

# Phylogeny and revision of the New World seed-feeding bruchine genus *Gibbobruchus* Pic (Coleoptera : Chrysomelidae)

D. Manfio<sup>A,C</sup>, C. S. Ribeiro-Costa<sup>A</sup> and E. Caron<sup>B</sup>

<sup>A</sup>Laboratório de Sistemática e Bioecologia de Coleoptera, Departamento de Zoologia, Universidade Federal do Paraná, Caixa Postal 19020, 81531-980, Curitiba, Paraná, Brazil.

<sup>B</sup>Universidade Federal do Paraná, Campus Palotina, 85950-000, Palotina, Paraná, Brazil.

<sup>C</sup>Corresponding author. Email: [daiaramanfio@gmail.com](mailto:daiaramanfio@gmail.com)

**Abstract.** *Gibbobruchus* Pic, 1913 belongs to the subtribe Acanthoscelidina, which encompasses ~50% of the subfamily Bruchinae (Coleoptera : Chrysomelidae). These species are distributed in the Americas and are mainly associated with *Bauhinia* seeds (Fabaceae). The monophyly of *Gibbobruchus* and its species groups were tested based on 26 adult morphological characters and 15 taxa. Of these taxa, 13 species were recognised including two new species, *G. vinicius*, sp. nov. and *G. bolivianus*, sp. nov. *Gibbobruchus* is monophyletic and supported by seven synapomorphies. The currently proposed composition of species groups is: Group *speculifer*: *G. speculifer*, *G. ornatus*, *G. vinicius*, Manfio & Ribeiro-Costa, sp. nov.; Group *polycoccus*: *G. polycoccus*; Group *wunderlini*: *G. wunderlini*; Group *scurra*: *G. cavillator*, *G. bolivianus*, Manfio & Ribeiro-Costa, sp. nov., *G. scurra*; and Group *mimus*: *G. guanacaste*, *G. iturbidensis*, *G. mimus*, *G. cristicollis*, *G. divaricatae*. A lectotype is designated for *G. triangularis* and a neotype for *G. mimus*; two new synonyms are proposed: *Gibbobruchus cavillator* (Fåhraeus, 1839) = *Gibbobruchus triangularis* (Pic, 1926) syn. nov. = *Gibbobruchus nigronotatus* (Pic, 1931) syn. nov. Four species have new distribution records. An identification key for the species, descriptions, redescriptions, and illustrations, are also provided.

**Additional keywords:** *Bauhinia*, cladistic analysis, review, seed beetles, taxonomy, Western Hemisphere.

Received 22 November 2011, accepted 5 June 2012, published online 13 March 2013

## Introduction

Among the beetles, the Phytophaga, composed of the sister taxa Chrysomeloidea and Curculionoidea, comprises the second largest lineage of plant-feeding animals after the Lepidoptera (Grimaldi and Engel 2005). Chrysomelidae Latreille, 1802 is the third largest family of Coleoptera after Staphylinidae and Curculionidae, with more than 37 000 species (Chaboo 2007; Grebennikov and Newton 2009), and Bruchinae Latreille, 1802 (known as seed beetles) is one of its 13 subfamilies (Bouchard *et al.* 2011) with ~1700 species (Johnson and Romero 2004).

The taxonomic position of seed beetles is historically controversial (Ramos *et al.* 2007). In this paper, we follow the view of many authors who consider them a subfamily of Chrysomelidae (Reid 1996; Lingafelter and Pakaluk 1997; Reid 2000; Silva and Ribeiro-Costa 2008; Lawrence *et al.* 2011) based on cladistic studies that have confirmed the inclusion of seed beetles within this family, with the subfamily Sagrinae as the sister-group of Bruchinae (Reid 1995; Duckett *et al.* 2004; Farrell and Sequeira 2004).

Seed beetles are one of the most interesting groups in this phytophagous beetle lineage (Alvarez *et al.* 2006). About 85% of their host plants belong to Fabaceae (Johnson 1981; Johnson *et al.* 2003) and this group is widely used as a

model for evolutionary studies of insect–plant interactions (Jermý and Szentesi 2003; Kergoat *et al.* 2004). Some species are of significant economic importance because they feed on stored legume seeds consumed by humans (Southgate 1979; Romero and Johnson 2000), other species are beneficial when used in weed control programs (Redmon *et al.* 2000; Radford *et al.* 2001). However, many are very similar in appearance and there is evidence of intraspecific variability (Whitehead and Kingsolver 1975; Ribeiro-Costa and Almeida 2009), making it necessary in many cases to dissect and examine the male genitalia, making the identification process more laborious.

The largest tribe of the subfamily Bruchinae is Bruchini, and it contains ~80% of the species (Johnson and Romero 2004), distributed in four subtribes. The subtribe Acanthoscelidina Bridwell, 1946, has 30 genera and 800 species (Romero and Johnson 2003), but its circumscription is still not precise. All of these factors motivated us to study this large group that encompasses ~50% of the species of Bruchinae.

Acanthoscelidina has several groupings of genera. Borowiec (1987) defined 15, while Whitehead and Kingsolver (1975) recorded the existence of three – although none of these groupings were based on cladistic analyses.

The *Merobruchus* group was established by Whitehead and Kingsolver (1975) and Silva and Ribeiro-Costa (2008) with *Caryedes* Hummel, 1827, *Ctenocolum* Kingsolver & Whitehead, 1974a, *Gibbobruchus* Pic, 1913b, *Meibomeus* Bridwell, 1946, *Merobruchus* Bridwell, 1946, *Penthobruchus* Kingsolver, 1973, and *Pygiopachymerus* Pic, 1911. Whitehead and Kingsolver (1975) and Silva and Ribeiro-Costa (2008) presented alternative hypotheses concerning relationships within this group; the current study is one of a series intended to clarify this situation.

*Gibbobruchus* has 13 species distributed in the Americas from the United States to Argentina, that feed mainly on *Bauhinia* (Fabaceae:Caesalpinioideae) seeds, showing the strong tendency for taxonomic conservatism in their host interactions commonly displayed by bruchines (Tuda *et al.* 2006). According to Whitehead and Kingsolver (1975) and Silva and Ribeiro-Costa (2008), this genus is closely related to *Penthobruchus* + *Pygiopachymerus*, although neither study was based on cladistic analysis.

The most significant contribution to this genus was made by Whitehead and Kingsolver (1975) who reviewed the North and Central American species and proposed six species groups, five of them distributed exclusively in the Neotropical region. The main purpose of the present paper was therefore to provide a complete study of *Gibbobruchus*, including the South American fauna, to gain a better understanding of the Neotropical species groups and perform cladistic analyses to test its monophyly and its groupings. The current study also provides a taxonomic revision of *Gibbobruchus*, with redescriptions, descriptions, illustrations and a key to all valid species.

## Materials and methods

### Material examined

The 657 specimens here studied are deposited at the following institutions: Canadian National Collection of Insects, Ottawa, Canada – CNCI (A. E. Davies); Coleção de Entomologia Pe. J.S. Moure, Curitiba, Brazil – DZUP (C. S. Ribeiro-Costa); Florida State Collection of Arthropods, Gainesville, Estados Unidos – FSCA (M. C. Thomas); Museu de História Natural do Capão da Imbuia, Curitiba, Brazil – MHNCI (S. K. Sasaoka, S. R. Malkoski); Muséum National d'Histoire Naturelle, Paris, France – MNHN (*A. Mantilleri*); Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil – MNRJ (M. A. Monné); Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil – MZSP (S. Casari); Swedish Museum of Natural History, Stockholm, Sweden – NHRS (B. Viklund); Texas A. & M. University, College Station, Texas, United States – TAMU (E. Riley); United States National Museum of Natural History, Washington, DC, United States – USNM (D. G. Furth).

### Morphological study

The characters studied are derived from external morphology and male genitalia of adults kept dry. The terminology adopted follows that of Whitehead and Kingsolver (1975) and Silva and Ribeiro-Costa (2008). The nomenclature described in Kingsolver (1970) and Romero and Johnson (1999) was used to elucidate the male genitalia.

When necessary, specimens were boiled in water for about 5 mins for the study of the male genitalia, the pygidium was raised, without separating it completely from the rest of the

abdomen and, with aid of forceps, the mass of musculature and fat from the abdomen containing the genitalia was removed. This mass was boiled in 10% potassium hydroxide (KOH) for a few minutes to remove tissues and for whitening. After study, the dissected structures were stored in microtubes containing glycerin and pinned together with the specimen.

Drawings of the pronotum were made with a stereomicroscope and those of male genitalia with an optical microscope. Colour images of external morphology were obtained with a Leica DFC 500 digital camera (Image Manager) attached to a Leica MZ16 stereomicroscope (Leica Microsystems, Richmond, IL). The alignment of images was generated by Auto-Montage Pro software (Syncrosopy, Frederick, MD) of TAXon line – Rede Paranaense de Coleções Biológicas, of the Departamento de Zoologia, Universidade Federal do Paraná (UFPR).

The micrographs were taken from specimens not metalised, at low vacuum levels at the Centro de Microscopia Eletrônica (CME) of UFPR.

The host plants and geographic distributions of each species were based on label data and literature. The names of the plants were checked using the the International Legume Database & Information Service (ILDIS) (<http://www.catalogueoflife.org/>). When host plants are not cited under a species, we were unable to locate any records of associations.

### Cladistic analysis

The cladistic analyses included all 13 recognised species of *Gibbobruchus*. As the outgroup, we used *Penthobruchus germaini* (Pic, 1894) (which is the type species of the genus) and *Pygiopachymerus lineola* (Chevrolat, 1871). Both genera have two species and they were used because of their indicated proximity to *Gibbobruchus* (Whitehead and Kingsolver 1975; Silva and Ribeiro-Costa 2008). The analysis was therefore performed with a total of 15 terminal taxa.

### Character selection

Many of the informative characters used were previously studied by Whitehead and Kingsolver (1975) and Silva and Ribeiro-Costa (2008). Others added were: head characters (1, 2), thoracic characters (3, 4, 5, 6, 7), one abdominal character (19), and characters from the male genitalia (22, 23, 25, 26) (Table 1). The matrix was edited in NDE 0.5.0 (Page 2001). The states were coded with a dash (–) when any character was inapplicable.

### Analysis

The parsimony method of Fitch (1971) was used for optimisation criteria, with the characters being treated as having equal weights. The analysis was carried out using the NONA 2.0 (Goloboff 1993) interface in Winclada 0.9.9 (Nixon 1999), using a heuristic search with 1000 independent replicates and TBR branch swapping. The topology obtained was rooted *a posteriori* (Nixon and Carpenter 1993) with *Penthobruchus germaini*. Bremer support indices (Bremer 1994) were calculated for each node using NONA 2.0 (Goloboff 1993), with the commands 'hold 10000', 'sub 5', 'find\*' and 'bsupport'.

**Table 1. List of characters and character states used for the phylogeny of *Gibbobruchus*****Head**

- (1) *Ocular index* (ratio of greatest width of the head in front view divided by the narrowest distance between the eyes): (0) between 2.5 and 4.7 (Figs 18); (1) between 5.3 and 6.8 (Figs 22, 23).  
 (2) *Occipital sulcus*: (0) absent; (1) present.

**Thorax**

- (3) *Median transverse sulcus on pronotum*: (0) absent; (1) present.  
 (4) *Laterobasal margin on pronotum*: (0) straight to convex (Fig. 38); (1) concave (Fig. 40).  
 (5) *Basal emargination on pronotum*: (0) absent to shallow (Fig. 38); (1) deep (Fig. 36).  
 (6) *Single tooth at base of interstriae 4 and 5 of elytra*: (0) absent; (1) present (Figs 48, 49).  
 (7) *Base of striae 3 and 4 of elytra*: (0) straight (Figs 3, 5); (1) curved towards the inside of the body (Fig. 8).  
 (8) *Ventral sulcus of hind femur*: (0) pilous; (1) glabrous.  
 (9) *Anterior tooth of pecten with respect to posterior teeth*: (0) not contiguous (Fig. 95); (1) contiguous (Fig. 93).  
 (10) *External carina of hind tibia*: (0) micro-serreate; (1) smooth  
 (11) *Lateroventral carina of hind tibia*: (0) absent; (1) present.  
 (12) *Apex of hind tibia*: (0) without coronal denticles (Fig. 92); (1) with coronal denticles (Fig. 100).

**Abdomen**

- (13) *Pilosity of the pygidium in females*: (0) without speculum; (1) with speculum (Fig. 65).  
 (14) *Pygidial speculum in females*: (0) alutaceous (Fig. 68); (1) polished (Fig. 66, 72, 74).  
 (15) *Pilosity of the pygidium in males*: (0) without speculum; (1) with speculum (Fig. 55).  
 (16) *Pygidium of males with apical tubercle*: (0) absent; (1) present.  
 (17) *Abdominal ventrites*: (0) uniformly pubescent, without lateral area glabrous and polished (Fig. 79); (1) not uniformly pubescent, at least one ventrite laterally glabrous and polished (Fig. 87).  
 (18) *First male abdominal ventrite in median anterior region*: (0) of the same colour and density as the rest of the ventrite; (1) with an area of dense pilosity, light brown to white (Fig. 75).  
 (19) *First male abdominal ventrite in median apical region*: (0) without tubercle; (1) with tubercle (Fig. 76).  
 (20) *Last male abdominal ventrite*: (0) straight medially; (1) emarginate medially (Fig. 75).

**Male genitalia**

- (21) *Sclerites on internal sac of median lobe*: (0) absent (Figs 105, 110); (1) present (Figs 107, 109).  
 (22) *Median basal margin of the median lobe*: (0) straight (Fig. 107); (1) emarginate (Figs 118, 119).  
 (23) *Internal margin of ventral valve emarginate*: (0) absent; (1) present.  
 (24) *Apex of lateral lobes of tegmen*: (0) not expanded laterally (Fig. 125); (1) expanded laterally (Fig. 120, 121).  
 (25) *Setae thick at apex of lateral lobes of tegmen*: (0) absent; (1) present.  
 (26) *Internal subapical margin of the lateral lobes of the tegmen*: (0) straight; (1) completely concave.

**Results and discussion**

In total, 26 informative adult characters were used for 15 terminal taxa (Table 1; Appendix 1).

**Phylogenetic relationships**

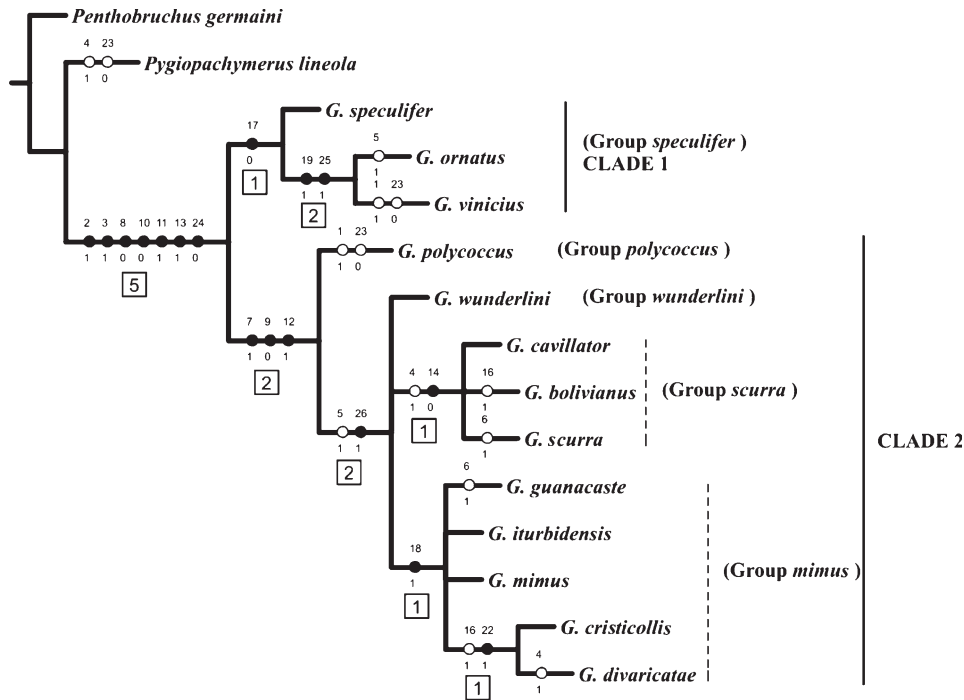
A single most parsimonious tree was obtained from the analysis of the matrix (Fig. 1) (37 steps, CI = 0.70, RI = 0.81).

*Gibbobruchus* forms a monophyletic group supported by seven synapomorphies (Bremer support = 5): presence of occipital sulcus (2 (1)) (Fig. 20); presence of a median transverse sulcus on pronotum (3 (1)) (Fig. 5); ventral sulcus of hind femur pilous (8 (0)) (Fig. 89); external carina of hind tibiae smooth (10 (1)) (Fig. 91); presence of lateroventral carina on hind tibiae (11 (1)) (Fig. 91); pygidium of female with speculum (13 (1)) (Fig. 66); and apices of lateral lobes of tegmen not expanded laterally (24 (0)) (Fig. 122).

There are two main distinct clades in *Gibbobruchus* (Fig. 1). Clade 1 has three species that share a unique synapomorphy (Bremer support = 1): abdominal ventrites uniformly pubescent, without glabrous and polished lateral areas (17 (0)) (Figs 79–81).

Inside Clade 1 there is a clade composed of *G. ornatus* and *G. vinicius*, sp. nov. (Bremer support = 2), supported by two synapomorphies: first male abdominal ventrite at the median apical region with tubercle (Fig. 76); and presence of thick hairs at the apices of the lateral lobes of the tegmen (Figs 122, 123).

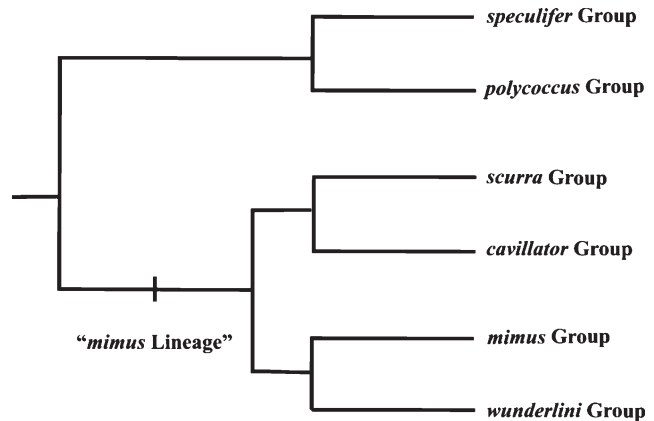
Clade 2 is composed of the other 10 species of *Gibbobruchus* grouped by three synapomorphies (Bremer support = 2): base of striae 3 and 4 of elytra curved towards the inside of body (7 (1)) (Fig. 9); anterior tooth of pecten not-contiguous to posterior teeth (9 (0)) (Fig. 95); and apex of hind tibiae with coronal denticles (12 (1)) (Fig. 96). There are two main clades inside Clade 2: the first is composed of three species, *G. cavillator*, *G. bolivianus* and *G. scurra* and is supported by a single synapomorphy: speculum in the pygidium of female alutaceous (Figs 67–69); the second brings together five species, *G. guanacaste*, *G. iturbidensis*, *G. mimus*, *G. cristicollis*, and *G. divaricatae* and is also supported by one synapomorphy: first male abdominal ventrite at median anterior region with area of dense, light brown to white pubescence (18 (1)) (Fig. 75).



**Fig. 1.** Most parsimonious tree of *Gibbobruchus* species based on an analysis with equal weighting of characters (37 steps, CI = 70, Ri = 81). Filled circles represent unique changes, open circles represent multiple changes. Values for the Bremer support are in squares below branches.

**Table 2.** Species groups of *Gibbobruchus* (Whitehead & Kingsolver, 1975)

Group <i>speculifer</i> <i>G. speculifer</i> <i>G. ornatus</i>	Group <i>scurra</i> <i>G. scurra</i>
Group <i>polycoccus</i> <i>G. polycoccus</i>	Group <i>mimus</i> <i>G. cristicollis</i> <i>G. divaricatae</i> <i>G. guanacaste</i> <i>G. iturbidensis</i> <i>G. mimus</i>
Group <i>wunderlini</i> <i>G. wunderlini</i>	
Group <i>cavillator</i> <i>G. cavillator</i> <i>G. nigronotatus</i> <i>G. triangularis</i>	



**Fig. 2.** Hypothesis of relationships among groups of *Gibbobruchus* according to Whitehead and Kingsolver (1975).

*The proposal of Whitehead and Kingsolver (1975) and the current phylogenetic analysis*

Clade 1 includes species of the group *speculifer* proposed by Whitehead and Kingsolver (1975) (Table 2) into which *G. vinicius* was included. According to these authors, the group *speculifer* is closely related to the monotypic group *polycoccus* (Table 2, Fig. 2) due to the presence of elongated male genitalia (in this study, character 20 (1)). However, this character was not included in the present analysis because it was difficult to codify, and *G. polycoccus* did not appear as a sister taxon of the group *speculifer* (Clade 1), but as part of Clade 2

and a sister taxon of the groups (*wunderlini* + *scurra* + *mimus*) (Fig. 1).

According to Whitehead and Kingsolver (1975), the groups *scurra* and *cavillator* could be sister taxa (Fig. 2), or even constitute a single clade, because they share the character female pygidial speculum alutaceous (in this study, character 14 (0)) and the presence, in most cases, of poorly developed spines on the internal sac of the median lobe of male. There was no agreement with the last character, however, in the studies developed here, because it was not possible to distinguish

‘male genitalia not strongly spiculate’; for this reason this character was not included in the analysis. The hypothesis of Whitehead and Kingsolver (1975) was corroborated in this study and suggests that these two groups should be joined into a single group, defined here as the group *scurra* (*G. cavillator* + *G. bolivianus* + *G. scurra*). Note that *Gibbobruchus nigronotatus* and *G. triangularis* were considered valid species in Whitehead and Kingsolver (1975), while they are considered here as junior synonyms of *G. cavillator* (see taxonomic study below).

The clade (*G. guanacaste* + *G. iturbidensis* + *G. mimus* (*G. cristicollis* + *G. divaricatae*)) is consistent with the *mimus* group of Whitehead and Kingsolver (1975) (Table 2). None of the hypothesised relationships obtained in the present analysis were consistent with the suggestions of these authors, i.e. ‘*G. mimus* probably is the sister to the ancestor of the other four species: the female pygidial speculum is emarginate basally, as in most members of the *cavillator* group; and the teeth of pecten are regularly spaced, without a large gap after the first or second teeth’ (Whitehead and Kingsolver 1975; p. 217, 219) (in this study, character 9).

In addition to being variable, the first character (female pygidial speculum) also occurs to a greater or lesser extent in other species of this clade, as already mentioned by Whitehead and Kingsolver (1975), and for this reason it was not used in the present analysis. Conversely, the second character (teeth of pecten) was included and, despite the occurrence of specimens with smaller spaces between the posterior and anterior teeth (Fig. 102) (when compared with other species of Clade 2) (Fig. 92), this distance is visible and even the anterior tooth of pecten is not contiguous to the posteriors.

According to Whitehead and Kingsolver (1975), the group *mimus* shares with the group *wunderlini* (Table 2, Fig. 2) the presence (in most cases) of highly developed spines on the internal sac of the median lobe of the male. It was not possible to test this character, however, due to the difficulty of determining what was meant by ‘highly developed’ spines; they were also considered ‘denticles’ and not ‘spines’ in some species. The analysis presented here does support the proximity between these groups, however: *G. wunderlini* appears as a sister taxon of the groups *mimus* and also of *scurra*, joined by having the internal subapical margins of the lateral lobes of the tegmen completely concave (26 (1)) (Fig. 126).

Groups of species proposed by Whitehead and Kingsolver (1975) (Table 2) based on their similarities were generally confirmed according to the cladistic analysis of the present study, with the exception of the groups *cavillator* and *scurra*, which were gathered into the group *scurra*.

With respect to the proposed relationships between the species groups suggested by Whitehead and Kingsolver (1975) (Fig. 8), the groupings formed by groups *cavillator* and *scurra* were corroborated, as well as the ‘lineage *mimus*’; in the present study, however, this lineage is a sister to *G. polycoccus*, which was not seen in the proposal of Whitehead and Kingsolver (1975). Conversely, the grouping that brings together the groups *polycoccus* + *speculifer* and is formed by the groups *wunderlini* and *mimus* are paraphyletic according to our phylogenetic analysis (Fig. 1).

## Taxonomy

### Genus *Gibbobruchus* Pic, 1913

*Pachymerus* (*Gibbobruchus*): Pic, 1913a: 110.

*Pseudopachymerus* (*Gibbobruchus*): Pic, 1913b: 10.

*Gibbobruchus*: Bridwell, 1932: 105; Blackwelder, 1946: 762; Bridwell, 1946: 54; Bottimer, 1968: 1022; Whitehead & Kingsolver, 1975: 169; Johnson, 1981: 999, 1002, 1004, 1005; Johnson & Kingsolver, 1982: 413; Kingsolver, 1990: 127; Kingsolver, 2004a: 166, 167; Romero & Johnson, 2004: 614; Ribeiro-Costa & Almeida, 2009: 531.

Type-species: *Bruchus speculifer* Gyllenhal, 1833, by subsequent designation of Bridwell (1932).

### Diagnosis

Occipital sulcus present (Fig. 20); antenna usually light brown with some segments dark brown (Fig. 7); median transverse sulcus on pronotum present (Fig. 5); median and lateral pronotum gibbositities often conspicuous (Figs 7, 10); median gibbosity divided by median transverse sulcus (Fig. 7); basal and humeral gibbositities of elytron and on interstria 3, 5, 7 and 9 generally conspicuous (Figs 7, 8). Hind femur with pilous ventral sulcus (Fig. 89); external ventral margins with teeth (Figs 92, 96); pecten with 3–7 teeth (Figs 92, 95); hind tibiae arcuate with smooth external carina, and lateroventral carina present (Figs 91, 92). Pygidium of the female and of both sexes of *G. ornatus*, *G. polycoccus*, *G. speculifer*, and *G. vinicius* with speculum polished or alutaceous on middle apical region (Figs 52, 67). Male genitalia with internal sac of median lobe often without sclerites (Fig. 109); tegmen with lateral lobes strongly emarginate, not expanded apically (Fig. 122), internal margins usually concave (Fig. 126).

### Redescription

Body length: 2.9–5.2 mm; width: 1.6–3.2 mm.

**Integument.** Variable on dorsum, from light brown to black or bicolor (Figs 5, 8, 9). Antenna usually light brown, with variable combinations of dark brown segments (Figs 5, 7). Pygidium of male generally rufous, sometimes from light to dark brown or black (Figs 52, 55, 57). Pygidium of female rufous, dark brown or black, rarely light brown to brown (Figs 65, 66, 69). Ventral region dark brown or rufous, sometimes light brown, brown, black or bicolor (Figs 78, 82). Front and middle femur usually bicolor; hind femur in general with dorsal region lighter than ventral, sometimes dorsal and ventral margins or basal region darker (Fig. 83).

**Vestiture.** Pattern on dorsum variable (Figs 5, 8, 9, 10). Pronotum at basal region and median gibbosity usually with dense pubescence, light brown or white (Figs 10, 12, 16); median gibbosity often with two bands brown, dark brown or black, short, generally parallel and narrow, posterior to median transverse sulcus (Figs 5, 9). Scutellum white or light brown (Figs 5, 10). Elytron in general with median black, short macula at interstria 2 and 3 (Fig. 9) and basal third with or without short oblique band or white tuft on interstria 5 (Figs 8, 9); rest of elytron with grumes and/or bands with varied colours (Fig. 5). Pygidium of male usually without speculum (Fig. 56); variegated in density and color, often with light brown pubescence and a short white band on median basal triangle, or median basal



**Figs 3–11.** Dorsal habitus: 3, *Penthobruchus germaini*; 4, *Pygiopachymerus lineola*; 5, *G. speculifer*; 6, *G. ornatus*; 7, *G. vinicius*; 8, *G. polycoccus*; 9, *G. wunderlini*; 10, *G. cavillator*; 11, *G. bolivianus*. Scale: 0.50 mm.

triangle white (Figs 56, 59); when speculum present, four glabrous spots above it (Fig. 52) or with sparse white to brown pubescence except in speculum (Fig. 55). Pygidium of female with vestiture light brown or white pubescence, of varying density, except on speculum, always glabrous, polished or

alutaceous, usually large, occupying most of pygidium (Figs 66, 67). Ventral region generally white (Fig. 86); metepisternum, mesepisternum, and mesepimerum with light brown pubescence (Fig. 80). First male abdominal ventrite with uniform colour or median anterior region with dense



**Figs 12–17.** Dorsal habitus: 12, *G. scurra*; 13, *G. guanacaste*; 14, *G. iturbidensis*; 15, *G. mimus*; 16, *G. cristicollis*; 17, *G. divaricatae*. Scale: 0.50 mm.

white to light brown pubescence; abdominal ventrites often not uniformly pubescent, ventrites 1–2, 1–3 or 1–4 with polished lateral areas (Fig. 84). Hind femur with pilous ventral sulcus (Fig. 89).

**Body.** Ocular sinus: 0.1–0.2 mm; ocular index: 2.5–6.8 mm; occipital sulcus present (Fig. 20); postocular lobe short. Head short, strongly constricted behind eyes; frons elevated to strongly elevated (Fig. 20); frontal carina prominent, polished or not, narrow or wide basally (Figs 31, 32); frontoclypeal region broad, pentagonal (Fig. 20). Antenna generally subserrate (Fig. 79). Pronotum campaniform; median and lateral gibbositities slightly to strongly elevated (Figs 80, 82); lateroapical margin straight or convex (Figs 35, 38); apical emargination shallow or deep (Figs 35, 39); median transverse sulcus present (Fig. 7); lateral carina obsolete. Scutellum small, square. Elytra subquadrate; basal gibbosity slightly to strongly elevated (Figs 80, 82); base of striae in general toothless; striae 3 and 4 straight or curved at

base; striae 7, 8 and 9 limited basally by moderate to strongly elevated humeral gibbosity; interstria 3, 5, 7 and 9 often with conspicuous gibbosity (Figs 5, 9); interstria 10 generally without basal sulcus. Pygidium of male and female variable, flat or convex, with or without tubercles (Figs 52, 58, 66, 67). Prosternum narrow, acute. Mesosternum broad, flat, apex truncated or rounded. Metasternum not prominent. Front and middle legs slender; front coxae contiguous apically, middle coxae widely separated. Male abdomen generally uncompressed; first abdominal ventrite usually flat, without median apical tubercle; last abdominal ventrite medially emarginate or straight (Figs 75, 76). Hind femur weakly or strongly incrassate (Fig. 79); internal ventral margin with two or more small teeth before pecten; external ventral margin carinate, strongly toothed (Fig. 92); pecten with 3–7 teeth, anterior tooth contiguous to, or not, to the posteriors (Figs 92, 95). Hind tibiae arcuate, strongly carinate, external carina not



**Figs 18–26.** Frontal habitus: 18, *Penthobruchus germaini*; 19, *Pygiopachymerus lineola*; 20, *G. speculifer*; 21, *G. ornatus*; 22, *G. vinicius*; 23, *G. polycoctus*; 24, *G. wunderlini*; 25, *G. cavillator*; 26, *G. bolivianus*. Scale: 0.25 mm.

microserrate (Fig. 92); lateroventral carina present (Fig. 92); apex usually with coronal teeth (Fig. 96).

*Male genitalia.* Median lobe usually short, broad (Fig. 111); median basal margin often straight, not emarginate (Fig. 107). Ventral valve subtriangular, usually wider than long (Fig. 111);

apex generally round (Fig. 111); lateral margin slightly convex to straight (Fig. 107); internal margin straight to deeply emarginate (Figs 108, 111). Internal sac often without sclerites (Fig. 109); apical region with small spicules and/or dense denticles (Figs 110, 112); median region with spicules, denticles, or spines, usually



**Figs 27–32.** Frontal habitus: 27, *G. scurra*; 28, *G. guanacaste*; 29, *G. iturbidensis*; 30, *G. mimus*; 31, *G. cristicollis*; 32, *G. divaricatae*. Scale: 0.25 mm.

dense (Figs 113, 114, 115); basal region with small and thin spicules near gonopore sclerite (Fig. 110). Lateral lobes arcuate, moderate to deeply emarginate (Fig. 122); internal subapical margin straight to entirely concave (Figs 122, 126); divergent to convergent apex, not expanded laterally (Figs 122, 123).

#### Distribution

Argentina, Bolivia, Brazil, Costa Rica, El Salvador, Guatemala, French Guiana, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, United States of America, Uruguay, Venezuela.

#### Host plants

*Bauhinia bauhinioides* (Mart.) J. F. Macbr., *B. congesta* (Britton & Rose) Lundell, *B. coulteri* J. F. Macbr., *B. divaricata* L., *Bauhinia dipetala* Hemsl. var. *deserti* (Britton & Rose) Wunderlin, *B. forficata* Link, *B. forficata* Link var. *pruinosa* (Vogel) Fortunato & Wunderlin, *B. glabra* Jacq., *B. integerrima* Benth., *B. longicuspis* Benth., *B. longifolia* (Bong.) Steud., *B. macranthera* Hemsl., *Bauhinia microstachya* (Raddi) J. F. Macbr., *B. multinervia* (Kunth) DC., *B. pauletia* Pers., *B. pes-caprae* Cav., *B. pringlei* S. Watson, *B. pulchella* Benth., *B. unguolata* L., *Bauhinia rufa* (Bong.) Steud., *Cercis canadensis* L.,

*C. canadensis* L. var. *mexicana* (Britton & Rose) M. Hopkins, *C. canadensis* L. var. *texensis* (S. Watson) M. Hopkins, *C. occidentalis* A. Gray.

#### Key to the species of *Gibbobruchus*

1. Abdominal ventrites uniformly pubescent, without polished lateral areas (Fig. 80); striae 3 and 4 of elytron straight at base (Fig. 5); hind tibiae without coronal teeth (Fig. 92); internal sac of median lobe with sclerites (Fig. 107). (Group *speculifer*)..... 2
- 1'. Abdominal ventrites with polished lateral areas (Fig. 84); striae 3 and 4 of elytron curved at base (Fig. 9); hind tibiae with coronal teeth (Fig. 96); internal sac of median lobe without sclerites (Fig. 110). (Groups *polycoccus*, *scurra*, *wunderlini* and *mimus*) ..... 4
- 2(1). Pronotum with short, thin, oblique and dark band of pubescence over lateral gibbosity but not reaching the apex or the midline (Fig. 5); antenna with segments 5, 7 and 9 darker (Fig. 5); pygidium with rounded speculum in both sex (Fig. 52); first male abdominal ventrite flat, without median apical tubercle; lateral lobes of tegmen without thick hairs at apex (Fig. 122) ..... *G. speculifer*
- 2'. Pronotum without a band of oblique dark pubescence over the lateral gibbosity, or with a complete band extending from the apex to the midline (Figs 6, 7); antenna light brown with segments 8–10 dark brown (Fig. 7); pygidium with oval speculum (Figs 53, 54); first

- abdominal ventrite of male with median apical tubercle (Fig. 76); lateral lobes of tegmen with thick hairs at apex (Fig. 122) ..... 3
- 3(2'). Ocular index 5.3–6.8 mm (Fig. 22); frons strongly elevated (Fig. 22); basal emargination of pronotum shallow (Fig. 37); apex of mesosternum truncate; internal margin of ventral valve not emarginate (Fig. 109)..... *G. vinicius* sp. nov.
- 3'. Ocular index 4.3–4.8 mm (Fig. 21); frons flat or slightly elevated (Fig. 21); basal emargination of pronotum deep (Fig. 36); apex of mesosternum emarginate; internal margin of ventral valve emarginate (Fig. 108)..... *G. ornatus*
- 4(1'). Antenna flabellate (Fig. 8); pygidium with speculum in both sexes, bituberculate in female and flat in male (Figs 55, 65); integument generally black, rarely dark brown or rufous (Fig. 8); body vestiture generally white (Figs 8, 82); frons strongly prominent (Fig. 23); pecten with a maximum of 3 teeth, distal tooth often bifid (Fig. 95). (Group *polycoccus*)..... *G. polycoccus*
- 4'. Antenna subserrate (Fig. 79); only female pygidium with speculum (Fig. 66); integument light brown to dark brown, when integument black on dorsum, pubescence often light brown (Figs 5, 12); frons not distinctly prominent (Fig. 24); pecten with 4 or more teeth, distal tooth never bifid (Figs 102)..... 5
- 5(4'). Pubescence on abdomen, male pygidium and hind femur dense, white (Fig. 86); speculum of female pygidium bilobate (Fig. 69). (Group *scurra*) ..... *G. scurra*
- 5'. Vestiture of abdomen, male pygidium and metafemur not dense and variegated color; speculum of female pygidium not bilobate... 6
- 6(5'). Integument on dorsum bicolor, with anterior half lighter than posterior half (Fig. 9); interstria 4 with short band of oblique white pubescence at basal third (Fig. 9); pygidium speculum of female subtriangular, emarginate apically (Fig. 66). (Group *wunderlini*) ..... *G. wunderlini*
- 6'. Integument on dorsum never bicolor; if pubescence dense never forming oblique band; pygidium speculum of female not distinctly emarginate apically..... 7
- 7(6'). First male abdominal ventrite with homogeneous pubescence; pygidium speculum of female alutaceous (Fig. 67)..... 8
- 7'. First male abdominal ventrite with median apical region with dense pubescence, light brown to white (Fig. 75); pygidium speculum of female polished (Fig. 71)..... 9
- 8(7). Internal sac at median region with spines uniformly distributed; lateral lobes of tegmen strongly convergent at apex (Fig. 128). (Group *scurra*) ..... *G. bolivianus* sp. nov.
- 8'. Internal sac at median region with long spicules forming a dense mass; lateral lobes of tegmen moderately convergent at apex (Fig. 127). (Group *scurra*) ..... *G. cavillator*
- 9(7'). Elytron without median macula of dense pubescence distinctly prominent (Figs 13, 14) ..... 10
- 9'. Elytron with median macula of dense pubescence distinctly prominent (Fig. 17) ..... 11
- 10(9). Body with sparse pubescence, denser only in short bands mainly at interstria 1 (Fig. 14). (Group *mimus*)..... *G. iturbidensis*
- 10'. Body with dense vestiture forming a variegated pattern (Fig. 13). (Group *mimus*) ..... *G. guanacaste*
- 11(9'). Elytron with median macula of brown pubescence (Fig. 15). (Group *mimus*)..... *G. mimus*
- 11'. Elytron with median macula of black pubescence (Figs 16, 17) ..... 12
- 12(11'). Elytra with short, black, pubescent macula at median region (Fig. 16); pronotum at basal region usually with dense white pubescence (Fig. 16); pygidium of male with two apical tubercles (Fig. 63). (Group *mimus*) ..... *G. cristicollis*
- 12'. Elytra with elongate, black, pubescent macula at median region (Fig. 17); pronotum at basal region usually with white pubescence distributed homogeneously (Fig. 17); pygidium of

male with large apical tubercle (Fig. 64). (Group *mimus*).....  
..... *G. divaricatae*

The species of *Gibbobruchus* are arranged based on the results of phylogenetic analysis and by species groups, to facilitate discussions.

Group *speculifer*: *G. speculifer*, *G. ornatus*  
and *G. vinicius*

*Diagnosis*

Antenna light brown, with segments 5, 7 and 9 or 8–10, dark brown (Figs 5, 7). Pronotum with short, slender, oblique band of infuscate pubescence covering lateral gibbosity, not reaching the apex or the midline, or (Fig. 5) with a wider and complete band extending from apex to midline (Figs 6, 7). Striae 3 and 4 of elytra straight at base (Fig. 5). Pygidium with speculum rounded or oval (Figs 52–54). First male abdominal ventrite flat, or with median apical tubercle (Fig. 76). Abdominal ventrites uniformly pubescent, without polished lateral areas (Figs 80, 81). Hind tibiae without coronal teeth (Fig. 92). Pecten with 5–7 teeth. Internal sac of median lobe with sclerites (Fig. 92).

*Distribution*

Argentina, Bolivia, Brazil, Paraguay, Uruguay.

*Host plants*

*B. forficata* Link var. *pruinosa* (Vogel) Fortunato & Wunderlin, *B. integerrima* Benth., *B. microstachya* (Raddi) Macbr, *B. sp.*

New record: *B. forficata* Link

*Taxonomic discussion*

The group *speculifer* differs from other groups by having: abdominal ventrites uniformly pubescent without polished and glabrous lateral areas (Figs 80, 81). Whitehead and Kingsolver (1975) mentioned that the groups *speculifer* and *polycoccus* are easily recognised and have affinities because of the presence of elongated male genitalia, a character not used in the present analysis due to difficulties in coding it.

***Gibbobruchus speculifer* (Gyllenhal)**

(Figs 5, 20, 35, 52, 79, 92, 107, 122)

*Bruchus speculifer*: Gyllenhal, 1833: 87 (original description, type-locality: Brazil).

*Pachymerus speculifer*: Schrottky, 1906: 99.

*Pachymerus (Gibbobruchus) speculifer*: Pic, 1913a: 110.

*Pseudopachymerus (Gibbobruchus) speculifer*: Pic, 1913b: 12.

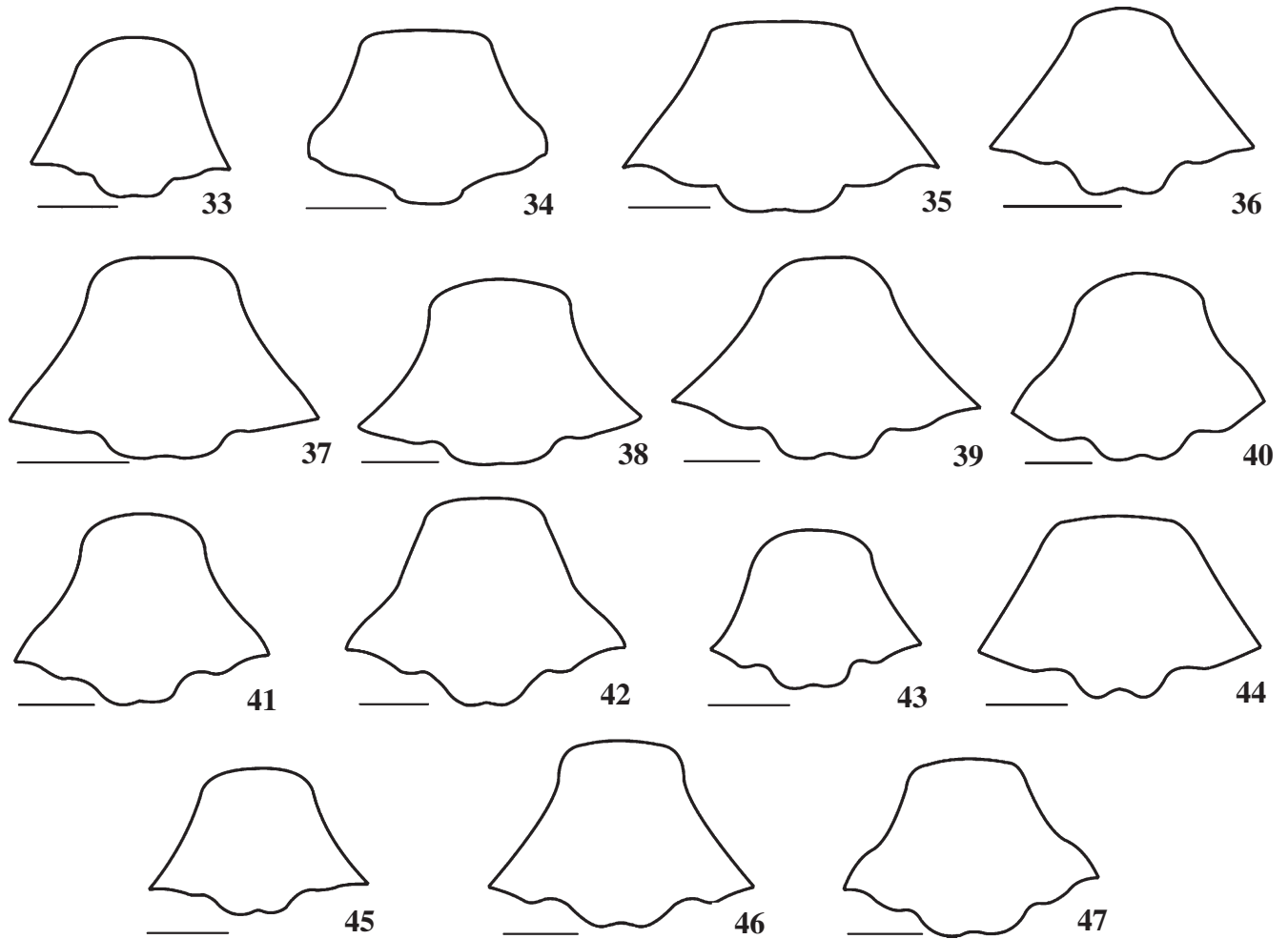
*Gibbobruchus speculifer*: Bridwell, 1938: 74; Zacher, 1952: 467; Costa Lima, 1955: 251; Whitehead & Kingsolver, 1975: 172, 218; Udayagiri & Wadhi, 1989: 83.

*Caryedes speculifera*: Blackwelder, 1946: 758.

*Caryedes speculifer*: Silva *et al.*, 1968: 380.

*Gibbobruchus atromaculatus*: Pic, 1931: 24 (original description, type-locality: Bahia, Brazil); Silva *et al.*, 1968: 382.

*Pseudopachymerus atromaculatus*: Bondar, 1931: 421; Bondar, 1936: 23.



**Figs 33–47.** Pronotum: 33, *Penthobruchus germani*; 34, *Pygiopachymerus lineola*; 35, *G. specularifer*; 36, *G. ornatus*; 37, *G. vinicius*; 38, *G. polycoccus*; 39, *G. wunderlini*; 40, *G. cavillator*; 41, *G. bolivianus*; 42, *G. scurra*; 43, *G. guanacaste*; 44, *G. iturbidensis*; 45, *G. mimus*; 46, *G. cristicollis*; 47, *G. divaricatae*. Scale: 0.50 mm.

#### Material examined

*Type.* *Bruchus specularifer* Gyllenhal, 1833. Syntype male: ‘21’; ‘Coll./Chevol.’; ‘Typus’; ‘SYNTYPE/ *Gibbobruchus/specularifer* (Gyllenhal, 1833)/ Manfio & Ribeiro-Costa, 2013’ (NHRS).

*Notes.* In the original description, Gyllenhal (1833) did not specify how many specimens were studied nor the place where the material was deposited. However, in literature the type material is quoted as deposited in NHRS (Whitehead and Kingsolver 1975; Udayagiri and Wadhi 1989). Only one specimen that matches the original description of *G. specularifer* was received from NHRS and, although the name of the author and the species were not written on labels, we believe it must be a type specimen and regarded as a syntype.

*Other material examined.* **ARGENTINA:** Buenos Aires: 1, Inta Castelar, vi.1979 (USNM); 9 (DZUP); **BOLIVIA:** 1, Yhancaroinza, iv.1924, G.L. Harrington col. (USNM). **BRAZIL:** Paraná: 1, Caviúna, x.1945, A. Maller col. (USNM); 24, Colombo, 28.iii.1992, C.S. Ribeiro-Costa col. (DZUP); 9, Curitiba, 19.vii.1992, C.S. Ribeiro-Costa col. (DZUP); 20, same locality, 25.viii.1992, same collector (DZUP); 1, same locality, xii.1969, Pe. J. S. Moure col. (DZUP); 12, Londrina, 24.iv.1996, A. Menezes Junior col., *Bauhinia* sp. (DZUP); 35, Pinhais, 2.vii.1999, Embrapa Florestacol., *Bauhinia* sp. (DZUP); 1, Ponta Grossa, Parque Estadual de Vila Velha, 29.vi.2000, C.S. Ribeiro-Costa col. (DZUP); 19, same locality,

14.vii.1992, A.M. Santos col., *Bauhinia* sp. (DZUP); 2, same locality, 1771, Bondar col. (Departamento de Zoologia de São Paulo); 1 (DZUP); 34, São José dos Pinhais, 2.vii.1999, *Bauhinia* sp. (DZUP). Rio de Janeiro: 2, Santa Cruz, Horto Florestal, 1.viii.1935, O.S. Mello col., *Bauhinia forficata* (MNRJ). Rio Grande do Sul: 1, Santa Maria, 25.viii.1971, D. Link col., *Bauhinia candicans* (USNM); 1, 22.v.1958, J.E. Mabry col., *Bauhinia* sp. (USNM); Santa Catarina: 1, Seara, Nova Teutônia, 19.i.1943, F. Plaumann col. (DZUP); 1, same locality, i.1967, same collector (DZUP); 4, same locality, xii.1980, same collector (DZUP); 2, same locality, 4.x.1951 (MHNCI). São Paulo: 2, Botucatu, Fazenda Edgárdia-UNESP, 24.vii.2007, L.M. Rodrigues col., *Bauhinia forficata* (DZUP); 2, Anhembi, ix.1996, J.A. Cerignoni col., *Bauhinia forficata* (ESALQ); 1, Folderman col., *Bauhinia* sp. (FSCA); 3, Hammar col. (CNCI); 5, same collector (USNM); 1, Mannerh. col. (FSCA). **URUGUAY:** Montevideo: 1, So Amer.Paras. Laboratory., 19.iv.1944, Parker col., *Bauhinia* sp. (USNM).

#### Redescription

Body length: 3.3–4.6 mm; width: 2.4–3.0 mm.

*Integument.* Dorsum light brown or brown (Fig. 5). Antenna light brown with segments 5, 7 and 9 dark brown (Figs 5, 79). Pygidium of male and female light brown or brown; speculum

generally black with light brown apex, sometimes rufous with light brown apex (Fig. 52). Ventral region often black; some specimens with rufous or light brown abdomen, with rest of ventral region rufous (Fig. 79). Front and middle femur and tibiae of same color; hind femur sometimes with basal region and ventral margin black (Fig. 79).

**Vestiture.** Dorsum with nearly uniform pubescence, white, light brown to dark brown or black (Fig. 5). Pronotum at basal region and median gibbosity without dense light brown or white pubescence; oblique dark brown or black band at median region, over lateral gibbosity; median gibbosity with two narrow, parallel brown bands anterior and posterior to transverse median sulcus (Fig. 5). Scutellum light brown to white (Fig. 5). Elytron without dark brown or black median macula; basal third without white tuft or band on interstria 5; narrow transverse white band at median region, laterally; remainder of elytron light brown (Fig. 5). Pygidium of male and female with dense white pubescence, except basal spot and speculum (Fig. 52). Light brown thorax and white abdomen (Fig. 79). Median anterior region of first male abdominal ventrite with same colour and same dense pubescence as other ventrites; abdominal ventrites uniformly pubescent, without polished lateral areas (Fig. 79).

**Body.** Ocular sinus: 0.1–0.2 mm; ocular index: 3.8–4.7; frons not elevated; frontal carina polished and often wide basally (Fig. 20). Antenna not sexually dimorphic, subserrate (Figs 5, 79). Pronotum with median gibbosity strongly elevated, and lateral gibbosity elevated; laterobasal margin straight; basal emargination shallow (Figs 5, 35, 79). Elytron with basal gibbosity elevated; base of striae toothless; striae 3 and 4 straight at base; striae 7, 8 and 9 limited basally by strongly elevated humeral gibbosity interstria 3, 5, 7 and 9 without gibbosities; interstria 10 without basal sulcus (Figs 5, 79). Pygidium flat, not sexually dimorphic, with large rounded speculum polished, almost no punctuation, except in lateroapical margin (Fig. 52). Mesosternum truncate at apex. Male abdomen never compressed; first male abdominal ventrite flat, without median apical tubercle; last male and female abdominal ventrite medially straight. Hind femur weakly incrassate; pecten with 5–7 teeth, anterior tooth contiguous to the posteriors (Figs 79, 92). Hind tibiae smooth at apex, without coronal teeth (Fig. 92).

**Male genitalia.** Median lobe long, slender; median basal margin straight, not emarginate (Fig. 107). Ventral valve subtriangular, longer than wide; lateral margin slightly concave and internal margin slightly emarginate; round apex (Fig. 107). Internal sac at apical region with thin spicules and two overlaid sclerites with round apices; median region with an inverted V-shaped sclerite, curved and apparently surrounded by a ring structure with elongated stem; basal region with denticles near gonopore sclerite (Fig. 107). Lateral lobes deeply emarginate and internal subapical margin straight; apex strongly convergent (Fig. 122).

#### *Distribution*

Argentina (Buenos Aires), Bolivia, Brazil (Goiás, Paraná, Rio de Janeiro, Rio Grande do Sul, Santa Catarina, São Paulo), Uruguay (Montevideo). Udayagiri and Wadhi (1989) listed this species

for Bolivia, Brazil, Paraguay and Uruguay and Cordo *et al.* (2005) listed for Argentina.

#### *Host plants*

*B. forficata* Link var. *pruinosa* (Vogel) Fortunato & Wunderlin, *B. integerrima* Benth., *B. microstachya* (Raddi) Macbr., *B. sp.*

New record: *B. forficata* Link

#### *Taxonomic discussion*

*Gibbobruchus speculifer* shares with other species of the group *speculifer* abdominal ventrites entirely pubescent, without polished lateral area (Fig. 79). It differs from them by the pronotum with oblique bands of dark brown or black vestiture in the median region above the lateral gibbosity (Fig. 5); the antenna with 5th, 7th and 9th segments infuscate (Fig. 5); and without thick hairs at the apex of the lateral lobes of the tegmen (Fig. 122).

#### *Gibbobruchus ornatus* Pic

(Figs 6, 21, 36, 53, 76, 80, 93, 108, 123)

*Gibbobruchus ornatus*: Pic, 1931: 24 (original description, type-locality: Jatahy, Brazil); Whitehead & Kingsolver, 1975: 173; Udayagiri & Wadhi, 1989: 82.

#### *Material examined*

**Type.** *Gibbobruchus ornatus* Pic, 1931. Syntype: 'Jatay/ Prov.Goyas, Brésil'; 'mihy'; 'ornatus/ n sp'; 'HOLOTYPE'; 'ornatus/ Pic/ det70/ J.M. Kingsolver'; 'Muséum/ Paris'; '(two illegible letters)/ (illegible letters) sobruchus/ Pic'; 'SYNTYPE/ *Gibbobruchus/ ornatus* Pic, 1931/ Manfio & Ribeiro-Costa, 2013' (MNHN).

**Notes.** In the original description Pic (1931) did not specify how many specimens were studied. The exemplar received from the MNHN was labelled as a holotype. However, we do not believe that this is Pic's label, because it was printed. Nevertheless this exemplar is here considered as a type specimen and regarded as a syntype.

Among the material received from USNM there was an homotype male, with the following labels: 'S Antonio/ de Guapore/ Brazil'; 'HOMOTYPE/ Ornatus/ Pic/ JK 70'; 'Carn. Mus./ Acc.4043'; 'July26/ 1909'; '101'.

**Other material examined.** BRAZIL: Goiás: 1, Jataí, V. Rolle col. (FSCA). Rondônia: 1, Ariqueemes, Fazenda Rancho Grande, 4–16.xi.1997, J.E. Eger col. (CNCI).

#### *Redescription*

Body length: 3.2–3.4 mm; width: 2.0–2.2 mm.

**Integument.** Dorsum brown or bicolor, light brown and black, gradually darker towards the anterior region (Fig. 6). Antenna brown with segments 8–10 dark brown. Pygidium of male and female light brown to brown (Fig. 53). Ventral region brown or thorax dark brown and abdomen rufous (Fig. 80). Front and middle femur and tibiae often unicolor; hind femur almost unicolor, basal region dark brown (Fig. 80).

**Vestiture.** Dorsum almost uniformly light brown and white (Fig. 6). Pronotum at basal region and median gibbosity without light brown or white dense pubescence, sometimes with black pubescence uniformly distributed; without a band of oblique dark pubescence over the lateral gibbosity, or with a complete black band extending from the apex to the midline; median gibbosity without brown parallel narrow bands anterior or posterior to median transverse sulcus (Figs 6, 80). Scutellum light brown

(Fig. 6). Elytron without a conspicuous macula at interstria 2 and 3; white pubescence forming a 'V' at anterior half of elytron, laterally; rest of elytron with light brown pubescence or with white tufts (Fig. 6). Pygidium of male and female with white pubescence, four maculas with sparse pubescence on speculum (Fig. 53). Ventral region white to light brown; mesepimerum, mesepisternum, and metepisternum light brown (Fig. 80). First male abdominal ventrite unicolor, without median anterior region of dense pubescence light brown to white; ventrites uniformly pubescent, without polished lateral areas (Fig. 80).

*Body.* Ocular sinus: 0.2 mm; ocular index: 4.3–4.7 mm; frons not elevated to elevated; frontal carina polished and narrow basally (Fig. 21). Antenna not sexually dimorphic, subserrated. Pronotum with median gibbosity elevated, lateral gibbosity slightly elevated; laterobasal margin straight, basal emargination deep (Figs 6, 36, 80). Elytron with basal gibbosity slightly elevated; base of striae toothless; striae 3 and 4 straight at base; striae 7, 8 and 9 limited basally by elevated humeral gibbosity; interstria 3, 5, 7 and 9 without gibbosities; interstria 10 without basal sulcus (Figs 6, 80). Pygidium flat, not sexually dimorphic, both sex with large oval speculum, roughly punctuated, slightly convex at apex (Fig. 53). Mesosternum emarginate at apex. Male abdomen never compressed; first male abdominal ventrite with median apical tubercle; last male and female abdominal ventrite medially straight (Fig. 76). Hind femur weakly incrassate; pecten with 5–7 teeth, anterior tooth contiguous to the posteriors (Figs 80, 93). Hind tibiae smooth at apex, without coronal teeth (Fig. 93).

*Male genitalia.* Median lobe long, slender; median basal margin straight, not emarginate (Fig. 108). Ventral valve subtriangular, longer than wide; lateral margin slightly concave and internal margin slightly emarginate; round apex (Fig. 108). Internal sac at apical region with two overlaid subtriangular sclerites round at apex and another sclerite densely surrounded by fine spicules; median region with dense denticles; basal region with small and thin dense spicules near gonopore sclerite (Fig. 108). Lateral lobes deeply emarginate and internal subapical margin straight, apex moderately convergent (Fig. 123).

#### *Distribution*

Brazil (Goiás, Rondônia).

#### *Taxonomic discussion*

This species is very similar to *G. vinicius*, mainly by having first male abdominal ventrite with one tubercle (Fig. 76) and thick hairs on lateral lobes of tegmen (Fig. 123). It differs from *G. vinicius* by the ocular index (between 4.3 to 4.7 mm), frons not strongly elevated (Fig. 21), pronotum with deep basal emargination (Fig. 36), mesosternum rounded, internal margin of ventral valve emarginate, and absence of stick-shaped sclerites on the internal sac of male genitalia (Fig. 108). Other comments are in the 'taxonomic discussion' section of *G. speculifer*.

***Gibbobruchus vinicius*, Manfio & Ribeiro-Costa sp. nov.**

(Figs 7, 22, 37, 54, 76, 81, 94, 109, 124)

#### *Material examined*

*Types.* Holotype male: 'Jaguariaíva, PR-BR/30/V/2003/L.T.Sari col.'; 'Pl. hosp./ *Bauhinia holophylla*/24/V/03'; '*Gibbobruchus/ ornatus* Pic, 1931/ Ribeiro-Costa, C.S. det 2005'; '♂'; 'HOLOTYPE/ *Gibbobruchus/ vinicius* Manfio & Ribeiro-Costa, 2013' (DZUP). 31 Paratypes: 9 at MNRJ, 2♂: '2566'; 'Estado da Bahia, G. Bondar leg.'; '6-60936/Vagem/ de UNHA/ de BOI'; 'COLEÇÃO/ CAMPOS SEABRA'; '*Caryedes/ atromaculatus*/Pic.'; '*Gibbobruchus/ ornatus/* Pic, 1931/ Ribeiro-Costa, C.S. det 2007'; 'PARATYPE/ *Gibbobruchus/ vinicius* Manfio & Ribeiro-Costa, 2011' (MNRJ). 4♂ and 1♀: '2,566'; 'PARATYPE/*Gibbobruchus/ vinicius* Manfio & Ribeiro-Costa, 2013' (MNRJ). 1♂ and 1♀: '2,566'; '*Gibbobruchus/ ornatus/* Pic, 1931/ Ribeiro-Costa, C.S. det 2007'; 'PARATYPE/ *Gibbobruchus/ vinicius* Manfio & Ribeiro-Costa, 2013' (MNRJ). 10 at DZUP, 1♀: 'Niquelândia-GO/ 14° 5' 33.63'S/ 48° 22' 44.1' N'; '*Bauhinia* sp.'; '♀'; 'PARATYPE/ *Gibbobruchus/ vinicius* Manfio & Ribeiro-Costa, 2013' (DZUP). 2♀: 'CHRYSOMELIDAE/ *Gibbobruchus/* sp.-R1282'; '48° 20' 13.9' W 14° 08' 57.6' S/ X.2009-BRASIL, Niquelândia, GO/ Bergamini, L. L. col/ Coleta Manual/ Frutos de *Bauhinia* sp.'; 'PARATYPE/ *Gibbobruchus/ vinicius* Manfio & Ribeiro-Costa, 2013' (DZUP). 2♂ and 2♀: 'Brasil, MG./ São Gonçalo do Rio Preto/ 27/X/2006/ S.L.A.Junior col.'; '*Planta hospedeira/ Bauhinia longifolia/* pata-de-vaca'; '*Gibbobruchus/ ornatus/* Pic, 1931/ Manfio, D. det. 2009'; 'PARATYPE/ *Gibbobruchus/ vinicius* Manfio & Ribeiro-Costa, 2013' (DZUP). 1♂: 'Jaguariaíva, PR-BR/02/VII/05/ L. T. Sari, col.'; 'Pl. hosp./ *Bauhinia holophylla*/ 26/V/05'; 'PARATYPE/ *Gibbobruchus/ vinicius* Manfio & Ribeiro-Costa, 2013' (DZUP). 1♂: 'Jaguariaíva, PR-BR/05/VI/05/ L. T. Sari, col.'; 'Pl. hosp./ *Bauhinia holophylla*/ 24/V/03'; '*Gibbobruchus/ ornatus* Pic, 1931/ Ribeiro-Costa, C.S. det 2005'; 'PARATYPE/ *Gibbobruchus/ vinicius* Manfio & Ribeiro-Costa, 2013' (DZUP). 1♂: 'Jaguariaíva, PR-BR/30/VI/05/ L. T. Sari, col.'; 'Pl. hosp./ *Bauhinia holophylla*/ 24/V/03'; '*Gibbobruchus/ ornatus* Pic, 1931/ Ribeiro-Costa, C.S. det 2005'; '♂'; 'PARATYPE/ *Gibbobruchus/ vinicius* Manfio & Ribeiro-Costa, 2013' (DZUP). 4 at MZSP, 2♀: 'Niquelândia-GO/ 14° 5' 33.63'S/48° 22' 44.1' N'; '*Bauhinia* sp.'; '♀'; 'PARATYPE/ *Gibbobruchus/ vinicius* Manfio & Ribeiro-Costa, 2013' (MZSP). 2♀: 'Brasil, MG./ São Gonçalo do Rio Preto/ 27/X/2006/ S.L.A.Junior col.'; '*Planta hospedeira/ Bauhinia longifolia/*pata-de-vaca'; '*Gibbobruchus/ ornatus/* Pic, 1931/ Manfio, D. det. 2009'; 'PARATYPE/ *Gibbobruchus/ vinicius* Manfio & Ribeiro-Costa, 2013' (MZSP). 4 at USNM, 2♀: 'CHRYSOMELIDAE/ *Gibbobruchus/* sp.-R1282'; '48° 20' 13.9' W 14° 08' 57.6' S/ X.2009-BRASIL, Niquelândia, GO/Bergamini, L. L. col/ Coleta Manual/ Frutos de *Bauhinia* sp.'; 'PARATYPE/ *Gibbobruchus/ vinicius* Manfio & Ribeiro-Costa, 2013' (USNM). 2♀: 'Brasil, MG./ São Gonçalo do Rio Preto/ 27/X/ 2006/ S.L.A.Junior col.'; '*Planta hospedeira/ Bauhinia longifolia/*pata-de-vaca'; '*Gibbobruchus/ ornatus/* Pic, 1931/ Manfio, D. det. 2009'; 'PARATYPE/ *Gibbobruchus/ vinicius* Manfio & Ribeiro-Costa, 2013' (Colección Entomológica del Instituto de Fitosanidad, Colegio de Postgraduados). 2♀: 'Jaguariaíva, PR-BR/02/VII/05/ L. T. Sari, col.'; 'Pl. hosp./ *Bauhinia holophylla*/26/V/05'; 'PARATYPE/ *Gibbobruchus/ vinicius* Manfio & Ribeiro-Costa, 2013' (Colección Entomológica del Instituto de Fitosanidad, Colegio de Postgraduados).

#### *Description*

Body length: 3.0–4.1 mm; width: 1.5–2.6 mm.

*Integument.* Dorsum bicolor, light brown and black, gradually darker towards the anterior region (Fig. 7). Antenna light brown with segments 8–10 dark brown (Figs 7, 81) Pygidium of male and female with speculum usually black,

apex light brown, sometimes rufous with apex light brown (Fig. 54). Thorax and abdomen rufous, sometimes only apex of abdomen rufous (Fig. 81). Front and middle femur and tibiae not bicolor; hind femur almost unicolor, dark brown at basal region (Fig. 81).

**Vestiture.** Dorsum almost uniformly light brown and white (Fig. 7). Pronotum at basal region and median gibbosity without dense brown or white pubescence; black pubescence uniformly distributed; a complete black band extending from the apex to the midline; median gibbosity without parallel, narrow, brown bands anterior or posterior to median transverse sulcus (Fig. 7). Scutellum light brown (Fig. 7). Elytron without a conspicuous macula on interstria 2 and 3; white pubescence forming a 'V' on anterior half of elytra; rest of elytra with white tufts (Fig. 7). Pygidium of male and female with white pubescence; four glabrous maculas over speculum (Fig. 54). Ventral region white; mesepimerum, mesepisternum, and metepisternum light brown (Fig. 81). First male abdominal ventrite in median anterior region of same colour and density as remaining ventrites; abdominal ventrites uniformly pubescent, without polished lateral areas (Fig. 81).

**Body.** Ocular sinus: 0.1–0.2 mm; ocular index: 5.3–6.8 mm; frons strongly elevated; frontal carina in general not polished and narrow basally (Fig. 22). Antenna not sexually dimorphic, subserrate (Figs 7, 81). Pronotum with median gibbosity elevated, lateral gibbosity never elevated; laterobasal margin straight; basal emargination shallow (Figs 7, 37). Elytron with basal gibbosity slightly elevated; base of striae toothless; striae 3 and 4 straight at base; striae 7, 8 and 9 limited basally by strongly elevated humeral gibbosity; interstria 3, 5, 7 and 9 without gibbosities; interstria 10 without basal sulcus (Figs 7, 81). Pygidium flat, not sexually dimorphic, both sex with large oval, speculum, roughly punctuated, slightly convex at apex (Fig. 54). Mesosternum truncate at apex. Male abdomen never compressed; first male abdominal ventrite with median apical tubercle; last male and female abdominal ventrite straight medially (Fig. 76). Hind femur weakly incrassate; pecten with 5–7 teeth, anterior tooth contiguous to the posteriors (Figs 81, 94). Hind tibiae smooth at apex, without coronal teeth (Fig. 94).

**Male genitalia.** Median lobe long, slender; median basal margin straight, not emarginate (Fig. 109). Ventral valve subtriangular, longer than wide; lateral margin nearly straight and internal margin not emarginate; pointed apex (Fig. 109). Internal sac at apical region with two overlaid subtriangular sclerites with thin dense spicules and round apex; median region with dense spines and denticles and with two rod-shaped sclerites covered by small denticles; basal region with small and thin spicules near gonopore sclerite (Fig. 109). Lateral lobes deeply emarginate and internal subapical margin straight; apex parallel (Fig. 124).

#### Etymology

The specific name is a noun in apposition, gender masculine.

#### Distribution

Brazil (Bahia, Goiás, Minas Gerais, Paraná).

#### Host plants

*Bauhinia longifolia* (Bong.) Steud., *Bauhinia rufa* (Bong.) Steud., *Bauhinia* sp.

#### Taxonomic discussion

This species has an external morphology very similar to *G. ornatus*, sharing principally the first male abdominal ventrite with tubercle and thick hairs at apex of lateral lobes of tegmen (Fig. 76). It differs from *G. ornatus* by the ocular index (between 5.3 and 6.8), frons strongly elevated (Fig. 22), pronotum with shallow basal emargination (Fig. 37), mesosternum truncate, internal margin of ventral valve not emarginate and sclerites stick-shaped on the internal sac of male genitalia (Fig. 109). Other comments are in the 'taxonomic discussion' section of *G. speculifer*.

#### Group *polycoccus*: *G. polycoccus*

#### Diagnosis

Integument usually black, rarely dark brown or rufous (Fig. 8). General body vestiture white (Figs 8, 82). Frons strongly elevated (Fig. 23). Antenna sexually dimorphic, strongly flabellate in male, weakly in female (Fig. 8). Pygidium of male flat, triangular speculum (Fig. 55). Pygidium of female with two tubercles strongly elevated, triangular speculum (Fig. 65). Pecten with maximum of three teeth, distal often bifid (Fig. 95).

#### Distribution

Brazil, Paraguay.

#### Host plants

*Bauhinia longicuspis* Benth.

New record: *B. forficata* Link

#### Taxonomic discussion

Whitehead and Kingsolver (1975) mentioned that the groups *polycoccus* and *speculifer* were easily recognised. According to these authors these groups are close due to the elongated male genitalia.

#### *Gibbobruchus polycoccus* (Fåhraeus)

(Figs 8, 23, 38, 55, 65, 82, 95, 110, 125)

*Bruchus polycoccus*: Fåhraeus, 1839: 121 (original description, type-locality: Brazil).

*Pachymerus polycoccus*: Schrottky, 1906: 101.

*Pachymerus (Gibbobruchus) polycoccus*: Pic, 1913b: 110.

*Pseudopachymerus polycoccus*: Pic, 1913a: 11.

*Caryedes polycoccus*: Blackwelder, 1946: 758.

*Gibbobruchus polycoccus*: Costa Lima, 1955: 251; Silva *et al.*, 1968: 382; Whitehead & Kingsolver, 1975: 174; Udayagiri & Wadhi, 1989: 82.

*Pachymerus (Gibbobruchus) bituberculatus* Pic, 1913b: 110 (original description, type-locality: Rio Grande do Sul, Brazil).

*Pseudopachymerus (Gibbobruchus) bituberculatus*: Pic, 1913a: 115.

*Caryedes bituberculata*: Blackwelder, 1946: 757.

### Material examined

*Type.* *Gibbobruchus polycoccus* Fähræus, 1839. Syntype male: 'Typus'; 'Brasilia in/ Sem. Euphorbi./ aca. Falderman'; 'SYNTYPE/ *Gibbobruchus/ polycoccus* Fähræus, 1839/ Manfio, Ribeiro-Costa & Caron, 2013' (NHRS).

*Notes.* In the original description Fähræus (1839) did not specify how many specimens he studied nor the place where the material was deposited. However, in literature the type material is quoted as deposited in NHRS (Whitehead and Kingsolver 1975; Udayagiri and Wadhi 1989). Only one specimen was received from this museum which matches with the original description of *G. polycoccus* and, although the name of the author and species are not written on labels, we believe it must be considered as a type specimen and regarded as syntype.

Among the material received from USNM there was an homotype, female: 'Lambary/ M. Geraes/ XI.1924/ J.halik/ 2414'; 'BRASIL/ Halik 1966/ Collection'; '242'; 'bituberculatus Pic/ JK 1920/ Homotype'; 'Comp. with Homoty/ i/ of *polycoccus* Fhs./ BM 1970. JMK/ Southgate comp. spm.'; 'G. polycoccus'.

*Other material examined.* **BRASIL:** Paraná: 1, Curitiba, 23.IX.1998, L.C. Haenle col. (DZUP); 3, same locality, 30.ix.1998, same collector (DZUP); 2, Foz do Iguaçu, 1952 (MNRJ); 1, Ponta Grossa, Vila Velha, Reserva IAPAR, 25.ii.1987 (DZUP). Rio de Janeiro: 1, Rio de Janeiro, Jardim Botânico, 12.viii.1952 (MNRJ). Santa Catarina: 1, Corupá (Hansa Humbolt), xi.1948, A. Maller col. (USNM). São Paulo: 1, Atibaia, 17.XII.1971, J.Halik (DZUP); 1, Botucatu, Fazenda Edgárdia-UNESP, 24.vii.2007, L.M. Rodrigues, *Bauhinia forficata* (DZUP); 1, same locality, 27.vii.2007, same collector and host plant (DZUP); 1, same locality, 13.viii.2007, same collector and host plant (DZUP); 1, same locality, 27.x.2007, same collector and host plant (DZUP).

### Redescription

Body length: 3.5–4.5 mm; width: 2.5–2.9 mm.

*Integument.* Dorsum black to rufous, rarely dark brown or rufous (Fig. 8). Antenna dark brown or black (Fig. 8). Pygidium of male and female black, sometimes dark brown or rufous (Figs 55, 65). Ventral region black, rarely dark brown or rufous (Fig. 92). Front and middle femur and tibiae bicolor; hind femur unicolor (Fig. 82).

*Vestiture.* Dorsum variegated with white hairs, light brown, or brown and dark brown (Fig. 8). Pronotum at basal region and median gibbosity without dense light brown or white pubescence; median gibbosity with two subparallel, narrow, brown or black bands anterior and posterior to median transverse sulcus (Fig. 8). Scutellum white (Fig. 8). Elytron with median, elongate, dark brown macula at interstria 1 to 3; basal third without white or light brown tuft or band at interestria 5; rest of elytra white with dark brown grumes and light brown or brown bands (Fig. 8). Pygidium of male and female with sparse white to brown pubescence except on speculum (Figs 55, 65). Ventral region white; mesepisternum, mesepimerum, and metepisternum light brown (Fig. 82). First male abdominal ventrite with uniform color, without median anterior region of dense light brown to white pubescence; ventrites not uniformly pubescent, ventrites 1–3 or 1–4 with polished lateral areas (Fig. 82).

*Body.* Ocular sinus: 0.2 mm; ocular index: 5.5–6.2 mm; frons strongly elevated; frontal carina not polished and wide basally (Fig. 23). Antenna sexually dimorphic, strongly flabellate in male and slightly flabellate in female (Fig. 8). Pronotum with median and lateral gibbosities strongly elevated; laterobasal margin straight; basal emargination shallow (Figs 8, 38, 82).

Elytron with basal gibbosity strongly elevated; base of striae toothless; striae 3 and 4 curved at base; striae 7, 8 and 9 limited basally by strongly elevated humeral gibbosity; interstria 3, 5, 7 and 9 with conspicuous gibbosities; interstria 10 with basal sulcus (Figs 8, 82). Pygidium of male flat with triangular speculum (Fig. 55). Pygidium of female with two strongly elevated tubercles on triangular speculum (Fig. 65). Mesosternum truncate at apex. Male abdomen sometimes strongly compressed; first male abdominal ventrite flat, without median apical tubercle; last male and female abdominal ventrite medially emarginate. Hind femur strongly incrassate; pecten with 3 teeth, anterior tooth not contiguous to the posteriors and the distal usually bifid (Figs 82, 95). Hind tibiae with coronal teeth (Fig. 95).

*Male genitalia.* Median lobe long, slender, median basal margin straight, not emarginate (Fig. 110). Ventral valve subtriangular, longer than wide; lateral margin nearly straight and internal margin not emarginate; pointed apex (Fig. 110). Internal sac at apical region without denticles or spicules; median region with dense denticles; basal region with small, thin spicules near gonopore sclerite (Fig. 110). Lateral lobes moderately deep emarginate and internal subapical margin straight; apex not convergent (Fig. 125).

### Distribution

Brazil (Minas Gerais, Paraná, Rio de Janeiro, Santa Catarina, São Paulo). Udayagiri and Wadhi (1989) listed *G. polycoccus* for Brazil and Paraguay.

### Host plants

*Bauhinia longicuspis* Benth.

New record: *B. forficata* Link

### Taxonomic discussion

*Gibbobruchus polycoccus* shares with the species of the group speculifer the pygidium of the male with a speculum (Fig. 55), and with all other *Gibbobruchus* species the following synapomorphies: base of striae 3 and 4 curved at base (Fig. 8), anterior tooth of pecten not contiguous to the posteriors (Fig. 95), apex of hind tibiae with coronal denticles (Fig. 95), and the last abdominal ventrite medially emarginate in the male. It is closer to *G. vinicius* by the ocular index between 5.3 and 6.8, and the frons strongly elevated (Fig. 23).

*G. polycoccus* differs from other *Gibbobruchus* species by the presence of a black integument, rarely dark brown or rufous; the general vestiture of the body white (Fig. 8); antennae flabellate (Fig. 8); and pecten with a maximum of 3 teeth, the distal tooth usually bifid (Fig. 95).

Whitehead and Kingsolver (1975) found that the speculum of the pygidium is rufous in some specimens, black in others, and that there is little variation in the prominence of the tubercles of the female pygidium.

### Group *wunderlini*: *G. wunderlini*

#### Diagnosis

Dorsum bicolor, with the anterior half lighter than posterior (Fig. 9); interstria 4 with short band of white vestiture oblique

on basal third (Fig. 9). Pygidium of female with large, subtriangular, apically emarginate speculum (Fig. 66).

#### *Distribution*

Guatemala, Mexico.

#### *Host plants*

*Bauhinia dipetala* Hemsl. var. *deserti* (Britton & Rose) Wunderlin, *B. divaricata* L.

#### *Taxonomic discussion*

The group *wunderlini* shares with the groups *cavillator* and *mimus* a deep basal emargination on the pronotum (Fig. 39), and the subapical internal margin of the lateral lobes of the tegmen completely concave (Fig. 125).

According to Whitehead and Kingsolver (1975), the group *wunderlini* is closer to the group *mimus* due to the presence, in most cases, of strongly developed spines on the internal sac of the median lobe in male. These authors also commented that these groups are sympatric and are perhaps sister groups, but stressed that *G. wunderlini* is distinguished by the colour pattern of its dorsum, and the males differ from males of the group *mimus* by the absence of dense light brown to white pilosity at the median anterior region of the first abdominal ventrite and by a dense vestiture on the pygidium. The females of *G. wunderlini* differ from the females of group *mimus* by having the pygidium speculum flat and emarginate apically (Fig. 66).

According to Whitehead and Kingsolver (1975), morphological differences among the groups *wunderlini*, *cavillator*, *scurra*, and *mimus* that comprise the *mimus* lineage are subtle (Fig. 2). On the other hand, the groups *polycoccus*, *speculifer*, and *mimus* lineage are easily recognised (Fig. 2).

#### ***Gibbobruchus wunderlini* Whitehead & Kingsolver**

(Figs 9, 24, 39, 56, 66, 83, 96, 111, 126)

*Gibbobruchus wunderlini*: Whitehead & Kingsolver, 1975: 180 (original description, type-locality: Puebla, Mexico); Johnson & Kingsolver, 1982: 413; Udayagiri & Wadhi, 1989: 83; Romero & Johnson, 2004: 624.

#### *Material examined*

Types. *Gibbobruchus wunderlini* Whitehead & Kingsolver, 1975. 4 Paratypes at USNM, 1♂: 'Tehuacan, Oaxaca./ Mexico.Nov.7/ 1903. In seeds of/ Bauhinia dipetala/ var. deserti'; 'PARATYPE/ Gibbobruchus/ wunderlini/ Whd.& Kings.'. 1♂: 'MEX. Puebla/ nr. Tehuacan/ 30.VIII-8. IX.05/ JNRose et al'; 'B. dipetala v./ deserti (B & R)/ det RPW 67/ USNM herb.'; 'PARATYPE/ Gibbobruchus/ wunderlini/ Whd.+ Kings.'. 1♀: 'Mex. Oaxaca./ Cerro San Antonio/ 12.x.07. C.Conzatti/ B. dipetala var./ deserti'; 'PARATYPE/ Gibbobruchus/ wunderlini/ Whd.& Kings.'. 1♀: 'GUAT. El Pro-/ greso. Between/ Tutumajillo +/ Finca Montanita'; '3. FEB. 1942./ Steyermark./ Ex Bauhinia/ divaricata L.'. 'PARATYPE/ Gibbobruchus/ wunderlini/ Whd.& Kings'.

Other material examined. MEXICO: Puebla: 1, Tehuacan, S.V. Purpus col. (USNM).

#### *Redescription*

Body length: 3.2–4.9 mm; width: 2.0–3.2 mm.

*Integument*. Dorsum bicolor (Fig. 9). Antenna light brown with segments 8–10 dark brown. Elytron at most anterior half rufous and at most posterior half black (Fig. 9). Pygidium of male brown (Fig. 56). Pygidium of female rufous (Fig. 66). Ventral region usually black, sometimes bicolor, black and rufous (Fig. 83). Front and middle femur and tibiae light brown, not distinctly bicolor; hind femur bicolor, black and rufous (Fig. 83).

*Vestiture*. Dorsum variegated with white, light brown, dark brown and brown hairs (Fig. 9). Pronotum at the basal region and median gibbosity usually with sparse or absent light brown pubescence; median gibbosity with two brown, short, parallel, narrow bands anterior and posterior to median transverse sulcus (Fig. 9). Scutellum light brown (Fig. 9). Elytron with median, straight, short, black macula on interstria 2 and 3; basal third with white, short, oblique band on interstria 5; rest of elytra with white grumes and light and dark brown bands (Fig. 9). Pygidium of male with light brown dense pubescence uniformly distributed (Fig. 56). Pygidium of females with dense light brown and uniformly distributed pubescence except on speculum (Fig. 66).

Ventral region usually white; mesepisternum, mesepimerum, and metepisternum light brown (Fig. 83). First male abdominal ventrite of uniform color, without median anterior region of dense light brown to white pubescence; ventrites not uniformly pubescent, 1–3 with polished lateral areas.

*Body*. Ocular sinus: 0.1–0.2 mm; ocular index: 2.7–3.1 mm; frons not elevated; frontal carina polished and usually not enlarged basally (Fig. 24). Antenna not sexually dimorphic, subserrate. Pronotum with median gibbosity elevated; lateral gibbosity strongly elevated; laterobasal margin straight; basal emargination deep (Figs 9, 39, 83). Elytron with basal gibbosity elevated to strongly elevated; base of striae toothless; striae 3 and 4 curved at base; striae 7, 8 and 9 limited basally by elevated humeral gibbosity; interstria 3, 5, 7 and 9 with gibbosities; interstria 10 with basal sulcus (Figs 9, 83). Pygidium of male convex at apex (Fig. 56). Pygidium of female sparsely microponuated, convex at apex; large triangular speculum, apically emarginate (Fig. 66). Mesosternum truncate at apex. Male abdomen never compressed; first male abdominal ventrite flat, without median apical tubercle; last male and female abdominal ventrite medially emarginate. Hind femur strongly incrassate; pecten with 5 teeth, anterior tooth not contiguous to the posteriors (Figs 83, 96). Hind tibiae with coronal teeth (Fig. 96).

*Male genitalia*. Median lobe short, broad; median basal margin straight, not emarginate (Fig. 111). Ventral valve subtriangular, wider than long; lateral margin convex and internal margin moderately emarginate; round apex (Fig. 111). Internal sac at apical region with dense spicules and denticles uniformly distributed; median region with denticles uniformly distributed; basal region with dense, small, thin spicules uniformly distributed near gonopore sclerite (Fig. 111). Lateral lobes moderately deep emarginate and internal subapical margin slightly concave; divergent at apex (Fig. 126).

#### *Distribution*

Guatemala (El Progreso), Mexico (Oaxaca, Puebla).

*Host plants*

*Bauhinia dipetala* Hemsl. var. *deserti* (Britton & Rose) Wunderlin, *B. divaricata* L.

*Taxonomic discussion*

*G. wunderlini* differs from other species by having the dorsum bicolored, with anterior half lighter than the posterior (Fig. 9); a white, short, oblique band of vestiture at the basal third of interstria 5 (Fig. 9); and the female speculum subtriangular, emarginate apically (Fig. 66).

Group *scurra*: *G. cavillator*, *G. bolivianus* and *G. scurra*

*Diagnosis*

Antenna usually light brown, with or without dark brown segments (Figs 84, 85, 86). Pygidium of female often with tubercle at apex; speculum alutaceous (Figs 67, 68, 69).

*Distribution*

Argentina (Jujuy), Bolivia (Santa Cruz), Brazil (Bahia, Distrito Federal, Goiás, Mato Grosso, Minas Gerais, Pará, Paraná, Rio de Janeiro, Rio Grande do Sul, São Paulo, Tocantins), Paraguay (Cordillera), Venezuela (Aragua, Bolívar, Calabozo, Vargas).

*Host plants*

*B. bauhinoides* (Mart.) J. F. Macbr., *B. rufa* (Bong.) Steud.

New records: *B. longifolia* (Bong.) Steud., *B. multinervia* (Kunth) DC, *B. rufa* (Bong.) Steud., *B. unguolata* L., *B. sp.*

*Taxonomic discussion*

The group *scurra* shares with the groups *wunderlini* and *mimus* a pronotum with a deep basal emargination (Figs 40, 41, 42) and the subapical internal margin of the lateral lobes of the tegmen completely concave (Figs 127, 128, 129).

The alutaceous female pygidial speculum was suggested by Whitehead and Kingsolver (1975) as a character of proximity between the groups *cavillator* and *scurra* (Table 2, Fig. 2), as well as the presence, in most cases, of weakly developed spines on the internal sac of the median lobe. According to these authors, these could be sister groups (Fig. 2) or even constitute just one group – a hypothesis confirmed in this study (Fig. 1).

*Gibbobruchus cavillator* (Fåhraeus)

(Figs 10, 25, 40, 57, 84, 97, 112, 127)

*Bruchus cavillator*: Fåhraeus, 1839: 118 in Schöenherr, 1839: 118 (original description, type-locality: Brazil).

*Pseudopachymerus cavillator*: Pic, 1913a: 10; Bondar, 1931: 419; Bondar, 1936: 22.

*Caryedes cavillator*: Blackwelder, 1946: 758; Costa Lima, 1955: 249; Silva et al., 1968: 378.

*Gibbobruchus cavillator*: Whitehead & Kingsolver, 1975: 179, 218; Udayagiri & Wadhi, 1989: 80.

*Pseudopachymerus (Falsobruchus) triangularis*: Pic, 1926: 2 (original description, type-locality: Brazil). syn. nov.

*Caryedes triangularis*: Blackwelder, 1946: 758.

*Gibbobruchus triangularis*: Whitehead & Kingsolver, 1975: 179; Udayagiri & Wadhi, 1989: 80.

*Pseudopachymerus nigronotatus*: Pic, 1931: 24 (original description, type-locality: Brazil, Minas and Jatahy); Bondar, 1931: 422; Bondar, 1936: 23. syn. nov.

*Caryedes nigronotata*: Blackwelder, 1946: 758.

*Caryedes nigronotatus*: Costa Lima, 1955: 251; Silva et al., 1968: 379.

*Gibbobruchus nigronotatus*: Whitehead & Kingsolver, 1975: 179, 218; Udayagiri & Wadhi, 1989: 80.

*Material examined*

*Type*. *Bruchus cavillator* Fåhraeus, 1839. Syntype female: 'TYPUS'; 'Brasilian/ (illegible letters)'; 'SYNTYPE/ *Gibbobruchus/ cavillator* Fåhraeus, 1839/ Manfio, & Ribeiro-Costa, 2013' (NHRS).

*Notes*. In the original description Fåhraeus (1839) did not specify how many specimens were studied. However, in literature the type material is quoted as deposited in NHRS (Whitehead and Kingsolver 1975, Udayagiri and Wadhi 1989). Only one specimen was received from this museum which matches with the original description of *G. cavillator*. Therefore, for the same reasons cited to *G. speculifer* we believe it must be considered as type specimen and regarded as a syntype.

*G. nigronotatus* and *G. triangularis* are here proposed as synonyms of *G. cavillator*, because no significant morphological differences were observed between the specimens. Whitehead and Kingsolver (1975) had already commented that *G. cavillator*, *G. nigronotatus* and *G. triangularis* are closely related species and that they could be synonymous.

Among the material received was a homotype female specimen: 'Lambary/ M. Geraes/ XI.1924/ J.halik/ 2414'; 'BRASIL/ Halik 1966/ Collection'; '242'; 'bituberculatus Pic/ JK 1920/ Homotype'; 'Comp. with Homoty/ i /of polycoccus Fhs./ BM 1970. JMK/ Southgate comp. spm.'; 'G. polycoccus'.

*Pseudopachymerus triangularis* Pic, 1926. Lectotype female (present designation): 'SAntonio da Barra/ Pr de Bahia/ Ch Pujol'; 'triangularis/ Pic'; 'LECTOTYPE'; 'triangularis/det.70 Pic/ J.M.Kingsolver'; 'LECTOTYPE/ *Gibbobruchus/ triangularis* Pic, 1926/ Desig. Manfio & Ribeiro-Costa, 2013' (MNHN).

*Notes*. Although in the label of the specimen received from MNHN bears the indication 'LECTOTYPE', this formal designation had not been found in any publication. Thus, such specimen is here designated as the lectotype of this species to improve nomenclatural stability (Declaration 44, Amendment of Article 74.7.3, ICZN 1999).

Among the material received from USNM there was a female homotype, with the following labels: 'Rio de Jan./ Brazil/ Acc.No.2966'; 'HOMOTYPE/ triangularis/ det./ J.M.Kingsolver'.

*Pseudopachymerus nigronotatus* Pic, 1931. Syntype male: 'Matusinhos (Minas)/ Brésil/ F. Gounelle 3.4.1885'; 'mihy'; 'nigronotatus/ n sp'; 'HOLOTYPE'; 'nigronotatus/ Pic/ det.70/ J. M. Kingsolver'; 'SYNTYPE/ *Gibbobruchus/ nigronotatus* Pic, 1931/ Manfio & Ribeiro-Costa, 2013' (MNHN).

*Notes*. In the original description Pic (1931) did not specify how many specimens were studied. In addition, the exemplar studied from MNHN was labelled as holotype, but we do not believe that this is Pic's label, because it was printed. Therefore, we believe it must be considered as a type specimen and regarded as a syntype.

Other material examined. ARGENTINA: Jujuy: 1, El Quemado, 3.v.1928, G.L. Harrington (USNM). BOLIVIA: Santa Cruz: 2, Buena Vista vic. Flora & Fauna Hotel, 23–25.x.2000, R. Morris col. (FSCA). BRAZIL: 1, (Museum Frey Tutzing); 1, Chevrolet col. (NHRS); 1, (Coleção M. Alvarenga); Acre: 1, Porto Acre, Reserva Humaitá, 28–31.vii.2008, O. Mielke & M. Casagrande col. (DZUP); Alagoas: 1, Maceió, 21.ix.2006, T.R.S. Oliveira col. (DZUP). Bahia: 2, Água Preta, 19.ix.1936, G. Bondar col., *Bauhinia* sp. Goiás: 1, Jataí, x.1972 (DZUP); 1, Niquelândia, ix.2009, L. L. Bergamini col. (DZUP); 1, São Domingos, Fazenda Cipasa, 18.ix to 2.x.1992, D. Pimentel (MPEG). Pará: 1, Cachimbo, vi.1962, Alvarenga & Oliveira col. (USNM); 1, Carajás,

07.vii.1987, M. V. de Macedo col., *Bauhinia* sp. (DZUP). Paraná: 2, Foz do Iguaçu, 1952 (MNRJ); 155, Jaguariáiva, Parque Estadual do Cerrado, 2003–2005, L. T. Sari col. (DZUP); 1, same locality, 24.v.2003, same collector and host plant (DZUP); 3, same locality, 13.vi.2003, same collector and host plant (DZUP); 2, same locality, 25.vi.2003, same collector and host plant (DZUP); 13, same locality, 08.vii.03, same collector and host plant (DZUP); 4, same locality, 22.vii.2003, same collector, *Bauhinia holophylla* (DZUP); 1, same locality, 30.vii.2003, same collector and host plant (DZUP); Mato Grosso: 2, Chapada dos Guimarães, 5.ii.1961, J. & B. Bechyné col. (MPEG); 1, Cuiabá, 14.ii.1961, J. & B. Bechyné col. (MPEG); 2, Fazenda Ricardo Franco, 7.iii.1961, J. & B. Bechyné col. (MPEG). Minas Gerais: 20, Santana do Riacho, 24.ix.93, J.A. Lombardi & F. R. N. Toledocol.; 4, São Gonçalo do Rio Preto, 27.ix.2006, S.L.A. Junior col., *Bauhinia longifolia* (DZUP). Rio de Janeiro: 1, Floresta da Tijuca, 5.x.1951, C.A. Campos Ceabra col. (MNRJ); 3, Jardim Botânico, 12.viii.1952 (MNRJ). Rio Grande do Sul: 1, Caibaté, ix.1994, Guabirola; São Paulo: 1, Mogi Guaçu, Fazenda Campininha, 29–31.1969, J.M. & B.A. Campbell col. (CNCI); 1, Pirassununga, 8.viii.1976, J.B. Baitallo col., *Bauhinia holophylla*; 3, same locality, 25.ii.1975, *Bauhinia* sp. Tocantins: 1, Palmas, Serra do Lageado, Fazenda Céu, xi.1992 (DZUP). VENEZUELA: Aragua: 1, San Sebastian de los Reyes, 29.vi.1983, Ramirez & Hokche col., *Bauhinia* sp. (USNM); Bolívar: 2, Upata Cercanias de El Palmar, 23.V.1983, same collector and host plant (USNM). Carabobo: 3, Estación Biologica de los Llanos, i.1984, same collector, *Bauhinia unguolata* (USNM); Vargas: 3, Los Caracas, 15.vi.1984, same collector, *Bauhinia multinervia* (USNM).

### Redescription

Body length: 3.4–4.0 mm; width: 2.1–2.6 mm.

**Integument.** Colour usually different between sexes: male light brown to brown with variegate pattern, and female dark brown to black, rarely bicolor, black and rufous (Fig. 10). Antenna light brown to dark brown, without segments darkened or if darkened, in varied positions (Fig. 84). Pygidium of male and female black, sometimes rufous except female speculum and male apical tubercle (Figs 57, 67). Ventral region dark brown to black, rarely rufous (Fig. 84). Front and middle femur and tibiae bicolor; dorsal half of hind femur usually of lighter colour than ventral half (Fig. 84).

**Vestiture.** Dorsum variegated with white, light brown, dark brown and brown hairs (Fig. 10). Pronotum at basal region and median gibbosity with or without dense light brown pubescence; median gibbosity with two subparallel, narrow, brown bands anterior and posterior to median transverse sulcus (Fig. 10). Scutellum light brown, sometimes white (Fig. 10). Elytron with median, slightly curved, dark brown to black macula on interstriae 2 to 5; basal third of interstriae 5 with white tuft; rest of elytra white with black grumes and light and dark brown bands (Fig. 10). Pygidium of males light brown except on antero lateral areas (Fig. 57). Pygidium of females with sparse white pubescence on lateral areas and denser light brown pubescence on median basal region with short, white, median band (Fig. 67). Ventral region usually white; mesepisternum, mesepimerum, and metepisternum with conspicuous light brown pubescence, sometimes only anterior and posterior angles light brown (Fig. 84). First male abdominal ventrite with uniform color, without median anterior region of dense light brown to white pubescence; ventrites not uniformly pubescent, 1–2, 1–3 or 1–4 with polished lateral areas (Fig. 84).

**Body.** Ocular sinus: 0.1–0.2 mm; ocular index: 3.1–3.8 mm; frons not elevated; frontal carina in general not polished and

enlarged basally (Fig. 25). Antenna not sexually dimorphic, subserrate (Fig. 84). Pronotum with median and lateral gibbosities slightly to strongly elevated; laterobasal margin concave; basal emargination deep (Figs 10, 40, 84). Elytron with basal gibbosity elevated to strongly elevated; base of striae toothless; striae 3 and 4 curved at base; striae 7, 8 and 9 limited basally by slightly elevated to elevated humeral gibbosity; interstria 3, 5, 7 and 9 usually with conspicuous gibbosities; interstria 10 with basal sulcus (Figs 10, 84). Pygidium of male convex at apical third, narrow puncted band (Fig. 57). Pygidium of female with large tubercle and with a median depression on speculum; rounded alutaceous speculum, slight basal emarginate (Fig. 67). Mesosternum truncate or emarginate at apex. Male abdomen never compressed; first male abdominal ventrite without median apical tubercle; last male and female abdominal ventrite medially emarginate. Hind femur strongly incrassate; pecten with 4 teeth, anterior tooth not contiguous to the posteriors (Figs 84, 97). Hind tibiae with coronal teeth (Fig. 97).

**Male genitalia.** Median lobe short, broad; median basal margin straight, not emarginated (Fig. 112). Ventral valve subtriangular, wider than long; lateral margin concave and internal margin moderately emarginate; round apex (Fig. 112). Internal sac at apical with dense small and thin spicules, below valves and denticles nearly uniformly distributed; median region with long spicules forming a dense mass; basal region with thin spicules (Fig. 112). Lateral lobes moderately deep emarginated and internal subapical margin concave; apex moderately convergent (Fig. 127).

### Distribution

Argentina (Jujuy), Bolivia (Santa Cruz), Brazil (Bahia, Distrito Federal, Goiás, Minas Gerais, Pará, Paraná, Rio de Janeiro, Rio Grande do Sul, São Paulo, Tocantins) and Venezuela (Aragua, Bolívar, Calabozo, Vargas). Udayagiri and Wadhi, 1989 listed *G. cavillator* only for Brazil. Argentina, Bolivia and Venezuela are new records for *G. cavillator*.

### Host plants

New records: *Bauhinia longifolia* (Bong.) Steud., *B. multinervia* (Kunth) DC, *B. rufa* (Bong.) Steud., *B. unguolata* L., *B. sp.*

### Taxonomic discussion

*G. cavillator* shares with the other species of the group *scurra* the alutaceous female pygidial speculum (Fig. 57) and the lateral apical margin of the pronotum concave (Fig. 40). It differs from them by the female pygidium with an apical tubercle (Fig. 67) and from *G. bolivianus* by the median region of the internal sac of the median lobe with long, homogeneous, dense spicules (Fig. 112), and the apices of the lateral lobes moderately convergent (Fig. 127).

### *Gibbobruchus bolivianus*, Manfio & Ribeiro-Costa sp. nov

(Figs 11, 26, 41, 58, 68, 85, 98, 113, 128)

### Material examined

**Type.** Holotype male: 'BOLIVIA: Santa Cruz/ Buena Vista vic./ Flora & Fauna Hotel/ 14-16/X/00, R. Morris'; 'HOLOTYPE/ *Gibbobruchus/*

*bolivianus* Manfio & Ribeiro-Costa, 2013' (FSCA). 3 Paratypes at FSCA, 1♀: 'BOLIVIA: Santa Cruz/ 3.7 km.SSE.Buena Vista/ Hotel Flora & Fauna, 430 m/ 17°29.949'S-63°33.152'W/ 5-15-XI-2001, M.C.Thomas/ trop transition Forest, BLT'; 'PARATYPE/ *Gibbobruchus/ bolivianus* Manfio & Ribeiro-Costa, 2011' (FSCA). 1♂ and 1♀: 'BOLIVIA: Santa Cruz, 3.7 km/ SSE. Buena Vista, Hotel Flora/ & Fauna 405 m., 5-15-XI-2001/ 17°29.949'S;63°33.152'W/ M.C.Thomas & B.K. Dozier/ trop.transition Forest'; 'PARATYPE/ *Gibbobruchus/ bolivianus* Manfio & Ribeiro-Costa, 2013' (FSCA).

### Description

Body length: 3.1–3.7 mm; width: 2.0–2.3 mm.

**Integument.** General colour of dorsum often dark brown, sometimes light brown (Fig. 11). Antenna light brown to brown, segments 7–10 usually dark brown, sometimes segments 7 and 9 dark brown (Figs 11, 85). Pygidium of male brown to light brown (Fig. 58). Pygidium of female black (Fig. 68). Ventral region dark brown, rarely brown (Fig. 85). Anterior and middle femur and tibiae often bicolor; dorsal margin of hind femur sometimes darker than rest of femur (Fig. 85).

**Vestiture.** Dorsum variegated with white, light brown, dark brown and brown hairs (Fig. 11). Pronotum at basal region and median gibbosity with or without dense light brown pubescence; median gibbosity with two subparallel, narrow, black bands anterior and posterior to median transverse sulcus (Fig. 11). Scutellum light brown or white (Fig. 11). Elytron with median, slightly curved, dark brown to black macula on interstriae 2 to 5; basal third without white tuft or band on interstriae 5; rest of elytra light brown or white with black grumes and with light and dark brown bands (Fig. 11). Pygidium of males light brown except at antero lateral areas, apical region glabrous, short white band at median basal triangle (Fig. 58). Pygidium of females with sparse, white pubescence except on speculum, and denser light brown hairs at median basal region with short, white median band (Fig. 68). Ventral region white; dorsal angle of mesepimerum, mesepisternum, and metepisternum with dense light brown pubescence (Fig. 85). First male abdominal ventrite with uniform color, without median anterior region of dense light brown to white pubescence; ventrites not uniformly pubescent, 1–2 or 1–3 with polished lateral areas (Fig. 85).

**Body.** Ocular sinus: 0.1–0.2 mm; ocular index: 3.3–4.3 mm; frons not elevated; frontal carina not polished and usually wide basally (Fig. 26). Antenna not sexually dimorphic, subserrate (Figs 11, 85). Pronotum with median and lateral gibbosities elevated to strongly elevated; laterobasal margin concave; basal emargination deep (Figs 11, 41, 85). Elytron with basal gibbosity elevated to strongly elevated; base of striae toothless; striae 3 and 4 curved at base; striae 7, 8 and 9 limited basally by elevated humeral gibbosity; interstria 3, 5, 7 and 9 with conspicuous gibbosities; interstria 10 without basal sulcus (Figs 11, 85). Pygidium of male bituberculate at apex and convex at apical third (Fig. 58). Pygidium of female bituberculate at apex and convex at apical third; large rounded alutaceous speculum, basally emarginate (Fig. 68). Mesosternum truncate or emarginate at apex. Male abdomen never compressed; first male abdominal ventrite without median apical tubercle; last male and female abdominal ventrite medially emarginate. Hind femur strongly incrassate; pecten with 4 teeth, anterior

tooth not contiguous to the posteriors (Figs 85, 98). Hind tibiae with coronal teeth (Fig. 98).

**Male genitalia.** Median lobe short, broad; median basal margin straight, not emarginate (Fig. 113). Ventral valve subtriangular, wider than long; lateral margin nearly straight and internal margin slightly emarginate; slightly truncate apex (Fig. 113). Internal sac at apical region with dense small and thin spicules below valves and spines uniformly distributed; median region with spines uniformly distributed; basal region with thin spicules near gonopore sclerite (Fig. 113). Lateral lobes moderately deep emarginated and internal subapical margin concave; apex strongly convergent (Fig. 128).

### Etymology

The specific name '*bolivianus*' refers to Bolivia, the country where it is distributed.

### Distribution

Bolivia (Santa Cruz).

### Taxonomic discussion

*Gibbobruchus bolivianus* differs from *G. cavillator* mainly by having the female pygidium bituberculate (Fig. 68), the apical and median regions of the internal sac with homogeneously distributed denticles (Fig. 113), and the apex of the lateral lobes strongly convergent (Fig. 128). Other comments are in the 'taxonomic discussion' section of *G. cavillator*.

### *Gibbobruchus scurra* (Boheman)

(Figs 12, 27, 42, 48, 59, 69, 86, 99, 114, 129)

*Bruchus scurra*: Boheman, 1833: 86 (original description, type-locality: Brazil).

*Pseudopachymerus scurra*: Pic, 1913a: 12.

*Caryedes scurra*: Blackwelder, 1946: 758; Silva *et al.*, 1968: 379.

*Gibbobruchus scurra*: Whitehead & Kingsolver, 1975: 176; Udayagiri & Wadhi, 1989: 82.

*Pachymerus ruficornis*: Chevrolat, 1877: 90 (original description, type-locality: Mexico).

*Bruchus ruficornis*: Sharp, 1885: 442.

*Pseudopachymerus ruficornis*: Pic, 1913a: 11.

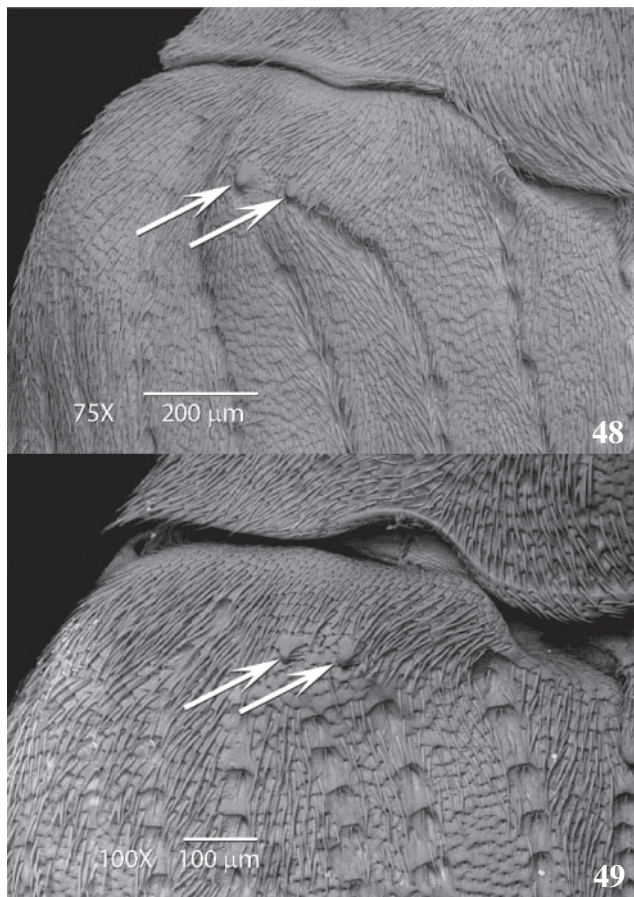
*Caryedes ruficornis* var. *subuniformis*: Blackwelder, 1946: 758.

### Material examined

**Type.** *Gibbobruchus scurra* (Boheman, 1833). Syntype male: 'Typus'; 'Brasilia./ Falderman'; 'SYNTYPE/ *Gibbobruchus/ scurra* (Boheman, 1833)/ Manfio & Ribeiro-Costa, 2013' (NHRS).

**Notes.** In the original description Boheman (1833) did not specify how many specimens were studied nor the place where the material was deposited. However, in literature the type material is quoted as deposited in NHRS (Whitehead and Kingsolver 1975; Udayagiri and Wadhi 1989). Only one specimen was received from this museum which matches with the original description of *G. scurra*. Therefore, for the same reasons cited for *G. speculifer*, we believe it must be considered as a type specimen and regarded as a syntype.

Among the material received from USNM there was an homotype of *Pachymerus ruficornis* Chevrolat 1877, male, with the following labels: 'BRAZIL: Goiás/ JATAI.Dec.1963/ M.Alvarenga'; 'Sent to Stockolm/ W. Southgate 1969/ but no comp Matl./ thore - Imk'; 'Homotype/ *Bruchus/ ruficornis/ det. 71 Chev./ J.M.Kingsolver*'.



**Figs 48–49.** Teeth on base of elytral striae: 48, *G. scurra*; 49, *G. guanacaste*.

Other material examined. **BRAZIL:** Distrito Federal: 1, Planaltina 24. v.1984, V.O.Becker col. (USNM). Goiás: 4, Barro Alto, 14.v.2009, L. L. Bergamini col., *Bauhinia* sp.; 1, Goiás, 12.vi.2009, same collector and host plant (DZUP); 1, Jataí, xii.1963, M. Alvarenga col. (USNM); 1, Niquelândia, v.2006, M. Pimenta col., *Bauhinia* sp. (DZUP); 1, same locality, 14.v.2006, L.L. Bergamini col., same host plant (DZUP). Mato Grosso: 1, Chapada dos Guimarães, xi.1983, M. Alvarenga col. (USNM). Minas Gerais: 1, Passos, 12–17.xi.1962, C. Elias col. (DZUP); 2, same locality, iv.1981, same collector (DZUP); 1, Serra do Salitre, 4.iv.1965, same collector (DZUP). São Paulo: 2, Atibaia, 22.vi.1960, Eiten & Eiten col., *Bauhinia rufa* (USNM); 1, Rio Claro, xi.1939, Claretiano col. (MHNCI). Pará: 2, Carajás, 7.vii.1987, M.V. de Macêdo col., *Bauhinia* sp. (DZUP); 1, same locality, vii.1983, C.P. Sandoval col., same host plant (USNM); 1, same locality, date and collector *Bauhinia pulchella* (FSCA). PARAGUAY: Cordillera: 1, Caacupé, 10. v.1986, R.E.Woodruff col. (FSCA).

### Redescription

Body length. 3.8–5.2 mm; width: 2.3–3.2 mm.

**Integument.** Dorsum black (Fig. 12). Antenna light brown to brown with segments 7, 9 and 11 brown to dark brown (Fig. 86). Pygidium of male and female black, rufous or bicolor (Figs 59, 69). Ventral region usually black, sometimes rufous (Fig. 86). Front and middle femur and tibiae generally light brown, not distinctly bicolor; hind femur of uniform colour (Fig. 86).

**Vestiture.** Dorsum variegated with white, light brown and dark brown hairs (Fig. 12). Pronotum at basal region and median

gibbosity with dense light brown to white pubescence; median gibbosity with two subparallel, narrow, black bands anterior and posterior to median transverse sulcus (Fig. 12). Scutellum white (Fig. 12). Elytron with median, straight, short, dark brown macula on interstria 2 and 3; basal third with white tuft on interstria 5; rest of elytra white with dark brown grumes and light brown bands (Fig. 12). Pygidium of male with dense, white pubescence, with less dense spots on basal, median and apical regions (Fig. 59). Pygidium of female with dense, white pubescence, with less dense spots on basal and median regions and speculum (Fig. 69). Ventral region white; mesepimerum, mesepisternum, and metepisternum with sparse, light brown pubescence (Fig. 86). First male abdominal ventrite of uniform color, without median anterior region of dense light brown to white pubescence; ventrites not uniformly pubescent, 1–3 or 1–4 with polished lateral areas (Fig. 86).

**Body.** Ocular sinus: 0.1–0.2 mm; ocular index: 3.1–3.4 mm; frons not elevated; frontal carina polished and usually wide basally (Fig. 27). Antenna not sexually dimorphic, subserrate (Fig. 86). Pronotum with median and lateral gibbosities strongly elevated; laterobasal margin concave; basal emargination deep (Figs 12, 42, 86). Elytron with basal gibbosity strongly elevated; base of striae 3 and 4 with one tooth on each and curved; striae 7, 8 and 9 limited basally by slightly elevated to elevated humeral gibbosity; interstria 3, 5, 7 and 9 usually with conspicuous gibbosities; interstria 10 without basal sulcus (Figs 12, 48, 86). Pygidium of male convex at apical third (Fig. 59). Pygidium of female with bilobate, micropuncted and sparsely macropuncted speculum (Fig. 69). Mesosternum truncate or emarginate at apex. Male abdomen never compressed; first male abdominal ventrite without median apical tubercle; last male and female abdominal ventrite medially emarginate. Hind femur strongly incrassate; pecten with 4–5 teeth, anterior tooth not contiguous to the posteriors (Figs 86, 99). Hind tibiae with coronal teeth (Fig. 99).

**Male genitalia.** Median lobe short, broad; median basal margin straight, not emarginate (Fig. 114). Ventral valve subtriangular, wider than long; lateral margin slightly concave and internal margin deeply emarginate; round apex (Fig. 114). Internal sac at apical region with small and thin spicules below valves and a few small sparse denticles; median region with a few small sparse denticles; basal region with small spicules near gonopore sclerite (Fig. 114). Lateral lobes moderately deep emarginate and internal subapical margin concave; apex moderately convergent (Fig. 129).

### Distribution

Brazil (Distrito Federal, Goiás, Mato Grosso, Minas Gerais, São Paulo, Pará), Paraguay (Cordillera). Udayagiri and Wadhi (1989) listed this species for Brazil. Therefore, the Paraguay is a new record to *G. scurra*.

### Host plants

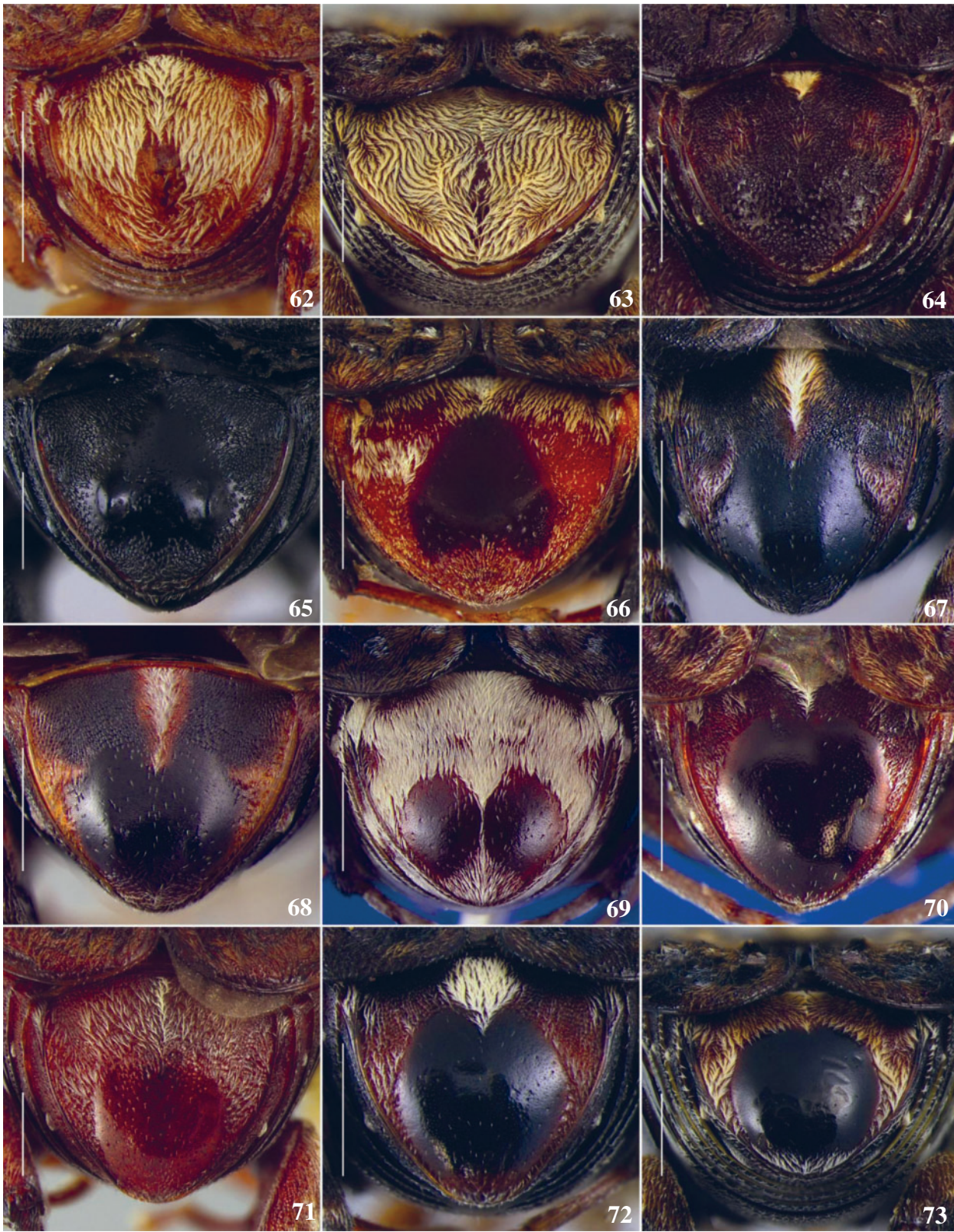
*Bauhinia bauhinioides* (Mart.) J. F. Macbr., *B. pulchella* Benth., *B. rufa* (Bong.) Steud.

### Taxonomic discussion

*Gibbobruchus scurra* is distinguished from other species of the genus mainly by the female pygidium with a bilobate speculum



**Figs 50–61.** Pygidium of male: 50, *Penthobruchus germaini*; 51, *Pygiopachymerus lineola*; 52, *G. speculifer*; 53, *G. ornatus*; 54, *G. vinicius*; 55, *G. polycoccus*; 56, *G. wunderlini*; 57, *G. cavillator*; 58, *G. bolivianus*; 59, *G. scurra*; 60, *G. guanacaste*; 61, *G. iturbidensis*. Scale: 0.50 mm.



**Figs 62–73.** Pygidium of male: 62, *G. mimus*; 63, *G. cristicollis*; 64, *G. divaricatae*. Pygidium of female: 65, *G. polycoccus*; 66, *G. wunderlini*; 67, *G. cavillator*; 68, *G. bolivianus*; 69, *G. scurra*; 70, *G. guanacaste*; 71, *G. iturbidensis*; 72, *G. mimus*; 73, *G. cristicollis*. Scale: 0.50 mm.

(Fig. 69) and the vestiture of the abdomen, the male pygidium and the hind femur dense, white (Figs 59, 86). Other comments are in the 'taxonomic discussion' section of *G. cavillator*.

**Group *mimus*: *G. guanacaste*, *G. iturbidensis*, *G. mimus*, *G. cristicollis* and *G. divaricatae***

*Diagnosis*

The elytra usually with a median macula with dense pubescence distinctly prominent (Figs 16, 17). The first male abdominal ventrite with a median anterior region of dense light brown to white pubescence (Fig. 75).

*Distribution*

Costa Rica, El Salvador, French Guiana, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Venezuela, United States of America.

*Host plants*

*Bauhinia congesta* (Britton & Rose) Lundell, *B. coulteri* J. F. Macbr., *B. divaricata* L., *B. glabra* Jacq., *B. pauletia* Pers., *B. pes-caprae* Cav., *B. pringlei* S. Watson, *B. unguolata* L., *Cercis canadensis* L., *C. canadensis* L. var. *texensis* (S. Watson) M. Hopkins, *C. occidentalis* A. Gray.

New records: *B. macranthera* Hemsl., *C. canadensis* L. var. *mexicana* (Britton & Rose) M. Hopkins.

*Taxonomic discussion*

See 'taxonomic discussion' section of group *wunderlini*.

***Gibbobruchus guanacaste* Whitehead & Kingsolver**  
(Figs 13, 28, 43, 49, 60, 70, 75, 87, 100, 115, 130)

*Gibbobruchus guanacaste*: Whitehead & Kingsolver, 1975: 186 (original description, type-locality: Canas, Guanacaste Province, Costa Rica); Janzen, 1977: 417; Janzen, 1978: 183; Janzen, 1980: 937; Johnson & Kingsolver, 1982: 413; Udayagiri & Wadhi, 1989: 81; Maes & Kingsolver, 1991: 26; Romero & Johnson, 2004: 623.

*Material examined*

*Types. Gibbobruchus guanacaste* Whitehead & Kingsolver 1975. Holotype male: '1 km W Canas/ Guanacaste Prov./ COSTA RICA/ 10 Feb 1971'; 'in seeds of *Bauhinia pauletia*/ #444 Janzen'; 'HOLOTYPE/Gibbobruchus/ guanacaste/ Kingsolver & Whitehead' (USNM). 19 Paratypes: 9 at CNCI, 2♂ and 2♀: 'Granada/ Gran.NICARAGUA/ VI-23.1963/ L.J.Bottimer'; 'L.J.Bottimer/ Collection/ No. 114Y'; 'PARATYPE/ Gibbobruchus/ guanacaste/ Kingsolver & Whitehead'; 'PARATYPE/ CNC No.14087'. 1♂: 'El Salvador/ Vol.Conchagua/ May27-29 58/ L.J.Bottimer'; 'Dpto./ La Union'; '10/ t'; 'c'; '♂'; 'PARATYPE/ Gibbobruchus/ guanacaste/ Kingsolver & Whitehead'; 'PARATYPE/ CNC No.14087'. 1♀: 'El Salvador/ Vol.Conchagua/ May27-29 58/ L.J. Bottimer'; 'Dpto./ La Union'; '10/ t'; 'A'; 'PARATYPE/ Gibbobruchus/ guanacaste/ Kingsolver & Whitehead'; 'PARATYPE/ CNC No.14087'. 1♀: 'El Salvador/ Vol. Conchagua/ May27-29 58/ L.J. Bottimer'; 'Dpto./ La Union'; '10/ t'; 'B'; 'PARATYPE/ Gibbobruchus/ guanacaste/ Kingsolver & Whitehead'; 'PARATYPE/CNC No.14087'. 1♀: 'JAMAICA, Try./ Barbecue Bottom/ VIII-13-1966/ A.T.Howden'; 'Collected/ atnight'; 'PARATYPE/ Gibbobruchus/ guanacaste/ Kingsolver & Whitehead'; 'PARATYPE/ CNC No.14087'. 10 at USNM, 3♂ and 2♀: 'COSTA RICA/ Guanacaste Prov./ D.H. Janzen ET al/ #VI-19-1972XX'; 'Santa Rosa/ Mar.9,1972/ *Bauhinia unguolata*'; 'PARATYPE/ Gibbobruchus/ guanacaste/ Kingsolver & Whitehead'. 1♂ and 2♀: 'COSTA RICA/ Guanacaste Prov./ D.H.Janzen ET al/ #VI-20-1972XXIV'; 'Santa Rosa/ Mar.9,1972/ *Bauhinia unguolata*'; 'PARATYPE/ Gibbobruchus/ guanacaste/ Kingsolver & Whitehead'. 1♂: '1 km W Canas/ Guanacaste Prov./ COSTA RICA/ 10 Feb 1971'; 2) 'in seeds of *Bauhinia pauletia*/ #444 Janzen'; 'PARATYPE / Gibbobruchus/ guanacaste/ Kingsolver & Whitehead'. 1♀: '1 km W Canas/ Guanacaste Prov./ COSTA RICA/ 10 Feb 1971'; 'in seeds of *Bauhinia pauletia*/ #444 Janzen'; 'PARATYPE / Gibbobruchus/ guanacaste/ Kingsolver & Whitehead'; 'Gibbobr./ guanacaste/ det.MSS/ J.M.Kingsolver.

Other material examined. COSTA RICA: Guanacaste: 1, Cañas, 19.i.1971, D.H. Janzen col., *Bauhinia unguolata* (FSCA); 5, same locality, Hacienda La Pacifica, 7.iii.1976, same collector, *Bauhinia glabra* (FSCA); 9, same locality and date, D.H. Janzen & Kingsolver col., same host plant (DZUP). MEXICO: Jalisco: 2, Estación de Biología Chamela, iv. 1980, A. Pescador col., *Bauhinia unguolata* (USNM).

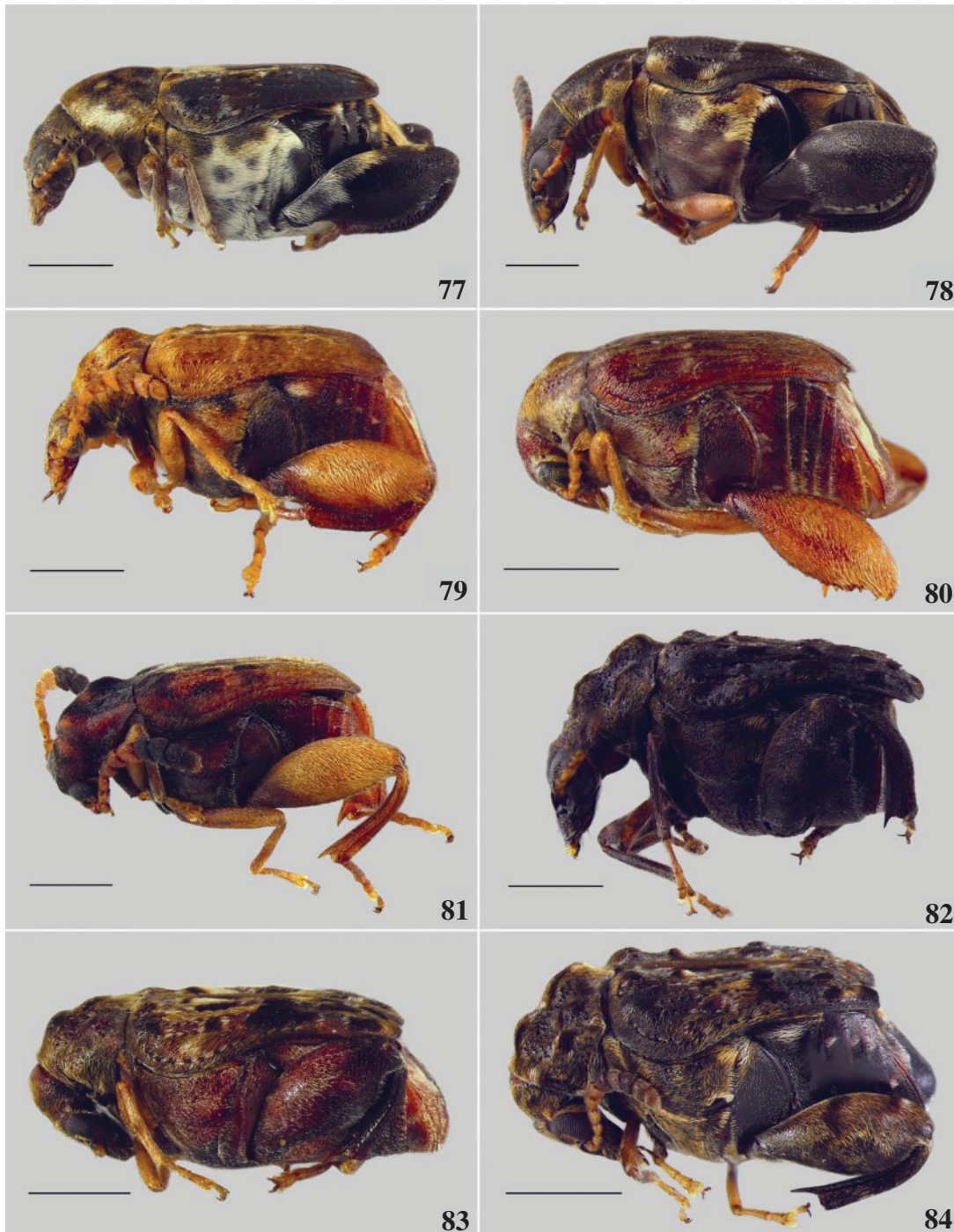
*Redescription*

Body length. 3.2–3.7 mm; width: 1.9–2.2 mm.

*Integument.* Dorsum rufous and dark brown (Fig. 13). Antenna light brown with segments 7–9 dark brown (Figs 13,



Figs 74–76. Pygidium of female: 74, *G. divaricatae*. Ventral view of male abdomen: 75, *G. mimus*; 76, *G. vinicius*. Scale: 0.50 mm.

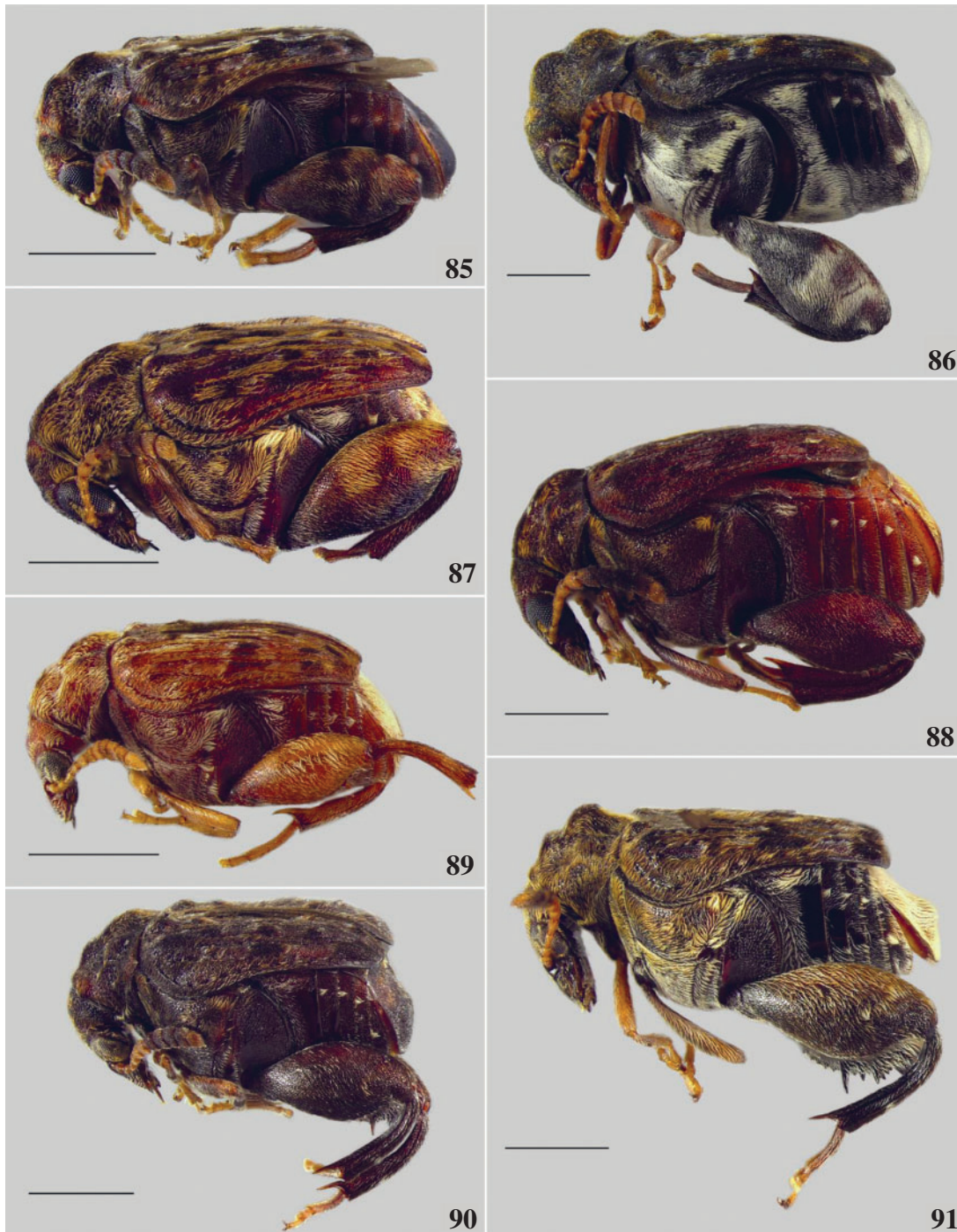


**Figs 77–84.** Lateral habitus: 77, *Pentobruachus germani*; 78, *Pygiopachymerus lineola*; 79, *G. speculifer*; 80, *G. ornatus*; 81, *G. vinicius*; 82, *G. polycoccus*; 83, *G. wunderlini*; 84 *G. cavillator*. Scale: 0.50 mm.

87). Pygidium of male and female rufous (Fig. 60, 70). Ventral region rufous to dark brown (Fig. 87). Front and middle femur and tibiae generally bicolor; hind femur usually with dorsal half lighter than ventral half (Fig. 87).

*Vestiture.* Dorsum variegated with white, light brown and black hairs (Fig. 13). Pronotum at basal region and median gibbosity with or without dense white pubescence; median

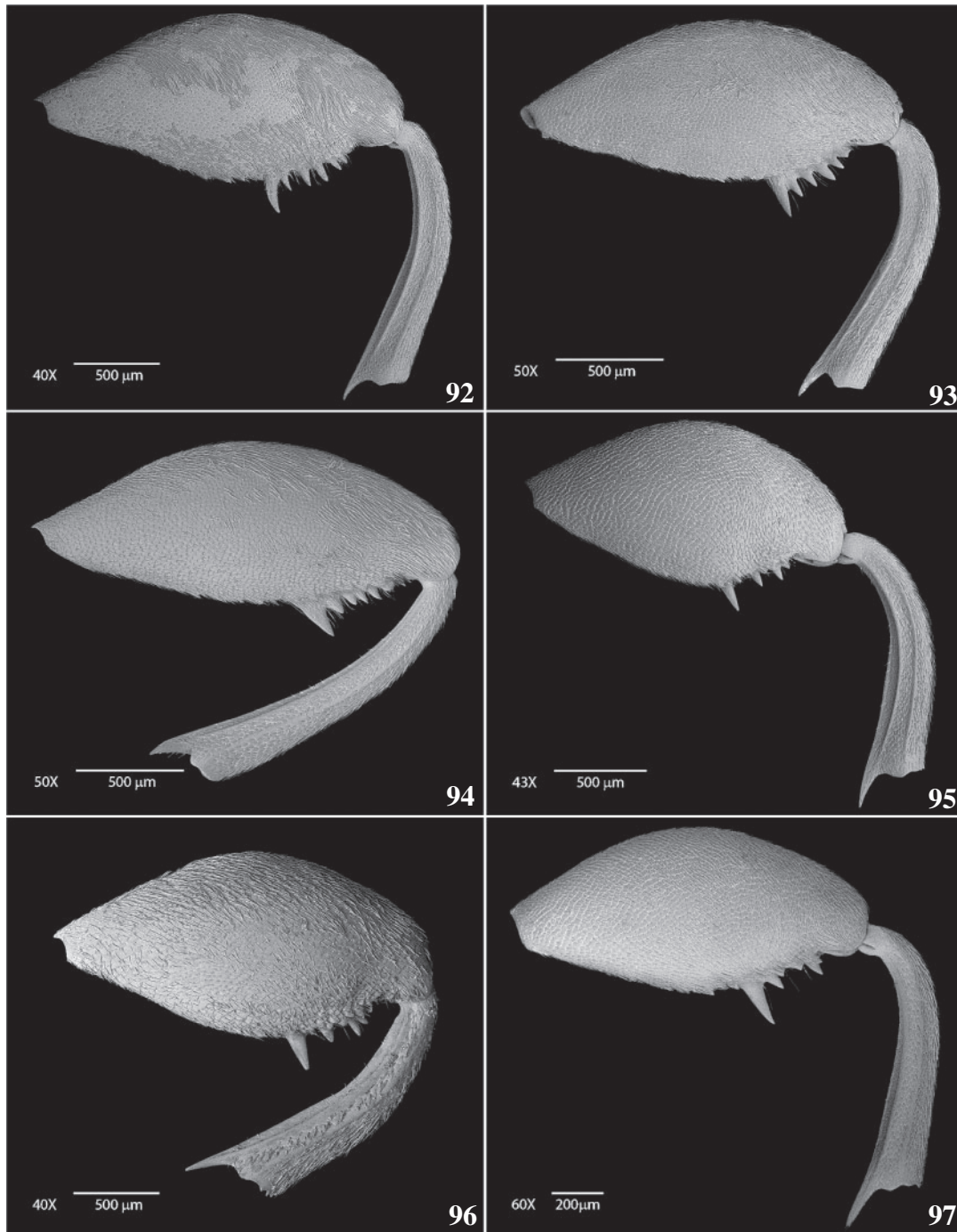
gibbosity with two parallel, narrow, black bands anterior and posterior to median transverse sulcus (Fig. 13). Scutellum light brown to white (Fig. 13). Elytron without conspicuous median macula; basal third with light brown tuft on interstria 5; rest of elytra white with black grumes and light brown bands (Fig. 13). Pygidium of male with dense, light brown pubescence, except at median basal triangle white, sometimes median region and apical



**Figs 85–91.** Lateral habitus: 86, *G. bolivianus*; 87, *G. scurra*; 88, *G. guanacaste*; 89, *G. iturbidensis*; 90, *G. mimus*; 91, *G. cristicollis*; 92, *G. divaricatae*. Scale: 0.50 mm.

third with sparse pubescence (Fig. 60). Pygidium of female with sparse, light brown to white pubescence, except at median basal triangle (Fig. 70). Ventral region white; mesepimerum, mesepisternum, and metepisternum light brown. First male abdominal ventrite on median anterior region with dense light brown to white pubescence; ventrites not uniformly pubescent, 1–2 with polished lateral areas (Figs 75, 87).

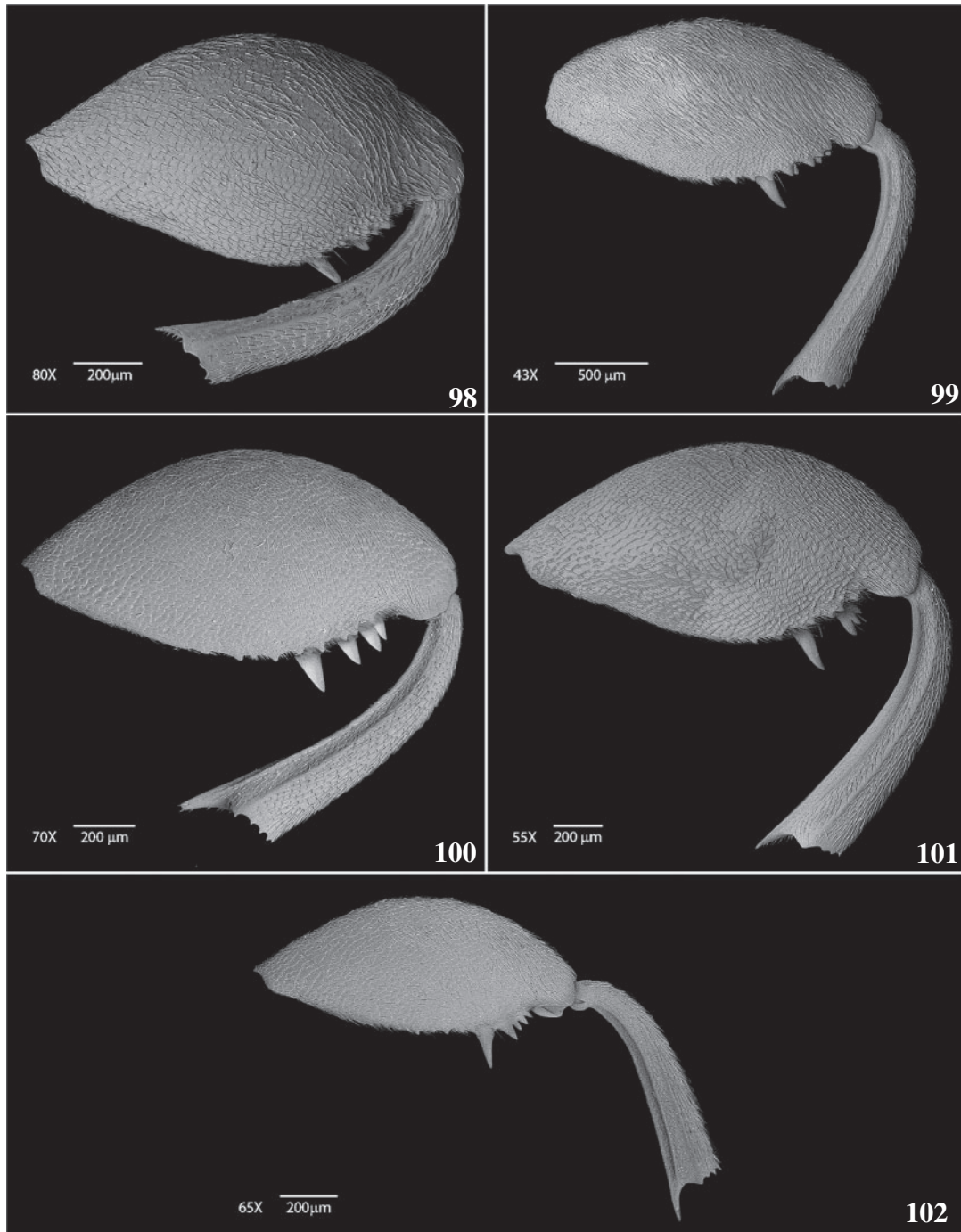
*Body.* Ocular sinus: 0.1–0.2 mm; ocular index: 2.9–3.5 mm; frons not elevated; frontal carina not polished and wide basally (Fig. 28). Antenna not sexually dimorphic, subserrate (Figs 13, 87). Pronotum with median gibbosity slightly elevated; lateral gibbosity slightly elevated to elevated; laterobasal margin straight; basal emargination deep (Figs 13, 43, 87). Elytron with basal gibbosity slightly elevated; base



**Figs 92–97.** Posterior leg, external view: 92, *G. speculifer*; 93, *G. ornatus*; 94, *G. vinicius*; 95, *G. polycoccus*; 96, *G. wunderlini*; 97, *G. cavillator*.

of striae 3 and 4 with one tooth on each and curved; striae 7, 8 and 9 limited basally by slightly elevated humeral gibbosity; interstria 3, 5, 7 and 9 usually with not conspicuous gibbosity; interstria 10 without basal sulcus (Figs 13, 49, 87). Pygidium of male convex at apex (Fig. 60). Pygidium of female slightly convex, micropuncted; large oval speculum polished, truncate or slightly basally emarginate (Fig. 70).

Mesosternum emarginate at apex. Male abdomen never compressed; first male abdominal ventrite without median apical tubercle; last male and female abdominal ventrite medially emarginate. Hind femur strongly incrassate; pecten with 4–5 teeth, anterior tooth not contiguous to the posteriors (Figs 87, 100). Hind tibiae with coronal teeth (Fig. 100).



**Figs 98–102.** Posterior leg, external view: 98, *G. bolivianus*; 99, *G. scurra*; 100, *G. guanacaste*; 101, *G. iturbidensis*; 102, *G. mimus*.

*Male genitalia.* Median lobe short, broad; median basal margin straight, not emarginate (Fig. 115). Ventral valve subtriangular, wider than long; lateral margin slightly concave and internal margin deeply emarginate; round apex (Fig. 115). Internal sac at apical region with small spicules below valves and with denticles and spines; median region with big and long dense spicules; basal region with small and thin spicules near gonopore

sclerite (Fig. 115). Lateral lobes moderately deep emarginate and internal subapical margin concave; apex moderately convergent (Fig. 130).

#### *Distribution*

Costa Rica (Guanacaste), El Salvador (La Union), Jamaica (Trelawny), Mexico (Jalisco), Nicaragua (Granada). Udayagiri

and Wadhi (1989) listed *G. guanacaste* for the same countries and also for Venezuela.

#### Host plants

*B. divaricata* L., *B. glabra* Jacq., *B. pauletia* Pers., *B. pes-caprae* Cav., *B. pringlei* S. Watson, *B. unguolata* L.

#### Taxonomic discussion

*Gibbobruchus guanacaste* differs from the other species of the group by having the body with dense vestiture forming a variegated pattern, and the elytra without a median darker macula (Fig. 13).

Whitehead and Kingsolver (1975) observed that females from Jamaica are darker, and that the vestiture of the males is bright and orange. The male genitalia of one specimen from Bejuco, Venezuela, had the lateral lobes less deeply divided and less convergent apically than seen in other specimens. There was also minor variation in the form of the ventral valve of the median lobe, or in the colour and distribution of the pygidial vestiture.

#### *Gibbobruchus iturbidensis* Whitehead & Kingsolver

(Figs 14, 29, 44, 61, 71, 75, 88, 101, 116, 131)

*Gibbobruchus iturbidensis*: Whitehead & Kingsolver, 1975: 185 (original description, type-locality: Iturbide, Mexico); Johnson & Kingsolver, 1982: 413; Udayagiri & Wadhi, 1989: 81; Romero & Johnson, 2004: 624.

#### Material examined

*Types.* *Gibbobruchus iturbidensis* Whitehead & Kingsolver 1975. Holotype female: 'MEX.: N.L./ Iturbide/ interc. Sep.5 1972/ Bauhinia sp.'; 'Laredo 4310/72-16004'; 'HOLOTYPE ♀/ Gibbobruchus/ iturbidensis/ Whitehead & Kingsolver' (USNM). 2 Paratypes, 1 at CNCI, ♀: 'PARATYPE/ Gibbobruchus/ iturbidensis/ Whitehead & Kingsolver'; 'Chipinque Mesa/ Monterrey, N.L./ MEX. VIII. 26-29/1960 H.F.Howden'; 'PARATYPE/ CNC No.14086'. 1 at USNM, ♀: 'State Vera Cruz/ Mexico/ BR. Tex81175/ x-12-59.60-7653'; 'c Palm/ seed?'; 'PARATYPE ♀/ Gibbobruchus/ iturbidensis/ Whitehead & Kingsolver'.

Other material examined. MEXICO: Nuevo Leon: 1, Linares, 16.xi.1981, *Bauhinia macranthera* (USNM).

#### Redescription

Body length. 3.3–4.2 mm; width: 2.3–2.7 mm.

*Integument.* Dorsum rufous to dark brown (Fig. 14). Antenna light brown to brown, with segments 7–10 dark brown (Figs 14, 88). Pygidium of male and female rufous or dark brown (Figs 61, 71). Ventral region rufous to dark brown (Fig. 88). Front and middle femur and tibiae unicolor; hind femur almost uniform colour, only dorsal and ventral margins darker (Fig. 88). Vestiture. Dorsum with pubescence almost uniformly distributed, with white, light brown and dark brown hairs (Fig. 14). Pronotum at basal region and median gibbosity without dense light brown or white pubescence; median gibbosity with two parallel, narrow, brown bands posterior to median transverse sulcus (Fig. 14). Scutellum light brown (Fig. 14). Elytron without conspicuous median macula; basal third without tuft or white band on interstria 5; rest of elytra light brown with dark brown bands and white tufts (Fig. 14). Pygidium of male with sparse, light brown pubescence, except apical half

glabrous (Fig. 61). Pygidium of female with sparse, white pubescence, except on speculum, and with short white median band (Fig. 71). Ventral region light brown to white; mesepimerum and posterior dorsal angle of metepisternum with conspicuous light brown pubescence (Fig. 88). Median anterior region of first male abdominal ventrite with dense light brown to white pubescence; ventrites not uniformly pubescent, 1–2 with polished lateral areas (Figs 75, 88).

*Body.* Ocular sinus: 0.1–0.2 mm; ocular index: 3.8–4.0 mm; frons not elevated; frontal carina usually polished and wide basally (Fig. 29). Antenna not sexually dimorphic, subserrate (Figs 14, 88). Pronotum with median and lateral gibbosities elevated; laterobasal margin straight; basal emargination deep (Figs 14, 44, 88). Elytron with basal gibbosity elevated; base of striae toothless; striae 3 and 4 curved at base; striae 7, 8 and 9 limited basally by slightly elevated humeral gibbosity; interstria 3, 5, 7 and 9 usually without conspicuous gibbosities; interstria 10 without basal sulcus (Figs 14, 88). Pygidium of male convex, apically macropuncted (Fig. 61). Pygidium of female with large, rounded, convex speculum, sparsely macropuncted (Fig. 71). Mesosternum emarginate at apex. Male abdomen never compressed; first male abdominal ventrite without median apical tubercle; last male and female abdominal ventrite medially emarginate. Hind femur strongly incrassate; pecten with 4 teeth, anterior tooth not contiguous to the posteriors (Figs 88, 101). Hind tibiae with coronal teeth (Fig. 101).

*Male genitalia.* Median lobe short, broad; median basal margin straight, not emarginate (Fig. 116). Ventral valve subtriangular, longer than wide; lateral margin convex and internal margin strongly emarginate; round apex (Fig. 116). Internal sac at apical region with dense small spicules below valves and a few denticles; median region with spines in part dense; basal region with small and thin spicules near gonopore sclerite (Fig. 116). Lateral lobes moderately deep emarginate and internal subapical margin concave; apex moderately convergent (Fig. 131).

#### Distribution

Mexico (Nuevo Leon, Veracruz).

#### Host plants

New record: *B. macranthera* Hemsl.

#### Taxonomic discussion

*Gibbobruchus iturbidensis* is characterised by the body with sparse vestiture, denser only in short bands mainly on interstria 1, and the elytron without a median darker macula (Fig. 14).

Other comments are in the 'taxonomic discussion' section of *G. guanacaste*.

It should be noted that the male of this species was studied and described for the first time.

#### *Gibbobruchus mimus* (Say)

(Figs 15, 30, 45, 62, 72, 75, 89, 102, 117, 132)

*Bruchus mimus*: Say, 1831: 2 (original description, type-locality: Indiana, USA); Horn, 1873: 316; Cushman, 1911: 493.

*Bruchus murinus* (sic): Schöenherr, 1839: 132.

*Bruchus borealis*: Schöenherr, 1839: 132. New name for *Bruchus murinus* which is preoccupied. *Gibbobruchus mimus*: Bridwell, 1938: 74; Bridwell, 1946: 54; Bottimer, 1968: 1022; Zacher, 1952: 467; Whitehead & Kingsolver, 1975: 203; Center & Johnson, 1976: 199; Johnson & Kingsolver, 1982: 413; Udayagiri & Wadhi, 1989: 81; Kingsolver, 2004a: 169, 170; Kingsolver, 2004b: 149, 150; Romero & Johnson, 2004: 624.

*Bruchus crataegi*: Fähraeus, 1839: 19 (Type-locality: Carolina, North America).

*Pseudopachymerus crataegi*: Pic, 1913a: 10.

## Material examined

*Type*. *Gibbobruchus mimus* Say, 1831. Neotype female (present designation): 'IND. Monroe County/ Bloomington BLT/ V.4.89/ FNYoung; 'NEOTYPE/ *Gibbobruchus/ mimus* (Say, 1831)/ Desig. Manfio & Ribeiro-Costa, 2013' (FSCA).

*Notes*. In the original description Say (1831) did not specify how many specimens he observed. The type material was not found and is considered lost (Whitehead and Kingsolver, 1975). In this case we are designating a neotype with the purpose of clarifying the taxonomic status (Article 75.3.1, ICZN 1999).

Other material examined. UNITED STATES OF AMERICA: Arkansas: 2, Washington, 18.vi.1949, L.O. Warren col., *Cercis canadensis* (USNM); 4, same locality, date, collector and host plant (CNCI). Florida: 2, Alachua, Chestnut Hill Nursery, 23.viii.2006, C. Banner col., *Cercis canadensis* (FSCA); 1, Gainesville, 23.iii.1963, F.W. Mead col. (FSCA); 1, same locality, 9.viii.1982, R.E. Woodruff col. (FSCA); 2, same locality, 29.iv.1937, L.J. Bottimer col. (CNCI); 2, Liberty Co. Torreya State Park, 4-6.v.2007, M.C. Thomas col. (FSCA). Illinois: 4, Pope, Bell Smith Springs, 21.vi.1963, J.M. Campbell col. (CNCI). Kansas: 1, Douglas, F.H. Snow col. (CNCI); 3, Lawrence, 4.x.1934, L.S. Henderson col. (CNCI); 1, Leavenworth, 29.v.1936, same collector (CNCI); 1, same locality, 7.vii.1933, same collector (CNCI). Kentucky: 1, Trigg, 25.vi.1961, J.M. Campbell col. (CNCI). Maryland: 4, Beltsville, 10.v.1943, L.J. Bottimer col., *Cercis* sp. (CNCI); 1, same locality, 23.vi.1945, same collector and host plant (CNCI); 1, same locality, 25.vi.1945, same collector and host plant (CNCI); 8, same locality, 27.vi.1945, same collector and host plant (CNCI); 5, same locality, 2.vii.1945, same collector and host plant (CNCI); 4, same locality, 7.x.1944, same collector and host plant (CNCI); 2, same locality, 7.v.1945, same collector (CNCI); 1, same locality, 10.v.1943, same collector (CNCI); 1, same locality, 5.vi.1943, L.S.H. col. (CNCI); 3, same locality, 15.iv.1947, same collector (CNCI); 2, same locality, 2.v.1945, same collector (CNCI); 2, same locality, 24.ix.1947, same collector (CNCI); 3, Glen Echo, 1931, L.J. Bottimer col., *Cercis* sp. (CNCI); 1, Plummer's Island, 6.iv.06, E.A.Schwarz col. (USNM); 1, same locality, 4.v.1913, W.L. McAtee col. (USNM). Nevada: 3, Springs Clark Co., 21.vii.1973, C.D. Johnson col., *Cercis occidentalis* (TAMU). New York: 2, Rochester, B. Harkness col., *Cercis* sp. (CNCI). Tennessee: 1, Washington, 22.viii.2000, L.B.O'Brien col. (FSCA). Texas: 4, Big Bend National Park, v.1959, L.J. Bottimer col., *Cercis canadensis mexicana* (CNCI); 3, Brady, iv.1946, L.J. Bottimer col. (CNCI); 2, same locality, 20.vi.1946, same collector, *Cercis* sp. (CNCI); 4, same locality, 21.vi.1946, same collector and host plant (CNCI); 3, same locality, 23.vi.1946, same collector and host plant (CNCI); 1, same locality, 24.vi.1946, same collector and host plant (CNCI); 3, same locality, 27.vi.1946, same collector and host plant (CNCI); 1, same locality, 2.vii.1946, same collector and host plant (CNCI); 2, same locality, 4.vii.1946, same collector and host plant (CNCI); 1, same locality, 10.vii.1946, same collector and host plant (CNCI); 1, same locality, 17.vii.1946, same collector and host plant (CNCI); 1, same locality, xi.1946, same collector and host plant (CNCI); 4, same locality, 25.xi.1946, same collector and host plant (CNCI); 4, Dallas, 27.xi, L.J. Bottimer col., *Cercis canadensis* (CNCI); 4, same locality, 9.xii.1927, same collector and host plant (CNCI); 1, same locality, ii.1928, same collector and host plant (CNCI); 4, same locality, 12.vii.1928, same

collector and host plant (CNCI); 9, Kerrville, ix.1953, C.L. Smith col., *Cercis* sp. (CNCI); 4, same locality, date and host plant (CNCI); 1, same locality, 15.ix.1944, L.J. Bottimer col. (CNCI); 4, Ozona, 1956, L.J. Bottimer col., *Cercis* sp. (CNCI). Virginia: 2, Bluemont, 22.vi.1913, A. Wetmore col. (USNM); 1, same locality, Snicker's Gap, same date and collector (USNM); 4, Great Falls, 4.v.1927, L.J. Bottimer (CNCI); 1, St. Falls, 17.vi.1913 (USNM); 2, Springhill, 21.ix.1911, F.Knab col. (USNM); 5, Vienna, Fairfax, 1926, same collector, *Cercis canadensis* (CNCI); 1, same locality, 28.v.1928, same collector and host plant (CNCI). FRANCH GUIANA: 1, 33 KM SE Roura on Kaw Rd. NO, 1-2.VI.2005, J.E.Eger & M.T.Messenger col. (FSCA). MEXICO: Nuevo Leon: 1, Monterrey, Chipinque Mesa, 23.vii.1963, H.F. Howden col. (CNCI); 5, same locality, 26-29.viii.1960, same collector (CNCI). San Luis Potosi: 1, El Salto del Águila, 28-30.vii.1960, H. Howden col. (CNCI).

## Redescription

Body length. 2.8–3.9 mm; width: 1.9–2.4 mm.

*Integument*. Dorsum rufous, sometimes light brown to dark brown (Fig. 15). Antenna light brown with segments 8–10 dark brown, or segment 9 lighter than 8 and 10 (Figs 15, 89). Pygidium of male light brown to rufous (Fig. 62). Pygidium of female light brown to rufous; speculum dark brown to black (Fig. 72). Ventral region rufous, sometimes light brown to dark brown (Fig. 89). Front and middle femur and tibiae in general bicolor; dorsal half of hind femur lighter than ventral half (Fig. 89).

*Vestiture*. Dorsum variegated with white, light brown and black hairs (Fig. 15). Pronotum at basal region and median gibbosity with or without dense light brown or white pubescence; median gibbosity with two parallel, narrow, black or brown bands anterior and posterior to median transverse sulcus (Fig. 15). Scutellum light brown (Fig. 15). Elytron with median, straight, short, dark brown to black macula on interstria 1 to 3; basal third with light brown tuft on interstria 5; rest of elytra light brown with white tufts and black bands (Fig. 15). Pygidium of male covered with dense, light brown pubescence, except for a median basal white triangle; some specimens with small polished median area, or with lateroapical and laterobasal glabrous maculas (Fig. 62). Pygidium of female with sparse, white pubescence, except on speculum, and median basal triangle with dense pubescence (Fig. 72). Ventral region white; mesepimerum, mesepisternum, and metepisternum light brown (Fig. 89). First male abdominal ventrite in median anterior region with dense light brown to white pubescence; ventrites not uniformly pubescent, 1–2 or 1–3 with polished lateral areas (Fig. 75, 89).

*Body*. Ocular sinus: 0.1–0.2 mm; ocular index: 3.1–3.6 mm; frons not elevated; frontal carina polished and usually wide basally (Fig. 30). Antenna not sexually dimorphic, subserrate (Figs 15, 89). Pronotum with median and lateral gibbosities slightly elevated to elevated; laterobasal margin straight; basal emargination deep (Figs 15, 45, 89). Elytron with basal gibbosity slightly elevated to elevated; base of striae toothless; striae 3 and 4 curved at base; striae 7, 8 and 9 limited basally by slightly elevated to elevated humeral gibbosity; interstria 3, 5, 7 and 9 usually without conspicuous gibbosities; interstria 10 without basal sulcus (Figs 15, 89). Pygidium of male convex at apex (Fig. 62). Pygidium of female slightly convex; large, rounded speculum, micropuncted and sparsely macropuncted, strong basal emarginate (Fig. 72). Mesosternum emarginated at apex. Male abdomen never compressed; first male abdominal ventrite

without median apical tubercle; last male and female abdominal ventrite medially emarginate. Hind femur strongly incrassate; pecten with 4–5 teeth, anterior tooth not contiguous to the posteriors (Figs 89, 102). Hind tibiae with coronal teeth (Fig. 102).

**Male genitalia.** Median lobe short, broad; median basal margin straight, not emarginate (Fig. 117). Ventral valve subtriangular, wider than long; lateral margin slightly convex and internal margin moderately emarginated; round apex (Fig. 117). Internal sac at apical region with dense small spicules below valves and dense spines; median region with sparse spines and moderately dense; basal region with lateral denticles and with small and thin spicules near gonopore sclerite (Fig. 117). Lateral lobes moderately deep emarginated and internal subapical margin concave; apex strongly convergent (Fig. 132).

#### Distribution

French Guiana, Mexico (Nuevo Leon, San Luis Potosi) and United States of America (Arkansas, Florida, Illinois, Indiana, Kansas, Kentucky, Maryland, Nevada, New York, Tennessee, Texas, Virginia). Udayagiri and Wadhi, 1989 listed *G. mimus* for United States of America and Mexico. Here we include French Guiana as a new record for *G. mimus*.

#### Host plants

*Bauhinia congesta* (Britton & Rose) Lundell, *Cercis canadensis* L., *C. canadensis* L. var. *texasensis* (S. Watson) M. Hopkins, *C. occidentalis* A. Gray.

New record: *C. canadensis* L. var. *mexicana* (Britton & Rose) M. Hopkins.

#### Taxonomic discussion

*Gibbobruchus mimus* differs from other species in this group by having the elytron with a median brown macula, and a pecten with the distance between the anterior and posterior teeth smaller than in the other species (Figs 15, 102). Other comments are in the 'taxonomic discussion' section of *G. guanacaste*.

Whitehead and Kingsolver (1975) observed that males from south Texas and Mexico have a distinct polished, sparsely punctuate median area on the pygidium. This area was not considered here, because the speculum of the pygidium is a smooth and shiny area that occurs in some males of the groups *speculifer* and *polycoccus*, and in females of all species.

#### *Gibbobruchus cristicollis* (Sharp)

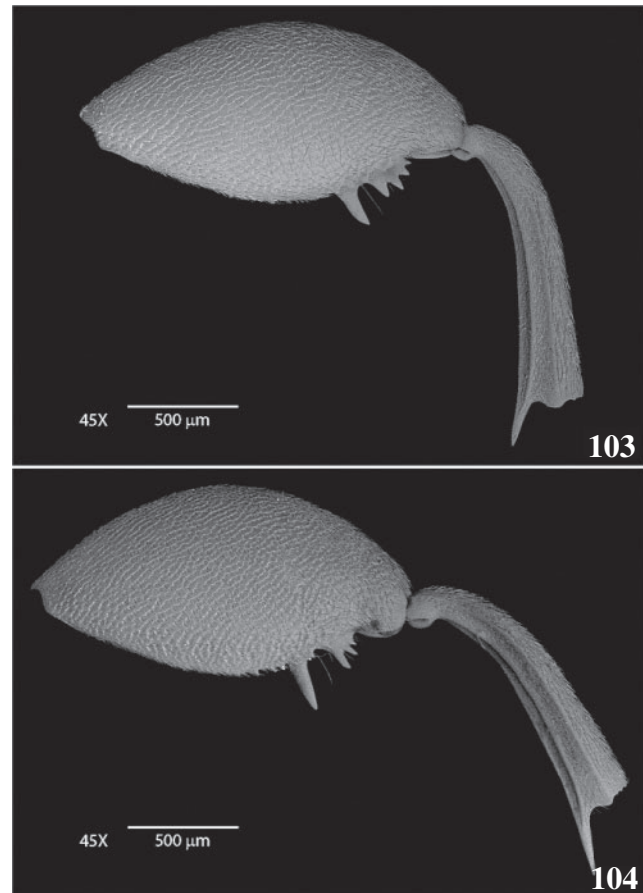
(Figs 16, 31, 46, 63, 73, 75, 90, 103, 118, 133)

*Bruchus cristicollis*: Sharp, 1885: 442 (original description, type-locality: Yolos, Oaxaca, Mexico).

*Pseudopachymerus cristicollis*: Pic, 1913a: 10.

*Caryedes cristicollis*: Blackwelder, 1946: 758.

*Gibbobruchus cristicollis*: Whitehead & Kingsolver, 1975: 190; Janzen, 1977: 417; Janzen, 1978: 183; Johnson & Kingsolver, 1982: 413; Udayagiri & Wadhi, 1989: 81; Maes & Kingsolver, 1991: 26; Turnbow *et al.*, 2003: 274; Kingsolver, 2004a: 167, 168; Kingsolver, 2004b: 145, 146; Romero & Johnson, 2004: 623.

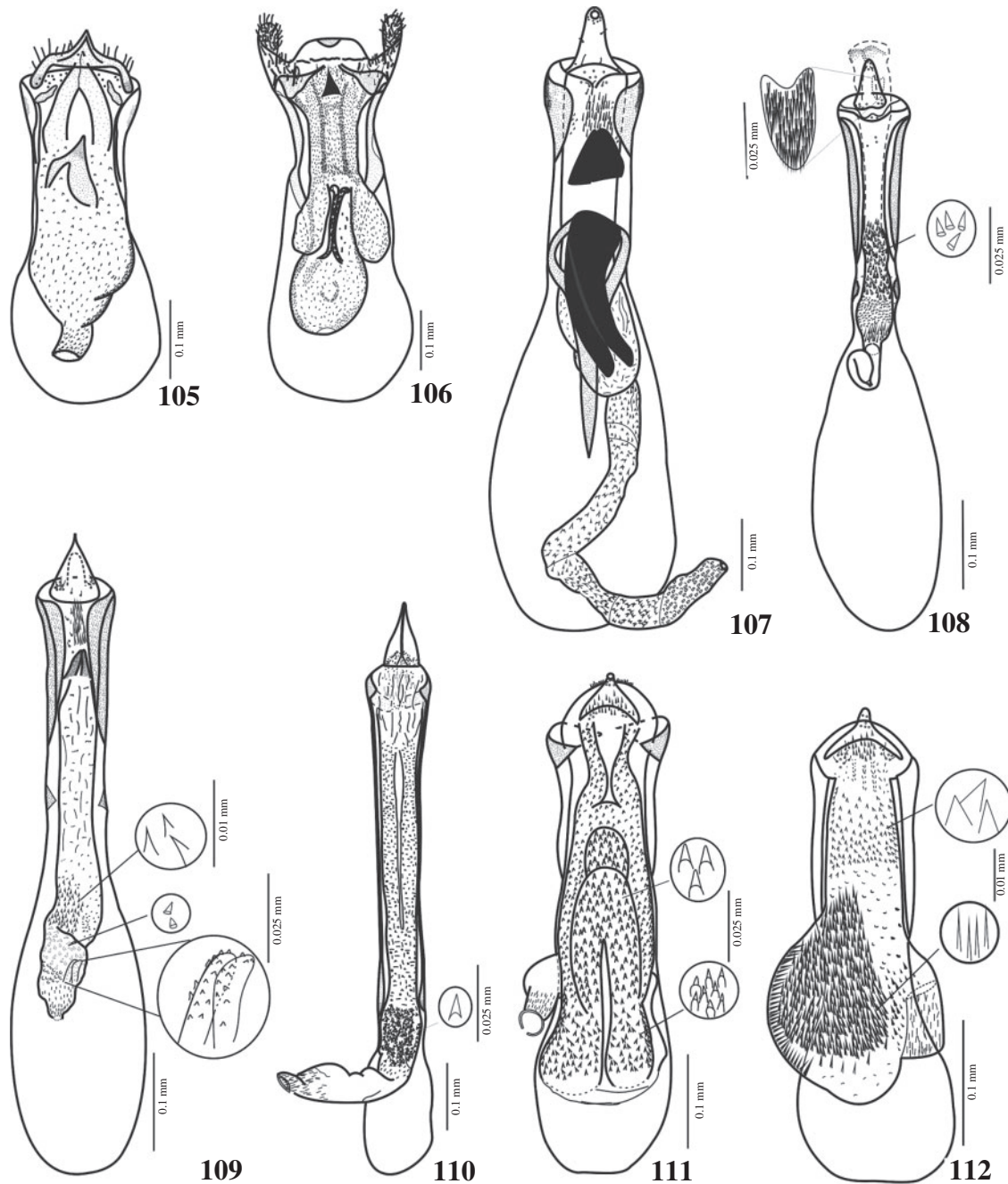


**Figs 103–104.** Posterior leg, external view: 103, *G. cristicollis*; 104, *G. divaricatae*.

#### Material examined

**Notes.** In the original description, Sharp (1885) specified that only one exemplar was studied. Unfortunately, we did not have access to this material that is deposited in BMNH. The specimens were determined by the original description, material previously identified by specialists and revisionary study (Whitehead and Kingsolver, 1975).

Other material examined. COSTA RICA: Guanacaste: 8, 20.vi.1972, D. H. Janzen *et al.* col. (USNM). EL SALVADOR: Conchagua: 1, 27–29.v.1958, L.J. Bottimer col. (CNCI). MEXICO: Chiapas: 2, Chicoasen Dam, 4.x.1986, J.E. Wappes col. (FSCA); 2, same locality, date, collector and host plant (USNM). NICARAGUA: Granada: 1, 28.v.1963, L. J. Bottimer col., *Bauhinia pauletia* (CNCI); 1, 22.vi.1963, same collector and host plant (CNCI). United States of America: Texas: 1, Alpine, Big Bend Mountain, Pine Canyon, 7.v.1959, H. Howden & E. Becker col. (CNCI); 1, same locality, Chisos Mountain, Pulliam Canyon, 12.v.1959, W.R.M. Mason col. (CNCI); 3, Kinney County, Big Bend National Park, 30.vii.1959, L. J. Bottimer col., *Cercis canadensis mexicana* (CNCI). 4, same locality, Anacacho Mts, 2.vii.1961, L. J. Bottimer col., *Bauhinia congesta*; 4, same locality, 3.vii.1961, same collector and host plant (CNCI); 1, same locality, 4.vii.1961, same collector and host plant (CNCI); 6, same locality, 7.vii.1961, same collector and host plant (CNCI); 4, same locality, 11.vii.1961, same collector and host plant (CNCI); 3, same locality, 17.vii.1961, same collector and host plant (CNCI); 1, same locality, 20.vii.1961, same collector and host plant (CNCI); 1, same locality, 22.vii.1961, same collector and host plant (CNCI); 1, same locality, 25.vii.1961, same collector and host plant (CNCI); 4, same locality, 27.vii.1961, same collector and host plant (CNCI); 4, same locality, 29.vii.1961, same



**Figs 105–112.** Male genitalia, median lobe: 105, *Penthobruchus germaini*; 106, *Pygiopachymerus lineola*; 107, *G. speculifer*; 108, *G. ornatus*; 109, *G. vinicius*; 110, *G. polycoccus*; 111, *G. wunderlini*; 112, *G. cavillator*.

collector and host plant; 3, same locality, 30.vii.1961, same collector, *Bauhinia congesta* (CNCI); 10, same locality, vii.1961, same collector and host plant.

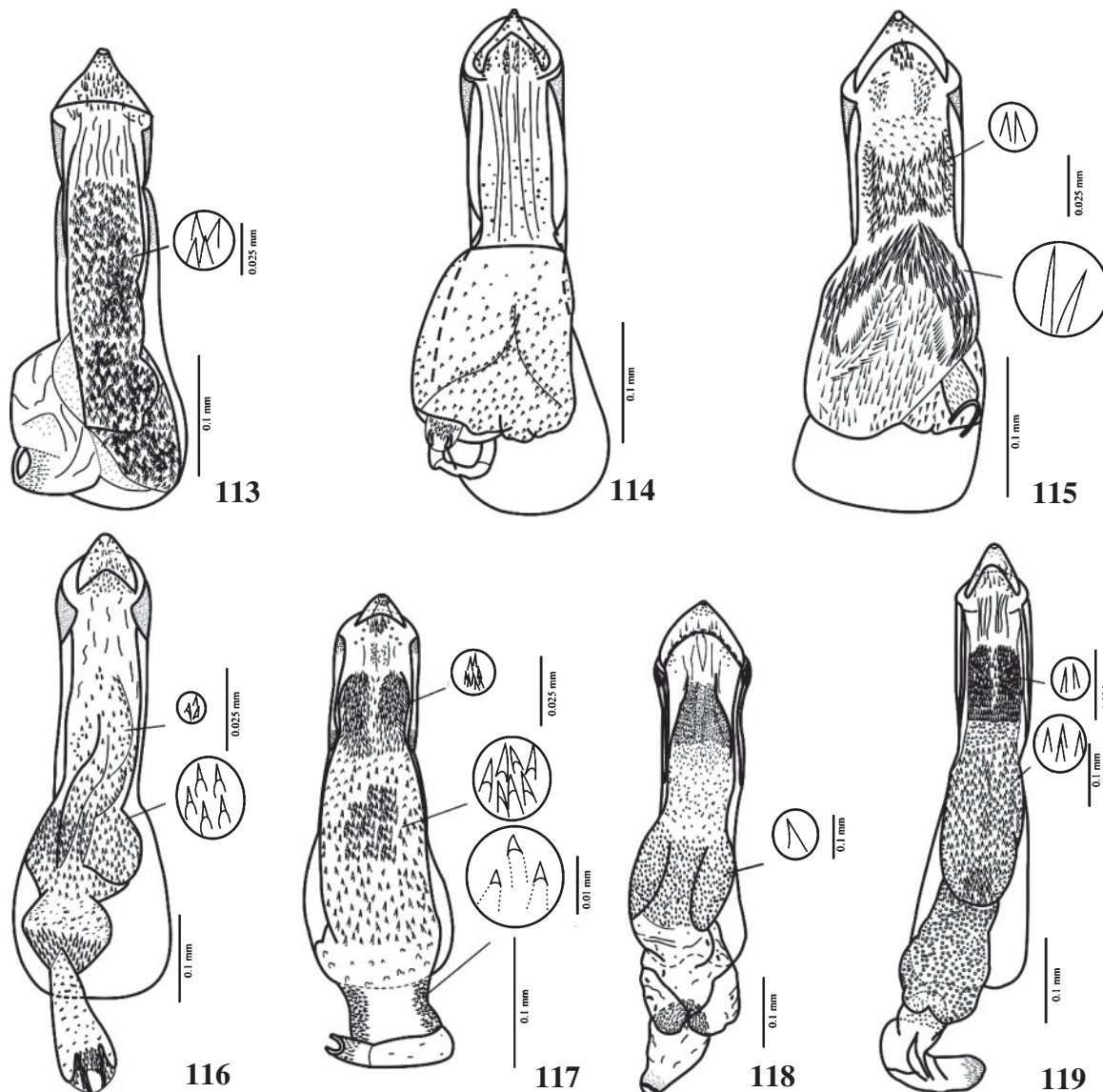
#### Redescription

Body length. 3.7–4.8 mm; width: 2.6–3.0 mm.

**Integument.** Dorsum rufous to dark brown (Fig. 16). Antenna light brown with segments 7 to 10 dark brown (Figs 16, 90). Pygidium of male rufous or dark brown

(Fig. 63). Pygidium of female dark brown and/or rufous (Fig. 73). Ventral region dark brown, sometimes rufous (Fig. 90). Front and middle femur and tibiae generally bicolor; dorsal third of hind femur generally lighter than rest of femur (Fig. 90).

**Vestiture.** Dorsum variegated with white, light brown and black hairs (Fig. 16). Pronotum at basal region and median gibbosity with dense light brown or white pubescence; median gibbosity with two parallel, narrow, brown bands anterior and

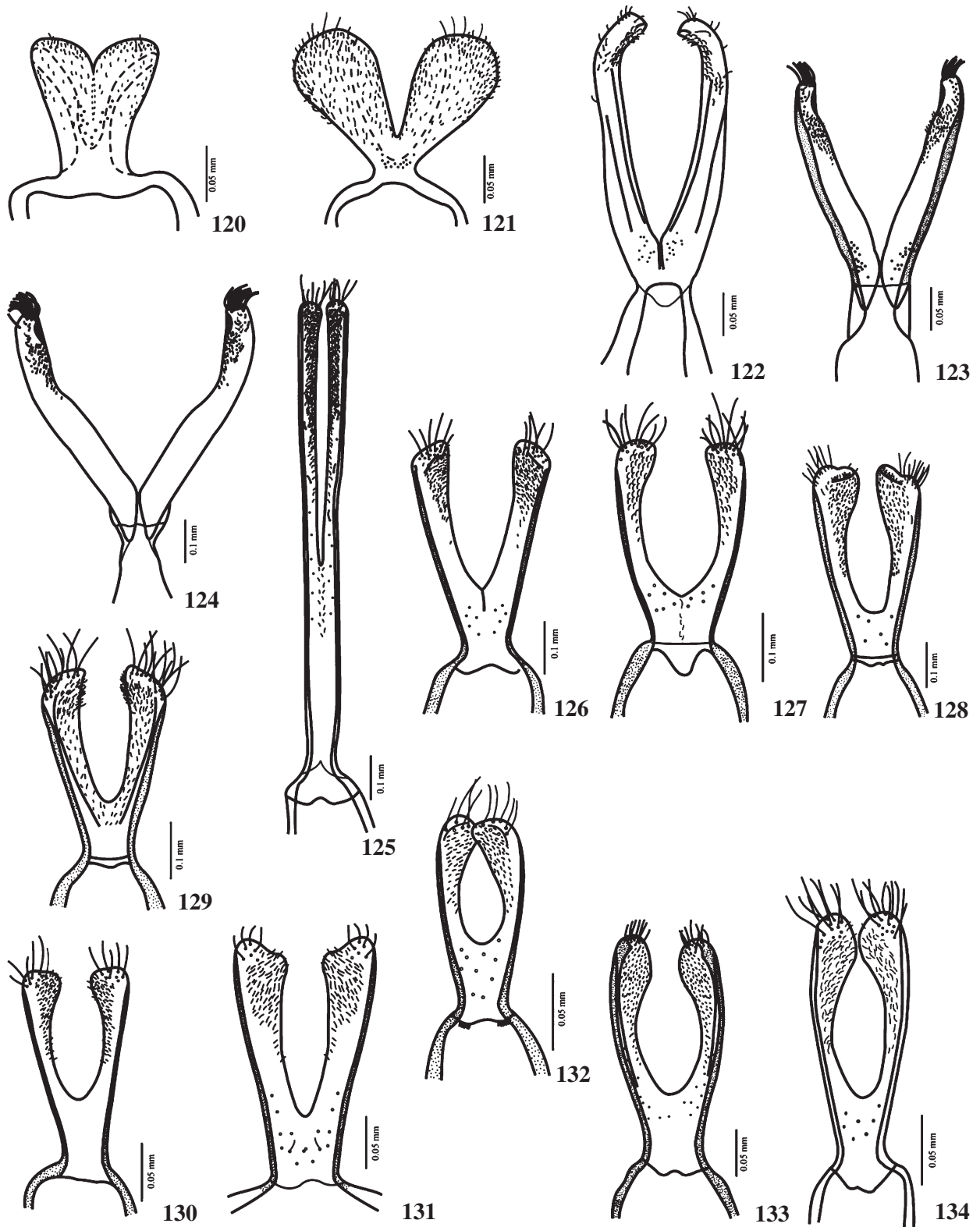


**Figs 113–119.** Male genitalia, median lobe: 113, *G. bolivianus*; 114, *G. scurra*; 115, *G. guanacaste*; 116, *G. iturbidensis*; 117, *G. mimus*; 118, *G. cristicollis*; 119, *G. divaricatae*.

posterior to median transverse sulcus (Fig. 16). Scutellum white (Fig. 16). Elytron with median, curved, short, dark brown to black macula on interstria 2 to 5; rest of elytra with black and white grumes and with light brown bands (Fig. 16). Pygidium of male with light brown to nearly white pubescence (Fig. 63). Pygidium of female white except on speculum (Fig. 73). Ventral region white; mesepimerum, mesepister, and metepisternum light brown (Fig. 90). First male abdominal ventrite in median anterior region with light brown to white dense pubescence; ventrites not uniformly pubescent, 1–3 with polished lateral areas (Figs 75, 90).

*Body.* Ocular sinus: 0.1–0.2 mm; ocular index: 2.5–3.0 mm; frons not elevated; frontal carina polished and wide basally (Fig. 31). Antenna not sexually dimorphic, sub serrate (Figs 16, 90). Pronotum with median and lateral gibbosities usually

strongly, sometimes elevated; laterobasal margin straight; basal emargination deep (Figs 16, 46, 90). Elytron with basal gibbosity strongly elevated, rarely elevated; base of striae toothless; striae 3 and 4 curved at base; striae 7, 8 and 9 limited basally by slightly elevated to elevated humeral gibbosity; interstria 3, 5, 7 and 9 usually with conspicuous gibbosities; interstria 10 sometimes with basal sulcus (Figs 16, 90). Pygidium of male distinctly bituberculate, convex at apical third (Fig. 63). Pygidium of female with large, rounded or oval speculum, convex, micropuncted or macropuncted (Fig. 73). Mesosternum emarginate to slightly emarginate at apex. Male abdomen never compressed; first male abdominal ventrite without median apical tubercle; last male and female abdominal ventrite medially emarginate. Hind femur strongly incrassate; pecten with 4–5 teeth, anterior tooth not



**Figs 120–134.** Male genitalia, lateral lobe: 120, *Pentobruchus germaini*; 121, *Pygiopachymerus lineola*; 122, *G. speculifer*; 123, *G. ornatus*; 124, *G. vinicius*; 125, *G. polycoccus*; 126, *G. wunderlini*; 127, *G. cavillator*; 128, *G. bolivianus*; 129, *G. scurra*; 130, *G. guanacaste*; 131, *G. iturbidensis*; 132, *G. mimus*; 133, *G. cristicollis*; 134, *G. divaricatae*.

contiguous to the posteriors (Figs 90, 103). Hind tibiae with coronal teeth.

**Male genitalia.** Median lobe short, broad; median basal margin emarginate (Fig. 118). Ventral valve subtriangular, wider than long; lateral margin convex and internal margin deeply emarginate; slightly pointed apex (Fig. 118). Internal sac at apical region in part with dense spicules; median region with dense spines; basal region with small and thin spicules near gonopore sclerite (Fig. 118). Lateral lobes moderately deep emarginated and internal subapical margin concave; apex strongly convergent (Fig. 133).

#### Distribution

Costa Rica (Guanacaste), El Salvador (Conchagua), Mexico (Chiapas), Nicaragua (Granada), United States of America (Texas). Udayagiri and Wadhi (1989) listed *G. cristicollis* for the same countries and also for Guatemala and Honduras.

#### Host plants

*Bauhinia congesta* (Britton & Rose) Lundell, *B. coulteri* J. F. Macbr., *B. divaricata* L., *B. macranthera* Hemsl., *B. pauletia* Pers.

New record: *C. canadensis* L. var. *mexicana* (Britton & Rose) M. Hopkins.

#### Taxonomic discussion

*G. cristicollis* shares with *G. divaricatae* the median basal margins of the median lobe emarginate (Fig. 133), and the pygidium of the male with an apical tubercle (Fig. 63). It differs by having the median black spot on the elytron short, a black macula at the median region of elytra, the basal region of the pronotum with dense white pubescence in most specimens (Fig. 16), and the pygidium of the male with two tubercles (Fig. 63). Other comments are in the 'taxonomic discussion' section of *G. guanacaste*.

Whitehead and Kingsolver (1975) noted that the median black spots on the elytra probably represented a synapomorphy between *G. cristicollis* and *G. divaricatae*. This character was not used in the present analysis because of the difficulty in coding it. Whitehead and Kingsolver (1975) commented about the variability of *G. cristicollis*. This species varies in many characters: elevation of the pronotum and elytra gibbosities; elytral coloration pattern; scutellum vestiture density; colour and shape of female speculum; and male lateral lobes.

#### ***Gibbobruchus divaricatae* Whitehead & Kingsolver**

(Figs 17, 32, 47, 64, 74, 75, 91, 104, 119, 134)

*Gibbobruchus divaricatae*: Whitehead & Kingsolver, 1975: 183 (original description, type-locality: Acayucan, Mexico); Johnson & Kingsolver, 1982: 413; Udayagiri & Wadhi, 1989: 81; Turnbow *et al.*, 2003: 274; Kingsolver, 2004a: 168, 169; Kingsolver, 2004b: 147, 148; Romero & Johnson, 2004: 623.

#### Material examined

**Types.** *Gibbobruchus divaricatae* Whitehead & Kingsolver, 1975. Holotype male: '10 mi. E./ Acayucan, Ver./ Mex. VI-15-68'; 'reared/seeds/ #111-68'; 'emergedby/ VII-18-68'; 'reared seeds/ Bauhinia/divaricata'; 'HOLOTYPE ♂/ Gibbobruchus/ divaricatus/ Kingsolver&

Whitehead' (USNM). 22 Paratypes: 11 at CNCI, 1♂: 'Brownsville, Tex./ XI-15 1948/ G.A.Pfaffman'; 'L. J. Bottimer/ Collection/ No. 9/ i'; 'ex seed of/ Bauhinia mexicana'; 'PARATYPE/ G./ divaricatae/ W&K'; 'PARATYPE/ CNC No.14088'. 2♂ and 1♀: 'Brownsville, Tex./ IX-10 1948/ G.A.Pfaffman'; 'L. J. Bottimer/ Collection/ No. 9/ i'; 'ex seed of/ Bauhinia mexicana'; 'PARATYPE/ G./ divaricatae/ W&K'; 'PARATYPE/ CNC No.14088'; '12 specimens/ retained in CNC/ same data'. 1♂: 'Brownsville, Tex./ XII-12 1948/ G.A.Pfaffman'; 'L. J. Bottimer/ Collection/ No. 9/ i'; 'ex seed of/ Bauhinia mexicana'; 'PARATYPE/ G./divaricatae/ W&K'; 'PARATYPE/ CNC No.14088'. 3 machos, etiquetas: 'Brownsville, Tex./ IX-13 1948/ G.A.Pfaffman'; 'L. J. Bottimer/ Collection/ No. 9/ i'; 'ex seed of/ Bauhinia mexicana'; 'PARATYPE/ G./ divaricatae/ W&K'; 'PARATYPE/ CNC No.14088'. 1♂: 'Brownsville, Tex./ IX-13 1948/ G.A.Pfaffman'; 'L. J. Bottimer/ Collection/ No. 9/ i'; 'ex seed of/ Bauhinia mexicana'; 'CNC'; 'PARATYPE/ G./ divaricatae/ W&K'; 'PARATYPE/ CNC No.14088'. 1♂: 'Tamazunchale/ SLP MEX. 8/5/63/ McCutchan and/ Bottimer, coll.'; 'L. J. Bottimer/ Collection/ No. 116 M'; 'no 6/ gen'; 'PARATYPE/ Gibbobruchus/ divaricatae/ Whitehead & Kings.'; 'PARATYPE/ CNC No.14088'. 1♂: '12k.w. Olanchito/HONDURAS/ July 14 1949/ E. C. Becker'; 'Sweeping'; 'PARATYPE/ Gibbobruchus/ divaricatae/ Whitehead & Kings.'; 'PARATYPE/ CNC No.14088'. 11 at USNM, 3♂ and 4♀: '#102-73/em-by/II-9-73'; 'PARATYPE/ Gibbobruchus/ divaricatus/ Whitehead & Kingsolver'. 1♂ and 1♀: '10 mi. E./ Acayucan, Ver./ Mex. VI-15-68'; 'seeds/ #111-68'; 'emerged by/ VII-18-68'; 'reared seeds/ Bauhinia/divaricata'; 'PARATYPE/ Gibbobruchus/ divaricatus/ Whitehead & Kingsolver'. 1♀: 'Atoyac/ VII:14:41'; 'Vera Cruz, Mex.'; 'Col. by/ H.S.Dybas'; '370'; 'PARATYPE/ Gibbobruchus/ divaricatae/ Whitehead & Kingsolver'. 1 at FSCA, ♂: 'Mexico/Tamazunchale/ VII-18-15-63'; 'Davis &/ Duckworth'; 'PARATYPE/ Gibbobruchus/ divaricatae/ Whitehead & Kingsolver'.

#### Redescription

Body length. 3.3–4.1 mm; width. 2.2–2.7 mm.

**Integument.** Dorsum dark brown, rarely rufous (Fig. 17). Antenna light brown to brown with articles 7–10 dark brown (Fig. 91). Pygidium of male and female, dark brown, rarely rufous (Figs 64, 74). Ventral region dark brown, rarely rufous (Fig. 91). Front and middle femur and tibiae bicolor; hind femur sometimes with dorsal half slightly lighter than the ventral half (Fig. 91).

**Vestiture.** Dorsum variegated light and dark brown, sometimes with white hairs (Fig. 17). Pronotum at basal region and median gibbosity without dense light brown hairs; median gibbosity with two parallel, narrow, black bands posterior to median transverse sulcus (Fig. 17). Scutellum white (Fig. 17). Elytron with median, straight, elongate, dark brown macula on interstria 1 to 3; basal third with a light brown tuft on interstria 5; rest of elytra light brown with black grumes, sometimes with narrow white bands (Fig. 17). Pygidium of male with light brown very sparse pubescence, except on median basal triangle (Fig. 64). Pygidium of female with white to light brown sparse pubescence, except for the glabrous speculum and a dense median basal triangle (Fig. 74). Ventral region usually white; mesepimerum, mesepisternum, and anterior and posterior angles of metepisternum with conspicuous light brown pubescence (Fig. 91). First male abdominal ventrite with light brown to white dense pubescence at median anterior region; ventrites not uniformly pubescent, 1–2 or 1–3 with polished lateral areas (Fig. 75, 91).

**Body.** Ocular sinus: 0.1–0.2 mm; ocular index: 2.7–3.3 mm; frons not elevated; frontal carina not polished and wide basally (Fig. 32). Antenna not sexually dimorphic, subserrate (Fig. 91).

Pronotum with median gibbosity elevated to strongly elevated; lateral gibbosity strongly elevated; laterobasal margin concave; basal emargination deep (Figs 17, 47, 91). Elytron with basal gibbosity usually strongly elevated, sometimes elevated; base of striae toothless; striae 3 and 4 curved at base; striae 7, 8 and 9 limited basally by elevated humeral gibbosity; interstria 3, 5, 7 and 9 usually with slightly conspicuous gibbosities; interstria 10 without basal sulcus (Figs 17, 91). Pygidium of male convex at apex with gibbous apical half and small polished and sparsely puncted area (Fig. 64). Pygidium of female slightly convex; large, rounded speculum, micropuncted (Fig. 74). Mesosternum truncate or emarginate at apex. Male abdomen never compressed; first male abdominal ventrite without median apical tubercle; last male and female abdominal ventrite medially emarginate. Hind femur strongly incrassate; pecten with 4–5 teeth, anterior tooth not contiguous to the posteriors (Figs 91, 104). Hind tibiae with coronal teeth (Fig. 104).

*Male genitalia.* Median lobe long, broad; median basal margin emarginate (Fig. 119). Ventral valve subtriangular, wider than long; lateral margin nearly straight and internal margin deeply emarginate; round apex (Fig. 119). Apical region of internal sac with a few spicules below valves and with dense spines; median region with dense spines; basal region with small and thin spicules near gonopore sclerite (Fig. 119). Lateral lobes moderately deep emarginated and internal subapical margin concave; apex strongly convergent (Fig. 134).

#### Distribution

Honduras (Yoro), Mexico (San Luis Potosi, Veracruz), United States of America (Texas).

#### Host plants

*Bauhinia divaricata* L., *B. pes-caprae* Cav., *B. unguolata* L.

#### Taxonomic discussion

*Gibbobruchus divaricatae* is characterised by its black, elongated macula at the median region of the elytra (Fig. 17); the basal region of the pronotum without intense white vestiture in most specimens (Fig. 17) and the pygidium of the male with a large apical tubercle (Fig. 64).

Other comments are in the ‘taxonomic discussion’ sections of *G. guanacaste* and *G. cristicollis*.

#### Final considerations

Detailed studies of the external adult morphological characters as well as of the male genitalia of *Gibbobruchus* permitted a cladistic analysis of this genus based on species recognised as valid in the taxonomic revision.

The monophyly of *Gibbobruchus* was tested and confirmed in this analysis, which resulted in only one cladogram based on 26 characters and 15 terminal taxa. Of these taxa, 13 were recognised in this taxonomic review, including two new species: *G. vinicius*, sp. nov. (Type locality: Brazil, Jaguariaíva) and *G. bolivianus*, sp. nov. (Type locality: Bolivia, Santa Cruz).

Of the six species groups proposed by Whitehead and Kingsolver (1975), four were confirmed in our analysis; the union of the other two is proposed. The current proposal for

the composition of groups is as follows: group *speculifer*: *G. speculifer*, *G. ornatus* and *G. vinicius*, sp. nov.; group *polycoccus*: *G. polycoccus*; group *wunderlini*: *G. wunderlini*; group *scurra*: *G. cavillator*, *G. bolivianus*, sp. nov. and *G. scurra*; and group *mimus*: *G. guanacaste*, *G. iturbidensis*, *G. mimus*, *G. cristicollis* and *G. divaricatae*.

#### Acknowledgements

This research was supported by Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) 473847/2009-4 and Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES). Our research authorizations of IAP was 217/10 and of IBAMA was 13699-1. We acknowledge the TAXon line – Rede Paranaense de Coleções Biológicas, Departamento de Zoologia (DZUP), Universidade Federal do Paraná (UFPR) for the photos and Centro de Microscopia Eletrônica (CME-UFPR); the curators and institutions listed for loan of types and other specimens used in this study; Dr John M. Kingsolver for the constant support, bibliographies and material. And, finally, we thank Dr Geoffrey Morse and the other anonymous reviewers who provided many valuable suggestions for improving the final version. Contribution number 1865, DZUP, UFPR, Brazil.

#### References

- Alvarez, N., Romero, J., Anton, K.-W., Benrey, B., and Hossaert-McKey, M. (2006). Phylogenetic relationships in the Neotropical bruchid genus *Acanthoscelides* (Bruchinae, Bruchidae, Coleoptera). *Journal of Zoological Systematics and Evolutionary Research* **44**(1), 63–74. doi:10.1111/j.1439-0469.2005.00344.x
- Blackwelder, R. E. (1946). Checklist of the coleopterous insects of Mexico, Central America, the West Indies, and South America. *Bulletin of United States National Museum* **185**, 551–763.
- Boheman, C. H. (1833). In ‘Genera et species curculionidum, cum synonymia hujus familiae. Vol. 1’. (Ed C. J. Schöenherr) pp. 1–381. (Lipsiae, Fleischer, Roret, Paris).
- Bondar, G. (1931). Notas biológicas sobre alguns bruchídeos brasileiros do gênero *Pseudopachymerus*. *Revista de Entomologia* **4**, 417–422.
- Bondar, G. (1936). Notas biológicas sobre bruchídeos observados no Brasil. *Archivos do Instituto de Biologia Vegetal* **3**, 7–44.
- Borowiec, L. (1987). The genera of seed beetles (Coleoptera, Bruchidae). *Polskie Pismo Entomologiczne* **57**, 3–207.
- Bottimer, L. J. (1968). Notes on Bruchidae of America North of Mexico with a list of world genera. *Canadian Entomologist* **100**, 1009–1049. doi:10.4039/Ent1001009-10
- Bouchard, P., Bousquet, Y., Davies, A. E., Alonso-Zarazaga, M. A., Lawrence, J. F., Lyal, C. H. C., Newton, A. F., Reid, C. A. M., Schmitt, M., Ślipiński, S. A., and Smith, A. B. T. (2011). Family-group names in Coleoptera (Insecta). *Zookeys* **88**, 1–972. doi:10.3897/zookeys.88.807
- Bremer, K. (1994). Branch support and tree stability. *Cladistics* **10**(3), 295–304. doi:10.1111/j.1096-0031.1994.tb00179.x
- Bridwell, J. C. (1932). The subfamilies of the Bruchidae. *Proceedings of the Entomological Society of Washington* **34**, 100–106.
- Bridwell, J. C. (1938). *Specularius erythrinae*, a new bruchid affecting *Erythrina* (Coleoptera). *Journal of the Washington Academy of Sciences* **28**, 69–76.
- Bridwell, J. C. (1946). The genera of the beetles of the family Bruchidae in America north of Mexico. *Journal of the Washington Academy of Sciences* **36**, 52–57.
- Center, T. D., and Johnson, C. D. (1976). Host plant and parasites of some Arizona seed-feeding insects. *Annals of the Entomological Society of America* **69**, 195–201.
- Chaboo, C. S. (2007). Biology and phylogeny of the Cassidinae Gyllenhal *sensu lato* (Tortoise and leaf-mining beetles) (Coleoptera:

- Chrysomelidae). *Bulletin of the American Museum of Natural History* **305**, 1–250. doi:10.1206/0003-0090(2007)305[1:BAPOTC]2.0.CO;2
- Chevrolat, A. (1871). Description de six coléoptères exotiques eclos a Paris. *Annales de la Société Entomologique Belgique* **14**, 5–8.
- Chevrolat, A. (1877). Les diagnoses de nouvelles espèces de bruchides. *Bulletin de la Société Entomologique de France* **5**(7), 89–90.
- Cordo, H. A., Logarzo G. and Di Lorio O. (2005). 'Catálogo de insectos fitófagos de la Argentina y sus plantas asociadas'. (Sociedad Entomológica Argentina, SEA).
- Costa Lima, A. (1955). 'Insetos do Brasil. Coleópteros, t.9, 3a. parte'. (Escola Nacional de Agronomia, Série Didática, Rio de Janeiro).
- Cushman, R. A. (1911). Notes on the host plants and parasites of some North American Bruchidae. *Journal of Economic Entomology* **4**, 489–510.
- Duckett, C. N., Gillespie, J. J., and Kjer, K. M. (2004). Relationships among the subfamilies of Chrysomelidae inferred from small subunit ribosomal DNA and morphology, with special emphasis on the relationship among the flea beetles and the Galerucinae. In 'New Contributions in Chrysomelidae Biology', (Eds P. Jolivet, M. Schmitt and J. Santiago-Blay.) pp. 3–18. (SPB Academic Publishing: The Hague, The Netherlands.)
- Fähræus, O. I. (1839). In 'Genera et species cacurculionidum, cum synonymia hujus familiae. Vol. 5.' (Ed C. J. Schöenherr.) pp. 1–456. (Lipsiae, Fleischer, Roret, Paris).
- Farrell, B. D., and Sequeira, A. S. (2004). Evolutionary rates in the adaptive radiation of beetles on plants. *Evolution* **58**, 1984–2001.
- Fitch, W. N. (1971). Toward defining the course of evolution: minimum change for a specified tree topology. *Systematic Zoology* **20**, 406–416. doi:10.2307/2412116
- Goloboff, P. A. (1993). 'NONA. Versão 2.0'. Available at <http://www.cladistics.com/> [Verified May 2011].
- Grebennikov, V. V., and Newton, A. F. (2009). Good-bye Scydmaenidae, or why the ant-like stones beetles should become megadiverse Staphylinidae sensu latissimo (Coleoptera). *European Journal of Entomology* **106**(2), 275–301.
- Grimaldi, D., and Engel, M. S. (2005). 'Evolution of the Insects'. (Cambridge University Press: Cambridge, UK.)
- Gyllenhal, L. (1833). In 'Genera et species curculionidum, cum synonymia hujus familiae'. (Ed C. J. Schöenherr.) pp. 1–381. (Lipsiae, Fleischer, Roret, Paris.)
- Horn, G. H. (1873). Revision of the Bruchidae of the United States. *Transactions of the American Entomological Society*, 4311–342.
- Hummel, A. D. (1827). 'Essais entomologiques.' # 6 St. Petersburg.
- ICZN (1999) 'International Code of Zoological Nomenclature, fourth edition [on line]'. The International Trust for Zoological Nomenclature 1999 c/o The Natural History Museum, Cromwell Road, London, UK (last updated 01 January 2000). Available from://www.iczn.org/iczn/index.jsp (accessed on 17 March 2011).
- Janzen, D. H. (1977). The interaction of seed predators and seed chemistry.-428. In 'Colloques Internationaux du C.N.R.S.'. (Ed Labeyrie) pp. 493. (Paris).
- Janzen, D. H. (1978). The ecology and evolutionary biology of seed chemistry as relates to seed predation. In 'Biochemical Aspects of Plant and Animal Coevolution'. (Ed. J. H. Harborne.) pp.163–206. (Academic Press: London.)
- Janzen, D. H. (1980). Specificity of seed-attacking beetles in a Costa Rican deciduous forest. *Journal of Ecology* **68**, 929–952. doi:10.2307/2259466
- Jermý, T., and Szentesi, A. (2003). Evolutionary aspects of host plant specialisation – a study on bruchids (Coleoptera: Bruchidae). *Oikos* **101**(1), 196–204. doi:10.1034/j.1600-0706.2003.11918.x
- Johnson, C. D. (1981). Seed beetles host specificity and the systematics of the Leguminosae. In 'Advances in Leguminosae Systematics. Vol. 2.' (Eds R. M. Polhill and P. H. Raven.) pp. 995–1027. (Royal Botanic Gardens: Kew.)
- Johnson, C. D., and Kingsolver, J. M. (1982). Checklist of the Bruchidae (Coleoptera) of Canada, United States, Mexico, Central America, and the West Indies. *Coleopterists Bulletin* **35**(4), 409–422.
- Johnson, C. D., and Romero, J. (2004). A review of evolution of oviposition guilds in the Bruchidae (Coleoptera). *Revista Brasileira de Entomologia* **48**(3), 401–408.
- Johnson, C. D., Southgate, B. J., and Delobel, A. (2003). A Revision of the Caryedontini (Coleoptera: Bruchidae: Pachymerinae) of Africa and the Middle East. *Memoirs of the American Entomological Society* **44**, 1–120.
- Kergoat, G. J., Delobel, A., and Silvain, J.-F. (2004). Phylogeny and host-specificity of European seed beetles (Coleoptera, Bruchidae), new insights from molecular and ecological data. *Molecular Phylogenetics and Evolution* **32**, 855–865. doi:10.1016/j.ympev.2004.02.019
- Kingsolver, J. M. (1970). A study of male genitalia in Bruchidae. *Proceedings of the Entomological Society of Washington* **72**(3), 370–386.
- Kingsolver, J. M. (1973). Description of a new genus and a new species of Bruchidae from South America (Coleoptera). *Journal of the Washington Academy of Sciences* **63**, 142–146.
- Kingsolver, J. M. (1990). New world Bruchidae. Past, present, future. In 'Bruchids and Legumes: Economics, Ecology and Coevolution'. (Eds K. Fujii, A. M. R. Gatehouse, C. D. Johnson, R. Mitchel, T. Yoshida.) pp.121–129. (Kluwer Academic Publishers: Dordrecht, The Netherlands.)
- Kingsolver, J. M. (2004a). Handbook of the Bruchidae of the United States and Canada (Insecta, Coleoptera). Vol.1. United States Department of Agriculture. Technical Bulletin 1912, xi + 324.
- Kingsolver, J. M. (2004b). Handbook of the Bruchidae of the United States and Canada (Insecta, Coleoptera). Vol.2. United States Department of Agriculture. Technical Bulletin 1912, ii + 198.
- Latreille, P. A. (1802). 'Histoire Naturelle, générale et particulière, des Crustacés et des Insectes. Tome III'. (Paris).
- Lawrence, J. F., Ślipiński, A., Seago, A. E., Thayer, M. K., Newton, A. F., and Marvaldi, A. E. (2011). Phylogeny of the Coleoptera based on morphological characters of adults and larvae. *Annales Zoologici* **61** (1), 1–217. doi:10.3161/000345411X576725
- Lingafelter, A., and Pakaluk, J. (1997). Comments on the Bruchinae and Chrysomelidae. *Chrysomela Newsletter* **33**, 3–4.
- Maes, J. M., and Kingsolver, J. M. (1991). Catálogo de los Bruchidae (Coleoptera) de Nicaragua. *Revista Nicaragüense de Entomología* **16**, 21–34.
- Nixon, K. C. (1999). 'Winclada (BETA) ver. 0.9.9'. Available at <http://www.cladistics.com/> [Accessed May 2011]
- Nixon, K. C., and Carpenter, J. M. (1993). On outgroups. *Cladistics* **9**(4), 413–426. doi:10.1111/j.1096-0031.1993.tb00234.x
- Page, R. (2001). 'Nexus Data Editor for Windows ver. 0.5.0'. Available at <http://taxonomy.zoology.gla.ac.uk/rod/NDE/nde.html> [Accessed on May 2010]
- Pic, M. (1894). Descriptions de deux coléoptères. *L'Échange* **10**, 65–66.
- Pic, M. (1911). Coléoptères exotiques nouveaux ou peu connus. *L'Échange* **27**, 132–134.
- Pic, M. (1913a). Coléoptères exotiques en partie nouveaux (suite). *L'Échange* **29**, 106–117.
- Pic, M. (1913b). 'Coleopterorum catalogus: Bruchidae. Pars 55. Vol. XXVI'. pp. 1–74. (W. Junk: Berlin.)
- Pic, M. (1926). Nouveautés diverses. *Mélange Exotico-Entomologiques* **47**, 1–32.
- Pic, M. (1931). Nouveautés diverses. *Mélange Exotico-Entomologiques* **57**, 1–36.
- Radford, I. J., Nicholas, M., and Brown, J. R. (2001). Assessment of the biological control impact of seed predators on the invasive shrub *Acacia nilotica* (prickly acacia) in Australia. *Biological Control* **20**, 261–268. doi:10.1006/bcon.2000.0903

- Ramos, R. Y., Kingsolver, J. M., and Romero-Nápoles, J. (2007). Sobre el estatus taxonómico actual de los brúquidos (Coleoptera: Bruchidae) en los Chrysomeloidea. *Dugesiana* **14**, 1–21.
- Redmon, S. G., Forrest, T. G., and Markin, G. P. (2000). Biology of *Bruchidius villosus* (Coleoptera: Bruchidae) on Scotch broom in North Carolina. *The Florida Entomologist* **83**, 242–253. doi:10.2307/3496342
- Reid, C. A. M. (1995). A cladistic analysis of subfamilial relationships in the Chrysomelidae *sensu lato* (Chrysomeloidea). In 'Biology, Phylogeny, and Classification of Coleoptera'. (Eds J. Pakaluk and S. A. Slipinski.) p. 1092. (Museum i Instytut Zoologii PAN: Warszawa, Poland.)
- Reid, C. (1996). More on the family Bruchidae. *Chrysomela Newsletter* **31**, 3.
- Reid, C. A. M. (2000). Spilopyrinae Chapuis: a new subfamily in the Chrysomelidae and its systematic placement (Coleoptera). *Invertebrate Taxonomy* **14**, 837–862. doi:10.1071/IT00042
- Ribeiro-Costa, C. S., and Almeida, L. M. (2009). Bruchinae (Coleoptera: Chrysomelidae). In 'Bioecologia e nutrição de insetos: base para o manejo integrado de pragas'. (Eds A. R. Panizi and J. R. P. Parra.) pp. 523–568. (Embrapa, Brasil.)
- Romero, J. N., and Johnson, C. D. (1999). *Zabrotes sylvestris*, a new species from the United States and Mexico related to *Z. subfasciatus* (Boheman) (Coleoptera: Bruchidae: Amblycerinae). *Coleopterists Bulletin* **53**(1), 87–98.
- Romero, J. N., and Johnson, C. D. (2000). Revision of genus *Zabrotes* Horn on Mexico (Coleoptera: Bruchidae: Amblycerinae). *Transactions of the American Entomological Society* **126**(2), 221–274.
- Romero, J. N., and Johnson, C. D. (2003). *Meganeltumius juani*, new genus, new species (Coleoptera: Bruchidae). *Coleopterists Bulletin* **57**(2), 237–242. doi:10.1649/549
- Romero, J., and Johnson, C. D. (2004). Checklist of the Bruchidae (Insecta: Coleoptera) of Mexico. *Coleopterists Bulletin* **58**(4), 613–635. doi:10.1649/694
- Say, T. (1831). 'Descriptions of North American Curculionidae and an arrangement of some of four known species agreeable to the method of Schöenherr'. (New Harmony, Indiana.)
- Schöenherr, C. J. (1839). 'Genera et species curculionidum, cum synonymia hujus familiae. Vol. 5'. (Lipsiae, Fleischer, Roret, Paris).
- Schrottky, C. (1906). Über die Lebensweise zweier *Pachymerus* (Bruchidae) und ihrer Parasiten. *Zeitschrift für Wissenschaftliche Insektenbiologie* **2**, 98–104.
- Sharp, D. (1885). Biologia Centrali-Americana. *Insecta. Coleoptera. Bruchidae*. **5**, 437–504.
- Silva, J. A. P., and Ribeiro-Costa, C. S. (2008). Morfologia comparada dos gêneros do grupo *Merobrychus* (Coleoptera: Chrysomelidae: Bruchinae): diagnoses e chave. *Revista Brasileira de Zoologia* **25**(4), 802–826. doi:10.1590/S0101-81752008000400021
- Silva, A. G. D. A., Gonçalves, C. R., Galvão, D. M., Gonçalves, A. J. L., Gomes, J., Silva, M. N., and Simoni, L. (1968). 'Quarto catálogo dos insetos que vivem nas plantas do Brasil, seus parasitos e predadores. 1º tomo. Insetos, hospedeiros e inimigos naturais. Parte II.' (Ministério da Agricultura, Laboratório Central de Patologia Vegetal. Rio de Janeiro).
- Southgate, B. J. (1979). Biology of the Bruchidae. *Annual Review of Entomology* **24**, 449–473. doi:10.1146/annurev.en.24.010179.002313
- Tuda, M., Rönn, J., Buranapanichpan, S., Wasano, N., and Arnqvist, G. (2006). Evolutionary diversification of the bean beetle genus *Callosobruchus* (Coleoptera: Bruchidae): traits associated with stored-product pest status. *Molecular Ecology* **15**, 3541–3551. doi:10.1111/j.1365-294X.2006.03030.x
- Turnbow, R. H. J., Cave, R. D., and Kingsolver, J. M. (2003). An annotated checklist of the Bruchidae of Honduras. *Ceiba* **44**(2), 269–278.
- Udayagiri, S., and Wadhi, S. R. (1989). Catalog of Bruchidae. *Memoirs of the American Entomological Institute* **45**, 80–83.
- Whitehead, D. R., and Kingsolver, J. M. (1975). Biosystematics of the North and Central American species of *Gibbobruchus* (Coleoptera: Bruchidae: Bruchinae). *Transactions of the American Entomological Society* **101**, 167–225.
- Zacher, F. (1952). Die Nahrungspflanzen der samenkafer. *Zeitschrift für angewandte Entomologie* **33**, 460–480. doi:10.1111/j.1439-0418.1952.tb00679.x