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Monographic revision of the genus *Aegidinus* Arrow (1904)
and generic phylogeny of the world Orphninae
(Coleoptera: Scarabaeidae: Orphninae).

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Monographic revision of the genus *Aegidinus* Arrow (1904)
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Abstract. A taxonomic revision was performed on the New World scarabaeoid genus *Aegidinus* Arrow (Coleoptera: Scarabaeidae: Orphninae). Twelve new species and three previously described species are included in the revision. Keys to New World genera, species of the genus *Aegidinus*, and distribution maps are provided. Phylogenetic analyses of the world genera of the Orphninae were conducted using 30 adult, morphological characters from representatives of 13 of the 14 genera and three out-group taxa. The subfamily Orphninae is a strongly supported monophyletic group (bootstrap support 88-90%) with respect to the chosen out-group. Characters that support the Orphninae are: mandibles not sickle shaped, molar surface on the mandibles present, lacinia present, and stridulatory comb present. Separate Old and New World lineages are also supported by the phylogeny, when two genera, *Goniorphnus* Arrow and *Stenosternus* Karsch, are excluded from the analysis. The new species described are: *Aegidinus cornutus* Colby, *A. crypticus* Colby, *A. howdenorum* Colby, *A. howeae* Colby, *A. oreibates* Colby, *A. petrovi* Colby, *A. simulatus* Colby, *A. sunidgea* Colby, *A. teamscaraborum* Colby, *A. tricornis* Colby, *A. unicus* Colby, and *A. venezuelensis* Colby.

Introduction

The Orphninae (Coleoptera: Scarabaeidae) are a small subfamily of scarab beetles. Arrow (1912) listed some 70 species in the entire subfamily, while Frolov (2005) included more than 100 species in Africa alone. Members of the Orphninae are found in the New World (four genera) and the Old World (ten genera) (Arrow 1912; Paulian 1984). The New World genera occur from southern Mexico to Bolivia, including some of the Caribbean Islands. The Old World genera occur from southern Europe to South Africa and east into Myanmar and Thailand.

Adult beetles range in size from 4 -17 mm and are almost exclusively brown or black. The characters commonly used to diagnose members of the Orphninae are mouthparts (labrum and mandibles) exposed beyond the clypeus (Fig. 1) and apical spines on the metatibia separated by the basal metatarsal segment (Fig. 2).

Larvae have been described for three Old World species: *Hybalus benoiti* Tourn, *Hybalus rotroi* Peyer (Paulian and Lumaret 1982), and *Chaetonyx robustus liguricus* Mariani (Barbero and Palestrini 1993). Larvae of the New World fauna are known from one species, *Aegidium cribratum* Bates (Morón 1991).

Little is known about the biology and ecology of the Orphninae. Adults and larvae have been observed feeding on the roots of sugar cane and potatoes in the Old World (Paulian and Lumaret 1982) and on decaying banana stems in the New World (Morón 1991).

The objectives of this work were to 1) construct a phylogenetic framework and place the Orphninae in the larger context of Scarabaeoidea, thus allowing the analysis of the relationships within and between orphnine genera, 2) test the hypotheses proposed by Paulian (1984) and Morón (1991) that the New and Old World genera arose from separate lineages, and 3) revise the New World genus *Aegidinus* Arrow.

Taxonomic History and Systematic Position

Erichson (1847) erected the family group name Orphnidae, which has been used by various authors at the family (Bates 1887; Paulian 1984) and subfamily levels (Arrow 1912; Lawrence and Newton 1995). I follow Lawrence and Newton (1995) and consider the group a subfamily of the Scarabaeidae.

Several analyses support the monophyly of the Orphninae (Scholtz and Chown 1995; Ahrens 2006; Hunt et al. 2007). Grebennikov and Scholtz (2004) identified five larval characters that support the monophyly of the Orphninae using *Aegidium cribratum* and *Chaetonyx robustus lurguricus* as exemplars.

Relationships of the Orphninae to other groups in the family Scarabaeidae are uncertain. Based on larval morphology, Paulian and Lumaret (1982) considered the Orphninae to be an intermediate between the 'laparostict' and 'pleurostict' scarabs based on a mix of primitive and derived characters. Scholtz and Chown (1995) placed Orphninae as sister to a clade that includes Melolonthinae, Dynastinae, Rutelinae, Osmoderminae, Cetoniinae, Cremastocheilinae, and Valginae. Hunt et al. (2007) placed the Orphninae in a clade with phytophagous, pleurostict scarabs (Melolonthinae, Cetoniinae, Rutelinae, and Dynastinae).

Paulian (1984) re-elevated the Orphninae as a family in the Scarabaeoidea and created two new subfamilies, the New World Aegidiinae and the Old World Orphninae. He based this division on the reduction of apical teeth on the mandibles as well as a short cardo on the maxilla in the New World Orphninae. Morón (1991) supported Paulian's proposed classification based on a comparison of larval morphology, but he considered the New World and Old World lineages to be tribes in the subfamily Orphninae.

Previous to the work herein, the hypothesis that the Old and New World Orphninae constituted separate lineages had not been tested using phylogenetic methods.

Paulian's (1984) work is the only comprehensive revision and key of the New World fauna. However, his revision included only the three previously described species of the genus *Aegidinus*, and the keys and descriptions included were perfunctory.

Methods and Materials

Specimens examined for this study (approximately 170) came from 18 institutional and five individual collections (acronyms follow Evenhuis 2008) as follows:

AMNH	American Museum of Natural History, New York, NY (Lee Herman)
BCRC	Brett C. Ratcliffe Collection, Lincoln, NE
BMNH	The Natural History Museum, London, England (Malcolm Kerley, Max Barclay)
CMNC	Canadian Museum of Nature, Ottawa, Canada (François Génier)
CNCI	Canadian National Collection of Insects, Ottawa, Canada (Pat Bouchard)
DCCC	David C. Carlson Collection, Fair Oaks, CA
EMEC	Essig Museum of Entomology, University of California Berkeley, CA (Cheryl Barr)
FMNH	Field Museum of Natural History, Chicago, IL (James Boone)
FSCA	Florida State Collection of Arthropods, Gainesville, FL (Paul Skelley)
HAHC	Henry and Anne Howden Collection, Ottawa, Canada (deposited at CMNC)
GMMC	Gérard Moragues Collection, Marseilles, France
INBC	Instituto Nacional de Biodiversidad (INBio), Santo Domingo de Heredia, Costa Rica (Angel Solís)
IRSB	Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium (Patrick Grootaert, Alain Drumont, Pol Limbourg)
JEWC	James E. Wappes Collection, San Antonio, TX
MIZA	Museo del Instituto de Zoología Agrícola, Maracay, Venezuela (Luis Joly)
MLJC	Mary Liz Jameson Collection, Wichita, KS
MNHN	Muséum National d' Histoire Naturelle, Paris, France (Olivier Montreuil)
QCAZ	Pontificia Universidad Católica del Ecuador, Quito, Ecuador (Florencio Maza, Clifford Kreill)
RDCC	Ronald D. Cave Collection, Port St. Lucie, FL
SEMC	Snow Entomology Museum, University of Kansas, Lawrence, KS (Michael Engel, Zack Falin)
TAMU	Texas A&M University, College Station, Texas (Edward Riley)
UMRM	W.R. Enns Entomology Museum, University of Missouri, Columbia, MO (Robert Sites)
UNSM	University of Nebraska State Museum, Lincoln, NE (Brett Ratcliffe)
USNM	United States National Museum (currently housed at UNSM; Brett Ratcliffe)

ZMHB Museum für Naturkunde de Humboldt Universität, Berlin, Germany (Johannes Frisch, Manfred Uhlig, Joachim Willers)

Measurements, Punctures, and Setae. Body length is measured as the distance from the anterior edge of the clypeus to the posterior apex of the elytra. Body width is considered the widest width on either the pronotum or elytra.

Puncture density is defined as sparse if there were more than two puncture diameters between punctures, moderate if 1-2 puncture diameters separated punctures, dense if there was less than one puncture diameter that separated punctures, and contiguous if the punctures were touching. Puncture size is defined as small if punctures were less than or equal to 0.023 mm in diameter, moderate if punctures were 0.024-0.053 mm in diameter, and large if punctures were 0.054 mm in diameter or larger. All measurements were taken using an ocular micrometer. Terms for describing punctures and surface sculpturing follows Harris (1974).

Size of setae is defined as small if the setae were less than 0.036 mm in length, moderate if the setae were between 0.037 and 0.180 mm, and large if the setae were longer than 0.180 mm. Setae are hair-like unless otherwise noted. In describing the number of setae or setose crenulations present adjacent to the humerus, the designations of left and right refer to the left and right sides of the beetle in dorsal view if the head of the beetle is anterior.

Surface Structures. A tubercle (Fig. 83) is defined as a small horn. A boss (Fig. 85) is a bump with no defined edges. A fovea (Fig. 87) is defined as a discrete declivity of the surface. A depression (Fig. 90) is defined as a dip below the surface level of the surrounding structure. A sulcus is defined as an impressed line. A tumosity (Fig. 86) is defined as a conical to subtriangular, raised area.

Terms for the female genital sclerites follow Woodruff and Beck (1989). Here, the interior process is a projection of the inferior plate. Occasionally, the superior plate has another sclerite attached to it; these sclerites are referred to here as accessory sclerites (Fig. 3-4). Terms for the male genitalia are adapted from Sharp and Muir (1912). The parameres (which are attached to the phallobase) are composed of the connected lateral and median lobes (Fig. 5). In some species, the lateral lobes (Fig. 6-7) have become folded or twisted and are positioned above the median lobes, which may be either exposed or partially concealed. Homologizing the genitalic structures was difficult, and thus these terms are used as a means of description rather than any sort of statement of homology.

Terminology for the mouthparts follows Nel and Scholtz (1990). Terminology for the wings follows Browne et al. (1993).

Descriptions, Locality Data, Maps, Temporal Distribution, and Label Data. To avoid repetition, generic characters are not included in species descriptions. For greatest possible data retrieval, new species descriptions include a description of the holotype and variation observed in the allotype and other paratypes.

For locality data, country names are indicated in capital letters, and state or province names are in bold type. The locality itself is next, followed by the district or province name or the distance the locality is from a larger town or city, if known, in parentheses. The number of specimens from each locality is given in parentheses after the locality. The number of specimens for each country is given after the country name.

Distribution maps are provided for each species. Specimens where only the country was known are represented by an open symbol on the map. Specimens with no locality data or unspecific locality data (e.g. "San Carlos") are not included on distribution maps.

Temporal data are presented in chronological order, with the number of occurrences in parentheses after the month.

Type labels are reproduced as exactly as possible in plain type. Specific epithets and genus names have been italicized. The start of a new label is indicated by a letter (a), label text is enclosed in quotes and lines of each label are separated by a double back slash (//), and labels are separated by a back slash (/). Several labels from IRSB are compound labels, that is, they are several different colored labels pasted onto each other. In these cases, the text of each separate label is in quotes, and the labels are separated by a back slash, but are considered to be one label. Their position relative to the main label is noted in the

description of the label. For example: a) "Collection // Jones" (printed on a pink rectangular label)/ "Ohio: Chagrin Falls" (handwritten, rectangular white label, pasted onto the right hand side of the pink label).

Dissections, Preparation of Specimens, and Type Specimens. Dissection is required to accurately identify individual specimens to species. The genitalia of both sexes are species specific and in the case of female specimens, the only means of identification. Male genitalia were either card mounted or preserved in glycerin in microvials pinned below the specimen. Female genitalia were generally left attached to the specimen, but in some cases are card mounted. Mouthparts (if removed) were card mounted. If removed, the left wing was glued to an archival card and pinned below the specimen. For the revision of *Aegidinus*, all type specimens were examined.

Species Concept. I follow the phylogenetic species concept as defined by Wheeler and Platnick (2002): "A species is the smallest aggregation of (sexual) populations or (asexual) lineages diagnosable by a unique combination of character states." Phylogenetic species are character-based hypotheses that make specific, testable hypotheses that can be evaluated with further observations.

PHYLOGENY OF THE WORLD GENERA OF ORPHNINAE

Taxon sampling

Thirteen of the 14 orphnine genera were obtained for character and phylogenetic analyses. Every attempt was made to use exemplars of the type species of each genus. However, in some cases, exemplars of the type species were unavailable. Additionally, identification of species in many genera is difficult because of a lack of keys or other identification guides. In these cases, specimens used were identified to genus (based on published descriptions) or determined by authorities in the group (Arrow, Frolov, Paulian). There are virtually no keys to identify females to species, and so characters were scored using male specimens.

Representatives of one genus, *Crainorphnus* Kolbe, were not available for study. The only specimens of *Goniorphnus* Arrow and *Stenosternus* Karsch available were types, and these exemplars were not dissected (except to remove the genitalia).

Three out-groups from the superfamily Scarabaeoidea were used: *Allidiostoma* spp. (Allidiostomatinae: Scarabaeidae), *Aclopus* spp. (Aclopininae: Scarabaeidae), and *Brenskea cornata* Reitter (Hybosoridae). *Allidiostoma* spp. and *Aclopus* spp. were chosen as out-groups based on their stable position as sister groups to the Orphninae in molecular (Smith and Hawks, unpublished) and morphologically based phylogenies (Ocampo 2006). Arrow (1912) included *Brenskea* in the Orphninae, whereas Ocampo (2006) placed *Brenskea* in the Pachyplectrinae (Hybosoridae) based on character evidence. To examine these relationship hypotheses, I included *Brenskea* in my analyses.

Phylogenetic Analysis

Totals of 30 adult morphological characters and 13 in-group taxa were included in these analyses (Appendix 1). All characters were discrete and unordered. If a character could not be scored (either due to no dissection or a damaged specimen), it was coded as "?". Two phylogenetic analyses were performed on these data. The first analysis was designed to test the monophyly of the Orphninae. All taxa were included, and the most parsimonious tree was sought using a heuristic search in PAUP 4.0b10 (Swofford 2002). Non-parametric bootstrap values (Felsenstein 1985) were obtained for the heuristic consensus tree using 100 bootstrap replicates per analysis, each with 200 random-taxon-addition replicates, and max trees set at 5000. The second analysis was designed to evaluate the existence of separate lineages for the Old and New World fauna and the relationships between orphnine genera. The analysis was performed as listed above, with *Stenosternus* and *Goniorphnus* excluded from the data set because of missing data for many characters. The most parsimonious tree was generated using a branch and bound analysis. Bootstrap values were computed for the consensus tree using the protocol listed above.

List of Taxa for the phylogenetic analyses**In-group Taxa**

<i>Aegidiellus alatus</i> (Laporte)	New World
<i>Aegidinus guianensis</i> (Westwood)	New World
<i>Aegidium colombianum</i> Westwood	New World
<i>Chaetonyx robustus</i> Schaum	Old World
<i>Goniorphnus felschei</i> Arrow	Old World
<i>Hybaloides foveolatus</i> Quedenfeldt	Old World
<i>Hybalus</i> sp.	Old World
<i>Madecorphnus falciger</i> (Lansberge)	Old World
<i>Orphnus bicolor</i> (Fabricius)	Old World
<i>Paraegidium costalimai</i> Vulcano, Pereira, and Martínez	New World
<i>Pseudorphnus coquereli</i> Fairmaire	Old World
<i>Stenosternus costatus</i> Karsch	Old World
<i>Triodontus nitidulus</i> (Guérin-Méneville)	Old World

Origin**Out-group Taxa**

<i>Aclopus</i> sp. (Aclopinæ: Scarabaeidae)	New World
<i>Allidiostoma</i> sp. (Allidiostomatinae: Scarabaeidae)	New World
<i>Brenskea coronata</i> Reitter (Hybosoridae)	Old World

Character analysis

In total, 30 adult morphological characters were included in these analyses (character matrix, Appendix 1). Twenty-five of these characters were binary and five were multi-state. Fourteen of these characters were from the head and its appendages, one was from the dorsal surface of the beetle, two were from the wings, six were from the legs, three were from the male genitalia, and three were from the ventral surface of the beetle.

Head

1. Number of antennal segments 9 (0); 10 (1).
2. Attachment of first antennal club segment to stem offset (0; Fig. 8); not offset (1; Fig. 9).
3. First antennal segment non-cupuliform (0); cupuliform (1). In this analysis, *Aclopus* is coded as non-cupuliform, because the first segment of the antenna of all of the specimens I examined did not appear to have a first segment that could accept the second segment.
4. Length of third segment of antennal club one-half the length of first segment (0); not one-half the length of first segment (1).

Mouthparts

5. Apical margin of labrum bifurcated (0); non-bifurcated (1).
6. Mandibles without single, external lateral lobe (0); with single, external lateral lobe (1; Fig. 10). State 1 is an autapomorphy for *Aegidinus*.
7. Mandibles sickle shaped, no internal teeth (0; Fig. 11); non-sickle shaped, with interior teeth (1; Fig. 10, 12).
8. Molar surface absent (0); present (1).
9. Mandibular prosthema absent (0); present (1; Fig. 12).
10. Mandibles symmetrical (0); asymmetrical (1). Character state 1 is an autapomorphy for *Madecorphnus falciger*.
11. Mesal mandibular brush absent (0); present (1; Fig. 12).
12. Second maxillary palpomere (counting from attachment to maxilla) widest at middle (0); apex (1). *Hybaloides* was scored as “?” because both palps were damaged.

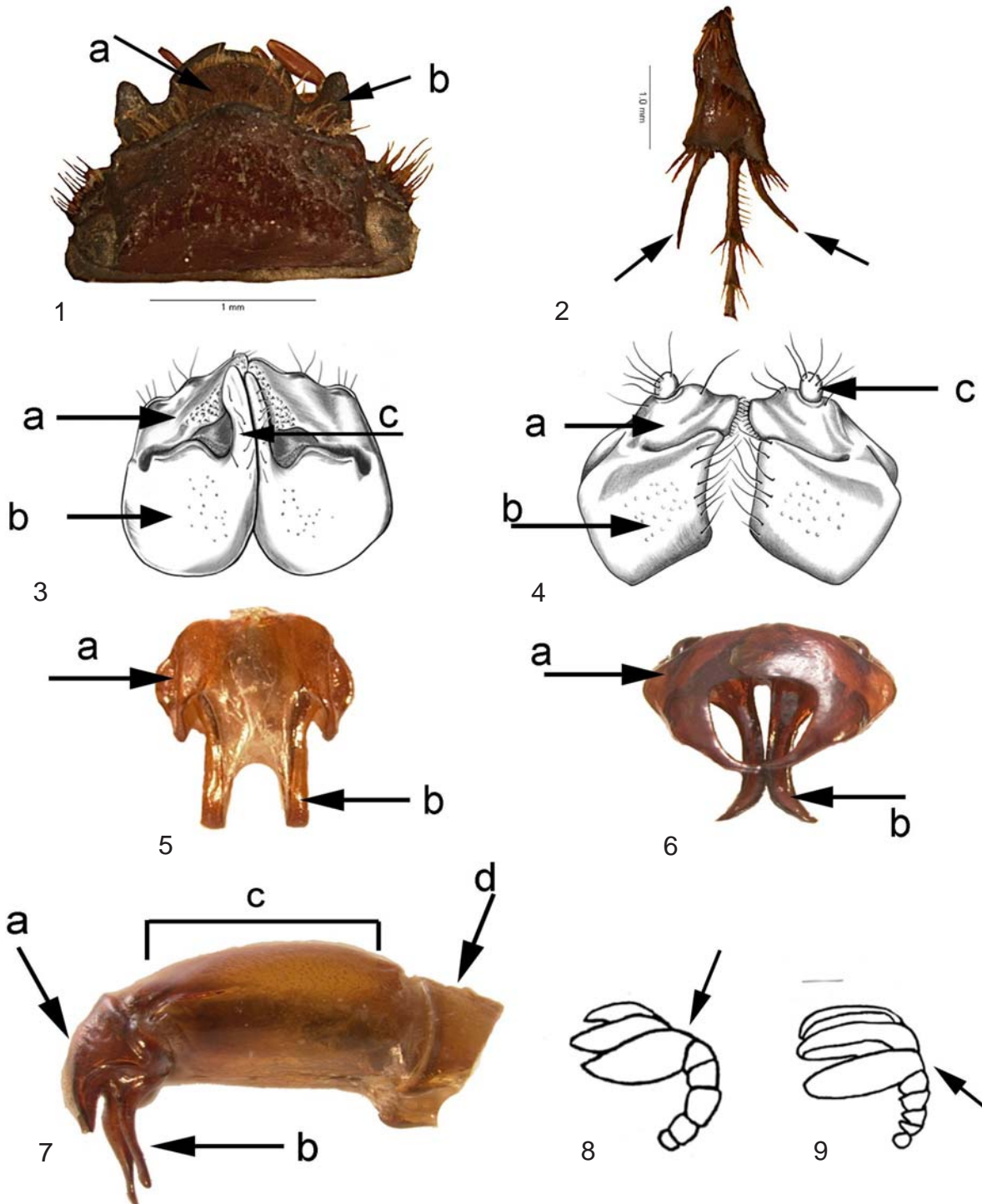


Figure 1-9. Scale bar = 1 mm. **1)** Mouthparts exposed beyond clypeus. a) Labrum exposed beyond edge of clypeus. b) Single, external, lateral lobe on mandibles. **2)** Apical spines of metatibia (indicated by arrows) separated by basal metatarsal segment. **3)** Female genital sclerites of *Aegidinus brasiliensis* Arrow. a) Superior sclerite. b) Inferior sclerite. c) Interior process. **4)** Female genital sclerites of *A. oreibates* Colby. a) Superior sclerite. b) Inferior sclerite. c) Accessory sclerite. **5)** Male parameres (frontal view) of *A. oreibates*. a) Lateral lobe. b) Median lobe. **6)** Male parameres (frontal view) of *A. brasiliensis*. a) Lateral lobe. b) Median lobe. **7)** Male parameres and phallobase (lateral view) of *A. guianensis* (Westwood). a) Lateral lobe. b) Median lobe. c) phallobase. d) Basal piece of phallobase. **8)** Attachment of first antennal club segment to stem offset (*Hybalus* sp.). **9)** Attachment of first antennal club segment to stem not offset (*Orphnus* sp.).

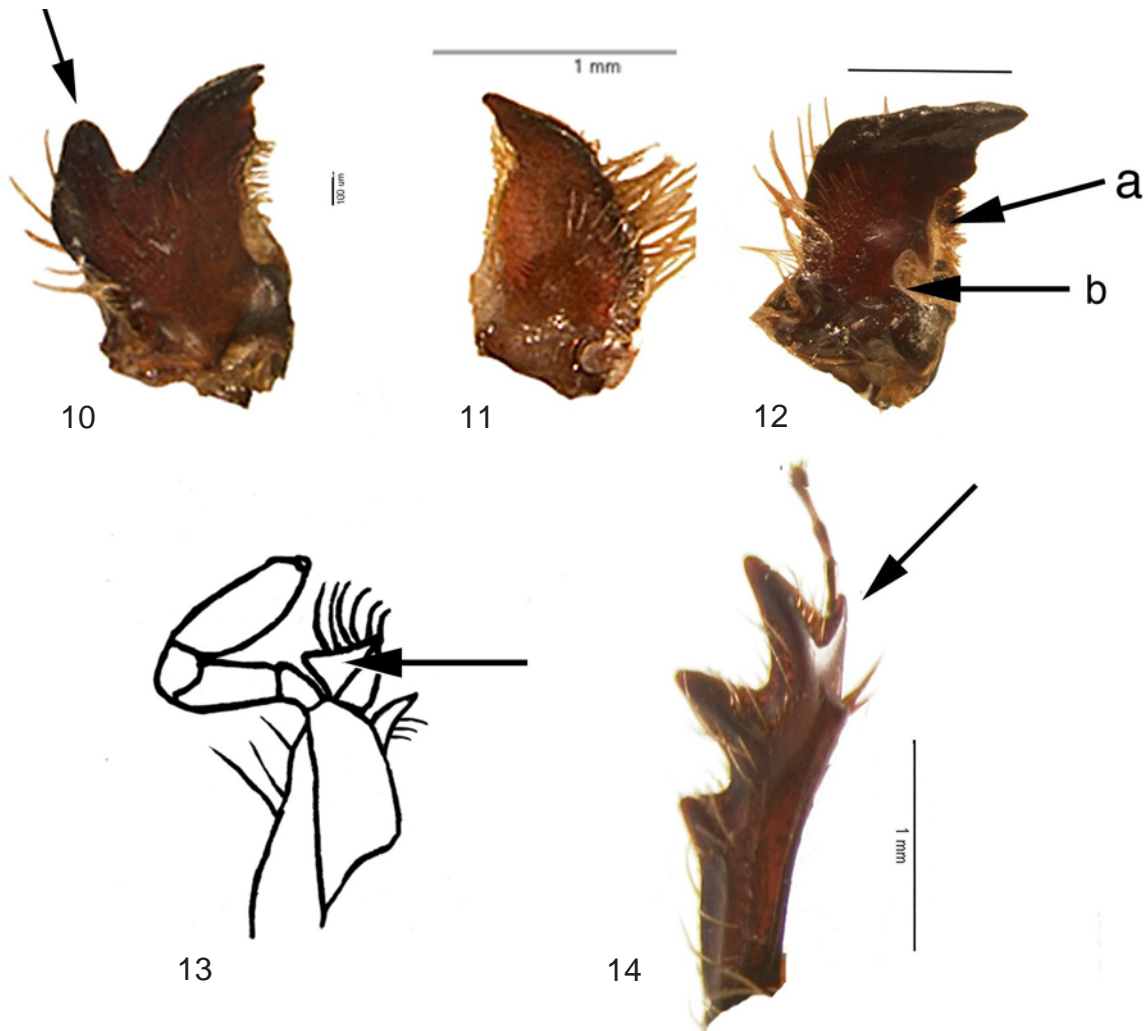


Figure 10-14. 10) Mandible of *Aegidinus* sp. Arrow indicates single, external, lateral lobe. Scale bar = 100 μ m. 11) Mandible of *Aclopus* sp. Scale bar = 1 mm. 12) Mandible of *Aegidium* sp. a) Mesal mandibular brush. b) Mandibular prosthema. Scale bar = 1 mm. 13) Galea of *Paraegidium* sp. Arrow indicates trapezoidal distagalea. 14) Protibia of *Aegidinus* sp. Arrow indicates apical denticle. Scale bar = 1 mm.

13. Lacinia present (0); absent (1).

14. Translucent distagalea absent or reduced (0); triangular (1); paddle shaped (2); trapezoidal (twice as wide as long) (3; Fig. 13).

Dorsal surfaces

15. Surface of elytra and pronotum setigerous (0); without setae (1).

Legs

16. Protibia with or without apical denticle (0); with apical denticle (1; Fig. 14). *Brenskea* is scored as “?” due to the difficulty of assessing homology between the apical denticle present in taxa such as *Aegidinus* and *Chaetonyx* and the possible apical denticle present in *Brenskea*.

17. Profemoral cleaning brush composed of a line of setae (0; Fig. 15); a patch of setae (1; Fig. 16); both a line and a patch of setae (2; Fig. 17).

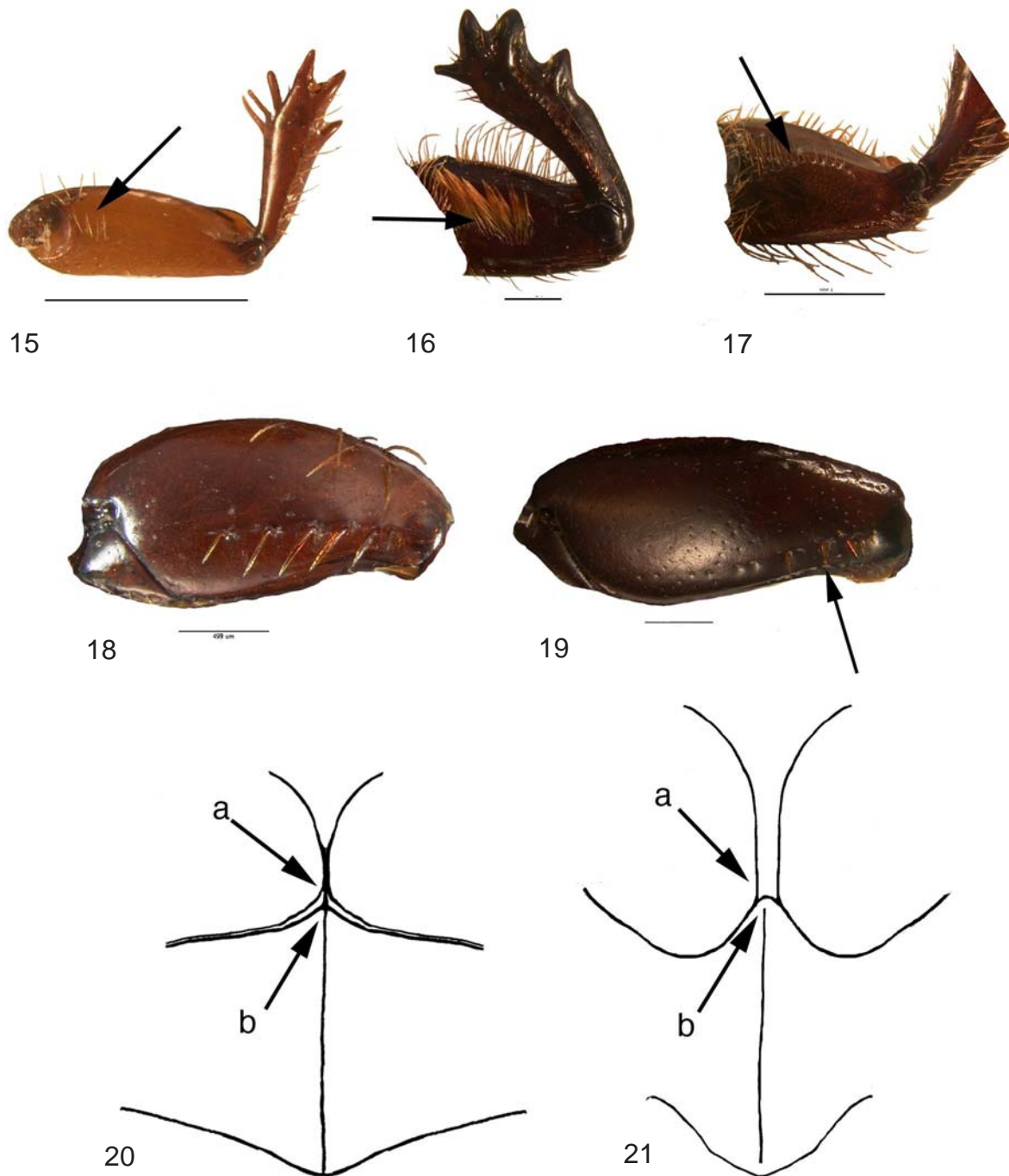
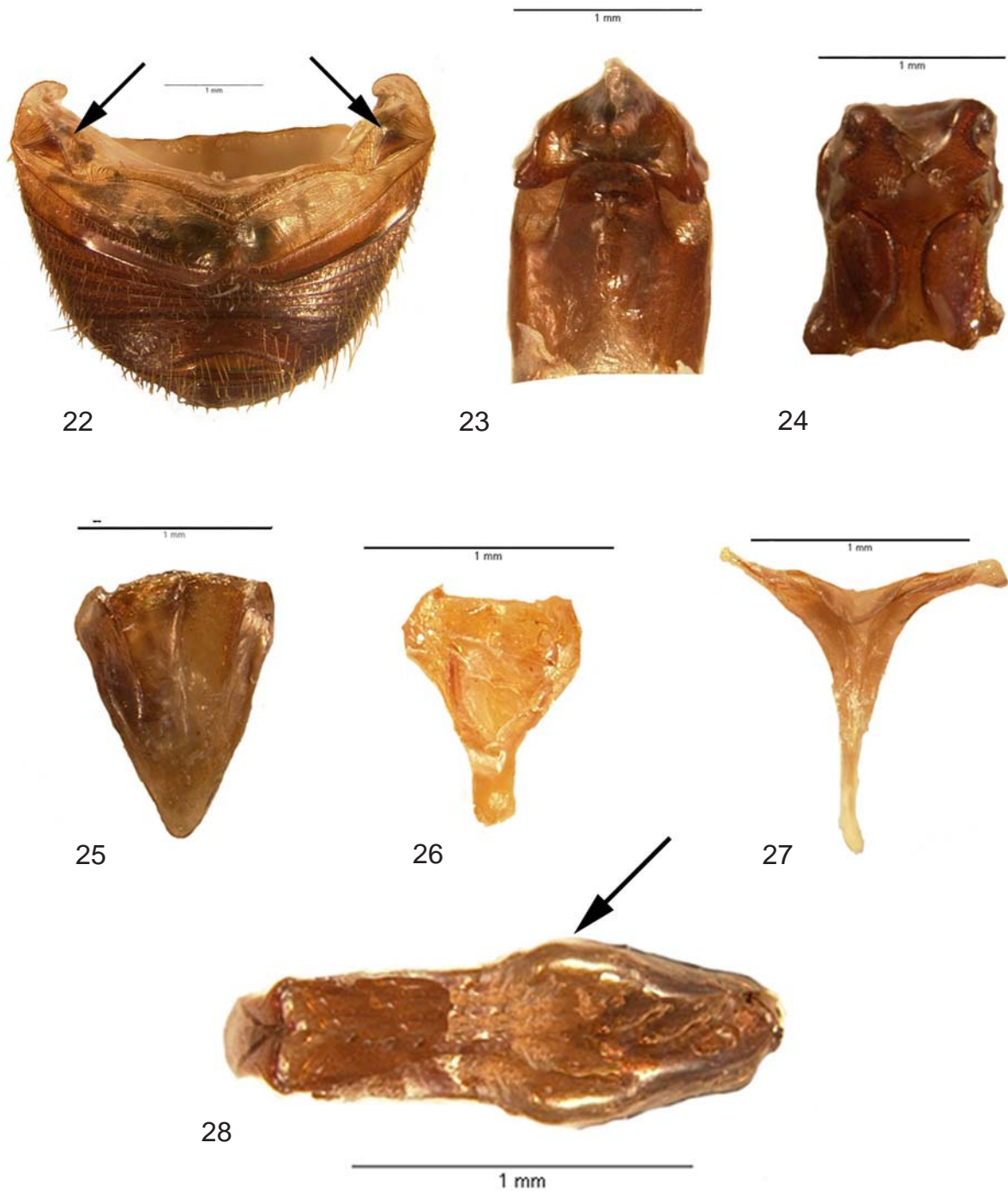


Figure 15-21. Scale bar = 1 mm. **15)** Prefemoral cleaning brush composed of a line of setae (*Madecorphnus* sp.). **16)** Prefemoral cleaning brush composed of a patch of setae (*Aegidium* sp.). **17)** Prefemoral cleaning brush composed of a line and a patch of setae (*Orphnus* sp.). **18)** Mesofemur without ridge along posterior edge (*Aegidiellus alatus*). **19)** Mesofemur with ridge along posterior edge; surface posterior to ridge minutely roughened (*Aegidium* sp.). Arrow indicates position of ridge. **20)** Ventral view of *Brenskeia coronata*. a) Mesocoxae contiguous. b) Meso-metasternum unsutured. **21)** Ventral view of *Orphnus* sp. a) Mesocoxae separated. b) Meso-metasternum sutured.

18. Tarsal claws absent on all legs (0); present on all legs (1). The specimen of *Hybaloides* had broken tarsomeres on all legs, and was scored as “?”.

19. Metatarsi reduced to spines (0); segmented as usual (1). Character state 0 is an autapomorphy for *Stenosternus*.



Figures 22-28. All scale bars = 1 mm. **22)** Abdomen of *Aegidinus* sp. Arrows indicate stridulatory combs. **23)** Completely sclerotized phallobase of *Aegidinus howdenorum* (ventral view). **24)** Incompletely sclerotized phallobase of *Hybalus* sp. (ventral view). **25)** Spiculum gastrale (*Orphnus* sp.) harp-shaped. **26)** Spiculum gastrale (*Chaetonyx robustus*) wishbone-shaped. **27)** Spiculum gastrale (*Aegidium* sp.) t-shaped. **28)** *Madecorphnus* sp. phallobase (dorsal view). Arrow indicates bulge.

20. Metatarsal spines inserted on either side of tarsal insertion (0); adjacent to each other (1).
 21. Mesofemur in ventral view without ridge along posterior edge, surface posterior to ridge not minutely roughened (0; Fig. 18); with ridge along posterior edge, surface posterior to ridge minutely roughened (1; Fig. 19).

22. Mesocoxae contiguous (0; Fig. 20); slightly separated (1; Fig. 21).

Wings

23. Leading edge of wing anterior of R2 lacking (wingless) (0); with setae (1); with pegs and setae (2).

24. Leading edge of wing distad of R2 lacking (wingless) (0); without setae (1); with setae (2).

Abdomen

25. Stridulatory combs on 1st abdominal sternite absent (0); present (1; Fig. 22).

Ventral Surface

26. Meso-metasternal border without suture (0; Fig. 20); with suture (1; Fig. 21).

Male genitalia

27. Apex of parameres without a patch of setae (0); with a patch of setae (1).

28. Venter of phallobase completely sclerotized (phallobase is a complete tube) (0; Fig. 23); incompletely sclerotized (phallobase is not a complete tube) (1; Fig. 24). Species with an incompletely sclerotized ventral surface of the phallobase sometimes have a membranous covering over the open portion of the base, which was scored as 1.

29. Spiculum gastrale harp-shaped (0; Fig. 25); wishbone-shaped, with central membrane (1; Fig. 26); T-shaped (2; Fig. 27).

30. Ratio of phallobase basal piece length to total length of phallobase less than 0.5 (0); 0.5 (1); more than 0.5 (2). In some genera, such as *Brenskea* and *Madecorhphnus*, the basal piece of the phallobase is not a separate segment. A distinct bulge or swelling is present (best seen in ventral view), and the top of this was considered as the top of the basal piece (Fig. 28). The basal piece of the phallobase is illustrated in Fig. 7.

Results

The heuristic search to evaluate the monophyly of the Orphninae (using all available taxa) yielded 99 trees of 69 steps (CI 0.536, RI 0.640). Four characters were parsimony uninformative. The strict consensus tree with bootstrap values is shown in Fig. 29 with areas of uncertainty collapsed into polytomies. A branch and bound analysis to test separate Old and New World lineages (excluding *Stenosternus* and *Goniorhphnus*) yielded eight trees of 63 steps (CI 0.571, RI 0.654). Four characters were parsimony uninformative. The strict consensus tree with bootstrap values is shown in Fig. 30, with areas of uncertainty shown as polytomies. Both strict consensus trees show a monophyletic Orphninae (which does not include *Brenskea*) supported by 90% and 88% bootstrap values, respectively. The strict consensus tree produced when *Stenosternus* and *Goniorhphnus* are excluded supports separate Old and New World clades.

Discussion

Monophyly of the Orphninae and the position of *Brenskea*. The results of both analyses support the Orphninae as a monophyletic group with respect to the out-groups (bootstrap values of 90% and 88%, respectively). The Orphninae is supported by four synapomorphies: mandibles not sickle shaped, with internal teeth (character 7:1); molar surface present (character 8:1); lacinia present (character 13:1); and stridulatory comb present (character 25:1). The results also support Ocampo's (2006) placement of *Brenskea* outside of the Orphninae.

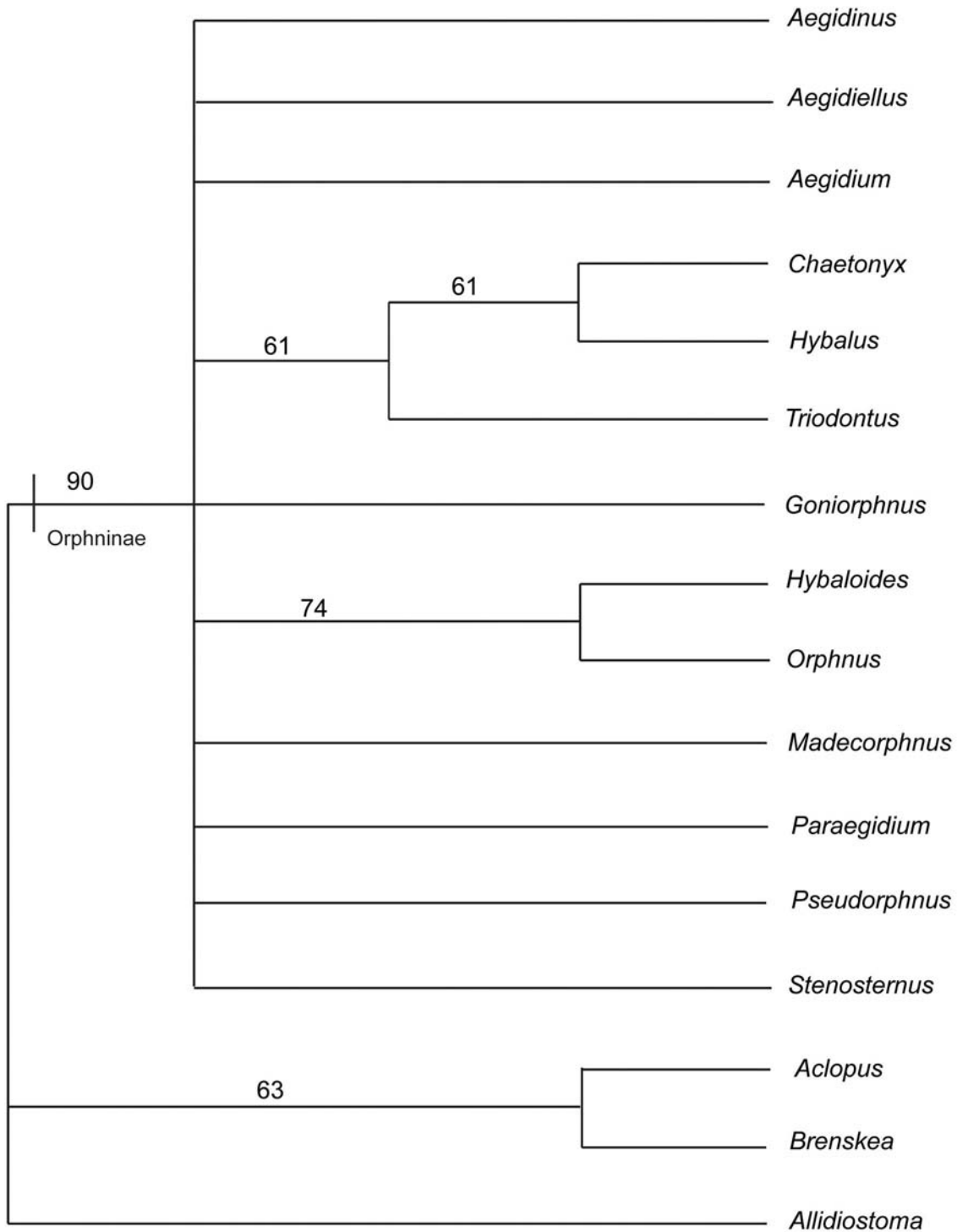


Figure 29. Strict consensus tree of the Orphninae, including all taxa. Boot strap values are shown on tree.

Separate lineages in the Old and New World. The second analysis supports Paulian’s (1984) and Morón’s (1991) hypotheses of separate Old and New World lineages. While there is not strong bootstrap support for either clade (60% for the New World, 58% for the Old World [in part]), there are several characters that support each clade. Characters that support the New World clade are: profemoral cleaning brush a patch of setae (character 17:1) (shared with the out-group); and one synapomorphy, venter of

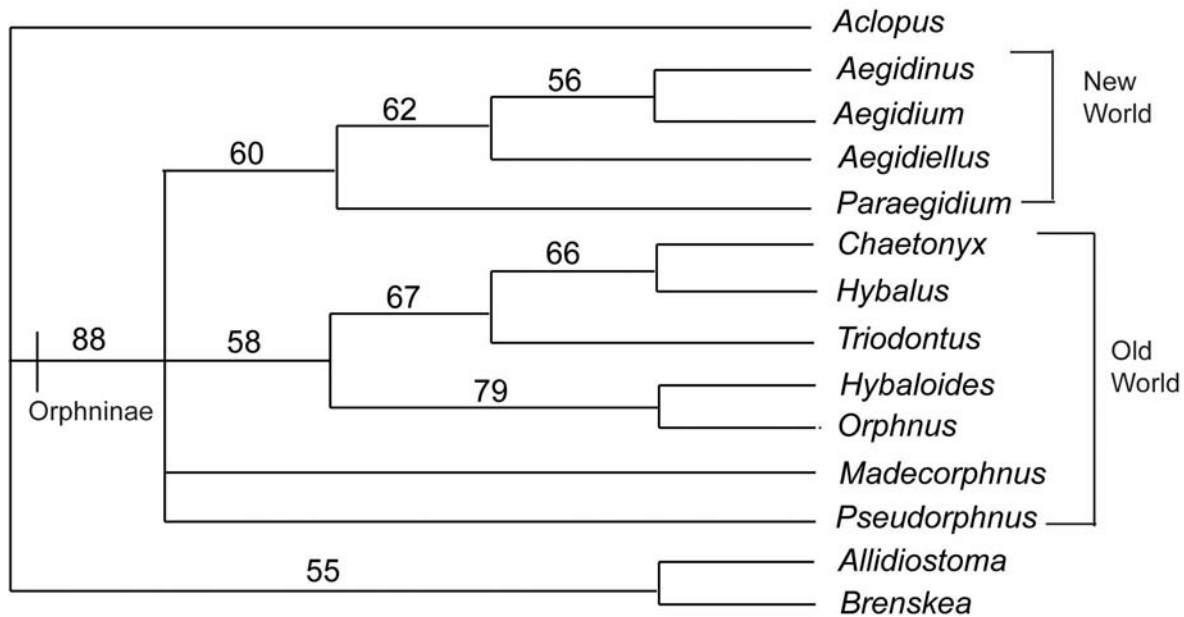


Figure 30. Strict consensus tree of the Orphninae showing separate Old and New World clades (excludes *Stenosternus costatus* and *Goniorphnus felschei*). Bootstrap values are shown on tree.

phallobase completely sclerotized (character 28:0). Characters that support the Old World clade are: apical margin of labrum bifurcate (character 5:0) (except for *Chaetonyx* and *Madecorphnus*, which do not have a bifurcated labrum and may represent a reversal); profemoral cleaning brush a line and a patch of setae (character 17:2) (except for *Madecorphnus* and *Pseudorphnus*, which have only a line of setae); leading edge of wing anterior to R2 with pegs and setae (character 23:2) (except for *Hybalus* and *Chaetonyx*, which are wingless, and *Madecorphnus* and *Pseudorphnus*, which only have setae; *Aegidinus* also has this character); venter of phallobase not completely sclerotized (character 28:1) (shared with the out-group).

Key to the genera of the Aegidiini

1. Clypeus reflexed, bifurcate in frontal view (Fig. 31), or slightly reflexed, but not bifurcate (females, minor males). Pronotum with dense punctures; punctures vermiform to U-shaped, setigerous (Fig. 32). Elytra with contiguous U-shaped punctures, each puncture with a seta in the center (Fig. 32). Length less than 8 mm. Brazil, Peru. (Fig. 32 and 33) ***Paraegidium* Vulcano, Pereira, and Martinez**
- Clypeus never reflexed and bifurcate in frontal view. Pronotum densely punctate to impunctate; punctures rarely vermiform to U-shaped, never setigerous. Elytra punctate to impunctate; punctures never contiguous and U-shaped or setose. Length 6-15 mm. (Fig. 34-37, 81, 83-87, 90-91) **2**
- 2(1). Labrum semicircular, exerted beyond clypeus (Fig. 1). Mandibles with single, external, lateral lobe (Fig. 1). South America and Trinidad. Length 6-12 mm. (Fig. 81, 83-87, 90-91) ***Aegidinus* Arrow**
- Labrum not exerted beyond clypeus; mandibles without external lateral lobe. (Fig. 34-37) **3**
- 3(2). Mesofemur (ventral view) (Fig. 19) with ridge along posterior edge; surface posterior to ridge minutely roughened in both males and females (may be more visible in males). Yucatan peninsula to Bolivia, including Dominica, St. Vincent, and Guadeloupe. Length 9-20 mm. (Fig. 34-35) .. ***Aegidium* Westwood**

- Mesofemur (ventral view) (Fig. 18) without ridge along posterior edge; surface smooth (Fig. 36-37). Coastal Brazil. Length 8-15 mm ***Aegidiellus Paulian***

***Aegidinus* Arrow 1904**

Aegidinus Arrow 1904:739

Type species. *Aegidinus guianensis* (Westwood), subsequent designation Paulian 1984.

Description. Scarabaeoidea, Scarabaeidae, Orphninae. *Color:* Reddish brown to piceous. *Form:* Body convex, oval, length 6.0-12.4 mm. Sides sub-parallel, pygidium never exposed beyond apices of elytra. *Head:* Surface aciculate, impunctate to rugopunctate; punctures sparse to dense, small to moderate. Frons convex in males or not, never convex in females. Frontoclypeal suture variably obsolete. Eye canthus setigerous; setae moderate in length and bristle-like or long and hair-like, reddish brown to testaceous. Anterior margin of clypeus armed with median horn (majors), tubercle (minors), or unarmed in some minors and all females. Base of declivous anterior edge of clypeus with fringe of short, slender, straw colored setae. Labrum elliptical to subquadrate, exerted beyond clypeus. Lateral and anterior margins of labrum setigerous; setae moderate in length, testaceous. Each mandible with a single, external, lateral lobe. Declivous lateral edges of mandibular lobes setigerous; setae moderate to long, tawny. *Pronotum:* Surface aciculate, never setigerous, always micropunctate; micropunctures sparse to dense, evenly distributed over surface. Surface variably punctate; punctures sparse to dense, small to large in size, occasionally umbilicate. Lateral margin weakly serrulate, setigerous; setae moderate to long, reddish brown, inserted in troughs of serrulations. Basal margin with variably complete bead, row of punctures, impressed line, or combination of previous. Females occasionally with median sulcus or depression anterior to basal margin. Disc with ovate to subtriangular fovea (major and some minor males) or depression (minor males and females) or not. In males, basolateral edge raised into carina (or not) or tumosities on each edge (major) or not (minors and females). Fovea or depression impunctate to punctate; punctures sparse to dense, small to large. Anterior margin of pronotum with median boss, tubercle, horn, or not. *Scutellum:* Shape subtriangular, apex rounded, typically impunctate. *Elytra:* Surface aciculate, micropunctate, punctures sparse to dense. Base of elytra with transverse row of U- or V-shaped, impressed lines with area anterior to line slightly raised (Fig. 78). Elytra with 5 variably complete, punctate striae from impressed sutural stria to humerus, punctures variable in size and shape. Lateral margin adjacent to humerus with 1-13 setose crenulations; setae reddish brown, long (Fig. 79). *Legs:* Each procoxa with 2 setose pits, 1 apical and 1 distal (Fig. 80). Protibia with 3 lateral teeth; apical denticle (Fig. 13) present in males or not (never present in females). Metatibial spinules arranged in transversely oblique rows. *Venter* (Fig. 81): Prosternum carinate-rugose and setigerous at base and apex; setae tawny anteriorly, reddish brown elsewhere, moderate to long; smooth medially, not setigerous. Posterior prosternal process long, columnar, slender, setigerous or a short, reflexed, flattened ridge (some minor males); setae reddish brown to tawny, long. Anterior prosternal process produced into rounded knob, knob setigerous; setae reddish brown, moderate to long. Proepimeron with longitudinal carina; carina setigerous; setae tawny, moderate to long. Mesepimeron apicolaterally weakly bulbous, rugose, setigerous; setae reddish brown, moderate in length. Metasternum smooth medially. Metepimeron and sides of metasternum irregularly rugose or rugulose, setigerous; setae reddish brown, moderate to long. Metacoxae carinate rugose, setigerous; setae reddish brown, moderate in length. Abdominal sternites strongly narrowed medially, completely variolate; setigerous; setae tawny, moderate in length. *Pygidium:* Surface concentrically imbricate to variolate, setigerous; setae tawny, moderate in length. In lateral view, surface evenly convex.

Diagnosis. The genus *Aegidinus* is distinguished from the other New World and World genera by the presence of a single, external, lateral lobe on each mandible, which is unique to this genus.

Distribution. Specimens are known from Colombia, Trinidad, Venezuela, Guyana, French Guiana, Ecuador, Peru, Brazil, and Bolivia.

Composition. As circumscribed here, the genus includes 15 species, 12 of which are new.

Key to *Aegidinus* Species (Males)

For a description of terms applied to genitalia, refer to the Materials and Methods section and Fig. 5-6. Sternite six in males is emarginated, but entire in females.

1. Protibia with apical denticle (Fig. 14). Phallobase with or without ventral plate (Fig. 42, 48, 54, 60). 4
- Protibia without apical denticle. Phallobase without ventral plate. 2

- 2(1). Parameres not broad, flattened, and paddle-like. Lateral lobes folded over and partially concealing median lobes (Fig. 6, 38-39, 56-57). 3
- Parameres broad, flattened, and paddle-like. Lateral lobes not folded over and partially concealing median lobes (Fig. 44-45) ***A. cornutus* Colby, n. sp.**

- 3(2). Parameres with sickle-shaped anterior angles of lateral lobes touching medially. (Fig. 6, 38) ***A. brasiliensis* Arrow**
- Parameres with sickle-shaped anterior angles of lateral lobes not touching medially (Fig. 56) ... ***A. howeae* Colby, n. sp.**

- 4(1). Phallobase with ventral plate (Fig. 42, 48, 54, 60) 5
- Phallobase without ventral plate (Fig. 50-51, 61-64) 8

- 5(4). Parameres (especially median lobes) twisted (Fig. 40-43) ***A. candezei* (Preudhomme de Borre)**
- Parameres (especially median lobes) not twisted (Fig. 46-55, 58-64) 6

- 6(5). Ventral plate generally rectangular at apex (Fig. 60), usually more than 6 times longer than wide (width measured at suture to phallobase); median lobes stout at apices (Fig. 58) ***A. oreibates* Colby, n.sp.**
- Ventral plate rounded (Fig. 48, 54), less than 5 times as long as wide; median lobes slender at apices (Fig. 46, 52) 7

- 7(6). Lateral lobe of each paramere with notch in lateral view (Fig. 55) ***A. howdenorum* Colby, n.sp.**
- Lateral lobe of each paramere without notch in lateral view (Fig. 49) ***A. crypticus* Colby, n.sp.**

- 8(4). Lateral lobe of each paramere positioned above median lobes (Fig. 50-51) ***A. guianensis* (Westwood)**
- Lateral lobe of each paramere not positioned above median lobes (Fig. 61-64) 9

- 9(8). Median lobe of each paramere longer than lateral lobe in lateral view (Fig. 64); length of entire phallobase less than 3 mm. ***A. teamscaraborum* Colby, n. sp.**
- Median lobe of each paramere not longer than lateral lobe in lateral view (Fig. 62); length of entire phallobase greater than 3 mm. ***A. petrovi* Colby, n. sp.**

Key to *Aegidinus* Species (Females)

For a description of the terms applied to the female genital sclerites, see Materials and Methods and Fig. 3-4. Sternite six in females is entire, but is emarginated in males.

1. Inferior sclerite with interior process produced into finger-like projections (Fig. 65, 67, 69), or inferior sclerite folded around and almost covering superior sclerite (Fig. 71) 2
 — Inferior sclerite with interior process not produced into finger-like projections (Fig. 66, 68, 70, 72-77), or inferior sclerite folded over and completely or almost completely covering superior sclerite (Fig. 71) 4
- 2(1). Finger-like projections of inferior sclerite less than twice as long as wide (Fig. 67) *A. guianensis* (Westwood)
 — Finger-like projections of inferior sclerite more than twice as long as wide (Fig. 65, 69) 3
- 3(2). Anterior margin of inferior sclerite with ridge (Fig. 65) *A. brasiliensis* Arrow
 — Anterior margin of inferior sclerite without ridge (Fig. 69) *A. howeae* Colby, n. sp.
- 4(1). Inferior plate folded over and almost or completely covering superior sclerite. (Fig. 71)
 *A. simulatus* Colby, n.sp.
 — Inferior plate never folded over, covering superior plate 5
- 5(4). Accessory sclerites projecting from face of fused inferior and superior sclerite. (Fig. 75)
 *A. tricornis* Colby, n.sp.
 — Accessory sclerites (if apparent) projecting anteriorly from apical margin of superior sclerite. Superior and inferior sclerites completely fused, partially fused, or unfused 6
- 6(5). Interior margins of superior plate produced into a spinulose bulb. (Fig. 76)
 *A. unicus* Colby, n.sp.
 — Interior margins of superior plate not produced into a bulb. Accessory sclerites present or apparently absent 7
- 7(6). Superior and inferior sclerites fused along entire length, with no visible suture; accessory sclerites present or apparently absent (Fig. 73-74) *A. teamscaraborum* Colby, n.sp.
 — Superior and inferior plates not fused along entire length; accessory plates always present 8
- 8(7). Each superior sclerite with a central, circular boss located just above inferior sclerite (Fig. 72).
 *A. sunidigea* Colby, n.sp.
 — Superior sclerites without circular boss 9
- 9(8). Superior plate much shorter than inferior plate (Fig. 70) *A. oreibates* Colby, n.sp.
 — Superior plate larger than or equal in size to inferior plate; superior plate sub-quadrate to rectangular in shape (Fig. 66, 68, 77) 10
- 10(9). Superior plate with transverse ridge (Fig. 66) *A. candezei* Preudhomme de Borre
 — Superior plate without transverse ridge 11
- 11(10). Spinulose region at interior margin of superior plate projecting downwards (Fig. 77)
 *A. venezuelensis* Colby, n.sp.
 — Spinulose region at interior margin of superior plate projects inwards (Fig. 68)
 *A. howdenorum* Colby, n.sp.

Aegidinus brasiliensis Arrow, 1904 Fig. 6, 38-39, 65, 82

Aegidinus brasiliensis Arrow 1904: 739.

Type Material. Holotype male and one paratype (labeled as female; actually a minor male) from Ega, Brazil examined (BMNH).

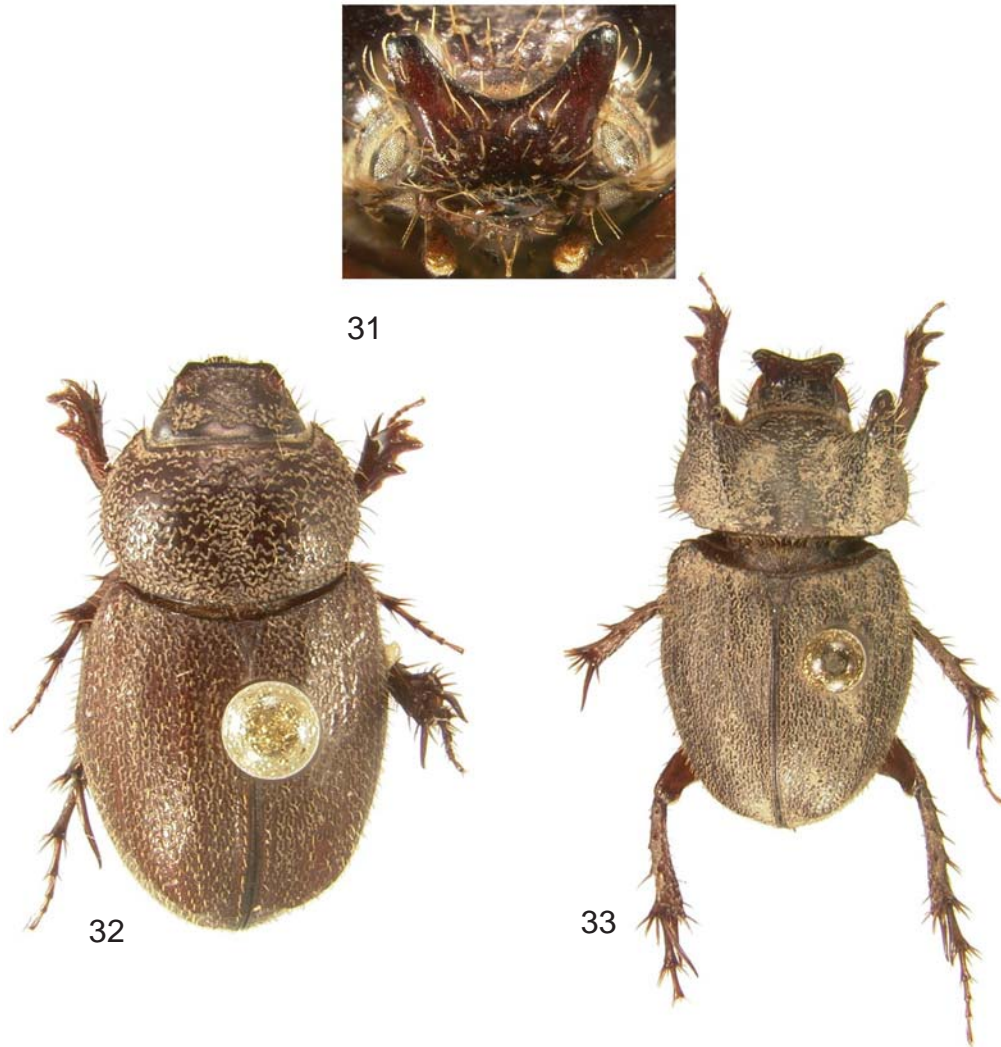


Figure 31-33. *Paraegidium costalimai*. **31)** Clypeus (frontal view). **32)** Dorsal habitus of female. Note vermiform punctures on pronotum and U- shaped punctures on elytra. **33)** Dorsal habitus of male.

Description. Male. (n = 10) Length 7.6-11.7 mm; width 4.3-5.7 mm. Color: Head, pronotum, and elytra black, piceous, or reddish brown. Legs and venter reddish brown. *Head:* Frons concave medially, punctate; punctures sparse, small. Frontoclypeal suture obsolete. Clypeus punctate, punctures sparse, small. Anterior margin of clypeus with erect, median horn (major) or tubercle (minor); carina (major) or carinula (minor) extending from base of horn laterally to each eye canthus. *Pronotum:* Surface punctate; punctures moderately dense to dense, moderate to large, occasionally umbilicate, concentrated on sides. Basal margin with partially effaced bead and complete to incomplete row of punctures (punctures may be obsolete adjacent to scutellum; punctures oblong to round, generally one puncture width apart. Disc with subtriangular fovea (major) or oval depression (minor), basolateral edge raised into carina or low, rounded tumosity on either side (major) or not (minor). Fovea or depression punctate; punctures sparse to dense, moderate in size, occasionally transverse. Anterior margin of pronotum with median, subquadrate tubercle (major) or smaller, raised boss (minor). *Elytra:* Punctures of striae vermiform, elongate, U-, V-, J-, or reverse J-shaped. Striae 1 and 2 obsolete at base. Lateral margin adjacent to humerus with 9-13 setose crenulations. *Legs:* Protibia without apical denticle. *Genitalia:* Fig. 6, 38-39.

Female (n = 17). Length 7.5-10.7 mm; width 4.2-5.7 mm. Females differ from males in the following respects: *Head:* Frons not concave, impunctate to punctate; punctures sparse to moderately dense, small.

Anterior margin of clypeus without horn or tubercle. *Pronotum*: Basal margin with bead and row of punctures; punctures obsolete in middle third. Disc with oval to transversely oval depression or not. Anterior margin without median boss or tubercle. *Elytra*: Lateral margin adjacent to humerus with 6-12 setose crenulations. *Genitalia*: Fig. 65.

Diagnosis. *Aegidinus brasiliensis* is best distinguished using male (Fig. 6, 38-39) and female genitalia (Fig. 65). The genitalia of this species are similar in appearance to those of *A. howeae*, but the two are easily separated. The female genitalia of *A. brasiliensis* have a ridge on the anterior border of the inferior sclerite which is absent in *A. howeae* (Fig. 69). In males, the length of the sickle shaped anterior angle of the lateral lobes is diagnostic. The lateral lobes are long enough to touch medially in *A. brasiliensis* but are much shorter (and not touching) in *A. howeae* (Fig. 56-57).

Distribution (Fig. 82). Guyana, Brazil. Twenty-seven specimens from BMNH, HAHC, UNSM, and SEMC: BRAZIL (7): **Amazonas**: Ega (2); Rio Madeira (Borba) (1); Reserva Ducke (26 km NE Manaus) (3). **Rondonia**: Porto Velho (BR 319, km 866) (1). GUYANA (19): **Potaro-Siparuni**: Iwokrama Forest Reserve (12); Iwokrama Forest, Turtle Mt. Base Camp (1); Iwokrama Field Station (1 km W Kurupukari) (6). UNKNOWN (1): Amazon (1).

Temporal Distribution. January (1), May (4), May-June (15).

Natural History. Specimens were collected from elevations between 50-200 m.

***Aegidinus candezei* (Preudhomme de Borre, 1886)**

Fig. 40-43, 66, 82

Orphnus candezei Preudhomme de Borre 1886:116.

Aegidinus candezei (Preudhomme de Borre): Arrow 1912: 31.

Type Material. Male holotype and female paratype from Choco, Colombia (IRSB). Examined.

Description. Male. (n = 3) Length 9.8-11.1 mm; width 5.4-6.2 mm. *Color*: Surface reddish brown. *Head*: Frons weakly concave medially, impunctate at base, with moderately dense, small punctures apically. Frontoclypeal suture obsolete. Clypeus with surface rugopunctate. Anterior margin with attenuate, slightly recurved horn projecting approximately 70° from plane of head; carina extending from base of horn laterally to each eye canthus. *Pronotum*: Surface with a few sparse, large punctures on sides. Basal margin with row of punctures, punctures less than 1 puncture width apart, becoming weak to obsolete in median third. Disc with fovea divided by slightly elevated, longitudinal line, posterior edge bordered on either side by an erect, large, subtriangular, obliquely compressed tumosity. Anterior margin with median boss. *Elytra*: Punctures of striae round, C-, U-, or kidney-shaped. Striae 2 and 4 variably obsolete, often half way to apical umbone. Lateral margin adjacent to humerus with 1-3 setose crenulations. *Legs*: Protibia with apical denticle. *Genitalia*: Fig. 40-43.

Female. (n = 1) Length 8.4 mm; width 5.0 mm. The female differs from the males in the following respects: *Head*: Surface not convex. Frons impunctate at base, becoming rugopunctate apically. Clypeus rugopunctate; anterior margin of clypeus without horn and with weak bead. *Pronotum*: Disc with small, round depression. *Elytra*: Lateral margin adjacent to humerus with 3 setose crenulations. *Legs*. Protibia lacks apical denticle. *Genitalia*: Fig. 66.

Diagnosis. *Aegidinus candezei* is best distinguished from other species by the form of the male and female genitalia. The twisting of the male parameres (especially the median lobes, Fig. 40-43) is unique. The female genitalia resemble those of *A. howdenorum* and *A. venezuelensis*. Females of *A. candezei* (Fig. 66) have a longitudinal carina on the superior sclerite which is absent in both *A. howdenorum* (Fig. 68) and *A. venezuelensis* (Fig. 77).

Distribution (Fig. 82). Colombia. Four specimens examined from IRSB, MNHN. COLOMBIA (2): Choco (2). UNKNOWN: San Carlos (2).

Temporal Distribution. No data.

Natural History. Nothing is known about the natural history of this species.

Remarks. The holotype bears a label that reads “Colombie, Choco Wallis”. Gustav Wallis (1830-1878) was a German collector who was employed by both J. Linden (a Belgian nursery) and J. Veitch and Sons Ltd. (a British nursery). He collected in Ecuador and Colombia and is known to have traveled in the Choco region (a cycad endemic to the area, *Zamia wallisi* Veitch ex A. Br., was discovered by him and is named for him) (Veitch 1906). It is plausible that Gustav Wallis was the collector.

***Aegidinus cornutus* Colby, new species**

Fig. 44-45, 82-83

Type material. Holotype male at HAHC labeled: a) “Sinop 12°31' S, 55°37' W // BR 163 km 500 a 600 / Mato Grosso, Brasil // 350 m IX.1974 // Alvarenga & Roppa col.” (printed, rectangular label)/ b) “Coleção // M. Alvarenga” (printed, rectangular label)/ c) “H. & A. Howden Collection ex. A. Martinez coll.” (printed, rectangular label with a black border)/ d) my handwritten type label.

One paratype male at HAHC labeled: a) “Oct. 9 76 // Brasil // Minas Gerais // Sinópolis // Alvarenga-leg. // Coll. Martínez” (handwritten on a rectangular label)/ b) “H. & A. Howden Collection ex. A. Martinez coll.” (printed, rectangular label with a black border)/ c) “*Aegidinus* n. sp // Det. F. C. Ocampo 2005” (handwritten and printed, rectangular label with a black border)/ d) my printed paratype label.

Type Locality. Brazil, Mato Grosso, Sinop.

Description. Holotype male (Fig. 83). Length 11.5 mm; width 6.4 mm. *Color:* Head, pronotum and elytra black to piceous. Venter and legs piceous to reddish brown. *Head:* Frons moderately convex medially, punctate; punctures sparse, small. Frontoclypeal suture obsolete. Clypeus moderately densely punctate, punctures small to moderate. Anterior margin of clypeus produced into slightly reflexed, subtriangular, erect or nearly erect horn with carina extending from base of horn to each eye canthus. *Pronotum:* Surface punctate; punctures moderately dense, moderate to large in size, concentrated on sides. Basal margin with impressed line and row of punctures. Disc of pronotum with transverse, oval, punctate fovea; punctures moderately dense to dense, occasionally contiguous, moderate to large in size, occasionally transverse. Anterior margin of pronotum with median, laterally compressed horn; apex broadly truncate and weakly emarginate. *Elytra:* Punctures of striae elongate or slightly vermiform, occasionally V-shaped at base. Stria 1 obsolete near base. Stria 2 obsolete halfway to apical umbone, with a few punctures at base. Lateral margin adjacent to humerus with 9 (right) or 10 (left) setose crenulations. *Legs:* Protibia without apical denticle. *Genitalia:* Fig. 44-45.

Paratype. One male. Length 10.7 mm; width 5.7 mm. The paratype differs from holotype in the following respects: *Color:* Reddish brown. *Pronotum:* Horn on anterior margin smaller, apex not emarginate. *Elytra:* Elytral punctures generally elongate, rarely vermiform or V-shaped; lateral margin adjacent to humerus with 6 (right) or 7 (left) setose crenulations.

Diagnosis. Male genitalia (Fig. 44-45) are the primary means of identification for this species and are unique in form. The two type specimens examined both have pronounced pronotal horns, which is unique to this species. It is unclear if a minor male or female would have this character. Females are not known for this species.

Etymology. From the Latin “*cornutus*”, meaning bearing horns or horned, in reference to the unique pronotal horn of this species.



34



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36



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Figures 34-37. 34) *Aegidium* sp. male dorsal view. 35) *Aegidium* sp. female, dorsal view. 36) *Aegidiellus alatus* male, dorsal view. 37) *Aegidiellus alatus* female, dorsal view.

Distribution (Fig. 82). Brazil. Two specimens examined from HAHC. BRAZIL (2): **Mato Grosso:** Sinop (BR 163 km 500 a 600) (1). **Minas Gerais:** Sinópolis (1).

Temporal Distribution. September (1), October (1).

Natural History. The holotype was collected at an elevation of 350 m.

***Aegidinus crypticus* Colby, new species**

Fig. 46-49, 84-85, 88

Type material. Holotype male at USNM labeled: a) "Guyana: Mazaruni //-Potaro District; // Kartabo Point // 27 December 1982 // W.E. Steiner" (printed, rectangular label)/ b) "*Aegidinus* n.sp // Det F.C. Ocampo 2005" (handwritten and printed on a rectangular label with a black border)/ c) my handwritten holotype label.

Type Locality. Guyana, Cuyuni-Mazaruni District, Kartabo Point.

Description. Holotype male (Fig. 84-85). Length 7.5 mm; width 3.9 mm. *Color:* Head, pronotum and elytra black to piceous. Legs and venter piceous to reddish brown. *Head:* Frons punctate to rugopunctate; punctures moderately dense to dense, small. Frontoclypeal suture obsolete. Clypeus punctate, becoming rugopunctate near eye canthus; punctures sparse, small. Anterior margin with marginal bead and small, slightly reflexed, median tubercle at apex; area behind tubercle tumid. *Pronotum:* Surface punctate; punctures moderately dense to dense, occasionally contiguous, moderate to large, concentrated on sides. Basal margin with bead and row of punctures, both becoming obsolete medially. Disc with shallow, punctate, suboval fovea; punctures sparse to dense, large. Anterior margin of pronotum with small, median boss. *Scutellum:* Surface divided longitudinally by impressed line. *Elytra:* Punctures of striae elongate, vermiform, V-, or U-shaped. All striae complete. Lateral margin adjacent to humerus with 4 setose crenulations. *Legs:* Protibia with apical denticle. *Genitalia:* Fig. 46-49.

Diagnosis. This species is best distinguished from other species using the form of the male genitalia (Fig. 46-59). The genitalia of this species are very similar to those of *A. oreibates* and *A. howdenorum*. The median lobes in *A. crypticus* (Fig. 46) are longer and thinner than in *A. oreibates* (Fig. 58). The shape of the ventral plate at the apex is much rounder in *A. crypticus* (Fig. 48) than in *A. oreibates* (Fig. 60). *Aegidinus crypticus* does not have a notch on the lateral margin of the lateral lobe (best seen in lateral view, Fig. 49), which is present in *A. howdenorum* (Fig. 55) but not *A. crypticus*. There are no females known for this species.

Etymology. From the Greek "*krypto*", meaning to hide, cover, or conceal, in reference to the difficulty in distinguishing this species from *A. oreibates* and *A. howdenorum*.

Distribution (Fig. 88). Guyana. One specimen examined from USNM. GUYANA (1): **Cuyuni-Mazaruni District:** Kartabo Point. Note: the Mazaruni-Potaro district was split in 1980. Today, Kartabo Point is in the Cuyuni-Mazaruni district.

Temporal Distribution. December (1).

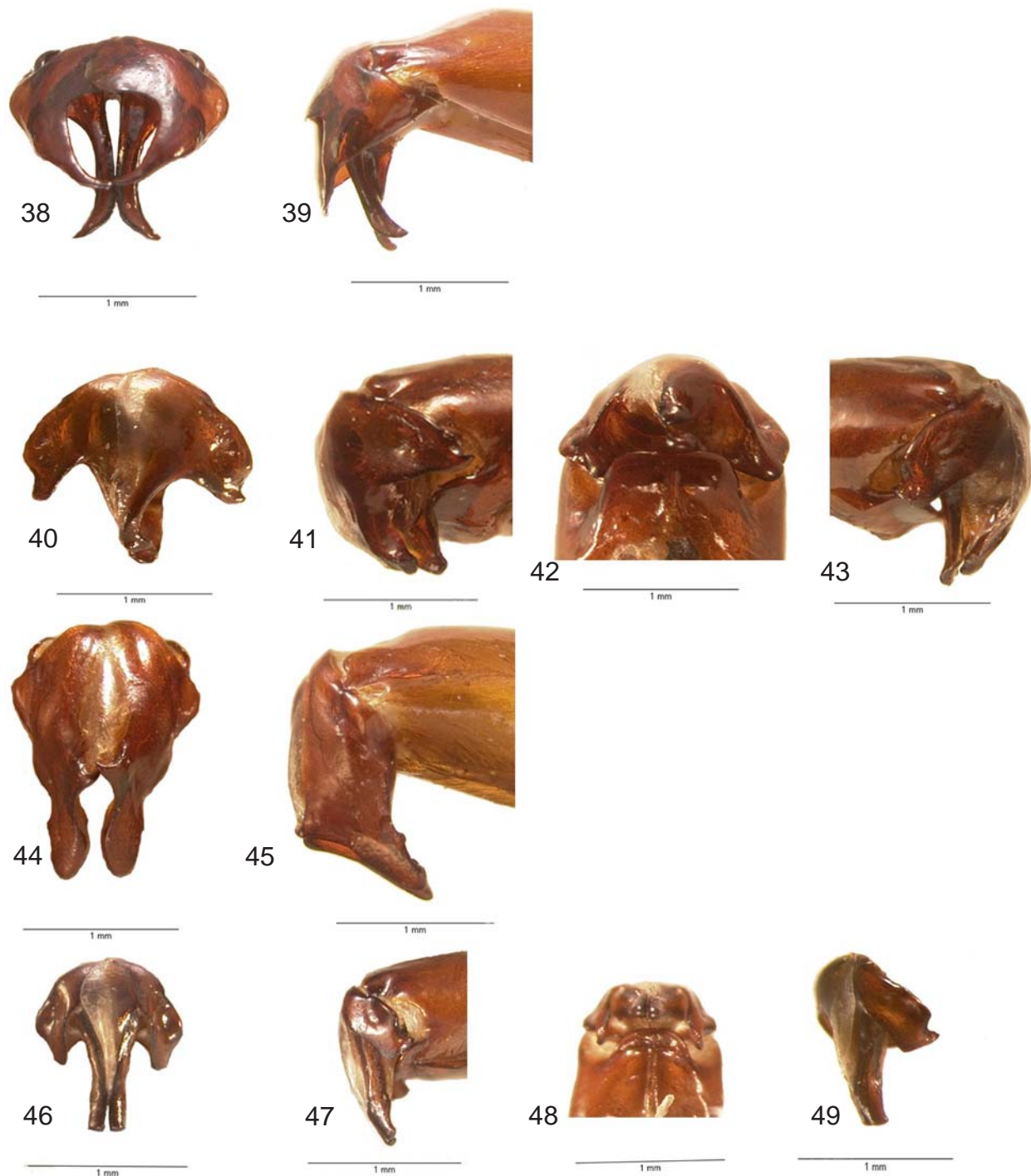
Natural History. Nothing is known about the natural history of this species.

***Aegidinus guianensis* (Westwood 1846)** Fig. 7, 50-51, 67, 86-87, 88

Aegidium guianense Westwood 1846:175.

Aegidium steinheili Harold 1880:43; synonym: Arrow 1904: 739.

Aegidinus guianensis (Westwood): Arrow 1904: 739.



Figures 38-49. Male genitalia. Scale bar = 1 mm. **38)** Parameres (frontal view) of *Aegidinus brasiliensis*. **39)** Parameres and part of phallobase (lateral view) of *A. brasiliensis*. **40)** Parameres (frontal view) of *A. candezei*. **41)** Parameres and part of phallobase (left, lateral view) of *A. candezei*. **42)** Ventral plate of *A. candezei*. **43)** Parameres and part of phallobase (right, lateral view) of *A. candezei*. **44)** Parameres (frontal view) of *A. cornutus*. **45)** Parameres and part of phallobase (lateral view) of *A. cornutus*. **46)** Parameres (frontal view) of *A. crypticus*. **47)** Parameres and part of phallobase (lateral view) of *A. crypticus*. **48)** Ventral plate of *A. crypticus*. **49)** Lateral lobe of *A. crypticus*.

Type Material. Female Holotype from Cayenne, French Guiana (BMNH). Examined.

Description. Male (Fig. 86-87) (n = 7). Length 8.6-12.4 mm; width 4.5-6.5 mm. *Color:* Head, pronotum, and elytra reddish brown to brown. Legs and venter reddish brown. *Head:* Frons concave medially, impunctate or mostly impunctate (major) to punctate (minor); punctures sparse to moderately dense, small. Frontoclypeal suture effaced. Clypeus impunctate to moderately densely punctate or rugopunctate, punctures small. Anterior margin of clypeus with erect or nearly erect median horn (major) or tubercle (minor); carina extending from base of horn or tubercle laterally to each eye canthus. *Pronotum:* Surface punctate; punctures moderately dense to dense, moderate to large in size, concentrated on sides. Basal margin with bead and row of punctures, both becoming weak medially. Disc with subtriangular fovea, basolateral edge raised into a low, rounded tumosity on either side. Fovea punctate; punctures moderately dense to dense, moderate in size. Anterior margin of pronotum with conical or subtriangular, slightly transverse, median tubercle. *Elytra:* Punctures of striae elongate or vermiform, occasionally V- or J-shaped near base. Stria 1 obsolete at base. Lateral margin adjacent to humerus with 5-9 setose crenulations. *Legs:* Protibia with apical denticle. *Genitalia:* Fig. 7, 50-51.

Female. (n = 3). Length 9.1-10.1 mm; width 5.2-7.8 mm. The females differ from the males in the following respects: *Head:* Frons not concave. Frons and clypeus rugopunctate. Anterior margin of clypeus without horn or tubercle, with marginal bead. *Pronotum:* Disc with small, ovate, punctate depression; punctures moderately dense, small. Anterior margin of pronotum with median boss. *Elytra:* Lateral margin adjacent to humerus with 4-5 setae or setose crenulations. *Legs:* Protibia without apical denticle. *Genitalia:* Fig. 67.

Diagnosis. This species is best distinguished from other species using the female and male genitalia. In females the unique combination of the interior process of the inferior genital sclerite produced into a finger like projection which is nearly as wide as long, and the presences of the accessory sclerites (Fig. 67) is sufficient to separate this species from all other described species. The short lateral lobes of the male genitalia are positioned above the much longer median lobes (Fig. 50-51), which is also a unique combination.

Distribution (Fig. 88): Brazil, Colombia, French Guiana. Ten specimens examined from BMNH, IRSB, and MNHN. BRAZIL: **Unknown:** (1). COLOMBIA (3): **Unknown:** Canoas (1); San Carlos (2). FRENCH GUIANA (1): **Cayenne:** Cayenne (1). UNKNOWN (5): San Carlos (4), Nare (1).

Temporal Distribution. Unknown.

Natural History. Nothing is known about the natural history of this species.

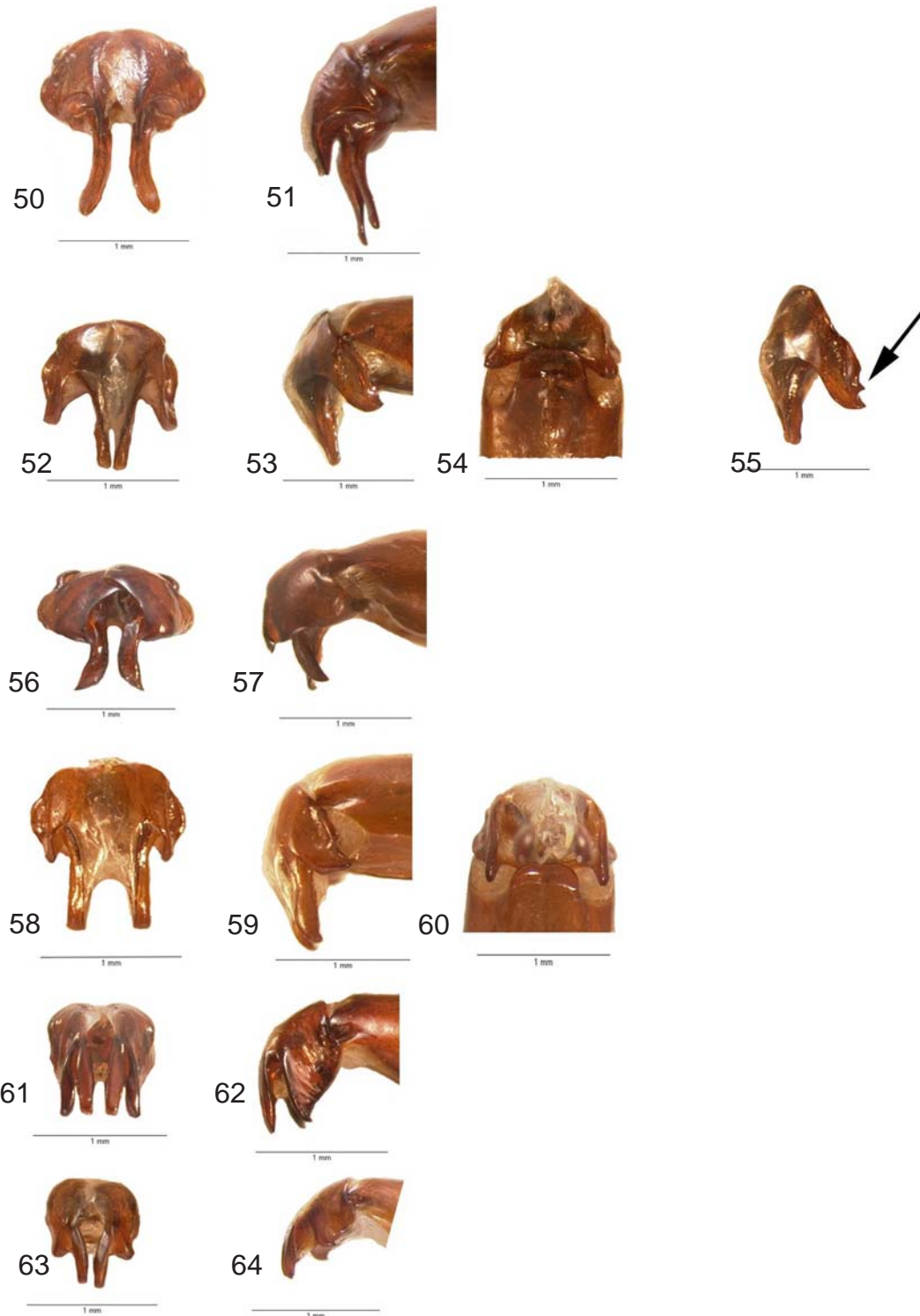
***Aegidinus howdenorum* Colby, new species**

Fig. 52-55, 68, 88

Type Material. Holotype female at HAHC labeled: a) "Colombia, N. de // S. 1000 m. 3 km. // N. Chinacota // May 10, 1974 // H. & A. Howden" (printed, rectangular label)/ b) "H. & A. Howden Collection Ottawa, Canada" (printed, rectangular label with a black border)/ c) my handwritten holotype label. Male allotype from CMNC labeled: a) as (a) above/ b) "*Aegidinus // guianensis // (Westw.) Det. H. F. Howden 70*" (handwritten and printed, rectangular label with a black border)/ c) my handwritten allotype label.

Paratypes. One male paratype at HAHC labeled: a) "Colombia, N. de // S. 1000 m. 3 km. // N. Chinacota // May 10, 1974" (printed, rectangular label)/ b) "S. Peck Carrion // traps #10" (handwritten and printed rectangular label)/ c) "H. & A. Howden Collection Ottawa, Canada" (printed, rectangular label with a black border)/ d) "*Aegidinus // n. sp // Det. F. C. Ocampo*" (handwritten and printed, rectangular label with a black border)/ e) my printed paratype label.

Type locality. Colombia, Norte de Santander, Chinacota (3 km N).



Figures 50-64. Male genitalia. Scale bar = 1 mm. **50)** Parameres (frontal view) of *A. guianensis*. **51)** Parameres and part of phallobase (lateral view) of *A. guianensis*. **52)** Parameres (frontal view) of *A. howdenorum*. **53)** Parameres and part of phallobase (lateral view) of *A. howdenorum*. **54)** Ventral plate of *A. howdenorum*. **55)** Lateral lobe of *A. howdenorum*. Arrow indicates notch. **56)** Parameres (frontal view) of *A. howeae*. **57)** Parameres and part of phallobase (lateral view) of *A. howeae*. **58)** Parameres (frontal view) of *A. oreibates*. **59)** Parameres and portion of phallobase (lateral view) of *A. oreibates*. **60)** Ventral plate of *A. oreibates*. **61)** Parameres (frontal view) of *A. petrovi*. **62)** Parameres and part of phallobase (lateral view) of *A. petrovi*. **63)** Parameres (frontal view) of *A. teamscaraborum*. **64)** Parameres and part of phallobase (lateral view) of *A. teamscaraborum*.

Description. Holotype female. Length 7.6 mm; width 4.3 mm. *Color:* Head, pronotum and elytra piceous to reddish brown. Venter and legs reddish brown. *Head:* Frons impunctate to sparsely or moderately densely punctate, punctures small. Frontoclypeal suture obsolete. Clypeus moderately densely punctate to rugopunctate; punctures small. *Pronotum:* Surface punctate; punctures moderate to dense, moderate to large, concentrated on sides. Basal margin with bead and row of punctures, punctures obsolete adjacent to scutellum. Disc with round, punctate depression; punctures moderate to dense, moderate in size. Anterior margin with median boss. *Elytra:* Punctures of striae elongate, vermiform, occasionally U- or V-shaped at base. Stria 1 obsolete at base. Lateral margin adjacent to humerus with 5 setose crenulations. *Legs:* Protibia lacks apical denticle. *Genitalia:* Fig. 68.

Allotype. Male. Length 9.1 mm; width 4.7 mm. Allotype differs from holotype in the following respects: *Head:* Frons slightly concave medially. Frons impunctate at base, sparse to moderately densely punctate anteriorly, punctures small. Clypeus punctate to rugopunctate; punctures moderate to dense, small. Anterior margin of clypeus with subtriangular, nearly erect horn, carina extending from base to horn laterally to each eye canthus. *Pronotum:* Both the bead and row of punctures on basal margin obsolete adjacent to scutellum. Disc with subtriangular fovea, posterior edge bordered by a subtriangular tumosity on either side. Fovea with a few large, dense, round to transverse punctures. *Scutellum:* Surface with a few moderately dense, small punctures. *Elytra:* Elytral punctures elongate, vermiform, kidney-shaped, round, or oval, occasional V-shaped at base. Lateral margin adjacent to humerus with 4 (left) or 5 (right) setose crenulations. *Legs:* Protibia with apical denticle. *Genitalia:* Fig. 52-55.

Paratype. One male. Length 6.8 mm; width 3.5 mm. Paratype differs from allotype in the following respects: *Head:* Anterior margin of clypeus without horn, clypeus slightly tumid. *Pronotum:* Disc with longitudinal, ovate depression. *Elytra:* Striae 1 and 2 obsolete at base. Lateral margin adjacent to humerus with 4 setose crenulations.

Diagnosis. This species is best distinguished by using the female and male genitalia. Females are most similar to *A. candezei* and *A. venezuelensis*. Female *A. howdenorum* (Fig. 68) do not have a longitudinal carina on the superior sclerite, a character that separates them from *A. candezei* (which does have a longitudinal carina, Fig. 66). The spinulose region on the superior plate of *A. howdenorum* projects outward, while in *A. venezuelensis* (Fig. 77), the spinulose region projects downwards. The male genitalia are similar to those of *A. oreibates* and *A. crypticus*. In *A. howdenorum* (Fig. 52-55) the ventral plate is rounder than in *A. oreibates* (Fig. 58-60). *Aegidinus howdenorum* has a notch on the lateral lobe (best seen in lateral view, Fig. 55), which is not present in *A. crypticus* (Fig. 49).

Etymology. This species is named in honor of Henry and Anne Howden. The type series for this species (and a great deal of the material for this revision) came from their collection.

Distribution (Fig. 88). Colombia. Three specimens examined from HAHC and CMNC. COLOMBIA (3): **Norte de Santander:** Chinacota (3 km N) (3).

Temporal Distribution. May (3).

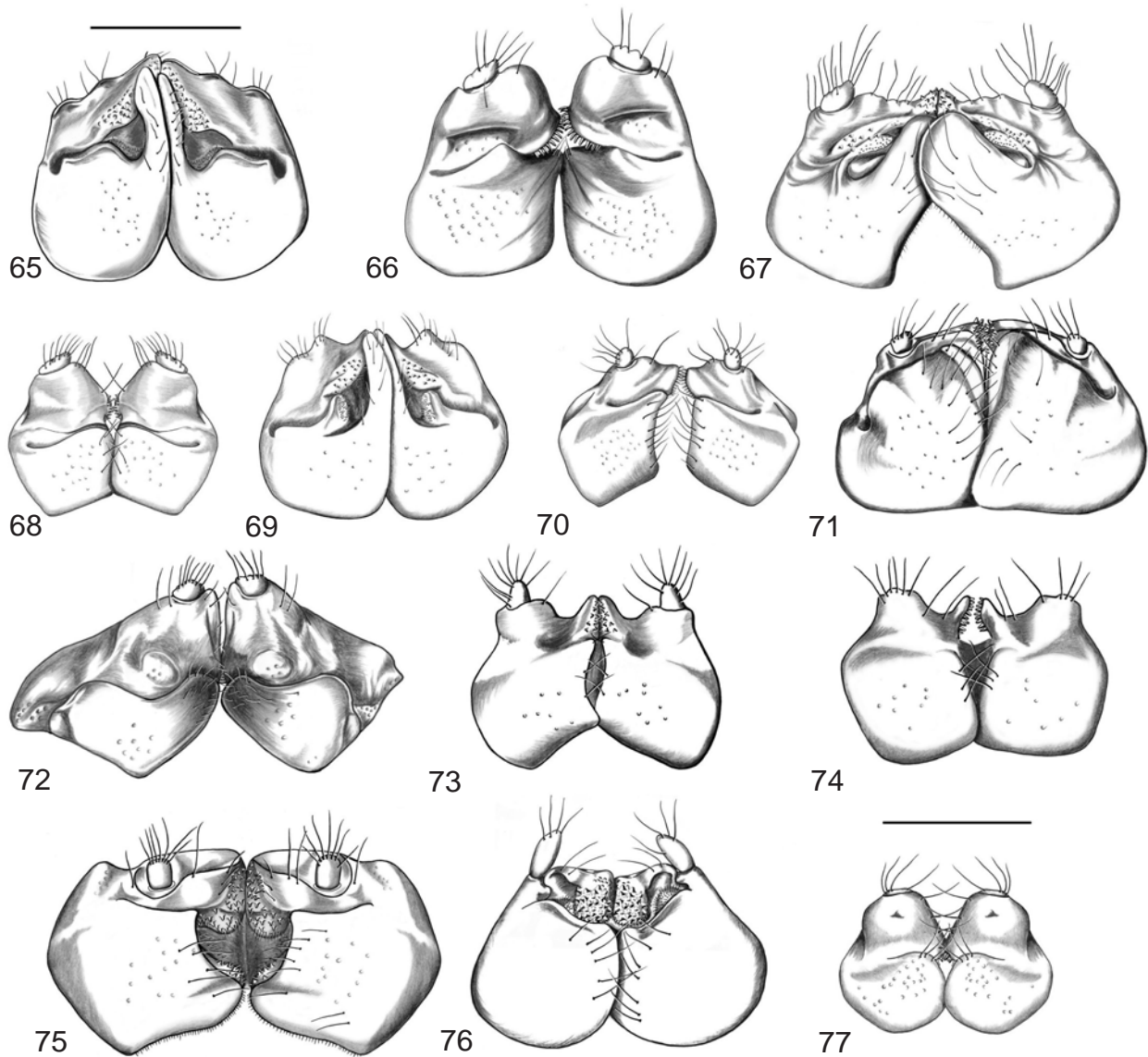
Natural History. All three specimens were collected at an elevation of 1000 m, and one was collected in a carrion trap.

Remarks. The female was the most complete of all three specimens, and thus is selected as the holotype.

***Aegidinus howeae* Colby, new species**

Fig. 56-57, 69, 89

Type material. Holotype male at USNM labeled: a) "Bolivia, Pando: nr. Villa Bella, // 120 m primary forest seasonally // flooded, pitfall human dung, 20 // km SW of Villa Bella // 10° 22' S 65° 22' W // F. Guerra, II-24, 1996" (printed, rectangular label)/b) "*Aegidinus* // *brasiliensis* // Arrow // Det. Aaron D.



Figures 65-77. Female genitalia, gonocoxites. Scale bar = 1 mm. **65)** *A. brasiliensis*. **66)** *A. candezei*. **67)** *A. guianensis*. **68)** *A. howdenorum*. **69)** *A. howeae*. **70)** *A. oreibates*. **71)** *A. simulatus*. **72)** *A. sunidigea*. **73-74)** *A. teamscaraborum*. **75)** *A. tricornus*. **76)** *A. unicus*. **77)** *A. venezuelensis*.

Smith 2004" (handwritten and printed on a rectangular label with a black border)/ c) my handwritten holotype label. Allotype female at USNM labeled: (a) same as (a) above/ b) "*Aegidinus* // sp. // Det. M.E. Jameson 2001" (printed and handwritten rectangular label with a black border)/ c) my handwritten allotype label.

Paratypes: One male paratype at IRSB labeled: a) "Coll. R. I. Sc. N. B. // Guyane Française" (Printed and handwritten on a purple rectangular label)/ "Cayenne" (handwritten on a green rectangular green label, pasted on the purple label)/ "Coll. J. Thomson" (printed in blue on a rectangular white label, glued onto purple label)/ b) "det....." (printed, white, rectangular label)/ "*Æ // guianense // West.*" (handwritten on a semi-circular blue label, pasted onto white label)/ c) my printed paratype label. One female paratype at IRSB labeled: a) "Coll. R. I. Sc. N. B. // Guyane Française // Cayenne" (printed and handwritten on a purple rectangular label)/ "Coll. J. Thomson" (printed in blue on a rectangular white label, glued onto purple label)/ b) "det..... // *Aegidinus // guianensis* Westw." (handwritten and printed on a rectan-

gular label)/ c) my printed paratype label. One female paratype at GMMC with the following data: French Guiana, Regina RN2 PK 125 +3 -23. XII. 2007, J. L. Giuglaris legit, flight intercept trap. Three female paratypes and two male paratypes at GMMC with the following collection data: French Guiana, Regina, RN2 PK 125 + 3, 11.I.2008, legit J.L. Giuglaris, flight intercept trap. One paratype female and one paratype male at GMMC with the following collection data: French Guiana, Regina, RN2 PK 125+3, 24.I. 2008, legit J.L. Giuglaris, flight intercept trap. Two male paratypes at GMMC with the following collection data: French Guiana, Regina, RN2 PK 125 +3, 6.II. 2008, legit J.L. Guiglaris, flight intercept trap.

Type locality. Bolivia, Pando, Villa Bella (20 km SW).

Description. Holotype male. Length 9.6 mm; width 5.4 mm. *Color:* Head, pronotum, and elytra piceous. Venter and legs reddish brown to piceous. *Head:* Frons convex medially, largely impunctate at base, becoming punctate apically; punctures sparse to moderately dense, small. Frontoclypeal suture obsolete. Clypeus with sparse, small punctures. Anterior margin of clypeus with erect, slightly recurved horn; carina extending from base of horn laterally to each eye canthus. *Pronotum:* Surface punctate; punctures moderate to dense, moderate to large, concentrated on sides. Basal margin with row of punctures, punctures obsolete medially. Disc with shallow, transversely suboval fovea, fovea punctate; punctures moderately dense to dense, moderate to large, occasionally slightly transverse. Anterior margin of pronotum with small, transverse, median tubercle. *Elytra:* Punctures of striae V-shaped, elongate, or vermiform. Striae 1, 2, and 3 obsolete at base. Lateral margin adjacent to humerus with 6 (right) or 7 (left) setose crenulations. *Legs:* Protibia without apical denticle. *Genitalia:* Fig. 56-57.

Allotype. Female. Length 8.3 mm; width 4.4 mm. The allotype differs from the holotype in the following respects: *Head:* Frons not convex; surface rugopunctate. Anterior margin of clypeus without horn, with marginal bead. *Pronotum:* Disc without fovea, anterior margin without median tubercle. *Elytra:* Striae 1 and 2 obsolete at base. Lateral margin of elytra with 6 setose crenulations. *Genitalia:* Fig. 69.

Paratypes: (Male = 6, female = 6). Length: 9.0-9.7 mm; width 4.9-5.2 mm. Paratypes differ from primary types in the following respects: Male. *Head:* Minor male with tubercle on anterior margin of clypeus, carinula extending laterally from base of tubercle to each eye canthus. *Elytra:* Striae 1 and 2 obsolete at base. Female. Female paratypes are not significantly different from allotype.

Diagnosis. *Aegidinus howeae* is best identified using the female and male genitalia which are similar to those of *A. brasiliensis*. Female *A. howeae* do not have a ridge on the apical margin of the inferior sclerite (Fig. 69), which is present in *A. brasiliensis* (Fig. 65). In males of *A. howeae*, the sickle-shaped anterior margins of the lateral lobes are not long enough to meet medially (Fig. 56-57) but are long enough to meet medially in *A. brasiliensis* (Fig. 38-39).

Etymology. This species is named in honor of Tiffany Howe, in recognition of all the support, skittles, and beer she has provided during this endeavor.

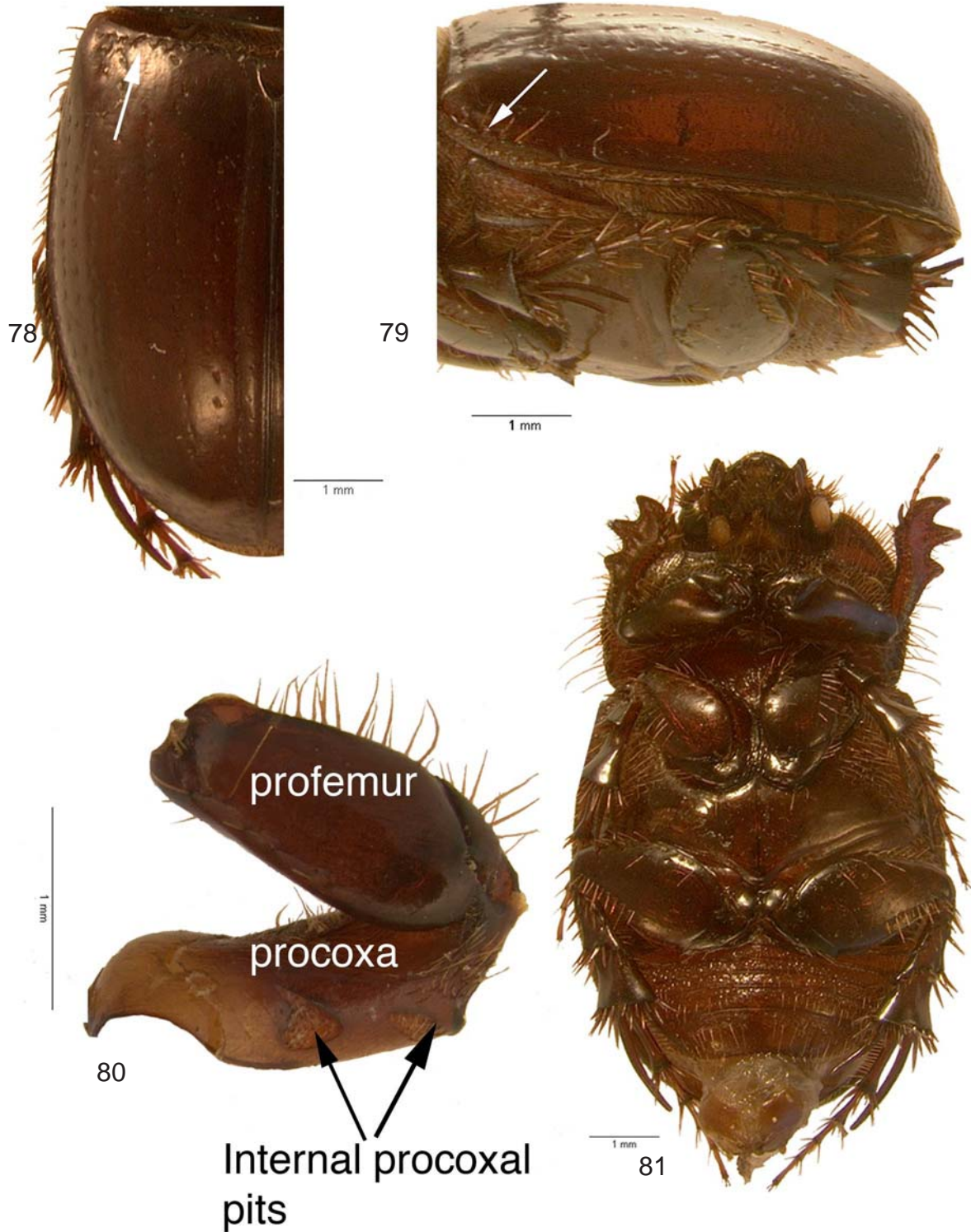
Distribution (Fig. 89). Bolivia and French Guiana. Four specimens examined from USNM and IRSB, and 10 from GMMC. BOLIVIA (2): **Pando:** Villa Bella (20 km SW) (2). FRENCH GUIANA (3): **Cayenne:** Cayenne (2); Regina (10).

Temporal Distribution. January (7), February (3), December (1).

Natural History. Nothing is known about the ecology of *A. howeae*. The primary types were collected from a pitfall trap baited with human dung in a seasonally flooded forest.

***Aegidinus oreibates* Colby, new species**

Fig. 58-60, 70, 89-91



Figures 78-81. 78) Elytra of *Aegidinus* sp. Arrow indicates transverse row of U- or V- shaped, impressed lines. 79) Lateral view of elytra. Arrow indicates location of margin adjacent to humerus. 80) Procoxa (dorsal surface), showing two setose pits. 81) Ventral view of *A. oreibates* female.

Type Material. Holotype male at CMNC labeled: a) "Trinidad: St. George // 8 km N. Arima, Simla Res. // Sta., 260 m, 14-24.VI.1993 // S. & J. Peck, Lower mont. // Rainforest, f.i.t. 93-48"(printed, rectangular label)/ b) my handwritten holotype label. Allotype female at CMNC with same data as holotype but with my handwritten allotype label.

Paratypes: 10 females and 12 male paratypes at CMNC labeled: a) same as (a) above/b)with my printed paratype labels. One female and two male paratypes at CMNC labeled: a) "Trinidad: St. George // 8 km N. Arima, Simla Res. // Sta., 260 m, 6-14. VI. 1993 // S. & J. Peck, tropical // forest, f.i.t., 93-09" (printed, rectangular label)/ b) my printed paratype label. One male paratype at CMNC labeled: a) "Trinidad: St. George // 8 km N. Arima Simla Res. // Sta., 260 m 24.VI-8.VII. 1993 // S. & J. Peck, lower mont. // rainforest, f.i.t., 93-57" (printed, rectangular label)/ b) my printed paratype label. 2 female and 2 male paratypes at CMNC labeled: a) "Trinidad: St. George // Maracas Valley, above // Loango Village, 600 m, // 22.VI-6. VII. 1993, S. & J. Peck // mont. Rainforest, f.i.t. 93-43" (printed, rectangular label) / b) my printed paratype label. One male paratype at CMNC labeled a) as (a) above / b) "*Aegidinus // guianensis // (Westwood) // Dét. F. Génier, 1996*" (handwritten and printed on a rectangular label with a black border)/ c) my printed paratype label. One male paratype at CMNC labeled: a) "Trinidad, Maracas Valley // above Loango Village, 600 m // 22.VI-6.VII.93, montane // rainforest FIT // S&J Peck, 93-43"(printed, rectangular label)/ b) my printed paratype label. 2. Two female paratypes at FMNH labeled: a) "Trinidad: Arima (8 Km // N), Simla Res. Sta., // 260 m, 14-24.VI.1993, // FMHD 93-431, lower" (printed, rectangular label)/ b) "montane rainforest FIT // (flight intercept trap), S. & J. Peck # 93-48 // Field Mus. Nat. Hist." (printed, rectangular label)/ c) my printed paratype label. One female paratype from FMNH labeled: a) "Trinidad: Arima (16 // km N), Andrews Trace, // 620 m, 7-24.VI.1993, // FMHD 93-402, upper" (printed, rectangular label)/ b) "montane rainforest FIT // (flight intercept trap), // S. & J. Peck #93-14 // Field Mus. Nat. Hist." (printed, rectangular label)/ c) my printed paratype label. Four female and three male paratypes at CMNC labeled: a) "Trinidad, 8 km N Arima // Simla Res. Sta., 260 m // 24.VI-8.VII.93, lower // montane rainforest FIT // S&J Peck, 93-57" (printed, rectangular label) / b) my printed paratype label. One male paratype at CMNC labeled a) as (a) above / b) "*Aegidinus // guianensis (West.) // det. B. Gill 1995*" (handwritten and printed on a rectangular label with a black border). Four female and 4 male paratypes at CMNC labeled: a) "Trinidad, 8km N Arima // Simla Res. Sta., 260 m // 6-14.VI.93 // trop. Forest, FIT // S&J Peck, 93-39" (printed, rectangular label) / b) my printed paratype label. Three female and 3 male paratypes at CMNC labeled: a) "Trinidad, 16 km N Arima // Andrews Trace, 620m // up. montane rainforest // FIT, 7-24.VI.93 // S&J Peck, 93-14" (printed, rectangular label) / b) my printed paratype label. One female paratype at CMNC labeled: a) "Trinidad, 19 km N Arima // Lalaja Trace, 650 m // 8-24.VI.93, montane // rainforest, FIT // S&J Peck, 93-20" (printed, rectangular label) / b) my printed paratype label. Three male paratypes at CMNC labeled: a) "Trinidad, 13 km S. Arima // 2 km N Talparo, Quesnell // Farm, rainforest, FIT // 12-22. VI. 93, 50 m // S&J Peck, 93-28" (printed, rectangular label) / b) my printed paratype label. Two male paratypes at CMNC labeled: a) "Trinidad, 11 km SE // Arima, Arena For. Res. // 13-22. VI. 93, 80 m // rainforest FIT // S&J Peck, 93-30" (printed, rectangular label) / b) my printed paratype label. One female paratype at CMNC labeled: a) "Trinidad, 9 km N Arima // Simla Res. Sta., 260 m // lower montane rainforest // 14. VI. 93, uv light // S&J Peck, 93-32" (printed, rectangular label) / b) my printed paratype label. Seven male paratypes at CMNC labeled: a) "Trinidad, 8 km N Arima // Simla Res. Sta., 260m // 14-24. VI. 93, lower // montane rainforest FIT // S&J Peck, 93-48" (printed, rectangular label) / b) my printed paratype label. Three female paratypes at CMNC labeled: a) "Trinidad, 16 km N Arima // Andrews Trace, 620m // 24.VI-7. VI.

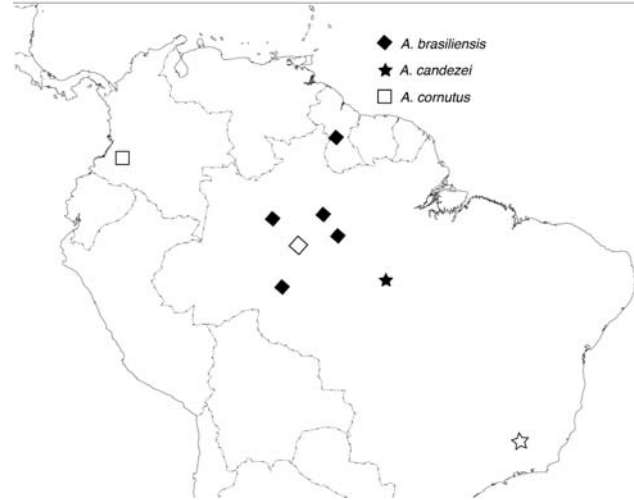


Figure 82. Distribution map of *A. brasiliensis*, *A. candezei*, and *A. cornutus*. Open symbols on the map indicate a country only record.



Figure 83- 87. Scale bar = 1 mm. **83)** Lateral 3/4 habitus of *A. cornutus*. Arrow indicates tubercle. **84)** Dorsal habitus of *A. crypticus*. **85)** Lateral habitus of *A. crypticus*. Arrow indicates boss. **86)** Lateral 3/4 habitus of *A. guianensis*. Arrow indicates tumosity. **87)** Dorsal habitus of *A. guianensis*. Arrow indicates fovea.

93, FIT // up. montane rainforest // S&J Peck, 93-61" (printed, rectangular label) / b) my printed paratype label. One male paratype at CMNC labeled: a) "Diego Martin // Trinidad, W.I. // Aug. 25, 69 // J. Boos" (handwritten on a rectangular label)/ b) "H. & A. Howden Collection Ottawa, Canada" (printed, rectangular label with a black border)/ c) printed paratype label. 1 female paratype at CMNC labeled: a) "Trinidad, Tunapuna // Mt. St. Benedict, Pax Guest // House, 200 m, 2-8. VII.93 // uv light over forest // S&J Peck, 93-53" (printed, rectangular label)/ b) my printed paratype label. One female paratype at CMNC labeled: a) "Trinidad, Tunapuna // Mt. St. Benedict, forest // 4-30.VI.93, 200-250 m // banana baits & gen. colln // S&J Peck, 93-31" (printed, rectangular label)/ b) my printed paratype label. One male paratype at CMNC labeled: a) "Trinidad, Tunapuna // Mt. St. Benedict, 500 m // 21.VI-8.VII.93, Mt. // Tabor rainforest FIT // S&J Peck, 93-38" (printed, rectangular label)/ b) my printed paratype label. Two female paratypes at CMNC labeled: a) "Trinidad, 15 km NE // Tunapuna, Caura Rec. // Area, Caura Valley // 22.VI.93, 100 m // S&J Peck, 93-39" (printed, rectangular label)/ b) my printed paratype label. One female paratype at USNM labeled: a) "Trinidad BWI // Port of Spain // 9-VI-1953" (printed, rectangular label)/ b) my printed paratype label. 1 male paratype at USNM labeled: a) "Trinidad, W.I. // Mt St Benedict // Light // 1.VII.1997 // A. W. Hook" (printed, rectangular label)/ b) my printed paratype label. One male paratype from USNM labeled: a) as (a) above/ b) "*Aegidinus* // n. sp // Det F.C. Ocampo 2005" (handwritten and printed on a rectangular label with a black border)/ c) my printed paratype label. One female paratype from IRSB labeled: a) "Female symbol" (printed, rectangular label)/ b) "Coll. R. I Sc. N. B" (printed in black on a purple, rectangular label) / "Caparo Trinidad // A. Heyne, Berlin-Wilm." (printed on a white, rectangular label pasted onto the purple label)/ c) "*Aegidinus* // *guianense* // West // Female symbol // E. Benderitter, det." (printed and handwritten on a rectangular label)/ c) my printed paratype label. One female paratype at MIZA labeled: a) "La Esperanza // Venezuela-Mona // gas-mts. // 10-VI-1967" (handwritten and printed on a rectangular label)/ b) "J. Salcedo // L. Rodriguez" (handwritten and printed on a rectangular label)/ c) "Dicraeodon // sp. // Det. A. Martinez" (handwritten on a rectangular label)/ d) "*Aegidinus* // sp. // det M.E. Jameson 2001" (handwritten and printed on a rectangular label with a black border)/ e) my printed paratype label. One female paratype at CMNC labeled: a) "Ven: Bolivar, 6 km // S San Isidro (km 88) // 25.VI.-11.VII. 87 // S & J Peck, lowland // rainforest FIT" (printed, rectangular label)/ b) my printed paratype label. One female and 3 male paratypes at MIZA labeled: a) "Venezuela Bolivar // Rio Guaniamo // N° 6° 45' // O 66° 01' // 160 m 25-28 -V-79" (handwritten, rectangular label)/ b) "cols. // J. Clavijo // A. Chacon // G. Yepez" (handwritten, rectangular label) / c) my printed paratype label. One male and 1 female paratype at HAHC labeled a) "Venezuela: Bolivar // Guri, 14.VI.1996 // H. & A. Howden // Dry Forest// Lt" (handwritten and printed on a rectangular label)/ b) "H. & A. Howden Collection Ottawa, Canada" (printed, rectangular label with a black border)/ c) my printed paratype label. One female paratype at CMNC labeled: a) "Guyana: Iwokrama F. R. // 4° 40' 19 N 58° 41' 04 W // 100-200 m, V-VI. 2001 // R. Brooks & Z. Falin // in FIT" (printed, rectangular label)/ b) my printed paratype label. One paratype male in GMMC with the following data: French Guiana, Kourou-savane Matiti-zone agricole Wayabo PK 4.5 -20.XII.2007 legit J. L. Giuglaris, flight intercept trap. One male in GMMC with the following data: Regina, RN2 PK 125 + 3, 11.I.2008, legit J. L. Giuglaris, flight intercept trap. One male in GMMC with the following data: Regina, RN2 PK 125 + 3, 6.II.2008, legit J. L. Giuglaris, flight intercept trap.



Figure 88. Distribution map for *A. crypticus*, *A. guianensis*, and *A. howdenorum*. Open symbols indicate country only records.

Description. Holotype male. Length 9.7 mm; width 5.0 mm. Color: Head and pronotum piceous; elytra piceous to reddish brown. Venter and legs reddish brown. *Head*: Frons impunctate, concave medially. Frontoclypeal suture effaced. Clypeus punctate to rugopunctate; punctures moderately dense, moderate in size. Anterior edge of clypeus produced into erect, slightly recurved, attenuate horn; carina extending from base of horn laterally to each eye canthus. *Pronotum*: Surface punctate; punctures sparse to moderately dense, large punctures concentrated on sides. Basal margin with row of punctures, punctures obsolete adjacent to scutellum. Disc with fovea, posterior edge of fovea bordered on each side by a conical tumosity. Fovea punctate; punctures moderate to dense, moderate to large, occasionally transverse. Anterior margin of pronotum with median boss. *Elytra*: Punctures of striae elongate, V-, U-, or J-shaped. Striae 1-4 obsolete at base. Lateral margin adjacent to humerus with 3 or 5 setose crenulations. *Legs*: Protibia with apical denticle. *Genitalia*: Fig. 58-60.



Figure 89. Distribution map for *A. howeae*, *A. oreibates*, and *A. petrovi*.

Allotype. Female. Length 8.5 mm; width 4.5 mm. Allotype similar to holotype except in the following respects: *Head*: Head not convex, anterior margin of clypeus without horn, with marginal bead. *Pronotum*: Surface more punctate, punctures sparse to dense, large. Punctures on basal margin occasionally contiguous. Disc with median, longitudinally oval, punctate depression; punctures moderate to dense, moderate in size, transversely oval. *Elytra*: Punctures of striae mostly J- or reverse J-shaped, rarely U- or V-shaped. Lateral margins adjacent to humerus with 4 setose crenulations. *Legs*: Protibia without apical denticle. *Genitalia*: Fig. 70

Paratypes. (Males = 54, females = 42) Length 7.5-10.4 mm; width 4.2-5.6 mm. Paratypes differ from primary types in the following respects: Males. *Head*: Anterior edge of clypeus with tubercle, without carina or marginal bead (minors). *Pronotum*: Disc of minors with long, shallow fovea; basal edge without tumosities. Females (Fig. 90-91). Females do not differ significantly from the allotype.

Diagnosis. This species is best distinguished using the male and female genitalia. Female *A. oreibates* (Fig. 70) is separated from other species in the genus based on the following characters: the inferior and superior plates are fused only half way from the exterior edge to the interior edge and accessory sclerites are round. The male genitalia of *A. oreibates* (Fig. 58-60) are similar to both *A. crypticus* (Fig. 46-49) and *A. howdenorum* (Fig. 52-55) but are separated by the relative thickness of the median lobes (much thicker in *A. oreibates* than in the others) and the shape of the ventral plate, which is quadrate in *A. oreibates*, but rounded in the others.

Etymology. From the Latin “*oreibates*” meaning mountain climber, used here as a noun in apposition. This species is named in honor of my brother, Samuel Colby, who is a climber, a soldier, and a gentleman.

Distribution (Fig. 89). Trinidad, Venezuela, Guyana, and French Guiana. 95 specimens examined from CMNC, FMNH, IRNSB, HAHC, USNM, MIZA, and four specimens at GMMC. TRINIDAD (84): **Caroni**: Caparo (1). **St. George**: Simla Research Station (8 km N Arima) (54); Andrews Trace (16 km N Arima) (10); Lalaja Trace (16 km N Arima) (1); Diego Martin (1); Quesnell Farm, 2 km N Talparo (13 km S Arima) (3); Arena Forest Reserve (11km SE Arima) (2); Loango Village (Maracas Valley) (4); Port of Spain (1); Mt. St. Benedict (Tunapuna) (4); Mt. St. Benedict, Pax Guest House (Tunapuna) (1); Caura Recreation Area (15 km NE Tunapuna) (2). VENEZUELA (8): **Bolivar**: Rio Guaniamo (4); Guri (2); San Iisidro

(1). **Monagas:** La Esperanza (1). FRENCH GUIANA (1): **Cayenne:** Kouru (1); Regina (2). GUYANA (1): **Potaro-Siparuni:** Iwokrama Forest Reserve (1).

Temporal Distribution. January (1), February (1), May (4), May-June (1), June (65), June-July (19), July (2), August (1), December (1).

Natural History. Specimens were collected from elevations of 50-650 m from montane rainforests, tropical forest, dry forest, and lowland rainforests.

***Aegidinus petrovi* Colby, new species**

Fig. 61-62, 89

Type material. Holotype male at BMNH labeled: a) "Peru, Loreto // near Iquitos // Itaya River, 5.ii.2006 // leg A. Petrov // BMNH (E) 2006-123" (Printed, rectangular label with a green printed line 1/3rd from top)/ b) my handwritten type label.

Type locality. Peru, Loreto, Iquitos, Itaya River.

Description. Holotype male. Length 10.0 mm; width 5.5 mm. *Color:* Head, pronotum and elytra piceous. Venter and legs piceous to reddish brown. *Head:* Frons convex, impunctate. Frontoclypeal suture effaced. Clypeus rugopunctate, punctures small. Anterior margin of clypeus with slightly reflexed, attenuate, erect horn, without bead or carina. *Pronotum:* Surface punctate, a few sparse to moderately dense, large punctures on sides. Basal margin with the occasional puncture. Disc with subtriangular fovea; fovea bordered on each edge by an erect, large, subtriangular, obliquely compressed tumosity. Anterior margin of pronotum with median, subtriangular tubercle. *Elytra:* Punctures of striae elongate or vermiform, occasionally U- or V-shaped. Striae 1-3 obsolete up to half distance between base and humeral umbone. Lateral margin adjacent to humerus with 11 (right) or 12 (left) setose crenulations. *Legs:* Protibia with apical denticle. *Genitalia:* Fig. 61-62.

Diagnosis. This species is best identified using the male genitalia (Fig. 61-62) which are similar in form to the genitalia of *A. teamscaraborum* (Fig. 63-64). The lateral and median lobes of the parameres of *A. petrovi* are subequal in length, but in *A. teamscaraborum*, the median lobes are longer than the lateral lobes. Females are not known for this species.

Etymology. This species is named in honor of Dr. Alexander Valentinovich Petrov, a specialist on Scolytidae at the Moscow State Forest University in Russia, who collected the holotype.

Distribution (Fig. 89). Peru. One specimen from BMNH. PERU (1): **Loreto:** Itaya River (near Iquitos) (1).

Temporal Distribution. February (1).

Natural History. Nothing is known about the natural history of this species.

***Aegidinus simulatus* Colby, new species**

Fig. 71, 92

Type Material. Holotype female (property of Dave Carlson) at UNSM labeled: a) "Ecuador Napo Pr. // Aliñahui, 21 Km E // Atahualpa, at lights // 3 April 2000 // Coll. D.C. Carlson." (printed, rectangular label)/ b) my holotype label.

One paratype female at MIZA labeled: a) "Colombia // Gigante Huila // VII-1979" (handwritten, rectangular label)/ b) "Col. // O. Rojas" (handwritten, rectangular label)/ b) my printed paratype label.

Type locality. Ecuador, Napo Province, Aliñahui. (21 km E of Atahualpa)



Figure 90-91. *Aegidinus oreibates* female. Scale bar = 1 mm. **90)** Dorsal habitus. Arrow indicates depression. **91)** Lateral habitus.

Description. Holotype female. Length 9.7 mm; width 5.3 mm. *Color:* Head, pronotum and elytra piceous. Legs and venter piceous to reddish brown. *Head:* Frons moderately to densely punctate, punctures moderate in size. Frontoclypeal suture present, rugopunctate; punctures moderate in size. Clypeus punctate to rugopunctate, punctures moderately dense, small to moderate in size. Anterior margin of clypeus with marginal bead. *Pronotum:* Surface punctate; punctures sparse to moderately dense, large, concentrated on sides. Basal margin with bead and punctures obsolete medially. Disc with small depression. Anterior margin with median boss. *Elytra:* Punctures of striae elongate, occasionally V-shaped at base. Striae 1-3 obsolete at base. Lateral margin adjacent to humerus with 10 setose crenulations. *Genitalia:* Fig. 71.

Paratype. One female. Length 9.2 mm; width 5.0 mm. The paratype differs from the holotype in the following respects: *Elytra:* Lateral margin adjacent to humerus with 9 setae or setose crenulations.

Diagnosis. This species is best distinguished using the female genitalia (Fig. 71). The inferior sclerite is as tall as the superior sclerite, and accessory sclerites are present, a combination unique to this species. Males are not known for this species.

Etymology. From the Latin “*simulatus*” meaning imitation or copy, referring to the high degree of external morphological similarity found in the females of the genus.

Distribution (Fig. 92). Colombia, Ecuador. Two specimens examined from MIZA and DCCC (housed at UNSM). COLOMBIA (1): **Hulia:** Gigante (1). ECUADOR (1): **Napo:** Ailñahui (21 km E Atahualpa) (1).

Temporal Distribution. April (1), July (1).

Natural History. Nothing is known of the natural history of this species.

***Aegidinus sunidigea* Colby, new species**

Fig. 72, 92

Type Material. Holotype female at IRSB labeled: a) “Coll. R.I.Sc.N.B. // Colombie” (printed in black ink on a purple label) / “San Carlos” (handwritten, rectangular white label pasted onto the purple label) / b) “*Aegidinus // candezei* Borre // R. Paulian det.” (handwritten and printed, rectangular label) / c) my handwritten type label.

Type locality. Colombia, San Carlos.

Description. Holotype female. Length 10.0 mm; width 5.6 mm. Color: Head and pronotum piceous. Elytra piceous to reddish brown. Legs and venter reddish brown. *Head:* Surface rugopunctate; punctures moderately dense, moderate in size. Frontoclypeal suture effaced. Anterior margin of clypeus with bead. *Pronotum:* Surface punctate; punctures moderate to dense, large, concentrated on sides. Basal margin with row of punctures, punctures obsolete medially. Disc with median longitudinal, punctate, oval depression; punctures moderately dense, moderate in size. Anterior margin with median boss. *Elytra:* Punctures of striae faint, round, ovate, elongate, occasionally U-shaped at base. Striae 2 and 4 obsolete half way to apical umbone, represented by an occasional puncture. Lateral margin adjacent to humerus with 3 (right) or 4 (left) setose crenulations. *Genitalia:* Fig. 72.

Diagnosis. This species is best distinguished by the female genitalia. The round tumosities on the superior sclerite are unique (Fig. 72). No males are known for this species.

Etymology. Sunidigea the reverse spelling of *Aegidinus*. According to Article 31.2.3 of the Code, if a species group name is not a Latin or latinized word, it is treated as indeclinable.

Distribution (Fig. 92). Colombia. One specimen from IRSB. COLOMBIA (1): **Unknown:** San Carlos (1).

Temporal Distribution. Unknown.

Natural History. Nothing is known of the natural history of this species.

***Aegidinus teamscaraborum* Colby, new species**

Fig. 63-64, 73-74, 92

Type material. Holotype male at CMNC labeled: a) “Bolivia: Cochabamba Dept. // Est. Biol. Sacta, Univ. Mayor S. // Simeon, S 17° 06.48' W 64° 46.94' // 16-27. XII. 05, 300 m, rainforest // FIT, S. & J. Peck, 05-47” (printed, rectangular label) / b) my handwritten primary type label. Allotype female at CMNC with same label data as holotype, except with a handwritten allotype label.

Two male and 3 female paratypes at CMNC with same label data as primary types, but with my printed paratype label. Seven female paratypes at FSCA labeled: a) “Bolivia, Cochabamba: // Villa Tunari, Hotel el Puente // S 16° 59.02' W 65° 24.50' // 357 m; Forest FIT; 15/27-XII- // 2005; S. & J. Peck; 05-45” (printed, rectangular label) / b) my printed paratype label. One female paratype at FSCA labeled: a) as (a) above / b) “Orphninae // det. M. J. Paulsen 2007” (printed and handwritten rectangular label) / c) my printed paratype label. Four female paratypes at CMNC labeled: a) “Bolivia: Cochabamba Dept. // Villa Tunari, Hotel El Puente // S 16° 59.02' W 65° 24.50', // 15-27. XII. 05, 357 m, rainforest // FIT, S. & J. Peck, 05-45” (printed, rectangular label) / b) my printed paratype label. One female paratype at BMNH labeled: a) “Chapare, 400 mts. // Bolivia // Zischka Col. // Coll. Martinez” (printed and handwritten rectangular label with a black border) / b) “H. & A. Howden // Collection // ex. A. Martínez coll.” (printed, rectangular label with a black border) / c) my printed paratype label. One female paratype at FSCA labeled: a) “Bolivia: Santa Cruz: 5 km // SSE Buena Vista: Hotel Flora & // Fauna; S 17° 29.925 W 63° // 39.128; 440 m; Forest FIT” 15/24 // -XII-2003; S. & J. Peck; 03-131” (printed, rectangular label) / b) my printed paratype label. Seven female paratypes at CMNC labeled: a) “Bolivia: Dpto. Sta. Cruz // 5 km SSE

Buena Vista, Hotel // Flora y Fauna, 440m, forest // FIT, W 63° 39.128' S 17° 29.925' // 6-15. XII. 03. S. & J. Peck 03-130" (printed, rectangular label)/ b) my printed paratype label. Nine female paratypes at CMNC, 8 female paratypes at CNCI labeled: a) "Bolivia: Dpto. Sta. Cruz // 5 km SSE Buena Vista, Hotel // Flora y Fauna, 440m, forest // FIT, W 63° 39.128' S 17° 29.925' // 15-24. XII. 03. S. & J. Peck 03-131"(printed, rectangular label)/ b) my printed paratype label. Two female paratypes at CMNC and 1 female paratype at CNCI labeled: a) "Bolivia: Dpto. Sta. Cruz // 5 km SSE Buena Vista, Hotel // Flora y Fauna, 440m, forest // FIT, W 63° 39.128' S 17° 29.925' // 24-31. XII. 03. S. & J. Peck 03-132"(printed, rectangular label)/ b) my printed paratype label. One female paratype at UNSM labeled a) "Bolivia: Santa Cruz // Flora & Fauna Lodge // 3.7 km SSE Buena Vista // 17° 29' 55 S, 63° 39' 9 W // 17-19 November 2006 // B. Ratcliffe & M. Jameson" (printed, rectangular label)/ b) my printed paratype label. One female paratype at UNSM labeled a) "Bolivia: Santa Cruz: Flora & // Fauna Lodge 17° 29' 55 S, 63° // 39' 9 W. 18-XI-2006 at light // B. Ratcliffe & M. L. Jameson" (printed, rectangular label)/ b) my printed paratype label. Eight female paratypes (2 pinned, 6 in alcohol) at UNSM labeled: a) "Bolivia: Santa Cruz: Flora & // Fauna Lodge 17° 29' 55 S, 63° // 39' 9 W. 18-XI-2006 // B. Ratcliffe & M. L. Jameson // At light 6:40-7:05 pm" (printed, rectangular label)/ b) my printed paratype label. Eight female paratypes (4 pinned, 4 in alcohol) at UNSM labeled: a) "Bolivia: Santa Cruz: Flora & // Fauna Lodge 17° 29' 55 S, 63° // 39' 9 W. 17-XI-2006 // B. Ratcliffe & M. L. Jameson. At light 6:45- // 7:00 pm in sandy area w/ plant debris" (printed, rectangular label)/ b) my paratype label. One female paratype at HAHC labeled: a) "Bolivia // Dpto. Santa Cruz // Prov. Ichilo // Loc. Rio Saguaro // 21-XII-1988" (printed and handwritten on a rectangular label)/ b) "Col. Paolo Bettella // En luz negra // Alt. 420 mt." (printed and handwritten on a rectangular label)/ c) "H. & A. Howden // Collection // Ottawa, Canada" (printed, rectangular label with a black border)/ d) "sp ? // Det. // H. F. Howden"(printed and handwritten rectangular label with a black border)/ e) my printed paratype label. One female paratype at HAHC labeled: a) "Dic 9 60 // Bolivia // D° Sta. Cruz // Pcia. Sara // Nueva Moka // Coll. Martínez" (handwritten, rectangular label) / b) "H. & A. Howden // Collection // ex. A. Martínez coll." (printed, rectangular label with a black border)/ c) my printed paratype label. One female paratype at BMNH labeled: a) "Bolivia: // Prov. Chopara. // R. Zischka // B.M. 1948-311." (printed, rectangular label)/ b) my printed paratype label. One female paratype at MNHN labeled a) "Coroico // Bolivia" (printed, rectangular label)/ b) "Muséum Paris // 1936 // Coll. A. Boucomont" (printed on a green rectangular label)/ c) "*Aegidinus // candezei* Pr ?" (handwritten in pencil on a rectangular label)/ d) my printed paratype label. One female paratype from AMNH labeled: a) "Peru: Junin: between // San Ramón de Pangoa // and Boca de Kiatari, // 40-55 km SE Satipo // 750 m., Mar. 31, 1972 // R. T. & J. C. Schuh" (printed and handwritten on a rectangular label)/ b) my printed paratype label. One female paratype at AMNH labeled: a) "Peru: Junin: between // San Ramón de Pangoa // and Boca de Kiatari, // 40-55 km SE Satipo // 750 m., Mar. 4 1972 // R. T. & J. C. Schuh" (printed and handwritten on a rectangular label)/ b) "*Aegidinus // sp.* // det. M. E. Jameson 2001" (printed and handwritten on a rectangular label with a black border)/ c) my printed paratype label. One female paratype at USNM labeled: a) "Peru: Madre de Dios; / Rio Tambopata Res; 30 air // km. SW Pto. Maldonado, 290 m. // 26-30 XI 1979 J. B. Heppner // subtropical moist forest" (printed, rectangular label)/ b) "*Aegidinus sp.* // Jameson 2001" (handwritten, rectangular label)/ c) my printed paratype label.



Figure 92. Distributional map for *A. simulatus*, *A. sundigea*, and *A. teamscaraborum*. Open circles indicate country only records.

Type locality. Bolivia, Cochabamba Department, Estación Biológica Sacta.

Description. Holotype male. Length 6.7 mm; width 3.5 mm. *Color:* Head, pronotum and elytra black to piceous. Venter and legs piceous to reddish brown. *Head:* Frons impunctate at base, becoming rugopunctate apically. Frontoclypeal suture effaced. Clypeus rugopunctate; anterior margin with median tubercle. *Pronotum:* Surface punctate; punctures moderate to dense, moderate to large, occasionally umbilicate, concentrated on sides. Basal margin with bead and complete row of punctures. Disc with longitudinally subovate, punctate fovea; punctures dense, small. Anterior margin with median boss. *Elytra:* Punctures of striae elongate or vermiform, occasionally V-shaped. Lateral margin adjacent to humerus with 6 setose crenulations. *Legs:* Protibia with worn apical denticle. *Genitalia:* Fig. 63-64.

Allotype. Female. Length 7.5 mm; width 4.4 mm. Allotype similar to holotype except in the following respects: *Head:* Anterior margin of clypeus without tubercle, with marginal bead. *Pronotum:* Disc with punctate depression; punctures moderate to dense, moderate in size, transversely oval. Anterior margin of pronotum with median boss. *Scutellum:* Surface with one median, moderately sized puncture. *Elytra:* Stria 1 obsolete at base. Lateral margin adjacent to humerus with 5 (right) or 7 (left) setose crenulations. *Legs:* Protibia without apical denticle. *Genitalia:* Fig. 73-74.

Paratypes. (Males = 2, females = 70) Length 6.0-9.1 mm; width 3.2-5.0 mm. Paratypes differ from the primary types in the following respects: Male. *Head:* Anterior margin of clypeus with erect, slightly recurved horn (major) or tubercle (minor). *Pronotum:* Disc with subtriangular fovea (major) or longitudinally suboval fovea (minor); fovea with a raised into a rounded tumosity on each edge (major) or not (minor). *Elytra:* Striae 1 and/or 2 obsolete at base. Lateral margin adjacent to humerus with 5-8 setose crenulations. *Legs:* Protibial denticle not as worn. Females. *Elytra:* Striae 1 and 2 variably obsolete at base. Lateral margin adjacent to humerus with 4-8 setose crenulations. *Genitalia:* Accessory sclerite reduced (Fig. 74) in some specimens.

Diagnosis. This species is easily distinguished from other species in the genus based on the form of the male genitalia (Fig. 63-64) and the female gonocoxites (Fig. 73-74). Males are similar to *A. petrovi* (Fig. 61-62), but in *A. teamscaraborum* the median lobes are longer than the lateral lobes (they are subequal in length in *A. petrovi*). In females, the superior and inferior plates are completely fused, which separates this species from the females of *A. oreibates* (Fig. 70; the superior and inferior plates are not completely fused). The size of the accessory sclerites varies, and in some specimens the sclerites may appear to be completely absent (Fig. 74).

Etymology. This species is named for the Team Scarab Lab at the University of Nebraska-Lincoln, and in honor of the lab's past, present, and future members.

Distribution (Fig. 92). Bolivia and Peru. Seventy-three specimens examined from AMNH, CMNC, CNCI, FMNH, HAHC, MNHN, USNM, and UNSM. BOLIVIA (70): **Cochabamba:** Chapare (1); Est. Biol. Sacta (7); Hotel el Puente (Villa Tunari) (12). **La Paz:** Corocio (Nor Yungas) (1). **Santa Cruz:** Flora and Fauna Hotel (5 km SSE Buena Vista) (28); Flora and Fauna Lodge (3.7 km SSE Buena Vista) (1); Flora and Fauna (Buena Vista) (17); Rio Saguaro (Ichilo) (1); Nueva Moka (Sara) (1). **Unknown:** Chopare (1). PERU (3): **Junín:** Between San Ramon de Pangoa and Boca de Kiatari (45-55 km SE Satipo) (2). **Madre de Dios:** Rio Tambopata Res (30 air km SW Puerto Maldonado) (1).

Temporal Distribution. March (2), November (19), December (49).

Natural History. Specimens were collected between 300-440 m elevation, and from sandy areas at lights at dusk.

***Aegidinus tricornis* Colby, new species**

Fig. 75, 93

Type Material. Holotype female at HAHC labeled: a) "Ven: Bolivar // 10 km N Corocito // 18. VI-3. VIII. 87 // S & J Peck, FIT // R. Caura rainforest"(printed, rectangular label)/ b) "*Aegidinus* // *guianensis* //

(Westw.) Det H.F. Howden 88" (handwritten and printed rectangular label with a black border)/ c) my handwritten holotype label.

Paratypes: Two paratype females at CMNC with same label data as holotype, but with my printed paratype label. One paratype female at HAHC labeled: a) same as holotype / b) H. & A. Howden Collection Ottawa, Canada" (printed, rectangular label with a black border). One paratype female at CNMC labeled: a) same as holotype / b) as (b) above / c) "*Aegidinus* // nr. *guianensis* // (Westw.) DET H. F. Howden 98" (handwritten and printed rectangular label with black border).

Type locality. Venezuela, Bolivar, Corocito (10 km N).

Description. Holotype female. Length 9.8 mm, width 5.8 mm. *Color:* Head, pronotum, elytra, legs, and venter piceous to reddish brown. *Head:*

Frons punctate; punctures moderately dense, moderate in size. Frontoclypeal suture present. Clypeus moderately densely punctate, punctures moderate in size. Anterior margin of clypeus with marginal bead. *Pronotum:* Surface punctate; punctures sparse to dense, large. Basal margin of pronotum with bead and row of punctures, punctures obsolete medially. Short, longitudinal, shallow sulcus present just anterior of basal margin. Anterior margin with small, median boss. *Scutellum:* One moderate sized puncture at base. *Elytra:* Punctures of striae elongate, vermiform, or V-shaped (at base). Stria 1 obsolete at base. Lateral margin adjacent to humerus with 7 setose crenulations. *Genitalia:* Fig. 75.

Paratypes. Four females. Length: 8.0-9.8 mm; width 4.5-5.1 mm. Paratypes differ from holotype in the following respects: *Head:* Frontoclypeal suture present or not. *Pronotum:* Punctures on basal margin sometimes contiguous, forming a line. Sulcus anterior of basal margin expressed as a sulcus, a depression, or absent. Median boss on anterior margin present or not. *Scutellum:* Surface with a median puncture or not. *Elytra:* Stria 2 variably obsolete. Lateral margin adjacent to humerus with 5-7 setose crenulations.

Diagnosis. This species is best diagnosed using the female genital sclerites. The superior and inferior plates are fused, and the accessory sclerite projects from the face of the fused sclerites (Fig. 75). No males are known for this species.

Etymology. From the Latin "*tri*" meaning three and "*cornus*" meaning crowned, in reference to the appearance of a crown with three points given by the lobes on each mandible and the shape of the labrum.

Distribution (Fig. 93). Venezuela. Five specimens examined from CMNC and HAHC. VENEZUELA (5): **Bolivar:** Corocito (10 km N) (5).

Temporal Distribution. June-August (5).

Natural History. Nothing is known about the natural history of this species.

Aegidinus unicus Colby, new species

Fig. 76, 93

Type Material. Holotype female at UNSM labeled: a) "Brazil, Sinop., // Mato Grosso, // X.1974, // M. Alvarenga" (printed and handwritten on a rectangular label)/ b) my handwritten holotype label.



Figure 93. Distributional map for *A. tricornus*, *A. unicus*, and *A. venezuelensis*.

Type locality. Brazil, Mato Grosso, Sinop.

Description. Holotype female. Length 9.4 mm; 5.2 mm. *Color:* Head, elytra, legs, and venter reddish brown. Pronotum piceous. *Head:* Frons and clypeus punctate to rugopunctate; punctures dense, moderate in size. Frontoclypeal suture effaced. Anterior margin of clypeus with marginal bead. *Pronotum:* Surface punctate; punctures moderate to dense, large, concentrated on sides. Basal margin with bead and row of punctures, both obsolete medially. Short, feebly impressed, median sulcus present just anterior to basal margin. Disc with punctate, ovate depression; punctures dense, moderate to large, occasionally ovate. Anterior margin with median boss. *Elytra:* Punctures of striae elongate, vermiform, occasionally S or V-shaped at base. Stria 1 obsolete at base. Lateral margin adjacent to humerus with 7 (left) or 9 (right) setose crenulations. *Genitalia:* Fig. 76.

Diagnosis. This species is best distinguished from other species in the genus by the form of the female genitalia. The spinulous bulb (Fig. 76) present on interior margin of the superior plate is unique to this species. No males are known for this species.

Etymology. From the Latin “*unicus*” meaning only or singular, which refers both to the singular appearance of the female genitalia, and that this species is known from only one specimen.

Distribution (Fig. 93). Brazil. One specimen at UNSM. BRAZIL (1): **Mato Grosso:** Sinop (1).

Temporal Distribution. October

Natural History. Nothing is known about the natural history of this species.

Remarks. This species is known only from one specimen. The sulcus described in this specimen could be variably expressed in other specimens of this species.

***Aegidinus venezuelensis* Colby, new species**

Fig. 77, 93

Type material. Holotype female at MNHN labeled: a) “Vénézuéla // Caracas” (printed, rectangular label)/ b) “Ex Museo // S Van de Poll” (printed, rectangular label with a black border)/ c) “Muséum Paris // 1936 // Coll. A. Boucomont” (printed, green, rectangular label with a black border)/ d) “*Aegidinus* // *brasiliensis* // Arr. R. Paulian det.” (handwritten and printed, rectangular label)/ e) my handwritten type label.

Type locality. Venezuela, D.C., Caracas.

Description. Holotype female. Length 7.9 mm; width 4.3 mm. *Color:* Head piceous to reddish brown. Pronotum, elytra, and legs reddish brown. *Head:* Frons impunctate at base, becoming punctate to rugopunctate anteriorly; punctures dense, large. Faint frontoclypeal suture present. Clypeus rugopunctate. Anterior margin with bead. *Pronotum:* Surface punctate; punctures moderate to dense, occasionally contiguous, moderate to large in size, concentrated on sides. Basal margin with bead and row of punctures, both obsolete adjacent to scutellum. Disc with shallow, longitudinally ovate depression. Anterior margin with median boss. *Elytra:* Punctures of striae kidney, V-, U-, J-, or reverse J-shaped. All striae complete. Lateral margin adjacent to humerus with 6 setae or setose crenulations. *Genitalia:* Fig. 77.

Diagnosis. This species is best distinguished from other species using the female gonocoxites (Fig. 77), which are similar in form to those of *A. howdenorum* (Fig. 68) and *A. candezei* (Fig. 66). *Aegidinus venezuelensis* lacks the transverse ridge on the superior sclerite (present in *A. candezei*). In *A.*

venezuelensis, the spinulose region on the interior of the superior plate projects downwards, while in *A. howdenorum*, the spines project inwards. No males are known for this species.

Etymology. This species is named for the country in which the type originates.

Distributional Data (Fig. 93). Venezuela. One specimen from IRSB. VENEZUELA (1): **Distrito Capital:** Caracas (1).

Temporal Distribution. Unknown.

Natural History. Nothing is known about the natural history of this species.

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Literature Cited

- Ahrens, D. 2006.** The phylogeny of Sericini and their position within the Scarabaeidae based on morphological characters (Coleoptera: Scarabaeidae). *Systematic Entomology* 31: 113-144.
- Arrow, G. J. 1904.** Sound production in lamellicorn beetles. *Transactions of the Entomological Society of London* 1904: 709-750.
- Arrow, G. J. 1912.** Scarabaeidae: Pachypodinae, Pleocominae, Aclopininae, Glaphyrinae, Ochodaeinae, Orphninae, Idiostominae, Hybosorinae, Dynamopinae, Acanthocerinae, Troginae. *Coleopterorum Catalogus*, pars 43. W. Junk; Berlin, Germany. 66 p.
- Barbero E., and C. Palestrini. 1993.** *Chaetonyx robustus* ssp. *liguricus* Mariani, 1946: descrizione del terzo stadio larvale e note sulla morfologia preimmaginale della famiglia (Coleoptera, Scarabaeoidea, Orphnidae). *Bollettino della Società Entomologica Italiana* 125: 143-149.
- Bates, H. W. 1887.** *Biologia Centrali Americana*. Insecta. Coleoptera. Pectinicornia and Lamellicornia. R.H. Porter; London. Volume II, Part II (1886-1890). 464 p.
- Browne, D. J., C. H. Scholtz, and J. Kukulová-Peck. 1993.** Phylogenetic significance of wing characters in the Trogidae (Coleoptera: Scarabaeoidea). *African Entomology* 1: 195-206.
- Erichson, G. F. 1847.** *Conspectus insectorum coleopterorum, quae in Republica Peruana observata sunt*. *Archiv für Naturgeschichte* 1847: 67-185.
- Evenhuis, N. L. 2008.** The insect and spider collections of the world website. Available at: <http://hbs.bishopmuseum.org/codens/>. Last accessed: 14 March, 2009.
- Felsenstein, J. 1985.** Confidence limits on phylogenies: an approach using the bootstrap. *Evolution* 39: 783-791.

- Frolov, A.V. 2005.** Taxonomic position of *Sissantobius mandibularis* (Lansberge) and synonymy of *Orphnus* over *Sissantobius* (Coleoptera, Scarabaeidae, Orphninae). *Journal of Afrotropical Zoology* 2: 71-73.
- Grebennikov, V. V., and C. H. Scholtz. 2004.** The basal phylogeny of Scarabaeoidea (Insecta: Coleoptera) inferred from larval morphology. *Invertebrate Systematics* 18: 321-348.
- Harold, E. 1880.** Verzeichniss der von E. Steinheil in Neu - Granada gesammelten coprophagen Lamellicornien. *Entomologische Zeitung* 41: 3-46.
- Harris, R. A. 1974.** A glossary of surface sculpturing. *Occasional Papers in Entomology*. State of California Department of Food and Agriculture; Sacramento, CA. 28: 1-32.
- Hunt, T., J. Bergsten, Z. Levkanicova, A. Papadopoulou, O. St. John, R. Wild, P. M. Hammond, D. Ahrens, M. Balke, M. S. Caterino, J. Gómez-Zurita, I. Ribera, T. G. Barraclough, M. Bocakova, L. Bocak, and A. P. Vogler. 2007.** A comprehensive phylogeny of beetles reveals the evolutionary origins of a superradiation. *Science* 318: 1913-1916.
- Lawrence, J. F., and A. L. Newton. 1995.** Families and subfamilies of Coleoptera (with selected genera, notes, and references and data on family-group names). p. 779-1006. *In*: J. Pakaluk and S. A. Slipinski (editors). *Biology, Phylogeny, and Classification of Coleoptera: Papers Celebrating the 80th Birthday of Roy A. Crowson*. Muzeum i Instytut Zoologii PAN: Warsaw, Poland. Volume 2. p. 560-1092.
- Morón, M. A. 1991.** Larva and pupa of *Aegidium cribratum* Bates (Coleoptera: Scarabaeidae: Orphninae). *Coleopterists Bulletin* 45: 360-367.
- Nel, A., and C. H. Scholtz. 1990.** Comparative morphology of the mouthparts of adult Scarabaeoidea (Coleoptera). *Entomology Memoirs* 80: 1-84.
- Ocampo, F. C. 2006.** Phylogenetic analysis of the scarab family Hybosoridae and monographic revision of the New World subfamily Anaidinae (Coleoptera: Scarabaeidae). *Bulletin of the University of Nebraska State Museum* 19: 1-210.
- Paulian, R. 1984.** Les Orphinidae américains (Coléoptères, Scarabaeoidea). *Annales de la Société Entomologique de France (N.S)* 20: 65-92.
- Paulian, R., and J-P. Lumaret. 1982.** La larve des Orphnidae (Col. Scarabaeoidea). *Bulletin de la Société Entomologique de France* 87: 263-272.
- Preudhomme de Borre, A. 1886.** Liste des lamellicornes laparostictiques recueillis par feu Camille Van Volxem pendant son voyage au Brésil et à la Plata en 1872 suivie de la description de dix huit espèces nouvelles et un genre nouveau. *Annales de la Société Entomologique de Belgique* 30: 103-120.
- Scholtz, C. H. and S. L. Chown. 1995.** The evolution of habitat use and diet in the Scarabaeoidea: a phylogenetic approach. p. 335-374. *In*: J. Pakaluk and S. A. Slipinski (editors). *Biology, Phylogeny, and Classification of Coleoptera: Papers Celebrating the 80th Birthday of Roy A. Crowson*. Muzeum i Instytut Zoologii PAN; Warsaw, Poland. Volume 1. p. 1-588.
- Sharp, D., and F. A. G. Muir. 1912.** The comparative anatomy of the male genital tube in Coleoptera. Reprinted without change, 1969. *Entomological Society of America; College Park, MD.* 165 p.
- Swofford, D. L. 2002.** PAUP*: Phylogenetic analysis using parsimony (* and other methods), version 4.10 b. Sinauer Associates; Sunderland, MA.
- Veitch, J. 1906.** Hortus Veitchii: A history of the rise and progress of the nurseries of Messrs. James Veitch and Sons, together with an account of the botanical collectors and hybridists employed by them and a list of the most remarkable of their introductions. J. Veitch and Sons; London, England. 684 p.
- Wheeler, Q. D., and N. Platnick. 2002.** The phylogenetic species concept (*sensu* Wheeler and Platnick). p. 55-69. *In*: Q. D. Wheeler and R. Meier (editors). *Species Concepts and Phylogenetic Theory: A Debate*. Columbia University Press; New York, New York. 230 p.
- Woodruff, R. E., and B. M. Beck. 1989.** The scarab beetles of Florida. (Coleoptera: Scarabaeidae), Part II. The May or June beetles (genus *Phyllophaga*). *Arthropods of Florida and Neighboring Land Areas* 13: 1-226.
- Westwood, J. O. 1846.** On the lamellicorn beetles which possess exerted mandibles and labrum, and 10-jointed antennae. *Transactions of the Entomological Society of London* 4: 15-180.

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Appendix 1. Characters and character states used in phylogenetic analysis.

Taxon Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
<i>Aegidius guianensis</i>	1	0	0	1	1	1	1	1	0	0	1	1	1	2	0	1	1	1	0	0	1	2	1	1	1	0	0	2	0	
<i>Aclopus</i> sp.	0	1	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	1	2	0	0	0	1	0	2	
<i>Aegidellus alatus</i>	1	1	0	1	1	0	1	1	1	0	1	1	1	3	0	1	1	1	0	0	1	1	1	1	1	1	1	0	1	0
<i>Aegidium colombianum</i>	1	0	0	1	1	0	1	1	1	0	1	0	1	2	0	1	1	1	0	1	1	1	1	1	1	1	0	0	2	0
<i>Allidiostoma</i> sp.	1	1	0	1	1	0	0	0	0	0	1	1	0	0	1	0	1	1	1	0	1	1	1	2	0	1	0	1	0	0
<i>Brenskeia coronata</i>	0	1	1	0	1	0	0	0	0	0	1	1	0	0	1	?	1	1	1	1	0	0	1	2	0	0	0	1	0	0
<i>Chaetonyx robustus</i>	1	0	0	0	1	0	1	1	1	0	0	0	1	0	0	1	2	0	1	0	0	1	0	0	1	1	0	1	1	2
<i>Goniorphnus felschei</i>	1	0	0	1	0	0	1	?	?	0	?	?	?	?	0	0	2	?	1	0	0	1	?	?	1	1	0	1	?	2
<i>Hybaloidea fo-veolatus</i>	1	0	0	1	0	0	1	1	1	0	0	?	1	1	0	0	2	?	1	0	0	1	2	1	1	1	0	1	0	1
<i>Hybalus</i> sp.	1	0	0	0	0	0	1	1	1	0	0	1	1	3	0	0	2	1	1	0	0	1	0	0	1	1	1	1	1	2
<i>Madecorophnus falciger</i>	1	1	0	1	1	0	1	1	1	1	0	0	1	1	0	0	0	1	1	0	0	1	1	2	1	1	0	1	1	2
<i>Orphnus bicolor</i>	1	1	0	1	0	0	1	1	1	0	0	0	1	0	0	0	2	1	1	0	0	1	2	1	1	1	0	1	0	1
<i>Paraegidium costalinai</i>	1	1	0	1	1	0	1	1	1	0	0	0	1	3	1	0	1	1	1	0	1	1	1	2	1	1	0	0	2	0
<i>Pseudorophnus coquereli</i>	1	0	0	1	0	0	1	1	1	0	0	1	1	0	0	0	0	1	1	0	0	1	1	2	1	1	0	1	0	0
<i>Stenosternus costatus</i>	1	1	0	1	?	0	?	?	?	?	?	?	?	?	?	?	1	0	0	0	1	?	?	?	1	1	1	0	0	2
<i>Tridontus nitidulus</i>	1	0	0	0	0	0	1	1	1	0	0	0	1	2	0	0	2	1	1	0	0	1	2	2	1	1	0	1	1	2

