotes californiensis*, male genitalia. 7, median lobe, ventral view; 8, lateral lobes, ventral view.

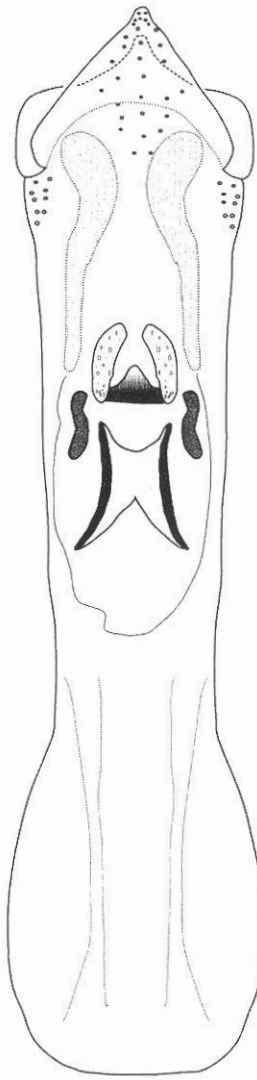


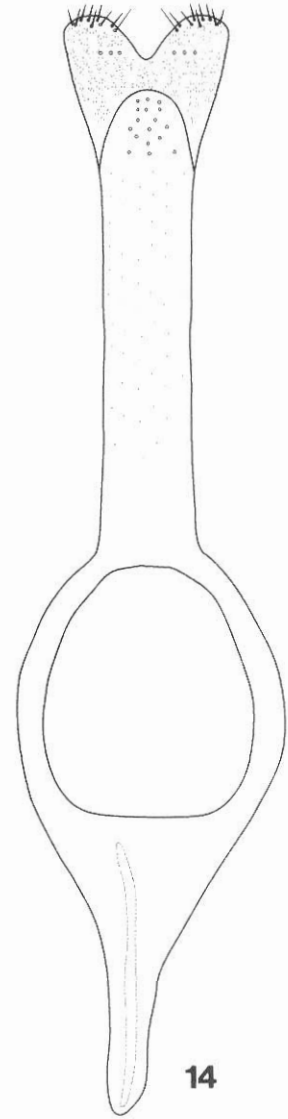
FIGS 9, 10. *Zabrotes chavesi*, male genitalia. 9, median lobe, ventral view; 10, lateral lobes, ventral view.



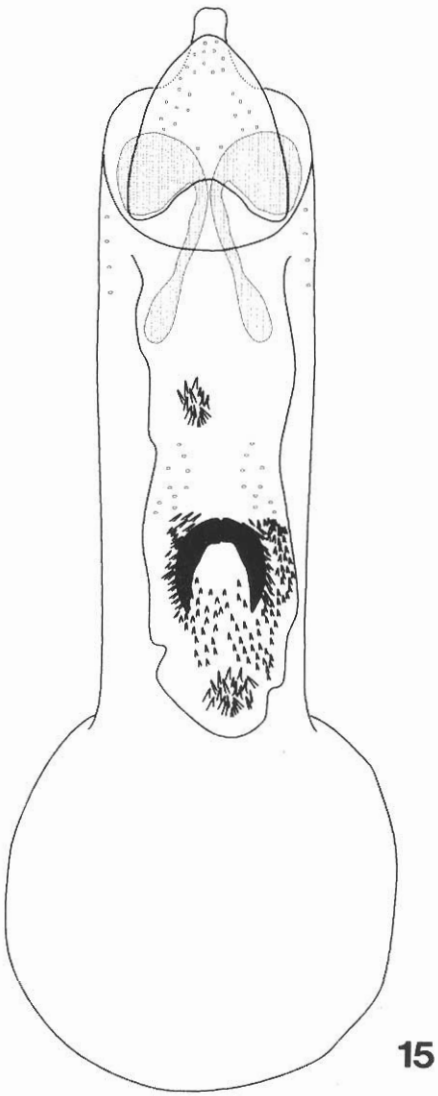


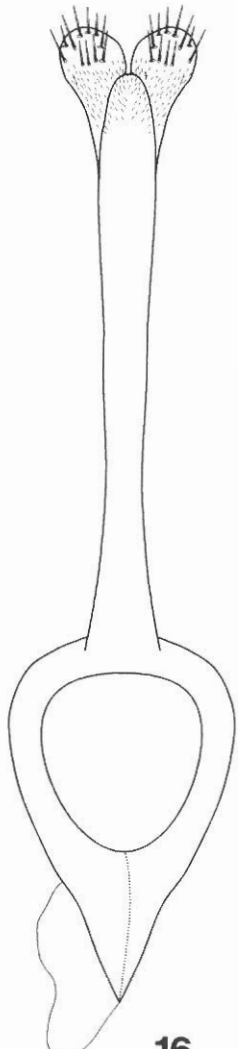
FIGS 11, 12. *Zabrotes densus*, male genitalia. 11, median lobe, ventral view; 12, lateral lobes, ventral view.



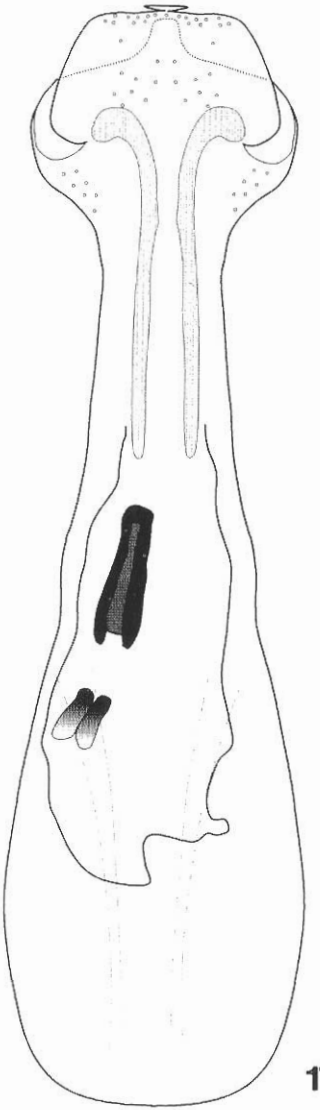


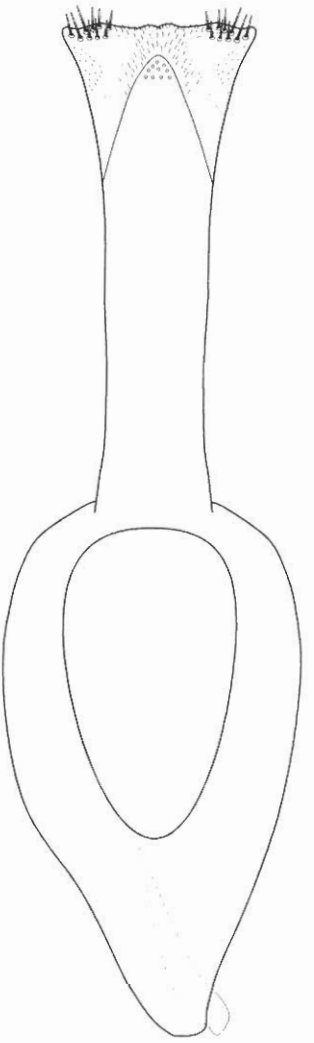
FIGS 13, 14. *Zabrotes flemingia*, male genitalia. 13, median lobe, ventral view; 14, lateral lobes, ventral view.





FIGS 15, 16. *Zabrotes guerrerensis*, male genitalia. 15, median lobe, ventral view; 16, lateral lobes, ventral view.





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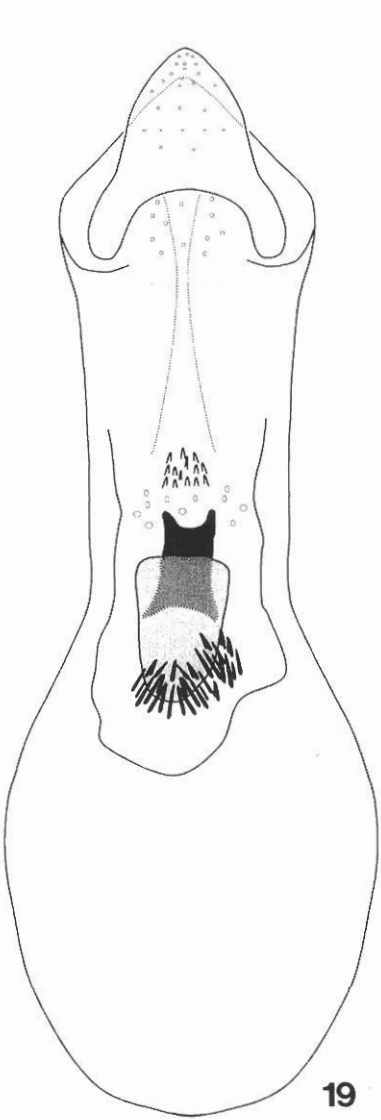
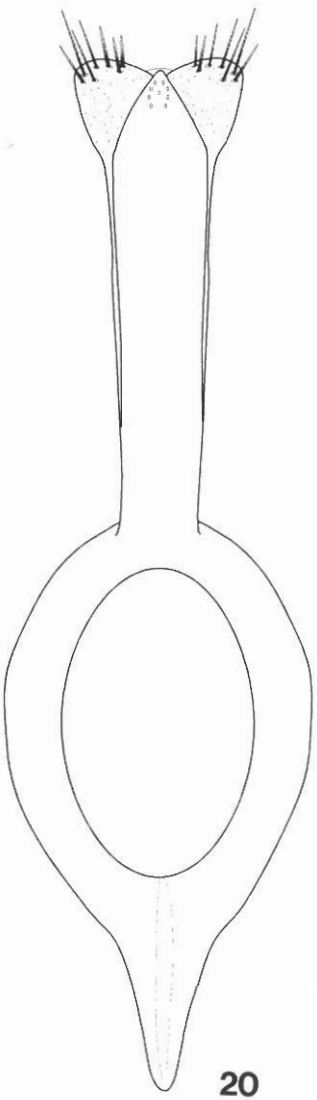
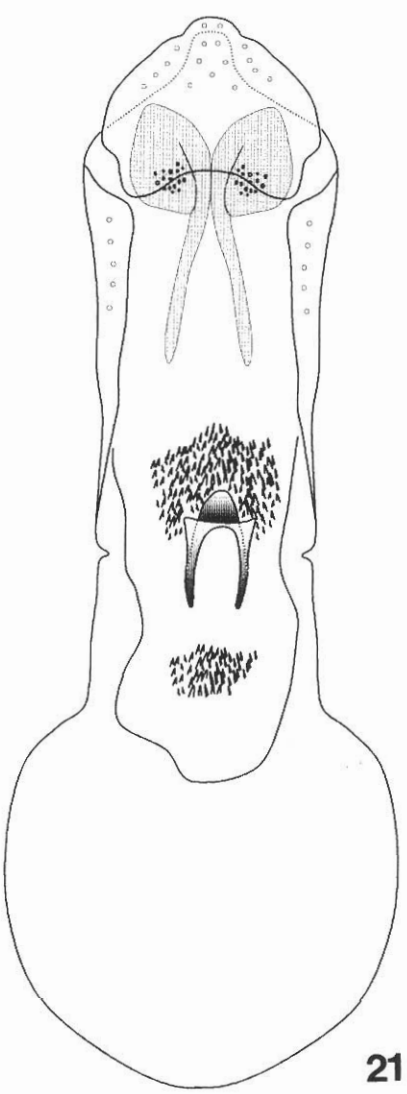
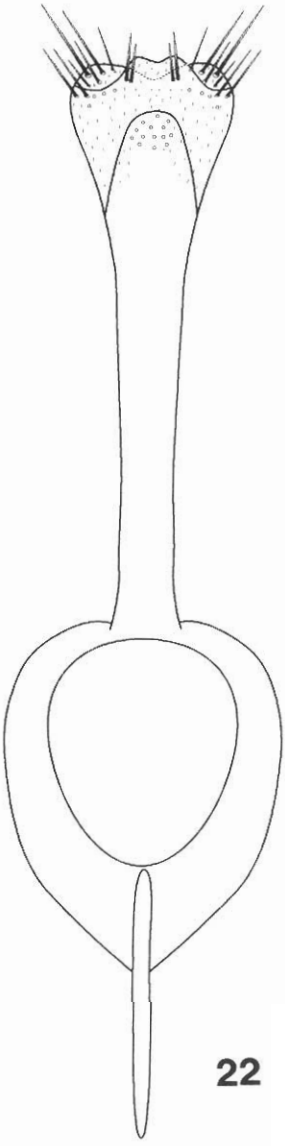
FIGS 17, 18. *Zabrotes interstitialis*, male genitalia. 17, median lobe, ventral view; 18, lateral lobes, ventral view.



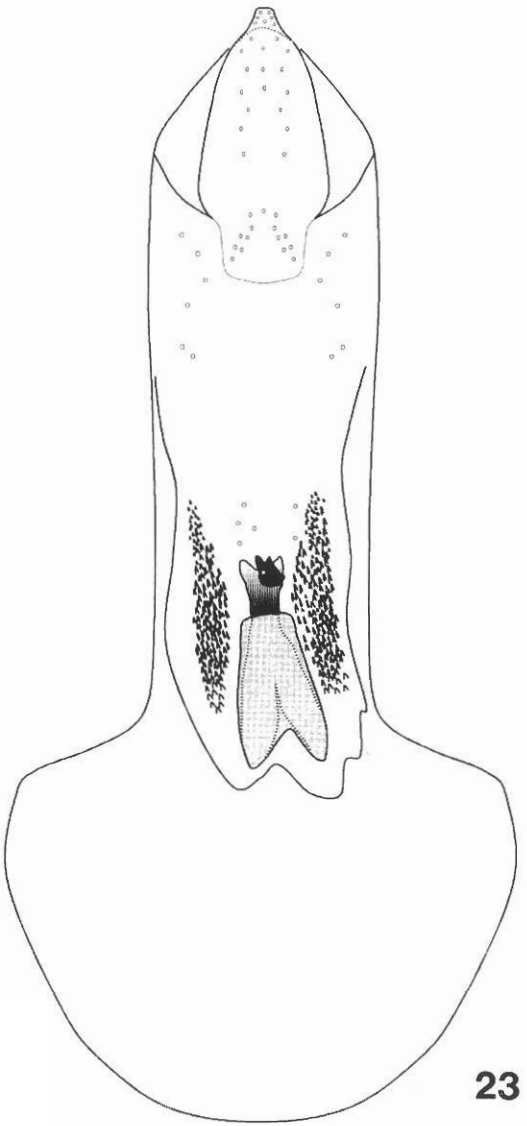


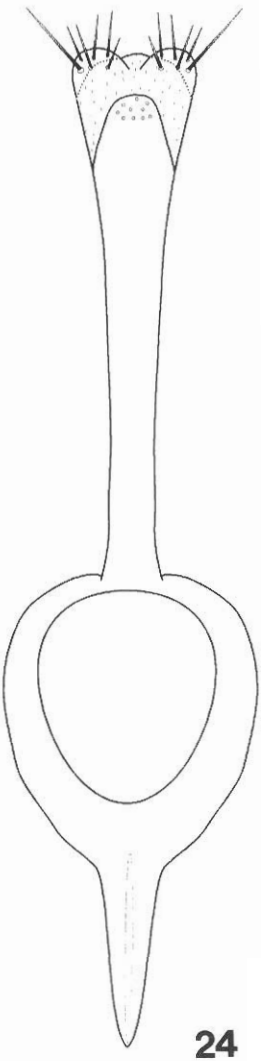
FIGS 19, 20. *Zabrotes ixtapan*, male genitalia. 19, median lobe, ventral view; 20, lateral lobes, ventral view.



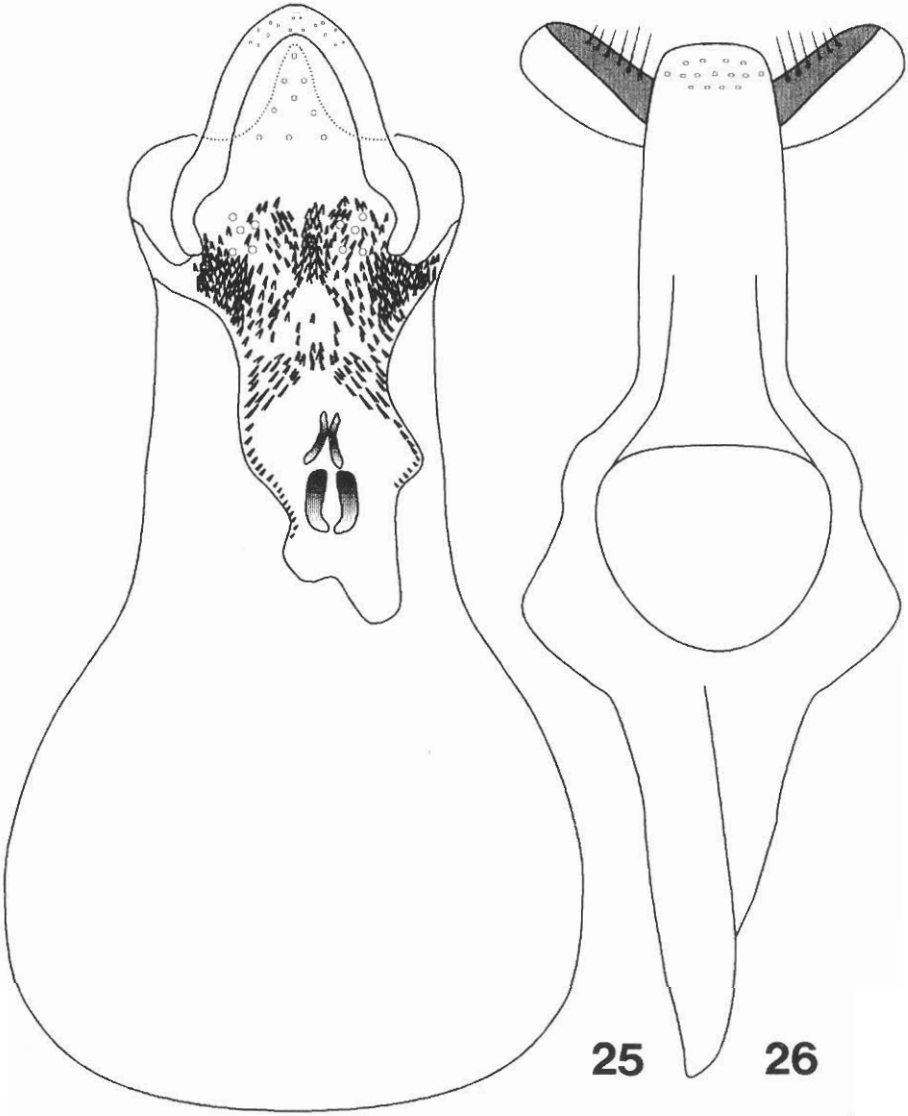


FIGS 21, 22. *Zabrotes moctezuma*, male genitalia. 21, median lobe, ventral view; 22, lateral lobes, ventral view.

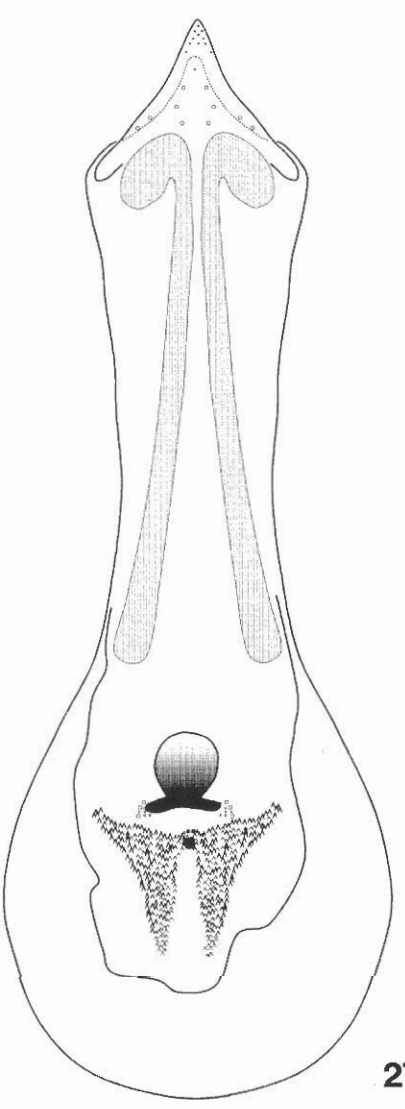


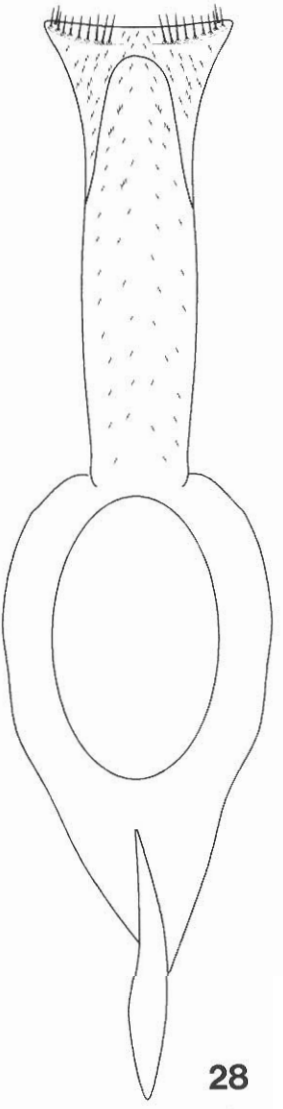


FIGS 23, 24. *Zabrotes obliteratus*, male genitalia. 23, median lobe, ventral view; 24, lateral lobes, ventral view.

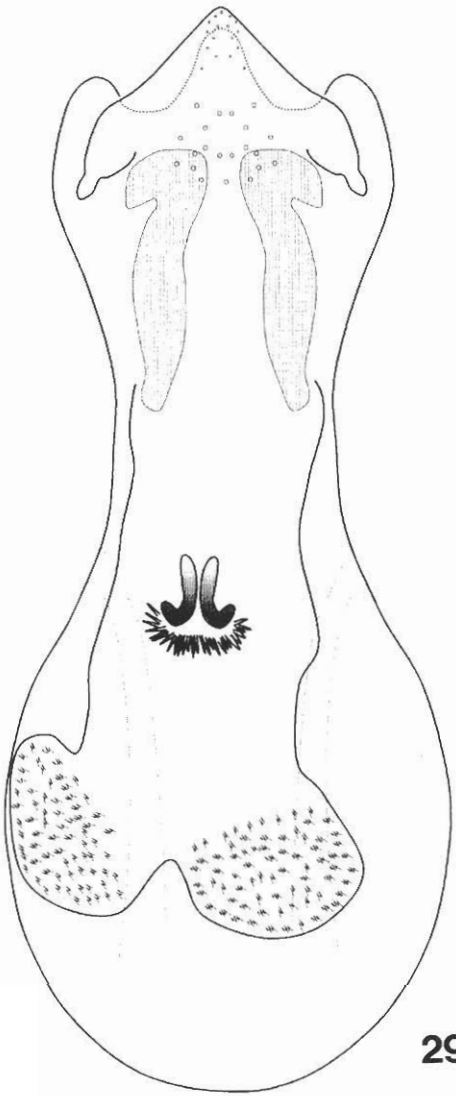


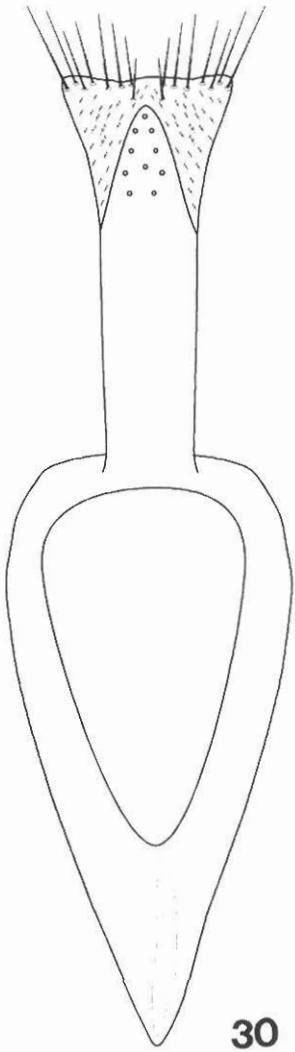
FIGS 25, 26. *Zabrotes planifrons*, male genitalia. 25, median lobe, ventral view; 26, lateral lobes, ventral view.



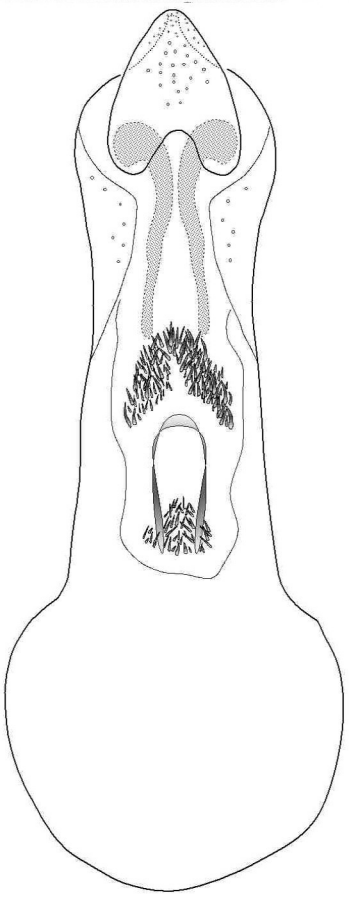


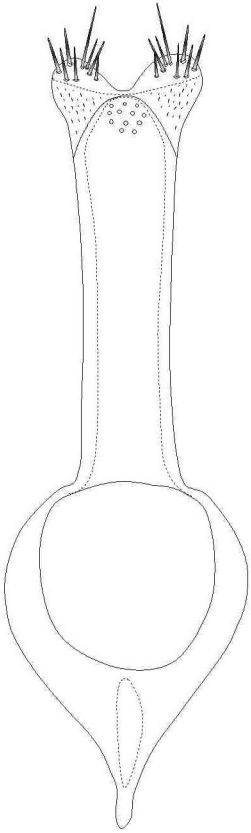
FIGS 27, 28. *Zabrotes sinaloensis*, male genitalia. 27, median lobe, ventral view; 28, lateral lobes, ventral view.





FIGS 29, 30. *Zabrotes spectabilis*, male genitalia. 29, median lobe, ventral view; 30, lateral lobes, ventral view.





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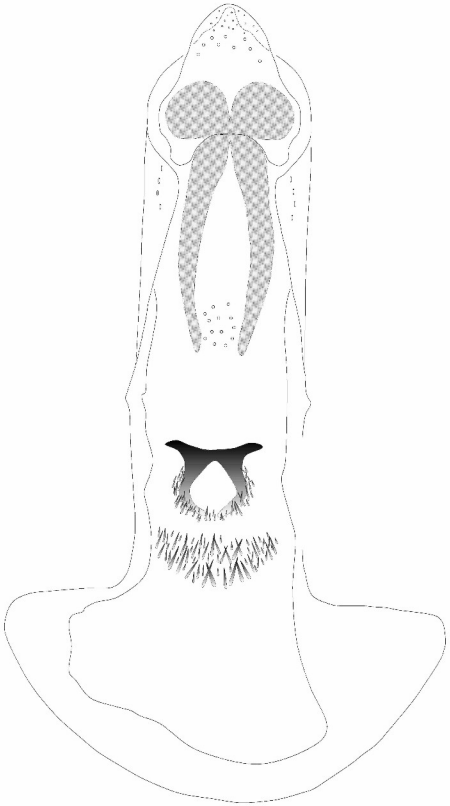
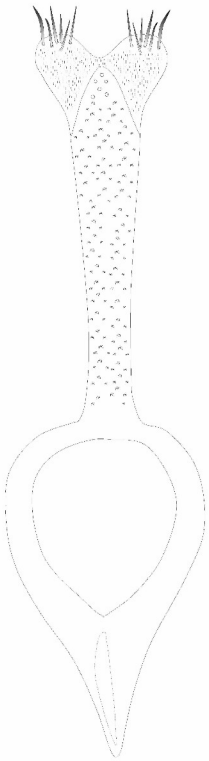
FIGS 31, 32. *Zabrotes subfasciatus*, male genitalia. 31, median lobe, ventral view; 32, lateral lobes, ventral view.





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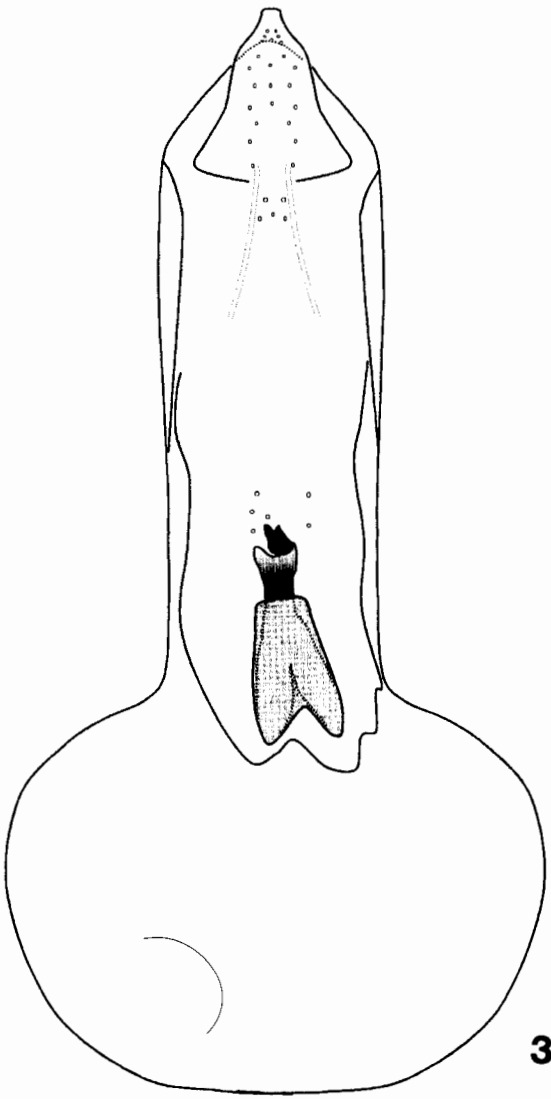
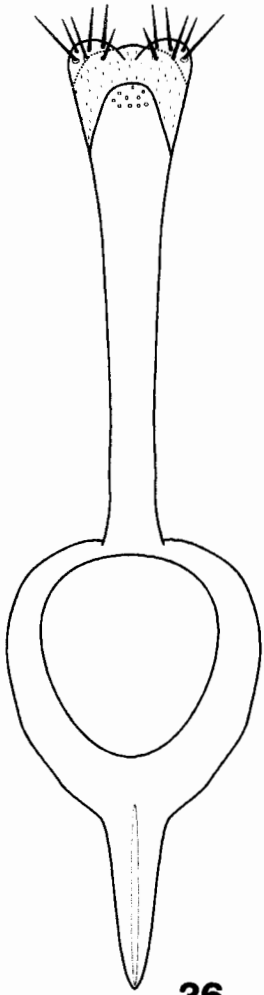
FIGS 33, 34. *Zabrotes sylvestris*, male genitalia. 33, median lobe, ventral view; 34, lateral lobes, ventral view.





FIGS 35, 36. *Zabrotes victoriensis*, male genitalia. 35, median lobe, ventral view; 36, lateral lobes, ventral view.