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Phylogenetic Analysis of the Subtribe Rutelina and Revision of the *Rutela* Generic Groups (Coleoptera: Scarabaeidae: Rutelinae: Rutelini)

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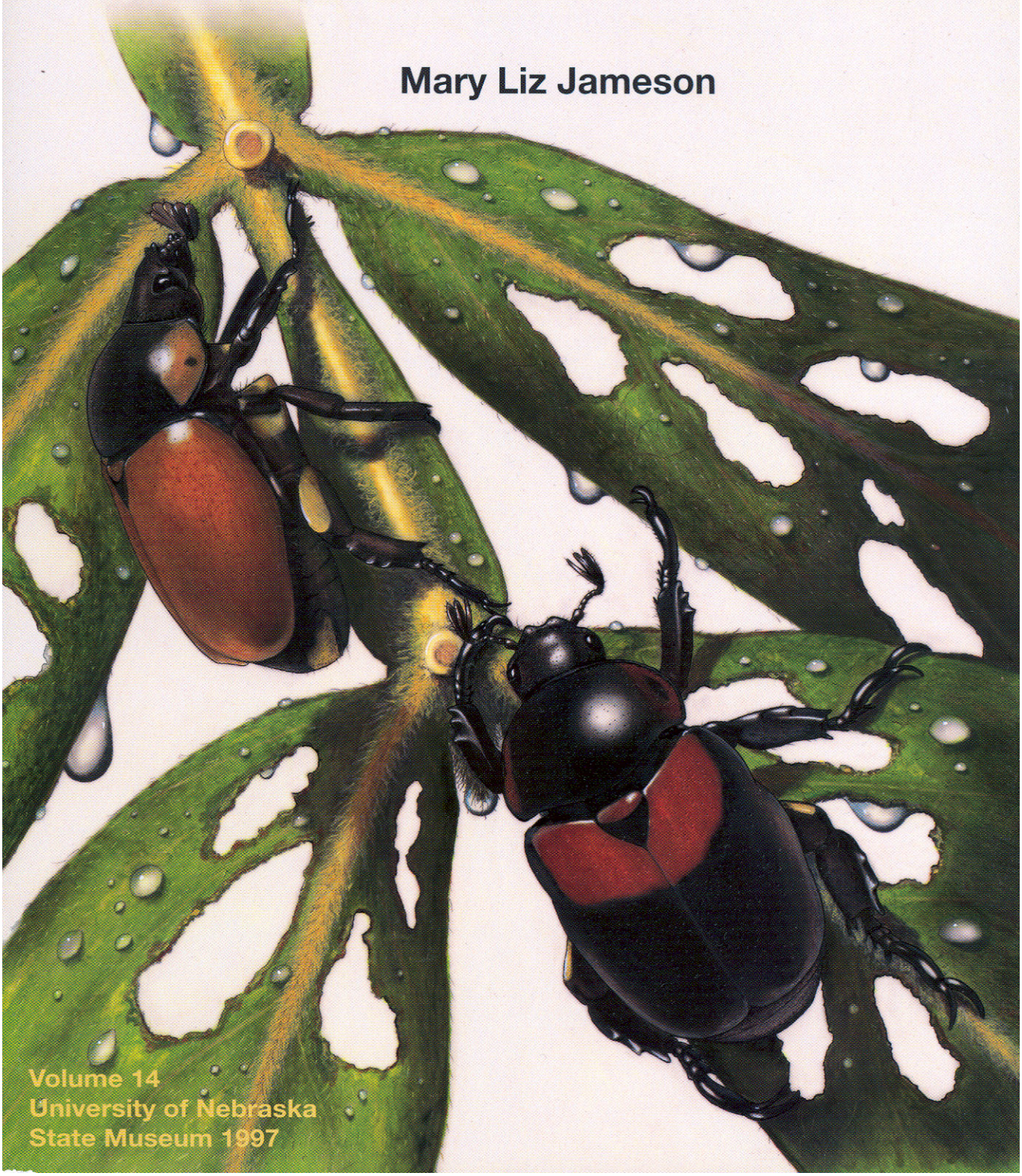

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C O N T E N T S

To the memory of Byron Alexander

"From time to time, a few truths are revealed,
tiny pieces of the vast mosaic of things. Better to divulge the discovery,
however humble it be. Others will come who, also gathering a few fragments,
will assemble the whole into a picture ever growing larger
but ever notched by the unknown."

—Fabre

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Phylogenetic Analysis of the Subtribe Rutelina and Revision of the *Rutela* generic groups (Coleoptera: Scarabaeidae: Rutelinae: Rutelini)

by

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Abstract. This work provides a comprehensive review of the phylogeny and classification of the subtribe Rutelina and a revision of the genus *Rutela* (Rutelina). Because of the lack of a thorough study of all taxa in the subtribe and because of differing philosophies regarding categorical levels, the classification of the subtribe is currently unstable. Phylogenetic analyses of 32 representative genera or subgenera in the tribe Rutelini were conducted as a means of: (1) resolving classification conflicts within the subtribe Rutelina, (2) identifying monophyletic groups within the subtribe, and (3) identifying monophyletic lineages within the tribe Rutelini. Analyses were conducted using 128 morphological characters and 72 taxa. Exemplars of all species of Rutelina were used as taxonomic ingroups. Outgroups included exemplars from the tribes Anomalini, Spodochlamyini, Adoretini (all Rutelinae), Dynastinae, and Melolonthinae. *A priori* decisions concerning taxonomic groupings were avoided by treating all taxa as terminal taxa. Results of the analysis demonstrated that: (1) the subtribe Rutelina is polyphyletic, (2) the genus *Rutela* is paraphyletic and is composed of four monophyletic groups, and 3) several subtribes in the tribe Rutelini are non-monophyletic. Based on the results of the phylogenetic analyses, classification changes in the tribe Rutelini are proposed.

Four monophyletic groups within the genus *Rutela* were identified as a result of the phylogenetic analyses. Each of these is treated as a distinct genus: (1) *Rutela sensu* Latreille, (2) *Microrutela* F. Bates (new status), (3) *Sphaerorutela*, new genus, and (4)

Plesiorutela, new genus. Each of these taxa is revised. The genus *Rutela* includes 17 species and two subspecies. The type species of the genus is *Rutela lineola* (L.). Three new species are described: *Rutela histrioparilis* from Colombia and Peru, *Rutela cryptica* from Panama, and *Rutela howdeni* from Brazil and Venezuela. Two taxa were reduced to subspecific status: *Rutela rufipennis* Ohaus (now *Rutela sanguinolenta rufipennis*) and *Rutela antiqua* Ohaus (now *Rutela striata antiqua*). *Rutela striata martinicensis* Chalumeau and Gruner is considered a synonym of *Rutela striata antiqua* Ohaus.

The genus *Sphaerorutela* is established for four species previously placed in the genus *Rutela*: *Sphaerorutela lauta* (Perty), *Sphaerorutela viridicuprea* (Ohaus), *Sphaerorutela coeruleohumeralis* (Ohaus), and *Sphaerorutela sumptuosa* (Ohaus). The type species for the genus is *Sphaerorutela lauta* (Perty). *Rutela coerulea atrohumeralis* Ohaus and *Rutela coerulea rubripennis* Ohaus are new synonyms of *Sphaerorutela coeruleohumeralis* (Ohaus). The following names are new synonyms of *Sphaerorutela lauta* (Perty): *Rutela coerulea sphaerica* (Burm.), *Rutela coerulea coeruleooxydata* Ohaus, *Rutela coerulea coeruleorufipes* Ohaus, and *Rutela coerulea coeruleovirens* Ohaus. *Rutela martinsi* Martínez and Martínez is a new synonym of *Sphaerorutela sumptuosa* (Ohaus). The following names are new synonyms of *Sphaerorutela viridicuprea* (Ohaus): *Rutela coerulea atra* Ohaus, *Rutela coerulea cruenta* Ohaus, *Rutela coerulea ephippiata* Ohaus, *Rutela coerulea flavovittata* Ohaus, *Rutela coerulea phalerata* Ohaus, and *Rutela coerulea stapiata* Ohaus.

The genus *Microrutela* F. Bates is resurrected, and the type species is *Microrutela coerulea* (Perty). The definition of genus *sensu auctorum* was found to be erroneous based on the type species of the genus. The genus is redefined and includes seven species, three of which are new: *Microrutela batesi* from the Amazon region of Brazil; *Microrutela vidua* from Costa Rica and Colombia, and; *Microrutela ucalayiensis* from the Amazon region of Peru and Brazil.

The new genus *Plesiorutela* is proposed to accommodate a single species, *Rutela specularis* H. Bates. Lack of shared, derived characters and several autapomorphic characters in *Plesiorutela specularis* preclude placement in any other genus.

The larva of *Rutela dorcyi* is described and compared with the only known larva of *Rutela*, *Rutela formosa*. The larva of *Microrutela viridiaurata* is described and compared with larvae in the genus *Rutela*. I provide an updated key to the American genera of Rutelini.

In summary, a new classification is proposed for the *Rutela* generic group that includes the genera *Rutela*, *Sphaerorutela*, *Microrutela*, *Plesiorutela*, *Macraspis*, *Calomacraspis*, and *Cnemida*. *Rutela*, *Sphaerorutela*, *Microrutela*, and *Plesiorutela* include a total of 29 species and subspecies that are distributed from southern Georgia and Florida, U.S.A., the West Indies, and southeast Mexico to Argentina.

Análisis filogenético de la subtribu Rutelina y revisión del grupo genérico *Rutela* (Coleoptera: Scarabaeidae: Rutelinae: Rutelini)

Resúmen. En este trabajo se presenta una revisión detallada de la filogenia y la clasificación de la subtribu Rutelina (según su delimitación reciente) y una revisión del género *Rutela* (Rutelina). La clasificación vigente de la subtribu es inestable debido a la ausencia de un estudio que abarque a todos los taxa de la subtribu, y a las diferentes filosofías implícitas en la asignación de categorías. En el presente estudio se efectuaron análisis filogenéticos de 32 géneros y subgéneros representativos de la tribu Rutelini con los siguientes propósitos: (1) resolver los conflictos en la clasificación interna de la

subtribu Rutelina, (2) identificar los grupos monofiléticos incluídos en la subtribu, y (3) identificar linajes monofiléticos dentro de la tribu Rutelini.

Para estos análisis se utilizaron 128 caracteres morfológicos de 72 taxa; los representantes de todas las especies de Rutelina fueron considerados como grupos internos; mientras que como grupos externos se incluyeron representantes de las tribus Anomalini, Spodochlamyini, Adoretini (todos Rutelinae), así como de las subfamilias Dynastinae y Melolonthinae. Se abandonaron las decisiones a priori concernientes al agrupamiento taxonómico, tratando a todos los taxa como taxa terminales. Los resultados de los análisis filogenéticos demostraron que: (1) la subtribu Rutelina es polifilética, (2) el género *Rutela* es parafilético y está compuesto de cuatro grupos monofiléticos, y (3) varias de las subtribus de Rutelini no son monofiléticas. Con base en estos resultados, se recomiendan cambios importantes en la clasificación de la tribu Rutelini.

Se decidió tratar a cada uno de los cuatro grupos monofiléticos identificados dentro del antiguo género Rutela como géneros distintos: (1) *Rutela* sensu Latreille, (2) *Microrutela* F. Bates (nueva posición), *Sphaerorutela*, nuevo género, y (4) *Plesiorutela*, nuevo género. La revisión de estos taxa nos proporciona los siguientes resultados.

El género *Rutela* incluye 17 especies y dos subespecies; considerando tres especies nuevas: *Rutela histrioparilis* de Colombia y Perú, *Rutela cryptica* de Panamá, y *Rutela howdeni* de Brasil y Venezuela. Dos taxa fueron reubicados en el nivel subespecífico: *Rutela rufipennis* Ohaus (ahora *Rutela sanguinolenta rufipennis*) y *Rutela antiqua* Ohaus (ahora *Rutela striata antiqua*); *Rutela striata martinicensis* Chalumeau y Gruner es considerada como un sinónimo de *Rutela striata antiqua* Ohaus.

El género *Sphaerorutela* se propone para agrupar a cuatro especies previamente situadas en el género *Rutela*: *Sphaerorutela lauta* (Perty), *S. viridicuprea* (Ohaus), *S. coeruleohumeralis* (Ohaus), y *S. sumptuosa* (Ohaus). *Rutela coerulea atrohumeralis* Ohaus y *R. coerulea sumptuosa* Ohaus son nuevos sinónimos de *S. coeruleohumeralis* (Ohaus). Las siguientes nombres son nuevos sinónimos de *S. lauta* (Perty): *R. coerulea sphaerica* (Burm.), *R. coerulea coeruleooxydata* Ohaus, *R. c. coeruleorufipes* Ohaus, *R. c. coeruleovirens* Ohaus. *Rutela martinsi* Martínez y Martínez es un nuevo sinónimo de *S. sumptuosa* (Ohaus). Los siguientes nombres son nuevos sinónimos de *S. viridicuprea* (Ohaus): *R. coerulea cruenta* Ohaus, *R. c. ephippiata* Ohaus, *R. c. flavovittata* Ohaus, *R. c. phalerata* Ohaus, y *R. c. stapiata* Ohaus.

Se resucita el género *Microrutela* F. Bates, pero como la definición original fué incorrecta, se le redefine para incluir siete especies, tres de las cuales son nuevas: *Microrutela batesi* del Amazonas brasileño, *M. vidua* de Costa Rica y Colombia, y *M. ucalayiensis* de la región amazónica de Perú y Brasil.

El nuevo género *Plesiorutela* se propone para ubicar a una sola especie, *Rutela specularis* H. Bates. La ausencia de caracteres derivados compartidos y varios caracteres autapomórficos impiden la inclusión de *P. specularis* en cualquier otro género.

Se describe la larva de *Rutela dorcyi* y se le compara con la única larva de Rutela hasta ahora conocida, *Rutela formosa*. Se describe la larva de *Microrutela viridiaurata*, la primera larva en esta género. Se proviene una clave nueva para separar las larvas de géneros americanos de Rutelini.

En síntesis, la nueva clasificación aquí propuesta para el grupo genérico *Rutela*, incluye los géneros *Rutela*, *Sphaerorutela*, *Microrutela*, *Plesiorutela*, *Macraspis*, *Calomacraspis* y *Cnemida*, y un total de 29 especies y dos subespecies para los primeros cuatro, que se distribuyen desde el sur de Georgia y Florida, E.U.A., el arco antillano y el sureste de México hasta Argentina.

INTRODUCTION

The subtribe Rutelina is currently a heterogeneous assemblage of scarab beetles, the classification of which has been unstable since its inception. As a higher taxon, no comprehensive work has been conducted on the subtribe since Ohaus (1934) who failed to adequately describe and clearly delimit the group. Numerous genera have been placed in the subtribe (or its historical equivalent rank) and removed from it (Burmeister 1844; Lacordaire 1856; H. Bates 1888; Arrow 1917; Ohaus 1918, 1934; Machatschke 1972; Kuijten 1988) (see Appendix 1). The lack of work at the subtribal level has resulted in confusion concerning the generic limits of taxa in the group and in instability within the subtribe.

As currently recognized (Kuijten 1988), the subtribe includes seven genera that are distributed in Asia and the New World. Kuijten (1992) revised the genus *Parastasia* (subtribe Parastasiina) which included three subgenera that Ohaus (1918, 1934) viewed as members of the subtribe Rutelina. Kuijten (1988) elevated these taxa (*Cyphelytra*, *Rutelarcha*, and *Lutera*) to generic status and transferred them from the subtribe Parastasiina to the Rutelina. Kuijten's revisions and classification changes, however, were not in the context of the entire subtribe, and he did not discuss the relationships of the Asian genera to the New World genera.

To understand the composition and relationships of the genera in the subtribe Rutelina, I undertook a phylogenetic analysis of the group (Jameson 1993, 1996 a). During the course of this analysis, it became clear that the phylogenetic limits of the subtribe and genera in the subtribe are mis-represented in the current classification. In order to address the question of monophyly, the study was enlarged to include exemplar taxa of all subtribes in the tribe Rutelini (Appendix 2). Due to similarities of some genera of Rutelina with the subtribe Parastasiina and the subfamily Dynastinae, the study was enlarged to address the relationship of the tribe Rutelini and the subfamily Dynastinae. In this work, I have attempted to place the subtribe Rutelina and the *Rutela* generic groups in a phylogenetic framework and also to discuss the relationships of other taxa in the tribe Rutelini. I also provide a revision and taxonomic treatment for the *Rutela* generic groups and new classification based on the phylogenetic analysis.

REVIEW OF THE SUBFAMILY RUTELINAE, TRIBE RUTELINI, AND SUBTRIBE RUTELINA

The subfamily Rutelinae (Scarabaeoidea: Scarabaeidae) is comprised of approximately 200 genera and 5,000 species (Machatschke 1972) although many taxa remain to be described. The group includes a wide array of beetles; some are metallic silver and gold (*Plusiotis*, *Anoplognathus*), some have enlarged, horn-like mandibles (*Fruhstorferia*) or enlarged hind femora (*Chrysina*, *Heterosternus*, *Parachrysina*), and many are small, obscure beetles (such as species in the genus *Anomala*, one of the largest genera in the Animal Kingdom with well over 1,000 described species). The subfamily is most diverse in tropical regions. Adults of most rutelines are phytophagous or floricolous, and larvae feed on roots or decaying organic matter. Some rutelines, such as *Popillia japonica* Newman, *Anomala* spp., and *Adoretus* spp., cause damage to crops. Aside from a few agriculturally important species, the behavior, natural history, and larvae are unknown for most rutelines.

Although other systematists have contributed to the knowledge of the subfamily, Frederick Ohaus is indisputably the "Father of Rutelinae." Ohaus provided the foundation for the classification of the subfamily, the only identification manual to the tribe Rutelini, and identifications that provided the foundation for subsequent work by Machatschke. In his lifetime (1864-1946) Ohaus published over 80 scientific papers, including revisions of many genera, subtribes, and tribes; compiled the *Coleopterorum Catalogus* for the Rutelinae (1918);

and completed the *Genera Insectorum* volume on the tribe Rutelini (1934). J.W. Machatschke (1912-1974) also contributed greatly to the knowledge of the world Rutelinae primarily using Ohaus' identifications to produce the *Genera Insectorum* on the Orthochilous Rutelinae (1965) and Anomalini (1957) and the supplement to the *Coleopterorum Catalogus* of the Rutelinae (1972).

As with most classifications, that of the Rutelinae is a product of history. Two hundred and forty years ago when Linnaeus described *Scarabaeus lineola* (now *Rutela lineola*), it was believed that God created all animals and that they were immutable. Even after Darwinian evolution had been accepted in the mid- to late 1800s, concepts of species as evolving units lagged far behind. Ruteline classifications that were built by taxonomists such as Ohaus (1918), Arrow (1917), H. Bates (1888), and Burmeister (1844) were based primarily on overall similarity in form (*gestalt*), a limited set of characters (sometimes due to limited magnification or poor optics), and the classifications of their predecessors. Systematics is a dynamic science, and techniques and ideas are constantly changing the complexion of how we interpret patterns in nature. Due to the history of systematics, the classifications that systematists inherit do not necessarily reflect true patterns of ancestry and descent. Revisions and phylogenetic studies are the basis for creating phylogenetic groups from historical taxonomic groups. From these data, patterns of biodiversity can be described. In terms of addressing evolutionary patterns in rutelines, I have found that the classification of the Rutelinae is greatly in need of revision.

Tribes and Subtribes within the Subfamily Rutelinae

Tribes in the subfamily Rutelinae have changed remarkably little since Burmeister's (1844) classification of the "Phyllophaga metallica," the group of animals that Blanchard (1850) dubbed the "Rutelinae." The subfamily is comprised of six tribes that are divided into two groups based on the form of the labrum. These two groups are referred to by Ohaus (1918, 1934) as the sections "Rutelinae homalochilidae" and the "Rutelinae orthochilidae." The homalochilous rutelines include the tribes Rutelini and Anomalini. Taxa in these tribes share the character of a horizontally produced labrum. The orthochilous rutelines include the tribes Adoretini, Spodochlamyini, Geniatini, and Anoplognathini. These taxa share the character of a vertically produced labrum.

Before the publication of Ohaus' catalog (1918), tribes (or the historical equivalent) were also proposed for the Parastasiini (the genera *Parastasia, Peperonota, Fruhstorferia, Didrepanephorus, Dicaulocephalus*) (Arrow 1917), Peltonotini (monobasic with the genus *Peltonotus*) (Arrow 1917), Heterosternini (the genera *Heterosternus, Macropoides, Parisolea*) (H. Bates 1888), and Areodini (the genera *Cotalpa, Parachrysina, Byrsopolis*) (H. Bates 1888). Arrow (1917) also proposed the subfamily Desmonychinae that included a single species, *Desmonyx humeralis* Arrow. Ohaus did not recognize these taxonomic groups in his catalogs, publications, or in the *Genera Insectorum*, and he did not discuss his justification for rejecting them. Perhaps due to the lack of systematists studying world Rutelinae in the interim, Ohaus' tribal classification of 1918 has remained the standard for the subfamily.

According to Ohaus' 1918 classification, members of the tribe Rutelini are predominantly distributed in the New World. Approximately 80% of the genera and 72% of the species occur in this region (Ohaus 1934). Various subtribal groupings have been used within the Rutelini (Appendix 1) but usually without definition or diagnosis or, at most, with diagnoses that provided little information for identification. Henry Bates (1888) and Ohaus (1934) provided vague definitions and diagnoses for only *some* subtribes, but even these were based on characters that were not constant among all genera. For example, Ohaus (1934) provided no discussion regarding characters for the subtribes Areodina,

Heterosternina, and Pelidnotina. For the subtribe Rutelina, Ohaus (1934) provided characters that vary among the genera; Ohaus seemed to group the taxa based on a robust body form and similar coloration (black with yellow or tan). Because of the lack of subtribal definition, taxonomists have placed and displaced genera within subtribes. Also, because subtribal groupings were not based on shared, derived characters, the subtribal classification provided only a rough estimation of natural groups. Kuijten (1992: 6), summarized our knowledge of the tribes and subtribes of the Parastasiina and Rutelina of Asia: "Only against the background of a phylogenetic taxonomic study of the whole subfamily, or at least the Rutelini, . . . [can] the question of monophyly . . . be solved."

Historically there has been little agreement upon the classification of groups within the tribe. These conflicts have primarily involved the placement of taxa in the subtribes Rutelina, Parastasiina, and Pelidnotina. Secondarily, there have been conflicts involving the placement of taxa in the subtribes Oryctomorphina, Didrepanephorina, and Fruhstorferiina as well as the placement of taxa in the subfamily Dynastinae. These classification conflicts warrant discussion and provide a background for understanding the current classification.

Separation of taxa in the Rutelina and Pelidnotina has long been, and continues to be, a stumbling block for taxonomists. In an attempt to define the Pelidnotina, Frederick Bates (1904: 250) stated: "It is much more difficult to find characters that will enable one at once to distinguish the "Pelidnotides" from those "Rutelides vraies" . . . for there is no single character sufficiently constant to enable us to do this . . ."

Traditionally, the Rutelina and Pelidnotina were separated based on the pronotal basal bead which was said to be lacking in the Rutelina and complete in the Pelidnotina (Ohaus 1934). However, several taxa *within* the Pelidnotina do not have a complete basal bead (*i.e.*, *Pelidnota quadripunctata* F. Bates, *P. lucida* Burm., *P. fuscoviridis* Ohaus, *P. polita* Latreille, species in the genus *Homothermon*, and some species of *Plusiotis*).

The overlap in many shared character states in *Pelidnota* and *Rutela* may have prompted H. Bates (1888) to place these two taxa together in the "Group Rutelina." Most workers (before and after H. Bates) separated the genera placing *Rutela* in the Rutelina (or its historical equivalent) and placing *Pelidnota* in the Pelidnotina (or its historical equivalent). Although F. Bates (1904) noted the "close relationship" of the genera *Pelidnota* and *Rutela*, he followed Lacordaire's (1856) classification that separated the taxa, and he did not discuss his brother's classification. Ohaus (1918, 1934) did not discuss Bates' classification, nor did he follow it.

Conflict regarding the classification of genera in the Rutelina and Parastasiina is, in part, a result of the lack of comprehensive study of *Parastasia* and its relatives. The Asian genera *Cyphelytra*, *Lutera*, and *Rutelarcha* have been synonymized under *Parastasia* (Arrow 1917; Machatschke 1972) and also have been recognized as valid genera (Waterhouse 1874, 1875; Westwood 1875; Ohaus 1918, 1934; Kuijten 1988, 1992). Arrow (1917: 36) synonymized the genera *Rutelarcha*, *Lutera*, and *Cyphelytra* under the genus *Parastasia*, "having entirely failed to find characters of more than specific importance by which they can be separated." Ohaus (1918, 1938) refuted the synonymy, placed the three genera in the subtribe Rutelina, and placed *Parastasia* in the subtribe Parastasiina with the genera *Peperonota*, *Dicaulocephalus*, and *Ceroplophana*. This grouping, however, was not accepted by other workers. In his work on American Scarabaeidae, Casey (1915: 103) commented that the Parastasiina, ". . . do not hold together among themselves at all well, the habitus of *Parastasia*, *Peperonota* and *Polymoechus* [*Parastasia*] being notably divergent . . ." In the *Coleopterorum Catalogus*, Machatschke (1972) synonymized the three genera and placed them in species groups within the genus *Parastasia* in the subtribe Parastasiina.

This age-old classification problem confronted Wada (1988) and Kuijten (1992) in

their works on the genus *Parastasia*. Wada (1988) conducted a phenetic analysis of the Asian Rutelinae (*sensu* Arrow 1917, see Appendix 1). Wada's dendrogram indicated that *Rutelarcha, Cyphelytra,* and *Lutera* (what he refers to as *Parastasia*) share 77% overall similarity and are a separate lineage from *Parastasia*. Although his analysis did not include the New World Rutelina, Wada (1988) suggested that the genera *(Rutelarcha, Cyphelytra,* and *Lutera)* may be members of the subtribe Rutelina (indicated on the dendrogram with a question mark). He showed that the *Parastasia westwoodi* group, *Ceroplophana, Fruhstorferia, Peperonota,* and *Dicaulocephalus* share 67% overall similarity. According to Wada, these genera, along with the remaining members of the genus *Parastasia,* are members of the subtribe Parastasiina.

In his monograph of *Parastasia,* Kuijten (1992) discussed subtribal classification with particular reference to *Parastasia* and the Asian Rutelina. Kuijten (1992) provided character states that unite all species in the genus *Parastasia,* thus maintaining Machatschke's (1972) classfication. As an aside, he noted that *Fruhstorferia* (subtribe Fruhstorferiina) shares characters with *Parastasia* and could, possibly, be included in the subtribe Parastasiina. Kuijten provided character states that unite the genera *Lutera, Cyphelytra,* and *Rutelarcha,* he resurrected these three taxa to generic standing once again (Kuijten 1988), and replaced them in the subtribe Rutelina. Kuijten (1988: 76), however, declined to address "the correctness of their connection with the American section of the subtribe . . ."

"Affinities" with the Dynastinae

For more than a century, systematists have noted "affinities" that the genus *Parastasia* shares with members of the subfamily Dynastinae. Arrow (1907: 357) was probably the first to recognize that such genera as *Oryctomorphus, Desmonyx, Parastasia,* and *Metapachylus* (what he refers to, loosely, as the "*Parastasia* group") link the Dynastinae and Rutelinae, thus blurring the "boundaries" of the subfamilies: ". . . the *Parastasia* group . . . embraces a variety of forms already recognized as connecting the Rutelidae and Dynastidae, but the latter family [Dynastinae], if these aberrant members are excluded from it, becomes fairly homogeneous." LeConte, in a letter to Lacordaire, declared "unconditionally that *Polymoechus* [*Parastasia*] can be nothing less than a dynastid" (from Casey 1915: 103). Arrow (1917: 25-26) noted the "Parastasiini form the point of closest contact of the Rutelinae with the Dynastinae. . ." and are ". . . undoubtedly the one with the nearest relationship to the Dynastinae. . . " In the description of the genus *Rutelisca,* H. Bates (1888: 270) noted that the genus is "[A]n interesting form, intermediate between the true Rutelae and Cyclocephali [Dynastinae], and having a marked affinity with the Indian and Malayan genus *Parastasia.*" In addition to adult characters, Ritcher (1966) noted that the larva of *Parastasia brevipes* LeConte shares affinities with *Ligyrus* (Dynastinae: Pentodontini), and the larvae of *Orizabus* and *Aphonus* (Dynastinae: Pentodontini) also share ruteline features (Ritcher 1966).

In addition to the lack of precise definition of the subfamilies, affinities between the Dynastinae and Rutelinae have caused classification conflicts. *Peltonotus* and *Oryctomorphus,* which were originally described in the subfamily Dynastinae, have been placed in both the Rutelinae *and* Dynastinae. *Oryctomorphus* was moved to the Rutelinae by Arrow (1917), and Endrödi (1969) returned it to the Dynastinae (Pentodontini) based on the form of the claws and antennae that he believed to be more dynastine-like. The genus *Peltonotus* has had a similar history. It was originally described in the "Dynastites" [Dynastinae] by Burmeister (1847) and transferred to the Rutelinae by Arrow (1908: 355) based on ". . . a well-developed externally-visible labrum and unequal claws on all feet . . . These are features characteristic of the Rutelinae . . ." Arrow placed the genus in its own tribe, the Peltonotini, because of its "aberrant" features. Ohaus (1918) rejected Arrow's tribe

Peltonotini (without explanation) and placed *Peltonotus* in the subtribe Pelidnotina.

Although systematists have noted "affinities" and character overlap between the subfamilies, the basic problem of characterizing the taxa has not been addressed. The subfamily Rutelinae has been traditionally recognized based on the form of the claws that are independently movable and of unequal size on all legs. In the Dynastinae, the claws of at least the middle and posterior legs are not independently movable and are of equal size. However, these characters are not completely reliable. As noted by Casey (1915: 1), "The primary divisions of the Scarabaeidae [Rutelinae, Dynastinae, Cetoniinae] are not rigorously definable . . . There is scarcely a structural feature defining one group that may or may not appear in some other group." Casey (1915: 107) faltered many times in trying to characterize the Dynastinae in such as way as to exclude the Rutelinae: "There are many structural features common to the Dynastinae and Rutelinae, for example the corneous ligula is soldered rigidly to the mentum and the almost uniformly 10-jointed antennae always a have 3-jointed club in both subfamilies. The Dynastinae differ radically, however, in having the tarsal claws equal in size, *excepting* the anterior in the males of certain species; but there are some genera the assignment of which to the Rutelinae, Dynastinae or Cetoniinae it is difficult if not impossible to decide under our present knowledge. The mandibles are *nearly always* exposed, though concealed in *most* of the Cheiroplatids [*Orizabus*], and are generally in part ciliate, and the anterior coxae are transverse and deeply seated. It is unsafe to add further to these few diagnostic characters, in view of the diversities of structure and the numerous exceptions, further than to say that corneous thoracic and cephalic processes in the males are as characteristic of the Dynastinae, as their absence is of the Rutelinae. It should also be added, that the labrum is always visible in the Rutelinae and *almost invariably* hidden under the clypeus in the Dynastinae. Excepting in the isolated Cyclocephalini, the clypeus is but *rarely* truncate as is so frequently the case in the preceding subfamily [Rutelinae], but is *generally* more or less acuminate and reflexed at tip and variously dentate to edentate. The scutellum varies greatly in the Rutelinae, being sometimes small and occasionally enormously developed, but here [Dynastinae] there is a remarkable uniformity, it being generally very moderate in size. Finally it is to be noted that metallic lustre of the integuments is a very common character among the Rutelids but is very rare among the Dynastids" (italics added).

There are exceptions to nearly every rule in characterizing the Rutelinae and Dynastinae. Even characters that are typically diagnostic for the Dynastinae (*i.e.*, thoracic and cephalic processes, tarsal claws equal in size, hidden labrum, lack of metallic luster) are also present in some Rutelinae and vice versa. These observations of character overlap between the Rutelinae and Dynastinae (and Cetoniinae) are indicative of the lack of phylogenetic analyses among the pleurostict scarabaeoids and the question of the monophyly of subfamilies.

Phylogenies for the Scarabaeoidea hypothesize three differing views for the relationships of the Dynastinae and Rutelinae: 1) that the subfamily Dynastinae is ancestral to the Rutelinae, 2) that the Dynastinae and Rutelinae are sister groups, or 3) that subfamilies are *possible* sister groups. Scholtz and Chown (1995) hypothesized that the dynastine lineage is ancestral to the ruteline lineage (depicted with an indecisive broken line). Iablokoff-Khnzorian (1977) hypothesized that the subfamilies are *possible* sister groups (branching off the same node). Howden (1982), Meinecke (1975), and Endrödi (1966) hypothesized that the subfamilies are sister groups. Clearly, the relatively simple question of relationships among the genera in the subtribe Rutelina has opened a Pandora's box of phylogenetic and classification problems, only some of which are within the scope of this study. I find it necessary, however, to bring these issues to the attention of systematists, and I hope that additional research and

interest in the phylogeny of the Rutelinae will culminate in new understanding.

MATERIALS AND METHODS

Specimens and Taxonomic Material

Specimens examined for this study were provided by 53 institutions and private collections that loaned thousands of specimens, including type specimens. A total of 4,572 specimens were used for the revision of the *Rutela* generic groups. Acronyms for loaning institutions follow Arnett *et al.* (1993).

ARGC Alan R. Gillogly Collection, College Station, TX
AVEC Arthur V. Evans Collection, Los Angeles, CA
AMNH American Museum of Natural History, New York, NY (Lee Herman)
ANSP Academy of Natural Sciences, Philadelphia, PA (Donald Azuma)
BCRC Brett C. Ratcliffe Collection, Lincoln, NE
BMNH The Natural History Museum, London, England (Malcolm Kerley)
DCCC David C. Carlson, Orangevale, CA
CASC California Academy of Sciences, San Francisco, CA (Dave Kavanaugh, Roberta Brett)
CMNC Canadian Museum of Nature, Ottawa, Canada (François Génier)
CMNH Carnegie Museum of Natural History, Pittsburg, PA (Robert Davidson)
CNCI Canadian National Collection of Insects, Ottawa, ON, Canada (Jean McNamara, José Poirier)
CUIC Cornell University Insect Collection, Ithaca, NY (Richard Hoebeke)
DCCC Richard A. Cunningham Collection, Chino, CA
DJCC Daniel J. Curoe Collection, Palo Alto, CA
DBTC Donald B. Thomas Collection, Weslaco, TX
EMEC Essig Museum of Entomology, Berkeley, CA (John Chemsak, Cheryl Barr)
EGRC Edward G. Riley Collection, College Station, TX
FMNH Field Museum of Natural History, Chicago, IL (Alfred Newton)
FREY Georg Frey Collection formerly at ZSMC, Munich, Germany (Gerhard Scherer, Max Kuhbander, Martin Baer)
FSCA Florida State Collection of Arthropods, Gainesville, FL (Bob Woodruff, Brenda Beck, Mike Thomas)
HAHC Henry and Anne Howden Collection, Ottawa, Canada
IJSM Natural History Museum, Institute of Jamaica, Kingston, Jamaica (Thomas A. Farr)
IMLA Fundacion e Instituto Miguel Lillo, Universidad Nacional de Tucuman, Tucuman, Argentina (Arturo L. Terán)
INBC Instituto Nacional de Biodiversidad, Santo Domingo de Heredia, Costa Rica (Angel Solís)
INPA Colecâo Sistemática da Entomologica, Instituto Naçional de Pesquisas da Amazônia, Manaus, Brazil (material deposited by Gerhard Gottsberger, Universitat Ulm, Germany)
JEWC James E. Wappes Collection, Bulverde, TX
JPHC Jeffrey P. Huether Collection, Geneva, NY
LACM Insect Collection, Los Angeles County Museum of Natural History, Los Angeles, CA (Roy Snelling)
LAGO Paul Lago, University, MS
MAMC Miguel A. Morón Collection, Xalapa, Mexico
MCZC Museum of Comparative Zoology, Cambridge, MA (Stephan Cover)
MEMU Mississippi Entomology Museum, Mississippi State University, MS (John MacDonald)
MLPA Museo de La Plata, La Plata, Argentina (Ricardo Ronderos)

MLUH Wissenschaftsbereich Zoologie, Sektion Biowissenschafter Martin-Luther-Universitat Halle, Halle, Germany (Manfred Dorn)
MNHN Museum National d'Histoire Naturelle, Paris, France (Jean Menier)
MNNC Coleccíon Nacional de Insectos, Santiago, Chile (Mario Elgueta)
MTEC Montana State University Entomology Collection, Bozeman, MT (Michael A. Ivie)
MUCR Museo de Insectos, Universidad de Costa Rica, San José, Costa Rica (Humberto Lezama, Ruth Leon)
MZHF Zoological Museum, Finnish Museum of Natural History, Helsinki, Finland (Olof Bistrôm)
NHRS Naturhistoriska Riksmuseet, Stockholm, Sweden (Fredrik Ronquist)
QBUM Museu Naçional, Rio de Janeiro, Brazil (Miguel Monné)
QCAZ Catholic University Museum, Quito, Ecuador (Giovanni Onore)
SEMC Snow Entomological Museum, University of Kansas, Lawrence, KS (Rob Brooks)
TAMU Department of Entomology Insect Collection, Texas A & M University, College Station, TX (Ed Riley)
UMRM W. R. Enns Entomology Museum, University of Missouri, Columbia, MO (Robert Sites, Kristin Simpson)
UNAM Coleccíon Entomologia, Instituto de Biología, Universidad Nacional Autonoma de Mexico, Mexico, D. F. (Silvia Santiago)
UNSM University of Nebraska State Museum, Lincoln, NE (Brett Ratcliffe)
USNM United States National Museum, Washington, D.C. (Bob Gordon, Gary Hevel)
UZIU Uppsala University, Zoological Museum, Uppsala, Sweden (Lars Wallin)
WBWC William B. Warner Collection, Chandler, AZ
ZMHB Museum für Naturkunde der Humboldt Universitat zu Berlin, Berlin, Germany (Manfred Uhlig, Joachim Schulze)
ZMUC Zoological Museum, University of Copenhagen, Denmark (Ole Martin)
ZSMC Zoologische Staatssammlung des Bayerischen Staates, Munich, Germany (Gerhard Scherer, Max Kuhbander, Martin Baehr)

Well over 70% of the material for this study was provided by early explorers such as Bates (1825-1892), d'Orbigny (1802-1857), Spix (1781-1816), Martius (1794-1868), Ohaus (1864-1946), Lacordaire (1801-1870), Castelnau (1810-1880), Langsdorff (1774-1852), Nevermann (1881-1938), Saint-Hilaire (1779-1853), Mathan (dates unknown), Salvin (1835-1898), and Champion (1851-1927). Because of the antiquity of most of the material, data such as locality, date, and ecological data are poor for most specimens. Papavero's "Essays on the History of Neotropical Dipterology" (1973) provided additional collecting locality information, especially for place names that have changed.

Type Specimens

During the course of the study, primary types (when available) were examined. Lectotypes, lectoallotypes, and paralectotypes were designated when necessary. I discuss the label data that are associated with the specimens, labels, specimen condition, and institution where specimens are deposited under the description of each taxon.

Ohaus, the primary authority to date on the world Rutelinae, described a number of new species during his lifetime. For reasons unknown to me, Ohaus habitually placed "type" or "cotype" labels on specimens long after the species description was originally published. This has created a number of nomenclatural problems (Kuijten 1988, 1992; Jameson 1990). This was not simply a "housekeeping" problem. In some cases, it was clear from the specimens that Ohaus' concept of the species had changed since the original

date of publication. Thus, Ohaus' "type" series occasionally included more than one species. Discriminating between the true types and those that were added after publication was a mission in sleuthing and a lesson in patience. Types that were invalidly designated by Ohaus were identified based on collecting data that post-dated the original publication, incorrect sex of the specimen, or descriptive data that did not agree with the specimen. When I was able to discern true type specimens from invalidly designated specimens, I placed an "invalid type designation" label on the latter specimens.

Dissection

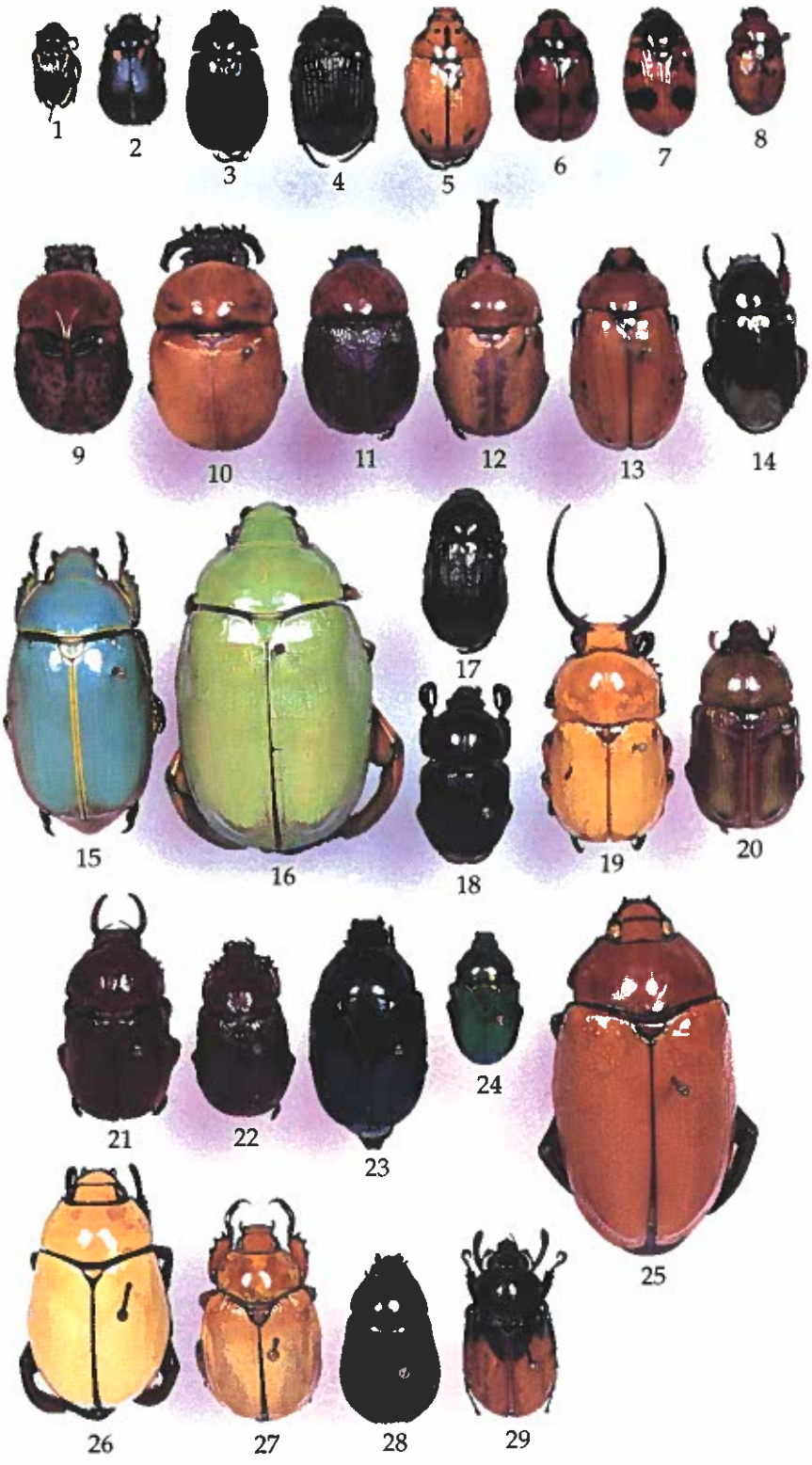
Dissection was essential for examination of many characters used in the study. Hind wings, mouthparts, the abdomen, and genitalia were dissected from exemplars for character analysis. Dried specimens were softened by boiling in distilled water for several minutes (with a drop of detergent to break up fat). Mouthparts (mentum, maxilla, mandible, labrum) were extracted using microforceps, microscalpel, and insect pins. Parts were card-mounted using ethylose glue and then pinned beneath the specimen. Ohaus' (1934) technique for card-mounting mouthparts was modified in order to mount parameres and the spiculum gastrale as well (Fig. 85). In most cases, the left mandible, left maxilla, mentum, and labrum were extracted, thus leaving the right mandible and maxilla intact. The left hindwing (including axillary sclerites) was extracted, dried between glass slides in an extended position, and mounted on a plastic cover slip using balsam. The hindwing was mounted beneath the specimen in order to avoid disassociation. The aedeagus and the spiculum gastrale were extracted using one of two techniques (depending upon the condition of the specimen and the fragility of the genitalia). First, the aedeagus and spiculum gastrale were extracted through the genital opening (Woodruff and Beck 1989). Microforceps, scalpel (to cut the membrane between the last ventral segment and the pygidium), and insect pins were sufficient instruments for extracting the genitalia. The membranous sheath that protects the aedeagus (and is held in place by the spiculum gastrale) was removed. If genitalia were especially fragile or difficult to extract through the genital opening, they were dissected by carefully removing the abdomen at the juncture between the metathorax and the first abdominal sternite. The aedeagus is found within the abdomen near the genital opening and is easily excavated. With this technique, however, it is more difficult to extract the spiculum gastrale. The spiculum is located at the last sternite and is firmly attached with muscles. The genitalia and spiculum gastrale were card-mounted using ethylose glue and pinned beneath the specimen (Fig. 85). The metendosternite and metanotum were examined by carefully dissecting the abdomen at the juncture between the metathorax and the first abdominal sternite. After removing thoracic muscles, the caudal end of the metendosternite is easily examined. The metanotum (the structure that lies above the metendosternite) is also easily examined in this view. These structures were observed and drawn, but not extracted because they are an integral part of the skeleton. Following the examination of all characters, the abdomen was replaced (using ethylose glue), and the specimen appeared intact. Additional information regarding the morphology of characters is discussed under the specific subheadings for that character in the "Character Analysis" section.

Character Examination

Internal and external morphological features formed the basis for this work. Specimens were examined with a dissecting microscope (6.5 to 80X power) and fiber-optic lights. For better definition of cuticular sculpturing, a piece of opaque drafting film was used as a "screen" between the specimen and the light element. This simple procedure reduced the reflectivity on the beetle surface and enhanced visibility of microsculpture.

FIGS. 1-29. Representative species from the tribe Rutelini.

1, *Cnemida retusa* (Fabricius).
2-3, *Rutelisca flohri* H. Bates, male and female.
4, *Metapachylus sulcatus* H. Bates, female.
5, *Lutera nigromaculata* Ohaus.
6, *Rutelarcha bakeri* Ohaus.
7, *Rutelarcha quadrimaculata* Waterhouse.
8, *Parastasia confluens* Westwood.
9, *Peperonota harringtoni* Westwood, male.
10-11, *Dicaulocephalus feae* Gestro, male and female.
12, *Ceroplophana modiglianii* Gestro, male.
13, *Pelidnota notata* Blanchard.
14, *Pelidnota belti* Sharp, male.
15, *Plusiotis chrysopedila* H. Bates.
16, *Chrysina macropus* (Francillon), male.
17, *Homonyx planicostata* Blanchard.
18, *Peltonotus morio* Burmeister, male.
19-20, *Fruhstorferia sexmaculata* Kraatz, male and female.
21-22, *Fruhstorferia mizunumai* Nagai & Hirasawa, male and female.
23, *Macraspis hirtiventris* (H. Bates).
24, *Calomacraspis splendens* (Burmeister).
25, *Heterosternus oberthueri* Ohaus, male.
26, *Macropoides crassipes* (Horn), male.
27, *Cotalpa lanigera* (L.).
28, *Pseudochlorota peruana* Ohaus.
29, *Acrobolbia macrophylla* Ohaus, male.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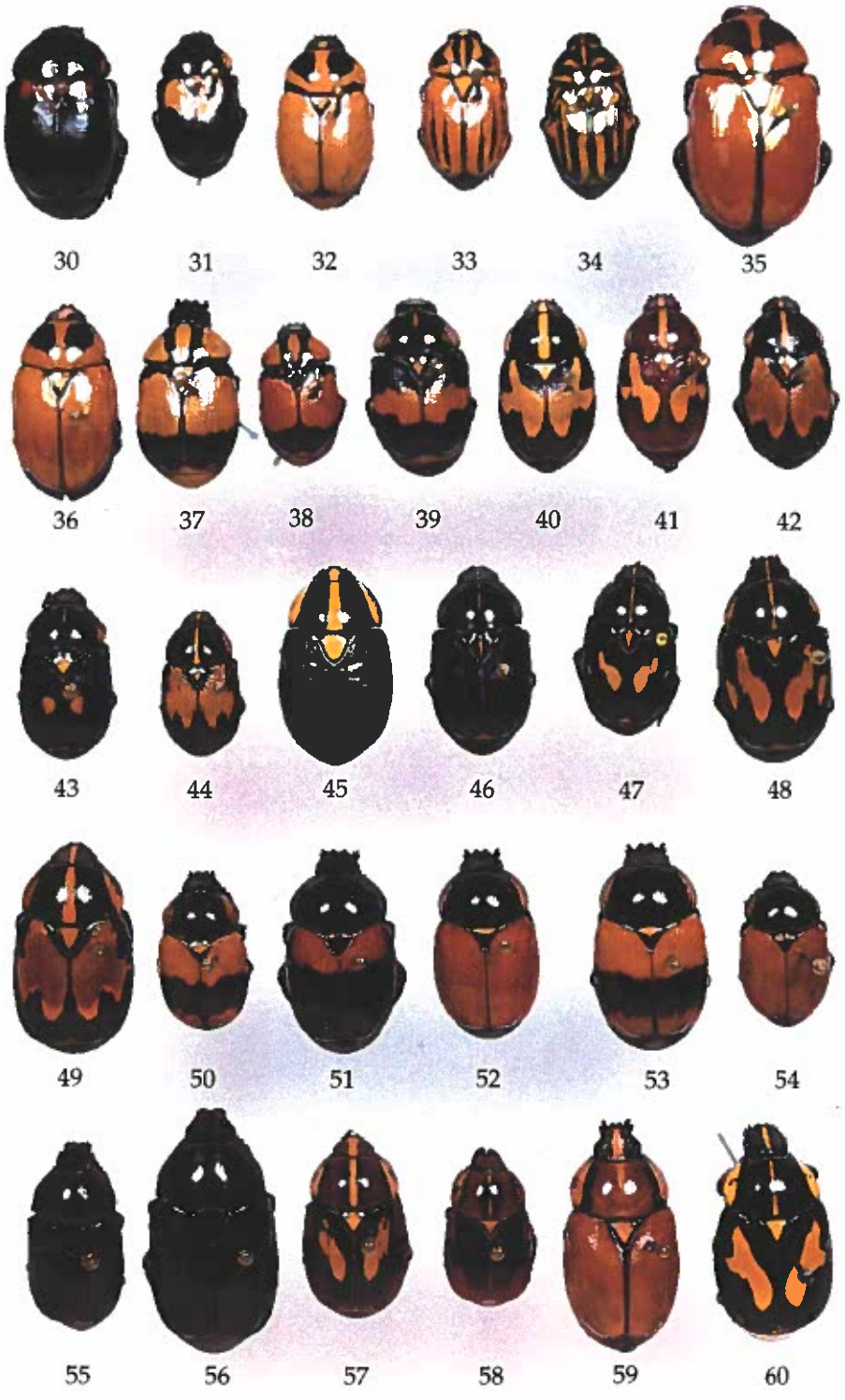
FIGS. 30-60. Species of *Rutela*.

30, *Rutela cryptica* Jameson.
31-32, *Rutela dimorpha* Ohaus, male and female.
33, *Rutela dorcyi* (Olivier).
34, *Rutela formosa* Burmeister.
35-36, *Rutela glabrata* (Fabricius), male and female.
37-38, *Rutela heraldica* Perty.
39, *Rutela howdeni* Jameson.
40-43, *Rutela histrio* Sahlberg [*43=Rutela histrio* "bimaculata" morphotype].
44, *Rutela histrioparilis* Jameson.
45, *Rutela laeta* (Weber).
46-49, *Rutela lineola* (L.).
50, *Rutela pygidialis* Ohaus.
51-53, *Rutela sanguinolenta sanguinolenta* Waterhouse.
54, *Rutela sanguinolenta rufipennis* Waterhouse.
55, *Rutela striata striata* Olivier.
56, *Rutela striata antiqua* Ohaus.
57-58, *Rutela tricolorea* Ohaus.
59, *Rutela versicolor* Latreille.
60, *Rutela vetula* Ohaus.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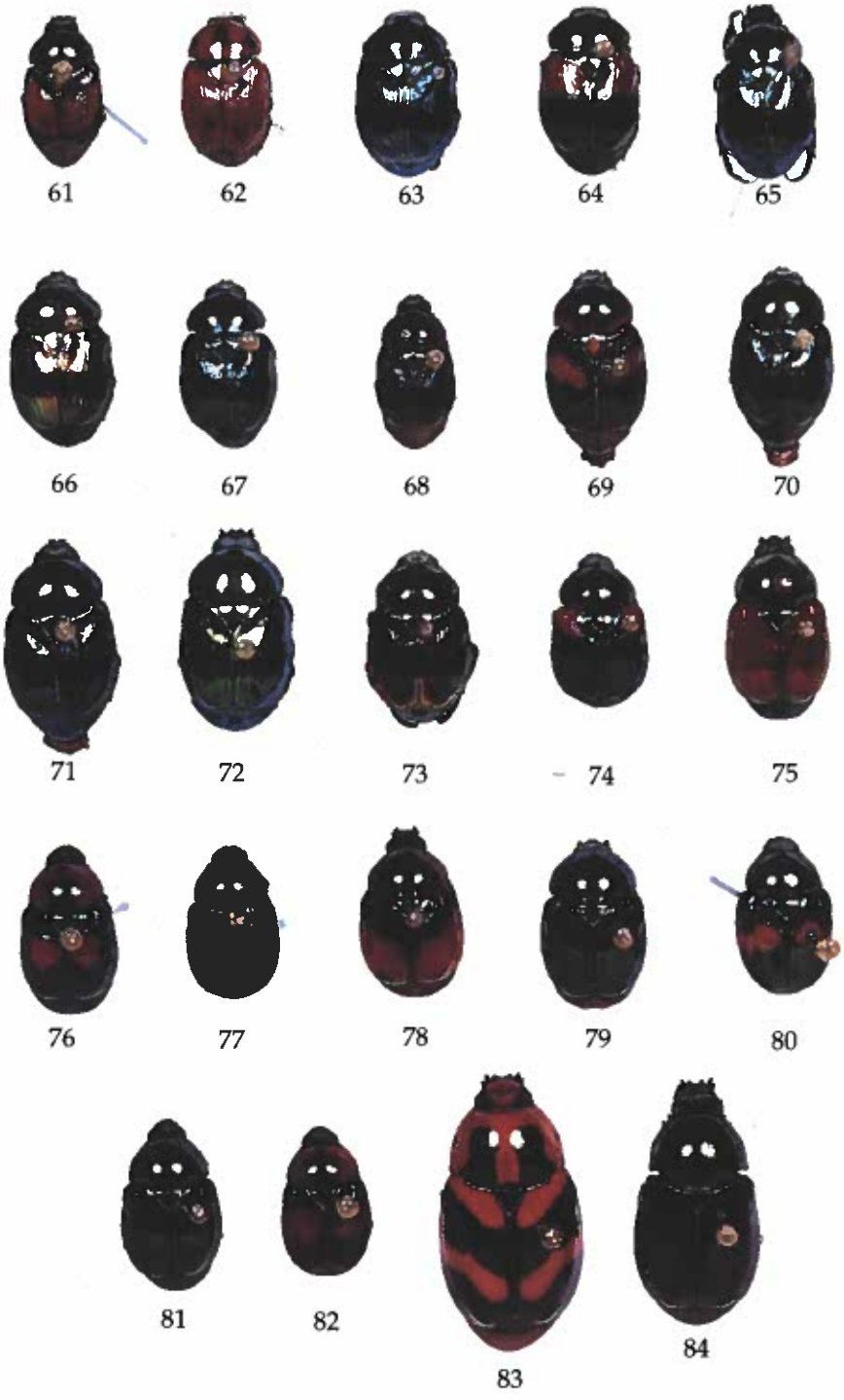
FIGS. 61-84. Species of *Microrutela*, *Sphaerorutela*, and *Plesiorutela*.

61-62, *Microrutela batesi* Jameson.
63-64, *Microrutela campa* (Ohaus).
65, *Microrutela coerulea* (Perty).
66-67, *Microrutela egana* (Ohaus).
68-69, *Microrutela ucalayiensis* Jameson.
70-71, *Microrutela vidua* Jameson.
72-73, *Microrutela viridiaurata* (H. Bates).
74-76, *Sphaerorutela coeruleohumeralis* (Ohaus).
77, *Sphaerorutela lauta* (Perty).
78-79, *Sphaerorutela sumptuosa* (Ohaus).
80-82, *Sphaerorutela viridicuprea* (Ohaus).
83-84, *Plesiorutela specularis* (H. Bates).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I attempted to use as many characters and suites of characters as possible for the analysis. Some characters, however, did not prove useful or appropriate due to excessive variability or due to constancy. The internal structure of the spiracles was not studied (due to the necessity of specimen destruction) although this may be informative phylogenetically. Ritcher (1969 a-b) noted differences in the trabeculae at the level of genus, tribe, and subfamily. Due to the lack of larvae and larval descriptions for most Rutelinae (the larvae of one third of the genera are not described), larval characters were not used.

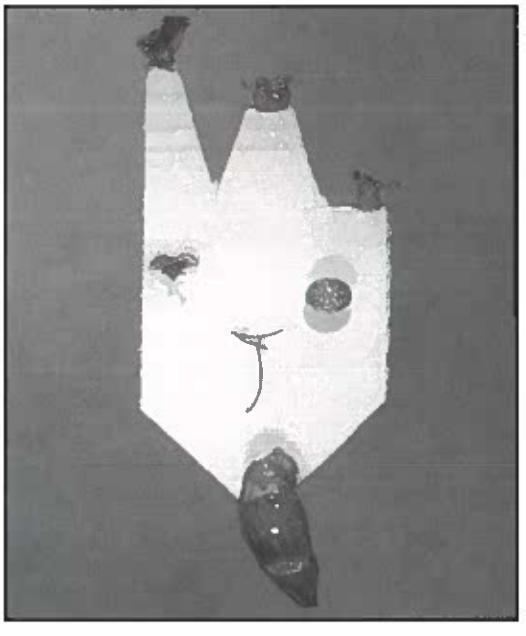


FIG. 85. Example of the mounting technique used for study of mouthparts and genitalia. Top row (stair-cased), left to right: mandible, maxilla, mentum. Second row: labrum. Third row: spiculum gastrale. Bottom row: parameres.

As a means of synopsis, the following observations were noted:

Hindwing. Characters of the hindwing appear to be fairly conservative and useful in characterizing taxa. Important characters include: 1) form and distribution of pegs on the leading edge of the precostal membrane; 2) distribution of setae on the anterior edge of the wing; 3) form of veins AA, AP, and ScA; 4) basoventral setal patches; 5) presence or absence of a membranous bulbous structure at the base of AP, and; 6) presence or absence of a membranous lobe at the base of ScA (for terminology see Fig. 93a). Browne and Scholtz (1995; personal communication Brown 1995) compared the hindwing articulation and axillary sclerites of scarabaeoid beetles, and did not find significant differences between the sclerites of the Rutelinae and Dynastinae. I also found that the axillary sclerites appeared constant between the two groups.

Prosternal Projection. The overall form (*i.e.*, cylindrical, triangular, or lacking) of the prosternal projection is informative for separation of taxa. Many Dynastinae (*e.g., Cyclocephala, Dyscinetus*) possess a cylindrical prosternal projection with an apical "nib."

Metendosternite. The metendosternite (Fig. 103), a sclerotized structure of the thorax that is important for muscle attachment, is an informative phylogenetic character. As demonstrated by Iablokoff-Khnzorian (1977), the caudal, dorsal, and lateral views provide useful information regarding relationships of the Scarabaeoidea. Because examination of all views necessitates destruction of specimens, I examined only the caudal view of the metendosternite. With thorough dissection, however, additional phylogenetic characters could be analyzed.

Male Genitalia. D'Hotman and Scholtz (1990) noted that there do not appear to be genitalic characters that diagnose the Rutelinae, Dynastinae, and Cetoniinae. However, form of the parameres is important for identification of many species. These may be symmetrical or asymmetrical, and may be fused dorsoventrally or laterally. The phallobase (or basal piece) is generally conservative.

Internal Sac of the Male Genitalia. The internal sac, a membranous structure that lies within the aedeagus, is the intromittent organ in higher scarabaeoids. The membrane may be armed with spines, setae, or plates. The internal sac was examined using the techniques discussed by Woodruff and Beck

(1989) and Meurgues and Ledoux (1966). In the Neotropical Rutelini, the internal sac is moderately useful for identification, but preparation is extremely time consuming. In some rutelines, the opening for the internal sac is small and restricted. Extracting the internal sac (intact), even after treatment in hot water, is difficult. Also, I found extensive variation within species of *Rutela* in the number and distribution of spines on the internal sac. For these reasons, the internal sac was not used in this work. Sabatinelli (1994), however, demonstrated that the internal sac is useful in identification of species of *Popillia*.

Spiculum Gastrale. In the Rutelinae and Dynastinae, the spiculum gastrale is a Y-shaped or T-shaped sclerite (Fig. 104) that functions to protect the aedeagus and to anchor the genitalic muscles to the abdominal wall (D'Hotman and Scholtz 1990). The form of the spiculum gastrale, shape of the associated sclerites (when present), and distribution of setae at the apex of the sclerites are useful characters for separation of some taxa.

Species in the *Rutela* generic groups are characterized by several characters, including form of the pronotum, scutellum, legs, metatrochanter, tarsomeres, mesometasternal projection, apical margin of the pygidium, apex of the terminal sternite, microsculpture (head, pronotal, elytral, pygidial), female gonocoxites, and parameres. The following characters were found to be taxonomically useful:

Apex of Metatarsomere 4. Males possess a produced, lobe-like, or keel-like (Figs. 99a-b) structure that lies between the apical spinulae. In females, the apex is simple.

Body Length and Width. *Length* was measured from the apex of the clypeus to the apex of the elytra. *Width* was measured at mid-elytra.

Color. Color was interpreted as viewed under magnification and fiber-optic illumination.

Elytral Sutural Length. Measured from the base of the elytral suture to the apex of the elytra.

Female Gonocoxites. Gonocoxites are diagnostic or not. Within the species for which gonocoxites are diagnostic (*Sphaerorutela* and *Microrutela*), there is slight variation in shape.

Interocular Width. Defined as the number of transverse eye diameters that span the vertex.

Parameres. Parameres are diagnostic for all species. They are symmetrical or asymmetrical, and there is some variation in shape and length within a species.

Metatrochanter. The posterior border of the metatrochanter may be produced beyond the posterior border of the femur (Figs. 94a-d) or not (Fig. 94e). The produced apex may be spur-like (Fig. 94a), rounded (Fig. 94b), or quadrate (Fig. 94c).

Puncture Size. Punctures were defined as *large* (easily seen without magnification; .17 mm and larger in diameter), *moderately large* (.09-.17 mm in diameter), *moderate* (.03-.09 mm in diameter), *small* (.01-.03 mm in diameter), and *minute* (less than .01 mm in diameter). Millimeter increments were assessed by using an ocular micrometer.

Puncture Density. Punctures were considered *dense* if they were nearly confluent to less than two puncture diameters apart, *moderately dense* if punctures were from 2 to 6 puncture diameters apart, and *sparse* if punctures were separated by more than 6 puncture diameters.

Scutellum Width and Length Ratio. Width was measured at the base of the elytra. Length was measured from the elytral base to the apex of the scutellum.

Locality Data

Locality data are presented for each species in the *Rutela* generic group. Data are presented in a descending order from largest place name (*i.e.*, country) to smallest place name (*i.e.*, park or river). Country names are in capital letters and bold font, provinces are in small capital letters, place names are in small letters. Numbers in parentheses follow the country and the province and indicate the

number of specimens collected in these regions.

Criteria for Ranking Taxa and Species Concept

The classification of the tribe Rutelini used for this study is based on Machatschke (1972) with the classification changes of Kuijten (1992) for the subtribes Parastasiina and Rutelina (Appendix 2). The history of the classification of the more contentious groups is summarized in Appendix 1. The results of the phylogenetic analysis provided the framework for the classification of species in the *Rutela* generic groups (Appendix 5) and reclassification of genera and subtribes (Appendix 4) that I propose here. I follow the convention that the classification of taxa must be consistent with the phylogeny on which it is based (Wiley *et al.* 1991). Phylogenetic analyses of exemplar genera in the tribe Rutelini demonstrate that the subtribe Rutelina is non-monophyletic. Thus, I do not use this subtribal designation. I do not propose a new classification of groups within the tribe Rutelini because the analysis included only exemplar taxa in each of the subtribes. Thus, a new classification for the tribe would be premature. However, I do provide recommendations for changes in subtribal categories based on the phylogenetic analysis (Appendix 4).

Genera were recognized based on shared morphological characters and inferred monophyly. Form of the pronotum, legs, claws, mesometasternal process, genitalia, wings, and scutellum were useful in delineating genera. Failure to share synapomorphic features precluded the inclusion of one taxon in another taxon.

The evolutionary species concept was applied in this work. "An evolutionary species is a single lineage of ancestor-descendant populations which maintains its identity from other such lineages and which has its own evolutionary tendencies and historical fate" (Wiley 1981: 25). The criteria that I applied to recognize species included constancy in characters such as form of genitalia, mesometasternal projection, sculpturing, and pronotal base. These characters were given more weight in species recognition than similarity of color or pattern. Constancy in the form of the male genitalia is a quality that maintains the identity of the species lineage. Form of the parameres may vary intraspecifically in length or width, but constancy in overall form was given the most weight. For example, there is intraspecific variation in the form of the parameres in *R. histrio* (Figs. 112g-j, 115, 116). This intraspecific variation may be caused by sub-population differences or clinal variation, but the overall form of the genitalia, in combination with constancy of other characters, indicates that individuals are still part of the same species lineage. Specific rank was also given to populations that were geographically separated (allopatric) and were distinct due to color and pattern although the form of the genitalia was identical (*e.g., R. pygidialis* and *R. dimorpha*). In this situation, I hypothesize that the populations are on their own evolutionary trajectory, thus warranting specific designation. Subspecific rank was given to populations that inhabited a part of the nominate species' range (parapatric) but where color, pattern, sexual dimorphism, and punctation differed (*e.g., R. sanguinolenta sanguinolenta* and *R. sanguinolenta rufipennis*).

Phylogenetic Methods

Cladistic analysis provides a method for hypothesizing relationships between taxa based on shared, derived character states (Wiley 1981; Wiley *et al.* 1991). Hennig (1965, 1966) showed that monophyletic groups (or clades) can be recognized if members share derived (rather than primitive) character states. The statement of phylogenetic relationships is an inference based on character and parsimony analyses. Character analyses are statements of homology, an implicit statement of relationship. Parsimony analyses combine evidence from character data to generate an overall hypothesis that is most

consistent with the body of evidence. The product of a phylogenetic analysis, a cladogram, is a hypothesis that can be interpreted as a sequence of evolutionary events (Schmitt 1989).

The computer programs PAUP (Swofford 1993) and MacClade (Maddison and Maddison 1992) were used to analyze the character state data. These programs implement parsimony analysis (as opposed to distance measures or maximum likelihood) to estimate relationships and construct cladograms. The large data set did not allow for an exhaustive searches for trees using the "Branch and Bound" or "Exhaustive" search options in PAUP. Instead, the "Heuristic" search option was used with the options: 1) minimal trees kept, 2) zero-length branches collapsed, 3) starting tree obtained by stepwise addition, 4) branches swapped on minimal trees, 5) simple addition sequence (one tree held at each step), 6) TBR branch swapping, and 7) all minimal trees saved (MULPARS). ACCTRAN optimization was used, and all characters are treated as unordered and of equal weight. Because a heuristic search, by definition, may not always find the shortest tree (Swofford 1993; Page 1993), I conducted a search for tree islands to examine collections of trees (Maddison 1991). In a heuristic search, the algorithm searches for minimal length trees in tree space (Page 1993). Branch swapping is performed on a starting tree. If a shorter tree is found, then a new round of branch swapping begins until all possible rearrangements have been performed and no shorter tree is found. All the trees that are retained form an island. However, the most optimal tree may be separated from this island by several less parsimonious arrangements. Thus, searching in tree space for islands of trees can reduce the possibility that the data set included a number of islands with differing topologies that were perhaps more optimal than the initial tree island (Maddison 1991; Forey *et al.* 1992). In PAUP, fifty replications were conducted with TBR, max-trees equal to 2,000, initial trees found by random addition sequences, and zero length branches collapsed (Maddison 1991; Forey *et al.* 1992).

Successive weighting (Farris 1969) was used to further evaluate phylogenetic relationships. This method uses *post hoc* character weighting based on the fit of each character as applied to the trees currently in memory. Thus, the quality of the character data is used rather than intuitive feeling regarding weighting of characters. Although this method increases the assumptions in the analysis (Forey *et al.* 1992), it is useful for hypothesizing phylogenetic pattern when characters exhibit a high level of homoplasy. Characters were reweighted based on the rescaled consistency index, retention index, and consistency index. Topologies of all weighting schemes are compared. The maximum value "best fit" option was used in all trials. The "base weight" was set at 100, and indices were truncated (as in the phylogenetic program Hennig 86 [Farris 1988]). Tree searches continued until the character weights no longer changed (Farris 1988) or until identical trees were found in consecutive searches (indicating stability in the trees). The strict consensus trees based on the results of each weighting scheme are reported (Figs. 105a-e).

PHYLOGENETIC ANALYSIS OF THE TRIBE RUTELINI (RUTELINAE: SCARABAEIDAE)

Out-groups for the phylogenetic analysis

Because cladistic relationships among the subtribes and tribes of Rutelinae have not been addressed phylogenetically, outgroups for the phylogenetic analysis of the Rutelina were particularly important. In a preliminary analysis of the genera in the subtribe Rutelina, exemplar genera from the subtribes Pelidnotina, Antichirina, Areodina, and Parastasiina were used as out-groups (Jameson 1993, 1996a). Results indicated that the subtribe Rutelina was paraphyletic: some members of the subtribe (*Rutelarcha, Lutera,*

Cyphelytra) formed a clade that was more closely related to genera in the subtribe Parastasiina than to other genera in the Rutelina. Also, some members (*Rutela* and *Cnemida*) were part of a clade that included genera in the subtribes Pelidnotina and Antichirina. In order to more thoroughly address relationships of the subtribe, and as a means of identifying the sister taxon of the *Rutela* and *Cnemida* group, additional taxa and all available subtribes in the tribe Rutelini were added to the analysis. The ruteline tribes Anomalini, Spodochlamyini, and Adoretini were added as out-groups. After extensive character analysis, it became clear that representatives of the subfamily Dynastinae would need to be included in order to address relationships of the subtribe Parastasiina and some genera of Rutelina (*Rutelarcha, Cyphelytra, Lutera*). Comparative data suggests that the subfamily Dynastinae is either the sister group to the Rutelinae (Endrödi 1966; Iablakoff-Khnzorian 1977; Howden 1982; Meinecke 1975) or is basal to the clade that includes the Rutelinae and Cetoniinae (Scholtz and Chown 1995). Phylogenies that resulted from these data showed that the placement of the Dynastinae was ambiguous (as part of the in-group or as an out-group). To solve this dilemma, representatives of the Melolonthinae were added as an additional out-group. Although the out-group to the Dynastinae and Rutelinae is ambiguous (Scholtz and Chown 1995; Meinecke 1975; Howden 1982; Ritcher 1966, 1969a, 1969b), the Melolonthinae is hypothesized as the sister taxon to the Rutelinae and Dynastinae (Howden 1982) or to a clade that includes the Dynastinae, Rutelinae, and Cetoniinae (Scholtz and Chown 1995).

Analyses were based on 128 characters and 72 taxa in the taxonomic in-groups and out-groups (Appendix 2; representative genera illustrated in Figs. 1-84). The taxonomic in-group (subtribe Rutelina) included exemplars of all taxa currently placed in the subtribe (Appendix 2). *Rutela howdeni* Jameson, n. sp., was discovered after the phylogenetic analysis was conducted and was not included in the analyses. Exemplars from the subtribes Desmonychina (one species) and Didrepanephorina (two species), both of which are known by only a few specimens, were unavailable for the analysis. Taxonomic outgroups for the analysis were exemplars from the tribe Anomalini (three genera), tribe Spodochlamyini (two genera), tribe Adoretini (one genus), subfamily Dynastinae (five genera), and subfamily Melolonthinae (four genera).

The out-group method was used to root cladograms and determine character polarity (Brooks and McLennan 1991; Nixon and Carpenter 1993; Lipscomb 1990; Maddison *et al.* 1984; Maddison and Maddison 1992; Watrous and Wheeler 1981; Wiley *et al.* 1991). As a method of determining monophyly of the ingroup, I included each species of Rutelina as a terminal taxon and allowed the parsimony analysis to demonstrate monophyly or non-monophyly. Thus, an unconstrained analysis of all terminals was employed (Nixon and Carpenter 1993), and the tree was rooted at the outgroup.

Character Analysis

Character states for the cladistic analysis were polarized as primitive or derived by out-group comparison (Brooks and McLennan 1991; Maddison *et al.* 1984; Nixon and Carpenter 1993; Watrous and Wheeler 1981). In some cases, both sexes of a taxon were not available or particular characters could not be observed due to condition of the specimens. In these situations, missing data were coded as "?". If both character states occurred in a taxon, the states were coded with an ampersand "&". Characters are scored for both males and females, and, if states varied between the sexes, I scored the character as polymorphic (0&1). All characters were discrete rather than continuous values. Characters were coded as either binary or multistate (0-4). Multistate characters were treated as unordered because a transformation series could not be determined *a priori*. Characters were initially treated as unweighted. After

the initial parsimony analysis, characters were weighted using successive approximation (Farris 1969; Carpenter 1988).

Care was taken to ensure that character states for the analysis were homologous. Remane's (1956) criteria of position and quality of resemblance were employed to assess homology during character state scoring. Hennig's auxiliary principle states that, in the absence of conflicting evidence, we accept the hypothesis of homology (Hennig 1965; Schmitt 1995; Wiley *et al.* 1991). When character state homology was dubious, I discussed this within the character analysis.

Characters for the phylogenetic analysis are discussed below. Numbers in parentheses indicate the state assigned for the character. The character matrix is provided in Appendix 3.

Head

1. Antenna with group 2 (0) or group 1 sensillae (1) (based on Meinecke 1975).

Using exemplars of many scarab taxa, Meinecke (1975) demonstrated that the Melolonthinae possess state (0) while the Rutelinae and Dynastinae possess state (1).

2. Antenna 10-segmented (0) or 9-segmented (1).

3. Eye canthus with a ridge or thickening (Figs. 86a-c) (0) or without (Fig. 86d) (1).

4. Frons with horn or tubercle absent (0) or present (1).

5. Clypeus with horn or tubercle absent (0) or present (1).

6. Frontoclypeal suture in the middle obsolete or lacking (0) or complete (1).

7. Frontoclypeal suture (laterally) planar (0) or raised above the plane of the frons (1).

The enlarged mandibles in males of *Dicaulocephalus* and *Peperonota* obscure this character. However, females of both genera have state (1), thus I hypothesize that this state is the ground plan for the genera.

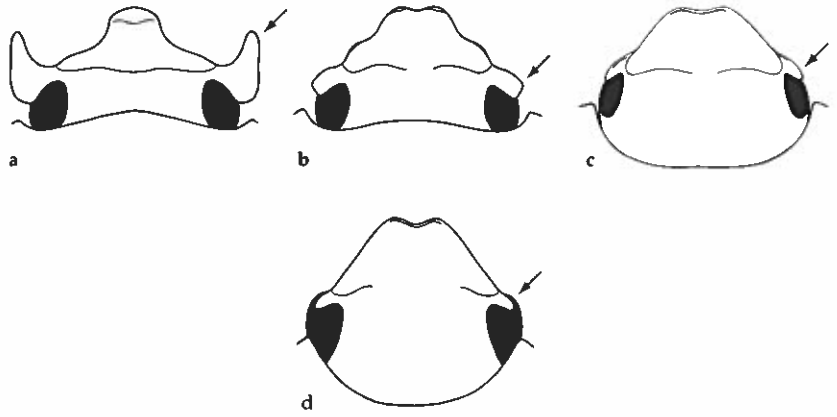
8. Base of the clypeus not reflexed (0) or reflexed (1).

9. Clypeal apex planar or weakly reflexed (0) or perpendicularly reflexed (1).

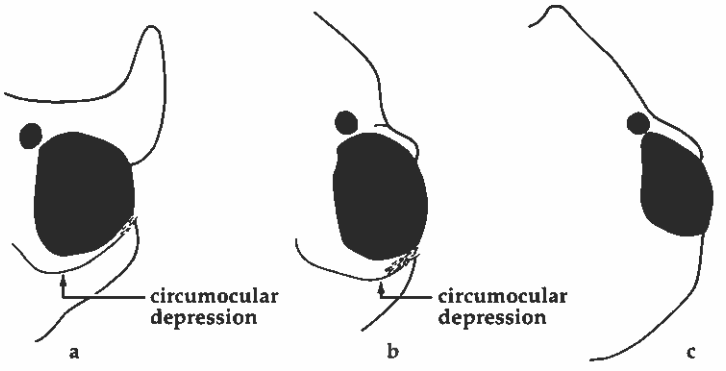
The clypeal apex of male *Dicaulocephalus* is obscured by the enlarged mandibles, however the female has state (1), thus I hypothesize that this is the ground plan for the genus.

10. Clypeal apex entire (0) or emarginate medially (1).

11. Eye large, size of post-occipital region reduced (0) or eye small, post-occipital region large (1).



FIGS. 86a-d. Dorsal view of head showing hornlike (a-c) or broad eye canthus (d) (character 3). 86a, *Dicaulocephalus fruhstorferi*, male; 86b, *Dicaulocephalus fruhstorferi*, female; 86c, *Rutelarcha quadrimaculata*; 86d, *Rutela versicolor*.



FIGS. 87a-c. Ventral view of the left ocular region showing the circumocular depression (a-b) or not (c) (character 12). 87a, *Dicaulocephalus fruhstorferi*; 87b, *Spodochlamys cupreola*; 87c, *Plesiorutela specularis*.

12. Eye in ventral view without a circumocular depression (Fig. 87c) (0) or with (Figs. 87a-b) (1).

Mouthparts

13. Apex of the labrum produced beyond the clypeal apex (0) or hidden, not obviously produced (1).

14. Labrum vertically produced (0) or horizontally produced (1).

15. Labrum lacking median, apical process (0), with weakly produced median, apical process (1), or with a produced and tooth-like median, apical process (2).

16. Labrum inflated at apex (0) or flattened at apex (1).

17. Apex of labrum bisinuate (0) or truncate at apex (1).

18. Base of submentum planar with respect to the mentum (0) or perpendicularly produced (1).

19. Submentum in cross section convex (0) or flat (1).

20. Mentum with apex not recurved (0) or recurved (1).

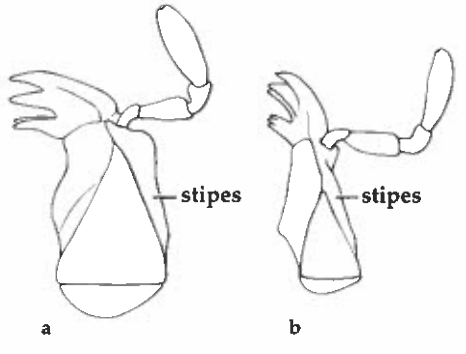
21. Apex of mentum narrower than the base (0) or apex of mentum approximately as wide as the base (1).

22. Stipes not flange-like (produced apically and laterally) (Fig. 88b) (0) or flange-like (Fig. 88a) (1).

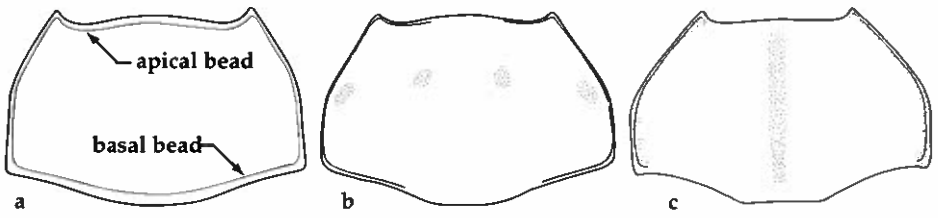
23. Lacinia with apically produced tooth on inner margin (0) or lacking lacinial tooth (1)

24. Maxilla with obvious teeth (0) or with teeth reduced to bristles or pegs (1).

25. Maxilla with fused medial tooth not hinged (0) or hinged (1).



FIGS. 88a-b. Ventral view of the left maxilla showing stipes flange-like (a) or not flange-like (b) (character 22). 88a, *Pelidnota notata*; 88b, *Peltonotus morio*.



FIGS. 89a-c. Dorsal view of the pronotum showing basal bead complete (a), incomplete (b), or lacking (c) (character 35); or apical bead complete (a) or incomplete (b-c) (character 41). 89a, *Pelidnota belti*; 89b, *Lutera nigromaculata*; 89c, *Rutela lineola*.

26. Mandible not produced beyond the labrum (0) or produced beyond the labrum (1).

27. Mandible at apex with no reflexed teeth (0), one reflexed tooth (1), or two reflexed teeth (2).

28. Mandible at apex deflexed (0) or not deflexed (1).

29. Scissorial region of mandible with basal tooth not developed (0) or developed (1).

30. Scissorial region of the mandible without ventral accessory teeth (0) or with ventral accessory teeth (1).

The mandibular ventral accessory tooth is located in the mandibular groove and is in the same plane as the basal tooth.

31. Scissorial region of the mandible with dorsal accessory teeth (0) or without dorsal accessory teeth (1).

32. Mandibular scissorial region with one tooth (0), two teeth (1), or three teeth (2).

33. Form of the epipharynx dorso-ventrally flattened (0) or dorso-ventrally vaulted medially (1).

34. Epipharynx with one simple, lateral torma (0) or with two lateral tormae (1).

Pronotum

35. Pronotum with basal bead complete (Fig. 89a) (0), incomplete (Fig. 89b) (1), or lacking (Fig. 89c) (2).

36. Lateral region without fovea (0) or with fovea (1).

37. Pronotal disc without two broad, black, longitudinal maculae that reach the base of the pronotum (0) or with such maculae (1).

38. Base of pronotum anterior to the scutellum evenly rounded posteriorly (0), straight (1), or weakly emarginate anteriorly (2).

39. Base of the pronotum lateral of the scutellum obliquely angled (0), emarginated (1), straight (2), or sinuate (3).

40. Pronotum not black with light-colored margins (0) or with (1).

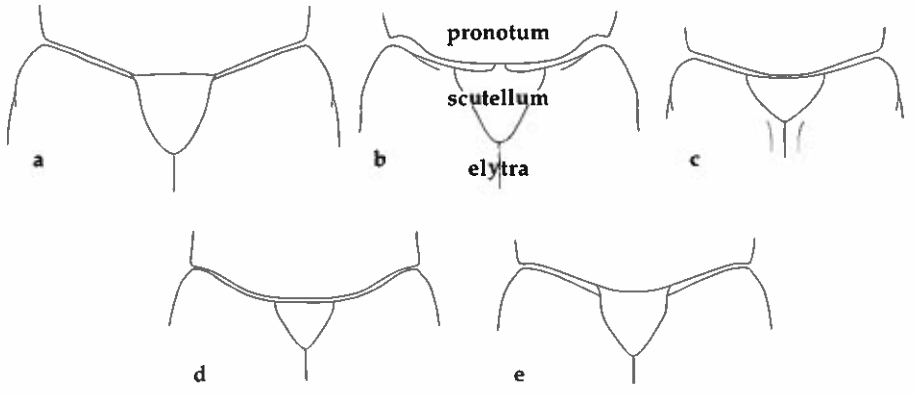
41. Anterior margin of pronotum with complete apical bead (Fig. 89a) (0) or incomplete apical bead (Figs. 89b-c) (1).

Scutellum

42. Base of the scutellum obliquely angled (0), depressed below the plane of the elytra (Figs. 90c, d) (1), planar with the elytra (Figs. 90a, e) (2), or with a medial, planar extension and depressed sides (Fig. 90b) (3).

43. Length shorter than metanotum (0) or equal in length (1).

44. Width greater than length (0), width about



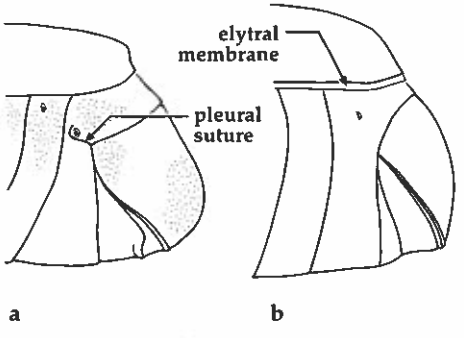
FIGS. 90a-d. Dorsal view of pronotal, elytral, and scutellar base showing form of pronotal base and form of scutellum. Scutellar base is depressed below the plane of the elytra (c and d), with a medial, planar extension and depressed sides (b), or planar and extending anteriorly beneath the pronotum (a and e) (character 42). 90a, *Rutela*; 90b, *Microrutela*; 90c, *Sphaerorutela*; 90d, *Pleisiorutela*; 90e, *Rutela*.

equal to length (1), or width less than length (2).

Width of the scutellum was measured from where the elytral base meets the base of the scutellum. Length was measured from the base of the scutellum to its apex.

45. Length of scutellum 1/6 to 1/14 length of elytral suture (0), 1/3 to 1/4 length of elytral suture (1), or 1/2 to equal to elytral suture (2).

46. Shape of the scutellum parabolic (0) or acute at its apex (1).



FIGS. 91a-b. Lateral view of the apex of the abdomen showing elytral margin with a membranous border (b) or without (a) (character 47) and with the pleural suture between sternite 7 and tergite 7 distinct (a) or lacking (b) (character 59). 91a, *Rutela*; 91b, *Anomala*.

Elytra

47. Elytral margin without a membranous border (Fig. 91a) (0) or with (Fig. 91b) (1).

48. Base of elytra laterad of scutellum not depressed (0) or depressed (Fig. 90b) (1).

49. Elytral epipleuron ridge-like (Fig. 92b) (0) or simple (epipleuron contiguous with dorsal surface of elytra) (Fig. 92a) (1).

50. Base of epipleuron with a raised line (0) or without (1).

51. Stria adjacent to the sutural stria punctate (0) or an impressed line (1).

Mesepimeron

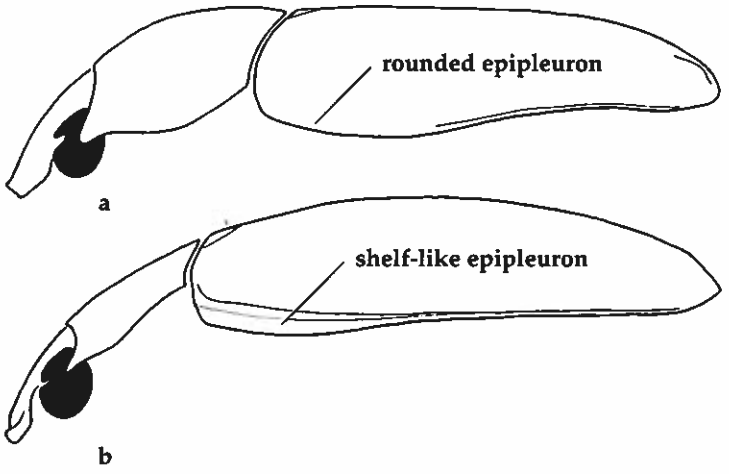
52. Base not projecting (0) or projecting anterior to elytral humerus (1).

Hindwing

53. Region anterior to RA_{3+4} with setae (Figs. 93a, c, d) (0), with pegs (Fig. 93b) (1), or membranous (2).

54. Anterior edge from the medial fold to the tip of the wing with many setae present (Figs. 93c-d) (0) or without setae (Figs. 93a-b) (1).

Paracotalpa, *Cotalpa*, and *Macraspis* have



FIGS. 92a-b. Lateral view of the thorax and abdomen showing the elytral epipleuron with a shelf-like, horizontal ridge (b) or with a rounded epipleuron (a) (character 49). 92a, *Rutela* generic groups; 92b, *Pelidnota*.

a few setae beyond the medial fold, but not an appreciable number as in the other taxa (scored as 1).

55. Vein AA_{1+2} shorter than AA_{3+4} (Figs. 93a, c) (0), subequal to AA_{3+4} (Fig. 93d) (1), or lacking (Fig. 93b) (2).

56. Vein AA_{1+2} straight or weakly recurved (0) or strongly decurved (1).

57. AP_{3+4} simple at base (0) or with a bulbous, setaceous, enlarged vein at base (1).

Spiracles and Tergites

58. Abdominal spiracles 1-5 placed in pleurites and tergites, spiracles 6-7 in sternites (0) or spiracles 1-3 in pleurites and sternites, spiracles 4-7 in sternites (1).

59. Pleural suture between sternite 7 and tergite 7 distinct (Fig. 91a) (0) or indistinct (Fig. 91b) (1).

60. Tergites on lateral edge unicolorous (0) or bicolored (1).

Propygidium

61. Surface with setigerous punctures (0) or punctate but without setae (1).

62. Apex hidden by apex of the elytra (0) or exposed beyond apex of the elytra (1).

Pygidium

63. Apical margin in female rounded (0), quadrate (1), bisinuate (2).

Appendages: Coxae

64. Procoxae of males with sparse setae (0) or with dense, long setae (1).

65. Mesocoxae more or less contiguous, not widely separated (0) or widely separated (1).

66. Metacoxa with medial region produced posteriorly beyond the posterior border of the metatrochanter (0) or contiguous with metatrochanter (1).

Appendages: Trochanter

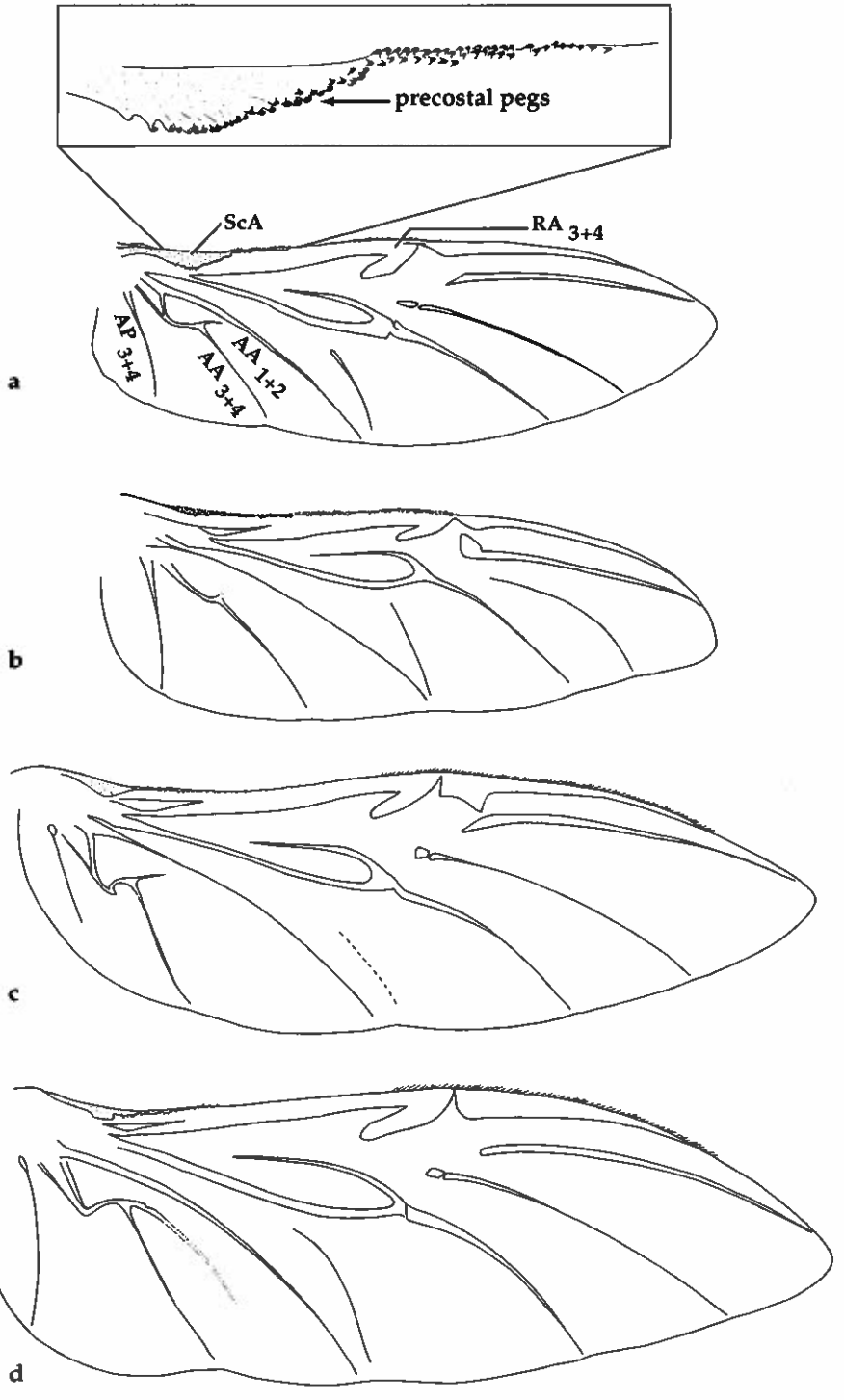
67. Subapex of metatrochanter not produced beyond posterior border of femur (Fig. 94e) (0) or produced (Figs. 94a-d) (1).

Appendages: Femur

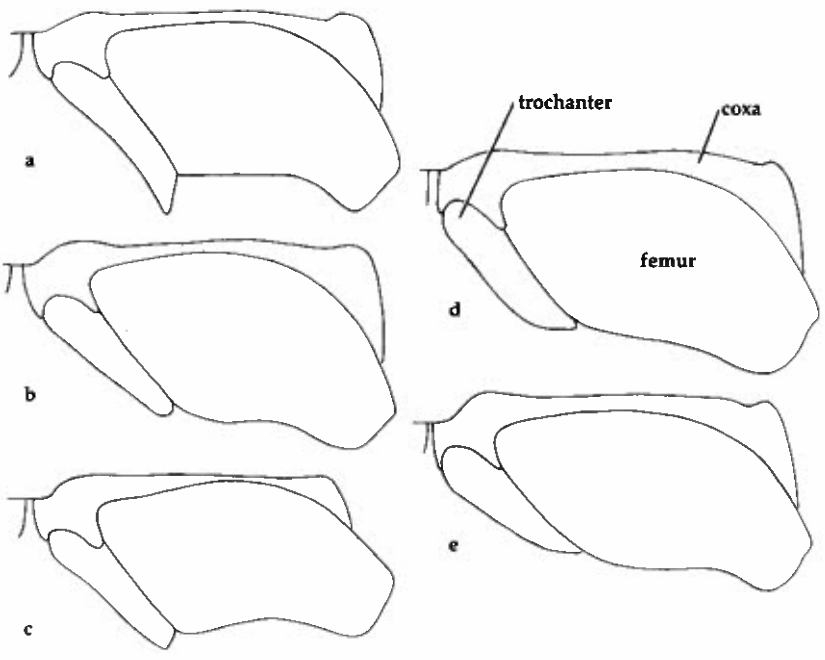
68. Metafemur of male without spurs on the posterior border (0) or with spurs (1).

Appendages: Tibiae

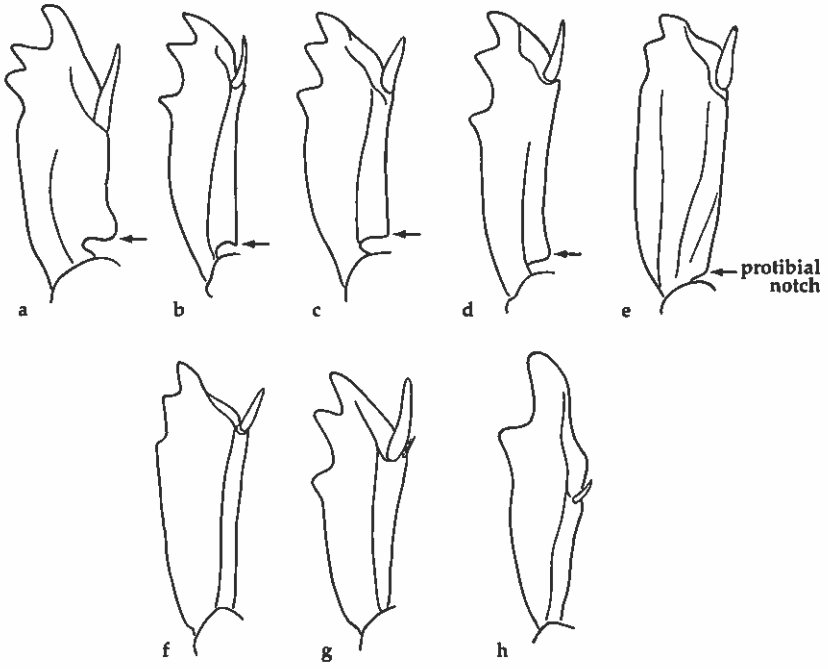
69. Base of the inner protibia notched (Figs.



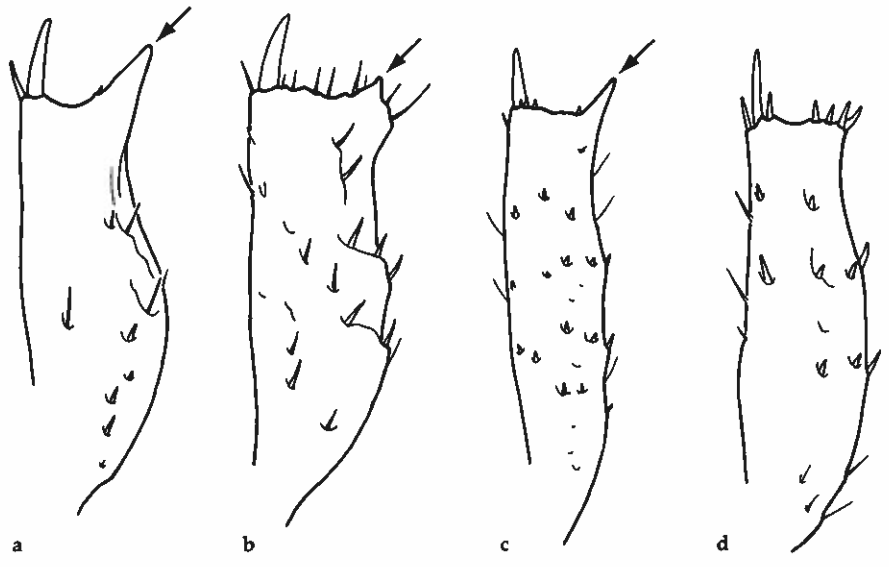
FIGS. 93a-d. Ventral view of the left hindwing showing venation, distribution of costal setae, and precostal pegs (inset shows location of precostal membrane and associated pegs) (characters 53-56). 93a, *Rutela*; 93b, *Parastasia*; 93c, *Fruhstorferia*; 93d, *Chrysina*.



FIGS. 94a-e. Ventral view of the left metacoxa, metatrochanter, and metafemur showing the apex of the metatrochanter produced beyond the posterior border of the femur (a-d) or not produced (e) (character 67). 94a, *Rutela lineola*, male; 94b, *Rutela lineola*, female; 94c, *Rutela histrioparilis*, male; 94d, *Rutela sanguinolenta sanguinolenta*; 94e, *Rutela sanguinolenta rufipennis*.



FIGS. 95a-h. Ventral view of the right protibia showing form and the basal, protibial notch (a-e) or lacking the basal, protibial notch (f-h) (character 69). 95a, *Parastasia*; 95b, *Rutelisca*; 95c, *Rutelarcha*; 95d, *Macropoides*; 95e, *Cyclocephala*; 95f, *Rutela*; 95g, *Macraspis*; 95h, *Anomala*.



FIGS. 96a-d. Ventral view of mesotibia showing apex with one spinose process at outer margin (a-c), middle margin (b), or lacking spinose process (d) (characters 72-73). 96a, *Parastasia*; 96b, *Rutelisca*; 96c, *Heterosternus*; 96d, *Macraspis*.

95a-e) (0) or simple (Figs. 95f-h) (1).

70. Protibia with external edge tridentate (Figs. 95a-g) (0), bidentate (Fig. 95h) (1), or quadridentate (2).

71. Median spur of protibia apical (0), subapical (Fig. 95h) (1), or lacking (2).

72. Mesotibial apex with one spinose process at outer margin (Figs. 96a, c) (0) or without (Fig. 96d) (1).

73. Apex of mesotibia at middle simple (0) or with one spinose process (Fig. 96b) (1).

74. Mesotibia of male without produced corbel (0) or with (1).

75. Apex of mesotibia with many spinose setae (0), with sparse spinose setae (1), with sparse hair-like setae (2), or lacking setae (3).

Character state (0) is defined as spinose setae separated by about one seta-width. Character state (1) is defined as spinose setae separated by more than one seta-width.

76. Apex of metatibia without produced corbel (0) or with (1) (Fig. 97c).

77. Apex of metatibia with many spinose setae (Figs. 97a, g) (0), sparse spinose setae (Figs. 97b, e, f) (1), sparse hair-like setae (Figs. 97d, h) (2), or lacking setae (Fig. 97c) (3).

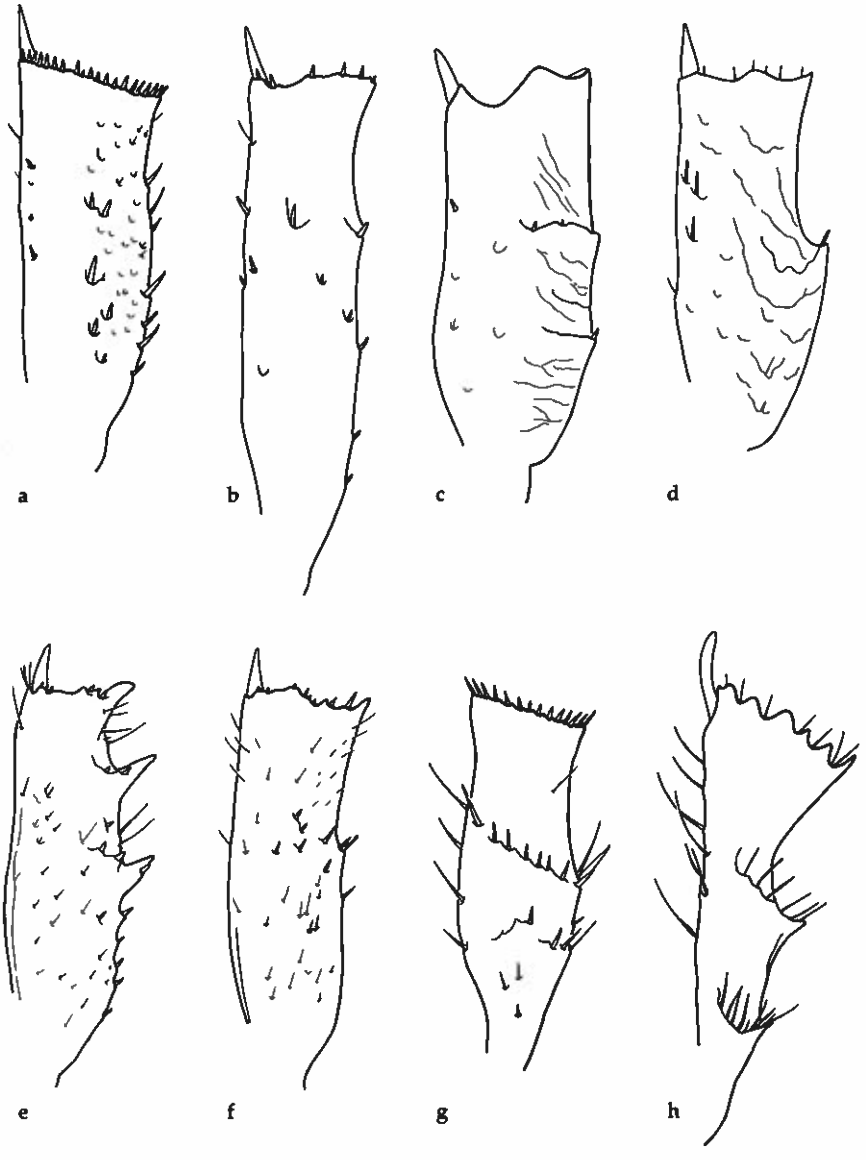
Character state (0) is defined as spinose setae separated by about one seta-width. Character state (1) is defined as spinose setae separated by more than one seta-width.

78. Metatibia of female simple (Fig. 98b) (0) or with inner, apical spur thickened and stalk-like (Fig. 98a) (1).

Appendages: Tarsi

79. First tarsomere of metatarsus produced at the outer edge (0) or not produced at the outer edge (1).

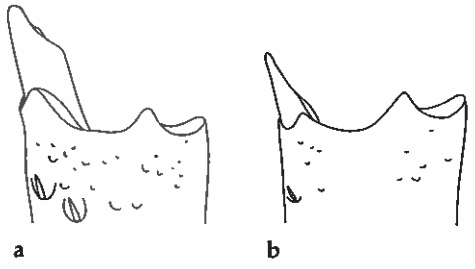
80. Apex of metatarsomeres 2-4 at the inner edge eroded and the outer edge produced, condyle exposed on the inner edge (Fig. 99f) (0) or the inner and outer edges of metatarsomeres 2-4 produced, condyle not exposed (Figs. 99a-e) (1).



FIGS. 97a-h. Ventral view of metatibia showing form of apex with many spinose setae (a, g), with sparse spinose setae (b, e, f), with sparse hairlike setae (d, h), or lacking setae (c) (character 77). Note that figure c has a produced, apical corbel (character 76). 97a, *Cotalpa lanigera*; 97b, *Plusiotis chrysopedila*; 97c, *Rutela striata*; 97d, *Parastasia marmorata*; 97e, *Dicaulocephalus feae*; 97f, *Fruhstorferia mizunumai*; 97g *Anomala flavipennis*; 97h, *Xyloryctes jamaicensis*.

81. First metatarsomere subequal in length or longer than the second tarsomere (0), half as long as the second tarsomere (1), or reduced (only a condyle with a rim) (2).

82. Inner apex of the fourth metatarsomere lacking attenuation (Fig. 99e) (0), with a keel-shaped process (Figs. 99a, b) (1), with a triangular process (apex not surpassing adjacent spines) (Fig. 99c) (2), with a weakly produced, U-shaped process (3), or with a spiniform process (Fig. 99d) (4).



FIGS. 98a-b. Metatibia of female showing apical spur robust, thickened, and on a stalk (a) or not robust and on a stalk (b) (character 78). 98a, *Rutela heraldica*; 98b, *Rutela lineola*.

83. Ventrolateral apex of the fourth metatarsomere in males with two long, hair-like setae (Figs. 99d, f) (0), one outer hair-like seta and one inner stout, spinose seta (Figs. 99a, b, c) (1), or one inner and outer stout and spinose seta (Fig. 99e) (2).

84. Ventrolateral apex of the fourth metatarsomere in females with two long, hair-like setae (0), one outer hair-like seta and one inner stout, spinose seta (1), or one inner and outer stout, spinose seta (2).

85. Ventromedial apex of the fourth metatarsomere in males with two long, hair-like setae (0), one outer, hair-like seta and one inner stout, spinose seta (1), or one inner and outer stout, spinose seta (2).

86. Apex of protarsomere 5 entire, with membrane encasing ungues (0) or with internal, longitudinal slit (1).

87. Apex of meso- and metatarsomere 5 entire, with membrane encasing ungues (Fig. 99f) (0) or with medial, longitudinal slit (Figs. 99a-e) (1).

88. Inner, median surface of the fifth protarsomere of the male lacking median projection (0), with one median projection (1), or with one anterior and one posterior projection (2).

Species of *Pelidnota*, *Plusiotis*, and the *Rutela* generic groups have a median "thickening," but not a projection (scored as a 0).

89. Inner, median surface of the fifth mesotarsomere of the male lacking median projection (0), with one median projection (1), or with one anterior and one posterior projection (2).

Species in the genera *Pelidnota*, *Plusiotis*, and the *Rutela* generic groups have a median "thickening," but not a projection (scored as a 0). Males of *Macraspis cupripes* (Kirsch) have a median tooth whereas females lack this state. Because other species of *Macraspis* lack a median tooth, I scored all *Macraspis* as (0), hypothesizing this to be the ground plan for the genus.

90. Inner, median surface of the fifth metatarsomere of the male lacking median projection (0), with one median projection (1), or with one anterior and one posterior projection (2).

Species in the genera *Pelidnota*, *Plusiotis*, and the *Rutela* generic groups have a median "thickening," but not a projection (scored as a 0).

91. In ventral view, metatarsomeres with two, parallel, longitudinal ridges (0) or with one longitudinal ridge (1).

Appendages: Claws

92. Protarsus with inner claw of male simple (Figs. 100a-b) (0), weakly and narrowly split (Figs. 100c-f) (1), or widely and deeply split (Figs. 100g-n) (2).

Claws are defined as simple if the claw lacks a split apex (although it may be thickened) (0) (Figs. 100a-b); weakly and narrowly split if split is narrower than the bisected portions (1) (Figs. 100c-f); and widely and deeply split if the split is wider or subequal to the bisected portions (2) (Figs. 100g-n).

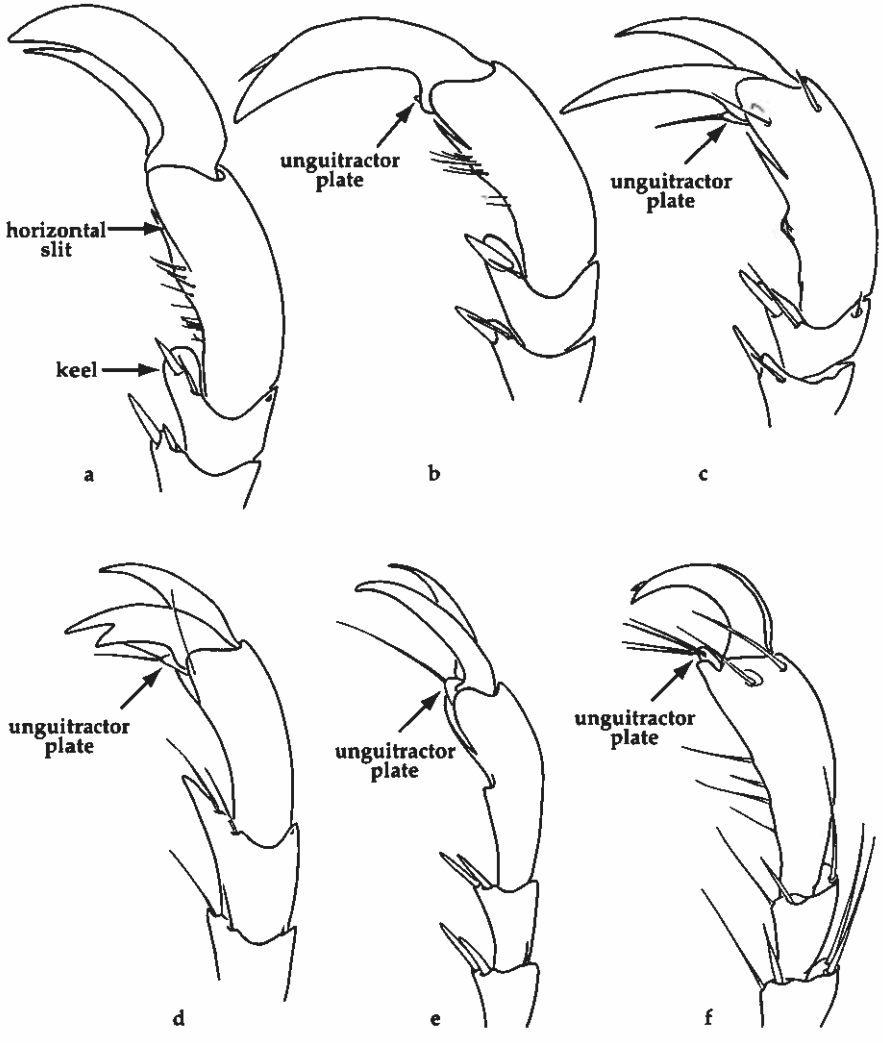
93. Inner claw of protarsus with posterior ramus at base (Figs. 100m-n) (0), at middle or sub-apex (Figs. 100c-l) (1), or lacking rami (Figs. 100a-b) (2).

94. Mesotarsus with inner claw in the male simple (Figs. 100a-b) (0), weakly and narrowly split (Figs. 100c-f) (1), or widely and deeply split (Figs. 100g-n) (2).

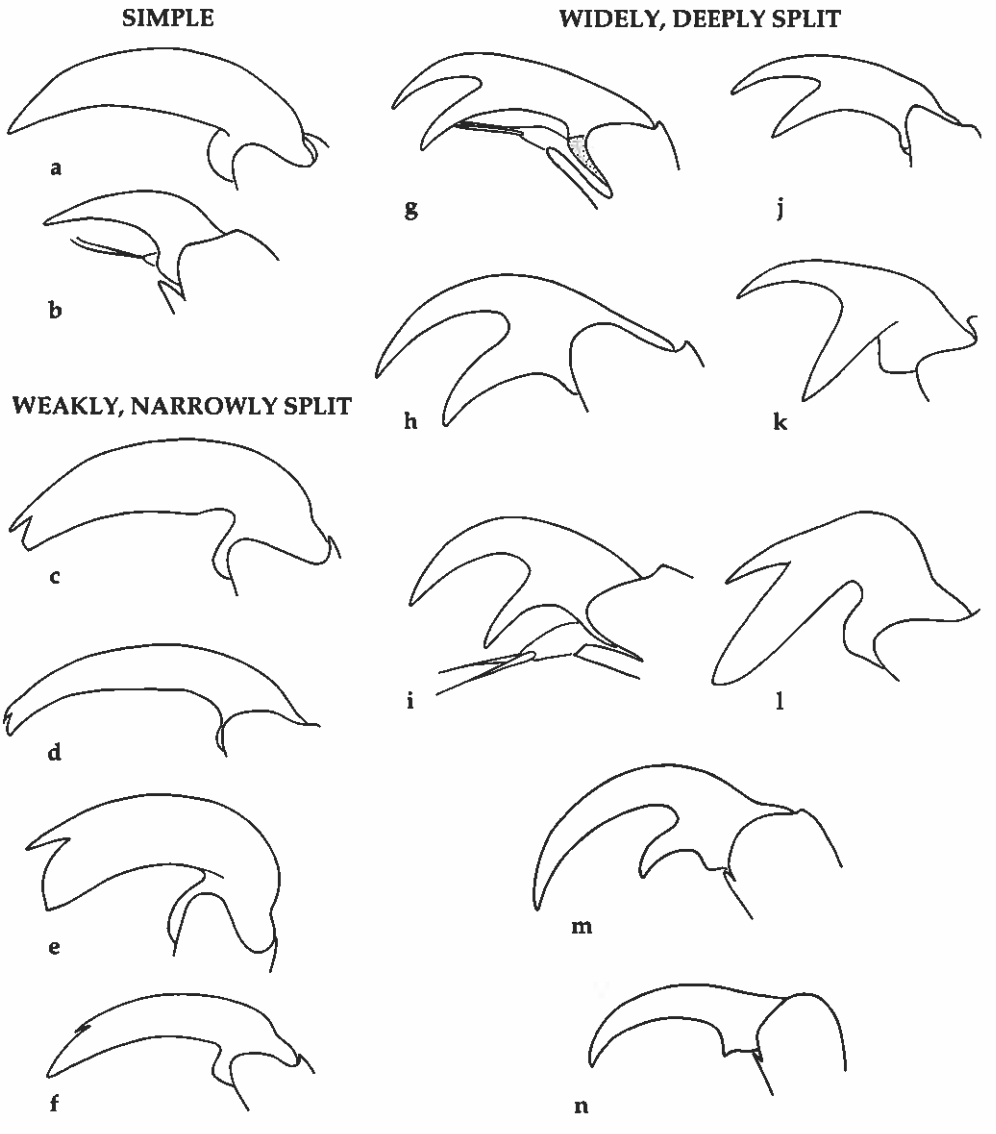
95. Metatarsus with inner claw in the male simple (Figs. 100a-b) (0), weakly, narrowly split (Figs. 100c-f) (1), or widely, deeply split (Figs. 100g-n) (2).

96. Claws of the protarsus in males equal in size (0) or unequal, outer claws larger than inner claws (1).

97. Claws of the meso- and metatarsus equal in size (0) or unequal in size, outer claws larger than inner claws in size (1) or claws of equal size (0).



FIGS. 99a-f. Ventrolateral view of metatarsomeres 3 to 5 showing: unguitractor plate exposed (c-e) or hidden (a) (character 100); inner edge of the third and fourth tarsomeres produced (a-e) or not produced (f) (character 80); apex of tarsomere 4 spiniform (d), keel-shaped (a-b), or triangular (c) (character 82); ventrolateral apex of tarsomere 4 with long, hairlike setae (d-f), 1 outer spinose seta and 1 inner stout spinose seta (a-c), or 2 stout spinose setae (e) (character 83); apex of tarsomere 5 split longitudinally (a-e) or entire (f) (characters 87). 99a, *Rutela*; 99b, *Plesiorutela*; 99c, *Plusiotis*; 99d, *Parastasia*; 99e, *Anomala*; 99f, *Xyloryctes*.



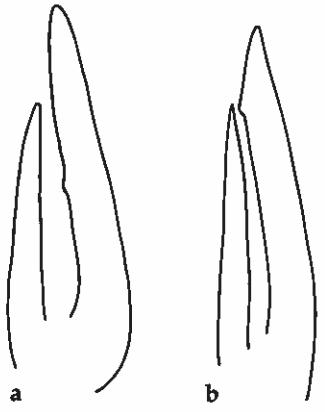
FIGS. 100a-n. Outer claw of the male showing form simple (a-b), weakly and narrowly split (c-f), or widely and deeply split (g-n) (characters 92-95). 100a, *Rutela* protarsal claw; 100b, *Parastasia* protarsal claw; 100c, *Rutelarcha* protarsal claw; 100d, *Cotalpa* metatarsal claw; 100e, *Macraspis* protarsal claw; 100f, *Strigoderma* protarsal claw; 100g, *Fruhstorferia* metatarsal claw; 100h, *Ceroplophana* metatarsal claw; 100i, *Dicaulocephalus* metatarsal claw; 100j, *Rutelisca* metatarsal claw; 100k, *Oryctomorphus* protarsal claw; 100l, *Lasiocala* protarsal claw; 100m, *Polyphylla* mesotarsal claw; 100n, *Phyllophaga* mesotarsal claw.

98. Outer claw of protarsomere 5 without apical or pre-apical tooth (0) or with (Figs. 101a-b) (1).

Appendages: Unguitractor Plate

99. Unguitractor plate of the protarsus cylindrical (0), plate-like at base and cylindrical at apex (1), or plate-like and triangular (2).

100. Unguitractor plate exposed beyond base of claws (Figs. 99b-f) (0) or hidden beyond base (Fig. 99a) (1).



FIGS. 101a-b. Protarsomere claws showing the outer claw with an apical tooth (b) or pre-apical tooth (a) (character 98). 101a, *Pelidnota glabra*; 101b, *Plusiotis chrysopedila*.

101. Unguitractor plate of the meso- and metatarsi cylindrical (0), plate-like at base and cylindrical at apex (1), or plate-like and triangular (2).

102. Setae of the empodium exposed, visible beyond ungues (0) or hidden (1).

103. Empodium of protarsus with two setae (0), many setae (1), or without setae (2).

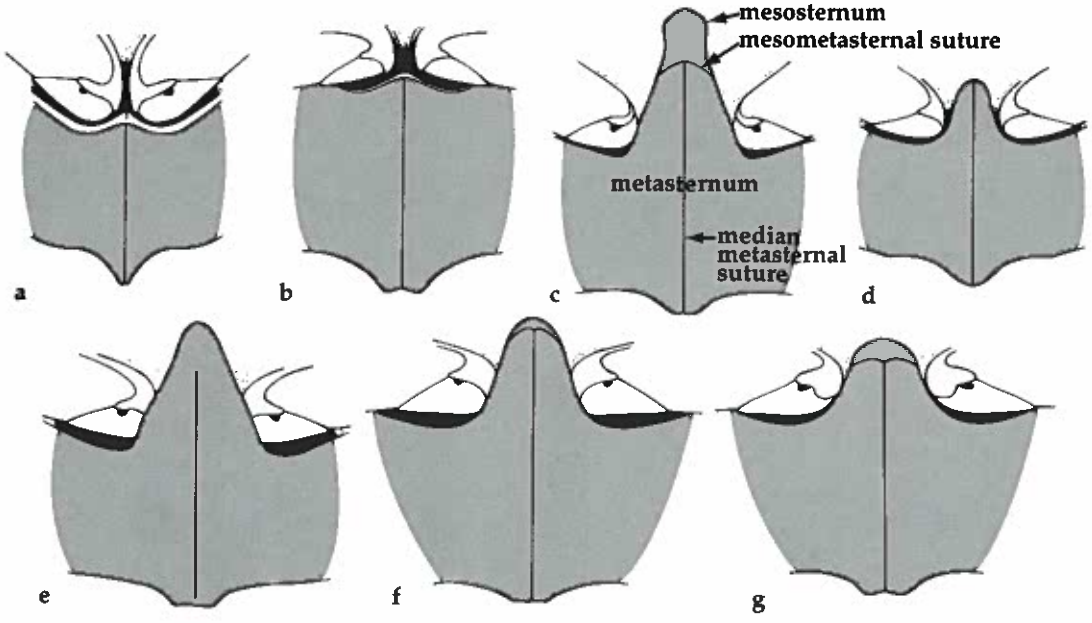
104. Empodium of meso- and metatarsus with two setae (0), three setae (1), many setae (2), or lacking setae (3).

Venter: Prosternum

105. Prosternal projection produced to trochanter (0), produced half-way to trochanter (1), or not appreciably produced (2).

106. Prosternal projection at the middle circular in cross section (0) or semicircular in cross section (1).

107. Prosternum at the middle greatly produced anteriorly (0) or not appreciably produced (1).



FIGS. 102a-g. Ventral view of the metasternum showing: the metasternum produced beyond the mesometasternal suture (c) or not produced (f) (character 111); the metasternum produced anteriorly beyond the base of the mesocoxae (c, e, f), not surpassing the base of the mesocoxae (d, g), or not produced (a-b) (character 110); mesometasternal suture well delineated with a horizontal suture (c, f, g) or poorly delineated (e) (character 114). 102a, *Dyscinetus*; 102b, *Adoretus*; 102c, *Macraspis*; 102d, *Rutelarcha*; 102e, *Rutela*; 102f, *Microrutela*; 102g, *Sphaeroutela*.

Venter: Proepisternum

108. Anterior angle of proepisternum not produced (0) or anterior angle of the proepisternum produced (1).

109. Suture between the proepisternum and anteriomedial prosternum poorly defined (indicated by a line) (0) or well defined and ridge-like.

Venter: Meso- and Metasternum

110. Mesosternum not produced (Figs. 102a-b) (0), weakly produced, not surpassing base of mesocoxae (Figs. 102d, g) (1), or produced anteriorly beyond base of mesocoxae (Figs. 102c, e, f) (2).

111. Mesosternum not appreciably produced beyond mesometasternal suture (Fig. 102f) (0) or appreciably produced (Fig. 102c) (1).

112. Metasternum not produced (0), produced to the apex of mesotrochanter (1), produced to the apex of mesocoxa (2), or produced to the base of prosternal projection (3).

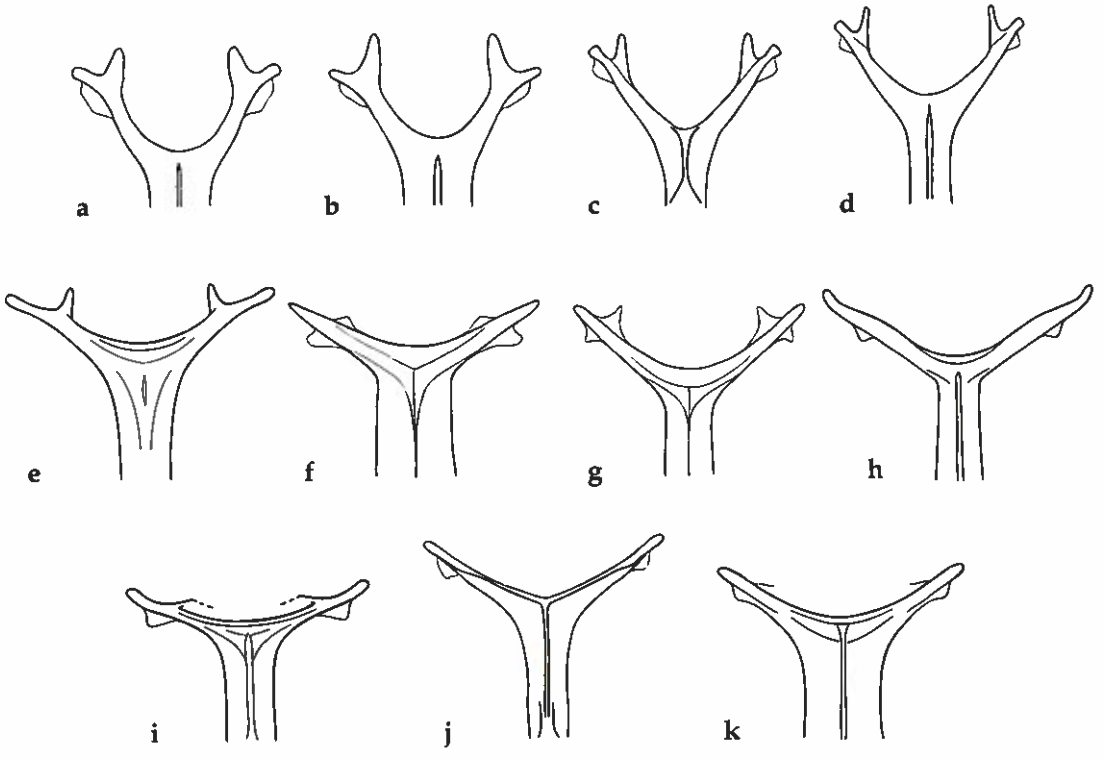
113. Metasternum of male in lateral view flat or weakly recurved (0) or decurved (1).

114. Mesometasternal suture well delineated (Figs. 102c, f, g) (0) or poorly delineated (Fig. 102e) (1).

Venter: Sternites

115. Sternites 1-2 at the middle strongly cariniform (0), fusiform (1), or weakly cariniform (2).

116. Sternites 2-5 subequal in length at the middle and at the sides (0) or shorter in length



FIGS. 103a-k. Caudal view of the metendosternite showing Y-shaped form (a-d) or T-shaped form (e-k) (character 122). 103a, *Rutela* generic groups; 103b, *Cnemida*; 103c, *Macraspis*; 103d, *Pelidnota*; 103e, *Telaugis*; 103f, *Parastasia*; 103g, *Rutelarcha*; 103h, *Rutelisca*; 103i, *Fruhstorferia*; 103j, *Anomala*; 103k, *Cyclocephala*.

at the middle than at the sides, thus causing the sternites to be greatly concave (1).

117. Sternites with stridulatory ridges absent (0) or stridulatory ridges present (1).

118. Subapex of the terminal sternite in the male entire (0) or terminal sternite in the male emarginate (1).

119. Apex of the terminal sternite in the female entire (0), quadrate (1), or trisinuate (2).

Metanotum and Metendosternite

120. Apex of the metanotum terminates at abdominal tergite 1 (0) extends posteriorly beyond abdominal tergite 1 (1).

121. Metanotum at the middle without X-shaped strut (0) or with X-shaped strut (1).

122. Metendosternite T-shaped (Figs. 103e-k) (0) or Y-shaped (Figs. 103a-d) (1).

123. Metendosternite with medial flanges poorly developed (0) or medial flanges well-developed (1).

124. Metendosternite poorly sclerotized (0) or well sclerotized (1).

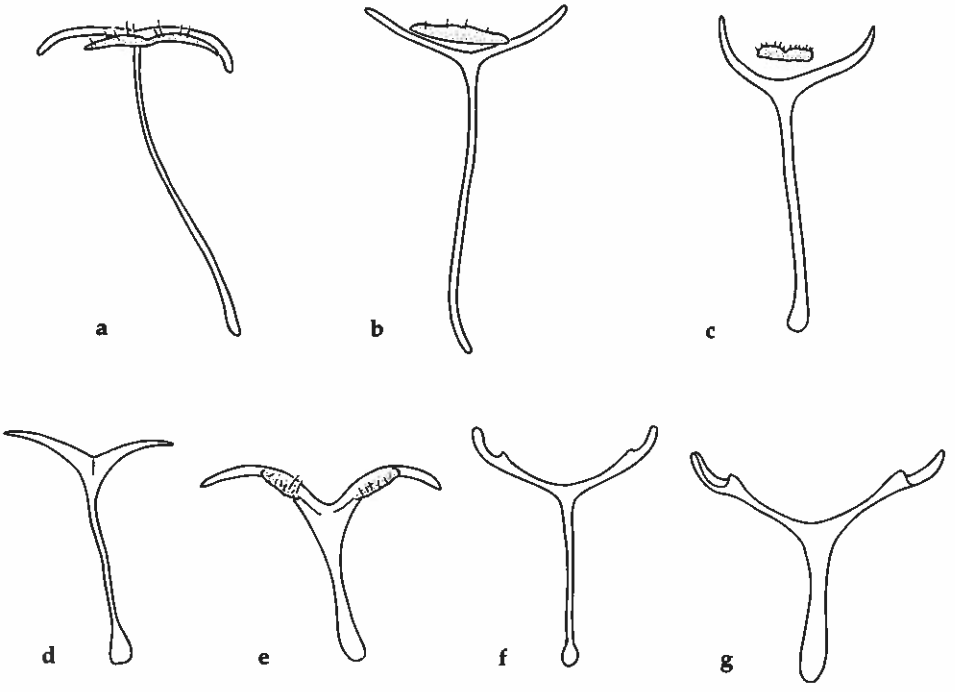
Male Genitalia

125. Phallobase with well developed posterior region (0) or lacking posterior region (1).

126. Parameres hinged dorso-ventrally (0), laterally (1), or fused (2).

127. Parameres with ventral piece membranous and poorly defined (0) or well-sclerotized and well-defined (1).

128. Spiculum gastrale with branches and associated sclerites separate (Figs. 104a-c) (0), branches and associated sclerites fused (Fig. 104e) (1), or sclerites entirely lacking (Figs. 104d-f) (2).



FIGS. 104a-g. Form of the spiculum gastrale (character 128). 104a, *Pelidnota*; 104b, *Rutela*; 104c, *Spodochlamys*; 104d, *Parastasia*; 104e, *Fruhstorferia*; 104f, *Adoretus*; 104g, *Cyclocephala*.

Results of Phylogenetic Analysis

Preliminary analysis of the distribution of 128 unweighted characters on all 72 taxa was performed with PAUP using the heuristic search routine. This resulted in 224 equally parsimonius trees with a total length (TL) of 589, consistency index (CI) of .431, retention index (RI) of .824, and rescaled consistency index (RC) of .355 (Fig. 105a). Because much of the homoplasy resulted from redundant taxa and characters (*i.e.*, scored identically), I filtered the taxa and characters in MacClade. This resulted in combining the following taxa; "*Rutela* A" *sanguinolenta sanguinolenta* and "*R.* A" *cryptica*; "*R.* A" *pygidialis*, "*R.* A" *dimorpha*, and "*R.* A" *sanguinolenta rufipennis*; "*R.* A" *striata striata* and "*R.* A" *striata antiqua*; "*Rutela* B" *egana*, "R. B" *campa*, and "*R.* B" *viridiaurata*; "*Rutela* C" species; *Cnemida aterrima*, *C. retusa*, and *C. intermedia*; and *Lutera nigromaculata* and *L. luteola*. These taxa were combined and another unweighted, heuristic search was performed. With redundant data filtered, the heuristic search found 96 shortest trees 589 steps in length (TL) with CI=.431, RI=.793, and RC=.342. The strict consensus of all trees is shown in Fig. 105b. The strict consensus tree that resulted from the unweighted analysis was well resolved except for: (1) a polytomy between the genera *Homonyx*, *Pelidnota (Pelidnota)*, and the *Pelidnota (Odontognathus)-Rutela* A clade (node 1), (2) polytomies in the "*Rutela* A" clade (node 2), (3) a polytomy among species of the "*Rutela* B" clade (node 3), and (4) a polytomy between the genus *Acrobolbia*, the clade *Peltonotus+Cyclocephala+Dyscinetus*, and the *Oryctomorphus*-Anomalini clade (node 4). Future analyses will focus on resolving relationships among these groups.

Because of the high number of equally parsimonious trees, and the possibility that the heuristic search did not reveal the shortest tree, I conducted a tree island search by changing the addition sequence of taxa (Maddison 1991; Forey *et al.* 1992). A tree island search reduces the possibility that "islands" of trees with shorter topologies than the initial tree island are not overlooked (Maddison 1991; Forey *et al.* 1992). Fifty replications were conducted with TBR, maxtrees=2,000, initial trees found by random addition sequences, zero length branches collapsed, and with uninformative characters included (Maddison 1991; Forey *et al.* 1992). Only one tree island was found.

To further examine phylogenetic pattern and to reduce the number of equally parsimonious trees, I used successive weighting (Farris 1969). This method of *a posteriori* character weighting is based on the fit of each character as applied to trees currently in memory. For large data sets and for characters with a high level of homoplasy, this technique allows for further evaluation of phylogenetic relationships. The phylogenetic program PAUP allows for characters to be weighted based on the rescaled consistency index (RC), retention index (RI), and consistency index (CI). To examine differences in topologies based on these weighting schemes, trials were performed using all three weighting schemes. The maximum value (best fit) option was used in each trial. The base weight was 100, and indices were truncated (as in the phylogenetic program *Hennig 86*). For all trials, three iterations were required to reach stability in character weight. Six shortest trees were found in each case. The strict consensus tree of each weighting scheme is presented in Figs. 105c-e. Comparisons of the strict consensus trees showed the following differences in taxa or groups: (1) hypothesized sister group of *Parabyrsopolis*, (2) hypothesized relationships of species in the "*Rutela* A" clade, (3) hypothesized relationship of the *Lasiocala+Pseudochlorota* clade, and (4) hypothesized relationship of the genus *Parastasia*. With the exception of these genera and groups, topologies between the trees did not differ greatly.

The topology of major lineages in the successive approximation consensus tree, based on the retention index (Figs. 105d, e), was equal to the topology of major lineages in the strict consensus tree based on unweighted characters (Fig. 105b). In addition,

the consensus tree based on the retention index was two steps shorter than the other successive approximation trees (Fig. 105c). Because of these two factors, decisions about generic and subtribal limits were based on the strict consensus tree which used the retention index weighting scheme (Figs. 105d, e). Figure 105e depicts the unambiguous character state changes on this tree (TL=589+, CI=.43, RI=.79).

Discussion

The results of the character and parsimony analyses demonstrated that the subtribe Rutelina, as currently recognized, is not a monophyletic group. In this section, I discuss the lineages and hypothesized relationships among the taxa in the subtribe Rutelina. Secondarily, the analyses showed that some subtribes in the tribe Rutelini are not monophyletic. Because my analyses were based only on exemplar taxa in the Rutelini, the phylogenetic relationships among all taxa are not conclusive. As a means of providing a foundation for further research, I discuss generic and subtribal relationships based on the strict consensus tree using the retention index (Fig. 105e).

Phylogenetic Analysis and the subtribe Rutelina

The phylogenetic analysis demonstrated that the subtribe Rutelina (Appendix 2) is polyphyletic. Members of the subtribe are in three lineages (Fig. 105e):

1) *Rutelarcha, Cyphelytra, Lutera* (the "*Rutelarcha* lineage"),

2) *Metapachylus* and *Rutelisca* (the "*Rutelisca* lineage"),

3) *Rutela* A, *Cnemida, Macraspis, Rutela* B, *Rutela* C, *Rutela* D, *Pelidnota (Odontognathus), Pelidnota (Pelidnota), Homonyx, Chrysina, Plusiotis, Telaugis* (the "*Rutela* lineage").

The "*Rutelisca* lineage" is hypothesized to be monophyletic based on two derived characters and one derived reversal: 13 (1), apex of the labrum hidden, not obviously produced; 24 (1), maxilla with teeth reduced to bristles or pegs; and 79 (1->0), first tarsomere of metatarsus produced at outer edge. The "*Rutelisca* lineage" is basal to the "*Rutelarcha* lineage." This lineage is hypothesized to be monophyletic based on four derived characters: 41 (1), anterior margin of pronotum with incomplete apical bead; 60 (1), lateral tergites bicolored; 77 (2), apex of the metatibia with sparse, hair-like setae, and: 94 (2->1), mesotarsus with inner claw in the male weakly and narrowly split. The taxa in the "*Rutelisca* lineage" and "*Rutelarcha* lineage" are removed from remaining genera that are currently placed in the Rutelina.

The "*Rutela* lineage" includes several genera that are currently placed in three subtribes: the Rutelina, Pelidnotina, and Antichirina. The group is supported by two derived characters and derived reversal: 22 (1), stipes flange-like; 122 (1), metaendosternite T-shaped, and; 115(2->1), sternites 1-2 at the middle fusiform. Within the "*Rutela* lineage," the apical taxa in this clade are "*Rutela* A" and its sister group, *Cnemida+Calomacraspis+Macraspis*. The apical clade is supported by only one character 120 (1), apex of the metanotum extending posteriorly beyond the first abdominal tergite. The sister genus to the apical clade ("*Rutela* A"+*Cnemida +Calomacraspis+Macraspis*) is "*Rutela* B" ("*Microrutela*") which shares two derived characters with the apical clade: 50 (1), base of the epipleuron without a raised line, and; 72 (1), mesotibial apex without a spinose process at the outer margin. "*Rutela* C" ("*Sphaerorutela*") is sister to the clade that includes "*Rutela* B"+"*Rutela* A"+*Cnemida+Calomacraspis +Macraspis*. Seven derived characters and one derived reversal provide robust support for this relationship: 17 (0), apex of the labrum truncate; 45 (1), length of the scutellum 1/3 to 1/4 length of the elytral suture; 52 (1), base of the mesepimeron projecting anterior to the elytral humerus; 61 (1), surface of the propygidium punctate but without setae; 100 (1), unguitractor plate hidden, not exposed beyond the base of the claws; 102 (1), setae of the empodium hidden, not visible beyond the

base of the claws, and; 55 (1->0), hindwing with vein AA_{1+2} shorter than AA_{3+4}. "*Rutela* D" ("*Plesiorutela*") is sister to the aforementioned clade, and this relationship is supported by eight derived characters: 35 (2), pronotum with basal bead incomplete; 42 (1), base of the scutellum depressed below the plane of the elytra; 49 (1), elytral epipleuron simple; 54 (1), anterior edge of the hindwing from the medial fold to the tip of the wing without setae; 62 (1), apex of the propygidium exposed beyond the apex of the elytra; 75 (1), apex of the mesotibia with sparse, spinose setae; 103 (2), empodium of the protarsus without setae, and; 104 (3), empodium of the meso- and metatarsus lacking setae. *Pelidnota (Odontognathus)* is sister to the above taxa, and shares five derived characters with the higher clade: 10 (1), clypeal apex emarginate medially; 74 (1), mesotibia of the male with a produced corbel; 78 (1), metatibia of the female with the inner, apical spur thickened and stalk-like; 110 (2), mesosternum produced anteriorly beyond the base of the mesocoxae, and; 112 (2), metasternum produced to the base of the prosternal projection. The genus *Pelidnota (Pelidnota)* is basal to the *Pelidnota (Odontognathus)*-"*Rutela* A" clade and shares one derived reversal with it. *Homonyx* is basal to the aforementioned taxa and shares one derived character with the higher clade (*Pelidnota [Odontognathus]*-"*Rutela* A"). *Plusiotis* and *Chrysina* are sister taxa and form a clade that is sister to the *Pelidnota (Odontognathus)*-"*Rutela* A" clade. This relationship is supported by four derived characters and one derived reversal: 55 (1), hindwing with vein AA_{1+2} subequal to AA_{3+4}; 93 (2), inner claw of protarsus lacking rami; 123 (1), metendosternite with medial flanges well-developed; 92 (1->0), protarsus with inner claw in the male simple, and; 94 (1->0), mesotarsus with inner claw in the male simple. The basal genus in the "*Rutela* lineage" is *Telaugis*.

The analysis also examined relationships within the genus *Rutela* as currently delimited. Species of *Rutela* clustered in four, independent lineages separated by the genera *Calomacraspis*, *Macrapis*, and *Cnemida*. This demonstrates that the genus is polyphyletic. The most apical clade, *Rutela* A (clade A), is equivalent to *Rutela sensu* Latreille. The clade is supported by three derived character and one derived reversal: 13 (1), apex of the labrum hidden, not obviously produced; 114 (1), mesometasternal suture poorly delineated; 119 (1), apex of the terminal sternite of the female quadrate; 17 (1->0), apex of the labrum bisinuate. Relationships within the clade are not strongly supported, as demonstrated by the differing topologies in the weighted and unweighted analyses. In all weighted analyses, the basal clade is comprised of *R. cryptica*, *R. dimorpha*, *R. heraldica*, *R. sanguinolenta*, and *R. pygidialis* (clade B). This is supported by two derived characters: 63 (1), apical margin of the pygidium quadrate, and; 113 (1), metasternum of the male in lateral view decurved. The species *R. glabrata*, *R. dorcyi*, *R. formosa*, and *R. striata* (all Caribbean island species), are transition taxa between the *R. cryptica* clade (clade B) and the *R. histrio*-*R. laeta* clade (clade C). Relationships in the *R. histrio*-*R. laeta* clade are poorly resolved due to the few characters that support relationships. Based on the characters of the species in the clade, my preferred hypothesis is shown in Fig. 105e. The clade that includes *Rutela histrio* and *R. tricolorea* is sister to the clade that includes *R. histrioparilis*-*R. laeta*. Within the higher clade (clade D), however, relationships are ambiguous. To fully understand the phylogeny of the *Rutela* clade, additional character data (such as larval or molecular) will need to be included in the analysis.

The *Rutela* B clade (clade E) is a monophyletic group that includes seven species. This group is supported by seven derived characters: 36 (1), lateral region of the pronotum with fovea; 39 (0->3), base of the pronotum lateral of the scutellum situate; 41 (1), anterior margin of the pronotum with incomplete apical bead; 48 (1), base of the elytra laterad of the scutellum depressed; 64 (1), procoxae of the males with long, dense setae; 113 (1), metasternum of the male in lateral view decurved. Because of the strong

character support for this clade, I treat this as a distinct genus, referred to in this work as *Microrutela* F. Bates (transferred from synonymy with *Rutela*). Relationships among the species are poorly resolved due to the lack of characters. *Microrutela campa, M. viridiaurata,* and *M. egana* were scored identically for all characters. Additional characters will be needed for interpretation of relationships within this clade.

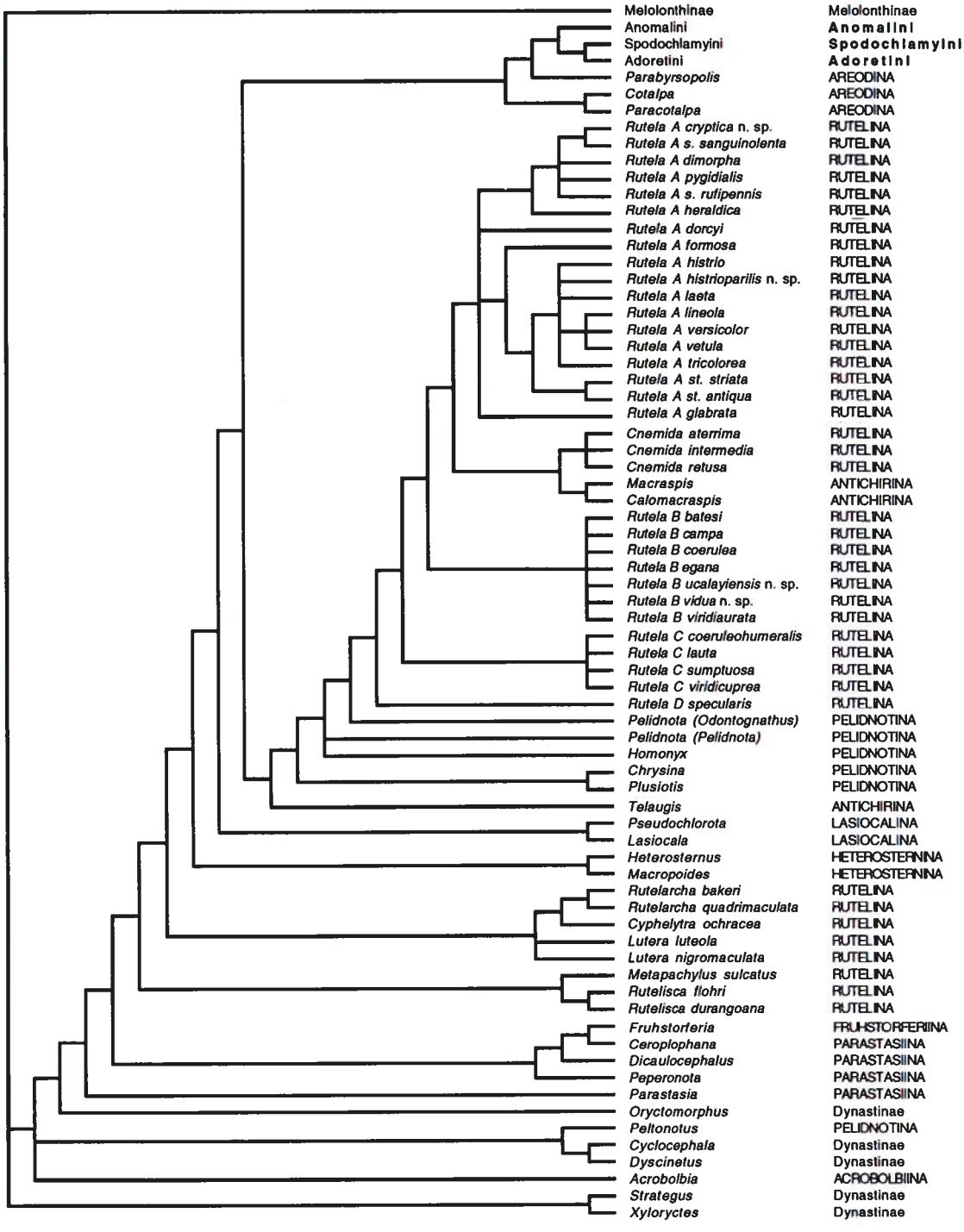
The *Rutela* C clade (clade F) is a monophyletic group and is supported by seven characters: 51 (1), stria adjacent to the sutural stria an impressed line; 82 (1->3), inner apex of the fourth metatarsomere with a weakly produced, U-shaped process; 83 (1->2), ventrolateral apex of the fourth metatarsomere in males with one inner and outer stout and spinose setae; 127 (1), parameres with the ventral piece well defined; 10 (1->0, derived reversal), clypeal apex entire, not emarginate medially; 81 (1->0, derived reversal), first metatarsomere subequal in length or longer than the second tarsomere; 110 (2->1, derived reversal), mesosternum weakly produced, not surpassing the base of the mesocoxae. The character support for this clade is substantial, and I treat this as a distinct genus, *Sphaerorutela* new genus. Four species are included in this clade.

The Rutela D clade is supported by seven derived characters: 13 (1), apex of the labrum hidden, not obviously produced; 36 (1), lateral region of the pronotum with fovea; 39 (0->3), base of the pronotum lateral of the scutellum sinuate; 41 (1), anterior margin of the pronotum with incomplete apical bead; 63 (1), apical margin of the pygidium in the female quadrate; 109 (1), suture between the proepisternum and anteriomedial prosternum well defined and ridge-like, and; 66 (1->0), metacoxae with medial region produced posteriorly beyond the posterior border to the metatrochanter. I treat this clade as a distinct genus, *Plesiorutela*, new genus. Only one species, *P. specularis*, is the member of this clade.

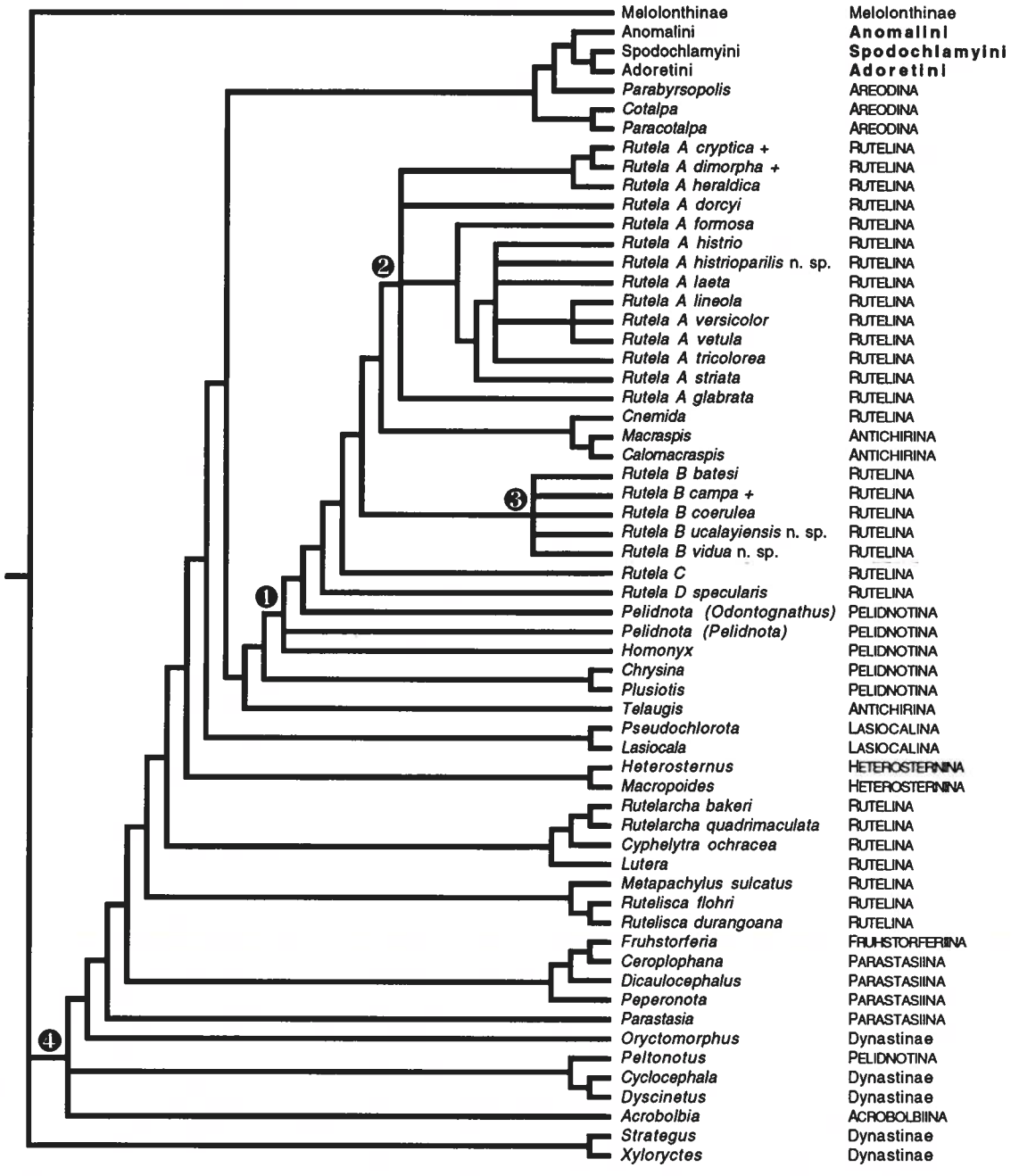
The sister lineage to the "*Rutela* lineage" is a clade that includes the tribes Spodochlamyini, Adoretini, Anomalini and the subtribe Areodina (Fig. 105e). Taxa included in the sister group clade is equivocal, as demonstrated by the results of the phylogenetic analyses which may or may not include the genera *Pseudochlorota+Lasiocala* (Figs. 105c, d) and may or may not include the tribe Anomalini and subtribe Areodina (Figs. 105c, d). Neither sister group relationship (Spodochlamyini + Adoretini + *Pseudochlorota* + *Lasiocala* or Anomalini + Spodochlamyini + Adoretini + Areodina) is robustly supported. The hypothesized sister group relationship that includes the Spodochlamyini + Adoretini + *Pseudochlorota* + *Lasiocala* is supported by only one derived reversal: 90 (1->0), inner, median surface of the fifth metatarsomere of the male lacking median projection. The hypothesized sister group relationship that includes the Anomalini + Spodochlamyini + Adoretini + Areodina is supported by one derived character and two derived reversals: 69 (1), base of the inner protibia simple; 94 (2->1), mesotarsus with inner claw in the male simple, and; 95 (2->0), metatarsus with inner claw in the male simple. Including additional tribes in the analysis (*i.e.*, Geniatini, Anoplognathini [both Rutelinae]), as well as including additional exemplars of Dynastinae, may help to resolve this problem.

Phylogenetic Analysis and the tribe Rutelini

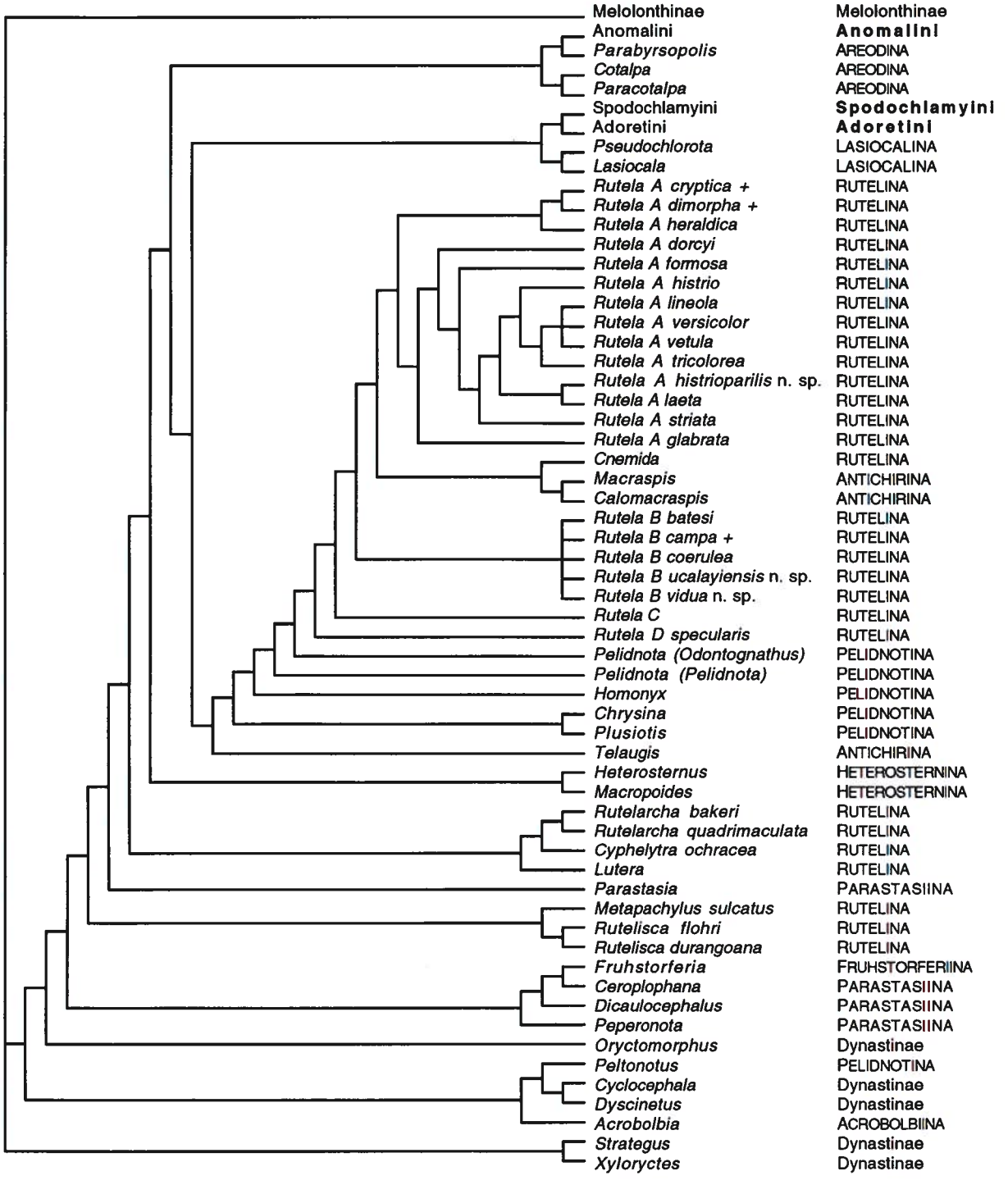
The phylogenetic analysis demonstrated that several traditional groupings within the tribe Rutelini are not monophyletic groups. The genera *Acrobolbia* (Acrobolbiina) and *Peltonotus* (Pelidnotina) are hypothesized as being members of the clade that includes *Cyclocephala* and *Dyscinetus* (Dynastinae). This clade is supported by two derived characters: 3 (1), eye canthus without a ridge or thickening; 53 (1), hindwing with region anterior to RA_{3+4} with pegs. The character and parsimony analyses provide adequate evidence that these two genera, which are currently placed in the tribe Rutelini, are more correctly placed in the subfamily Dynastinae.



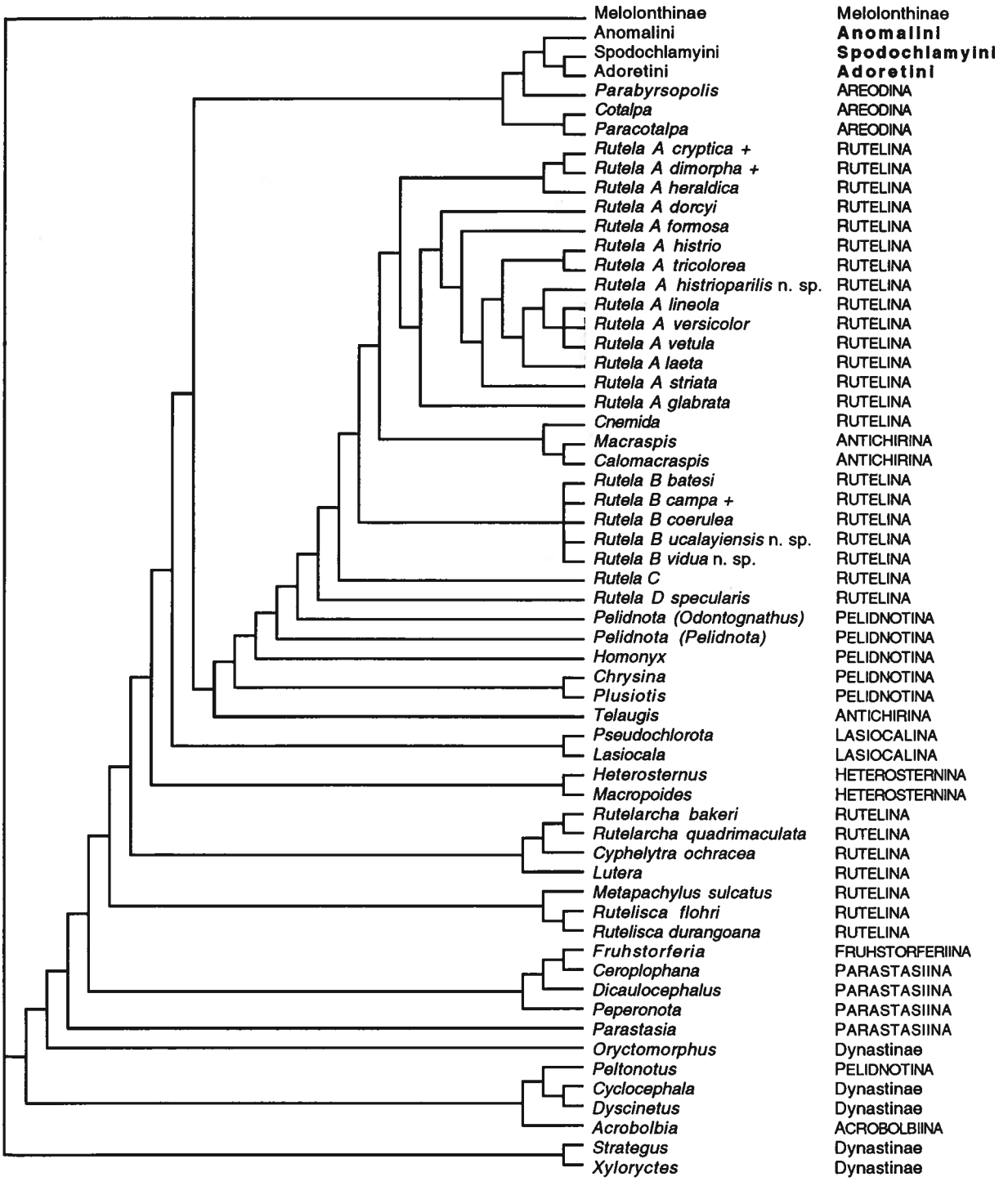
FIGS. 105a. Phylogeny of the Rutelina. Strict consensus tree of 224 equally parsimonius trees resulting from heuristic search (characters unweighted) before redundant taxa were filtered (TL=589, CI=.431, RI=.824, RC=.355).



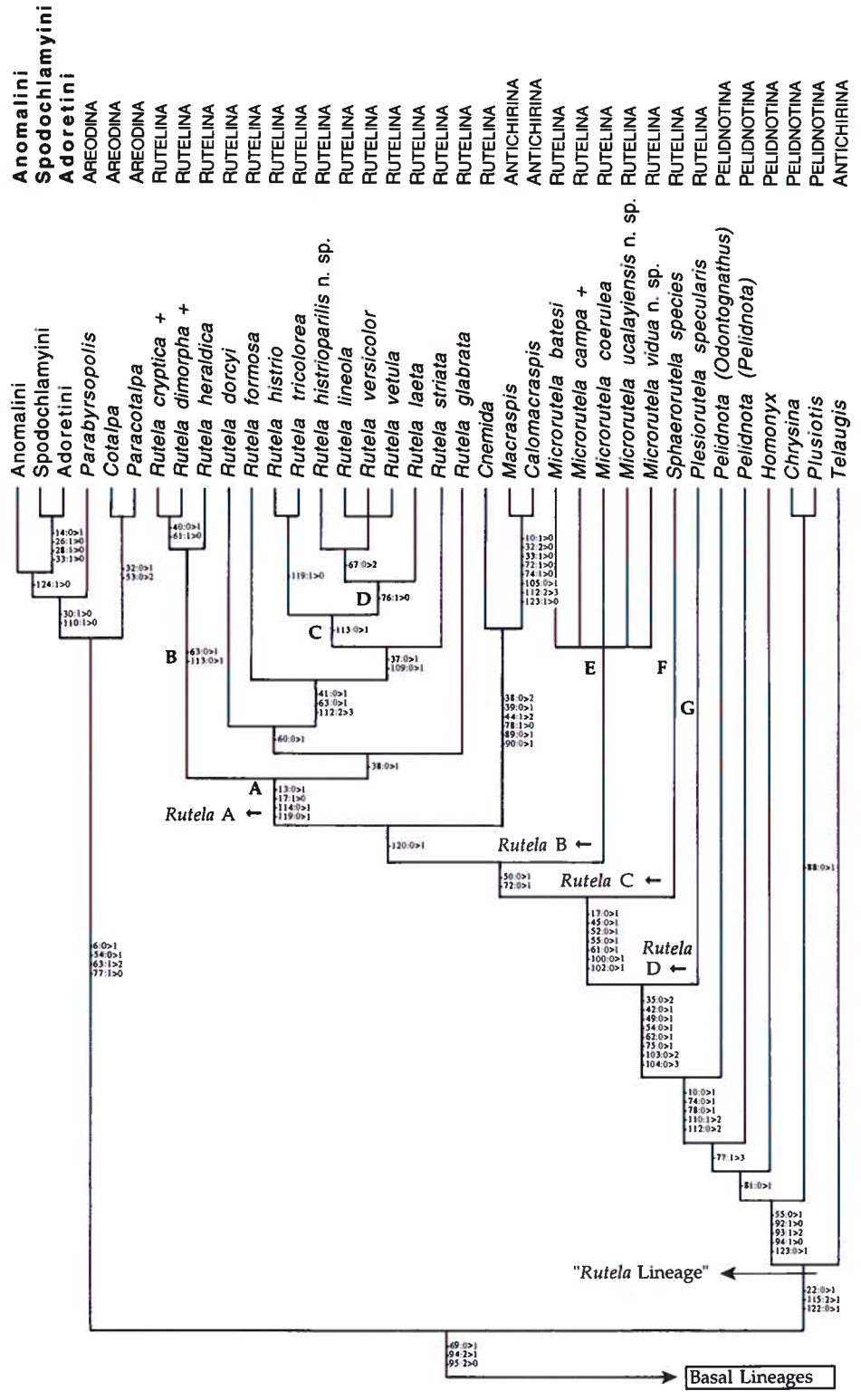
FIGS. 105b. Phylogeny of the Rutelina. Strict consensus tree of 96 equally parsimonius trees resulting from heuristic search (characters unweighted) after redundant taxa were filtered (TL=589, CI=.431, RI=.793, RC=.342).



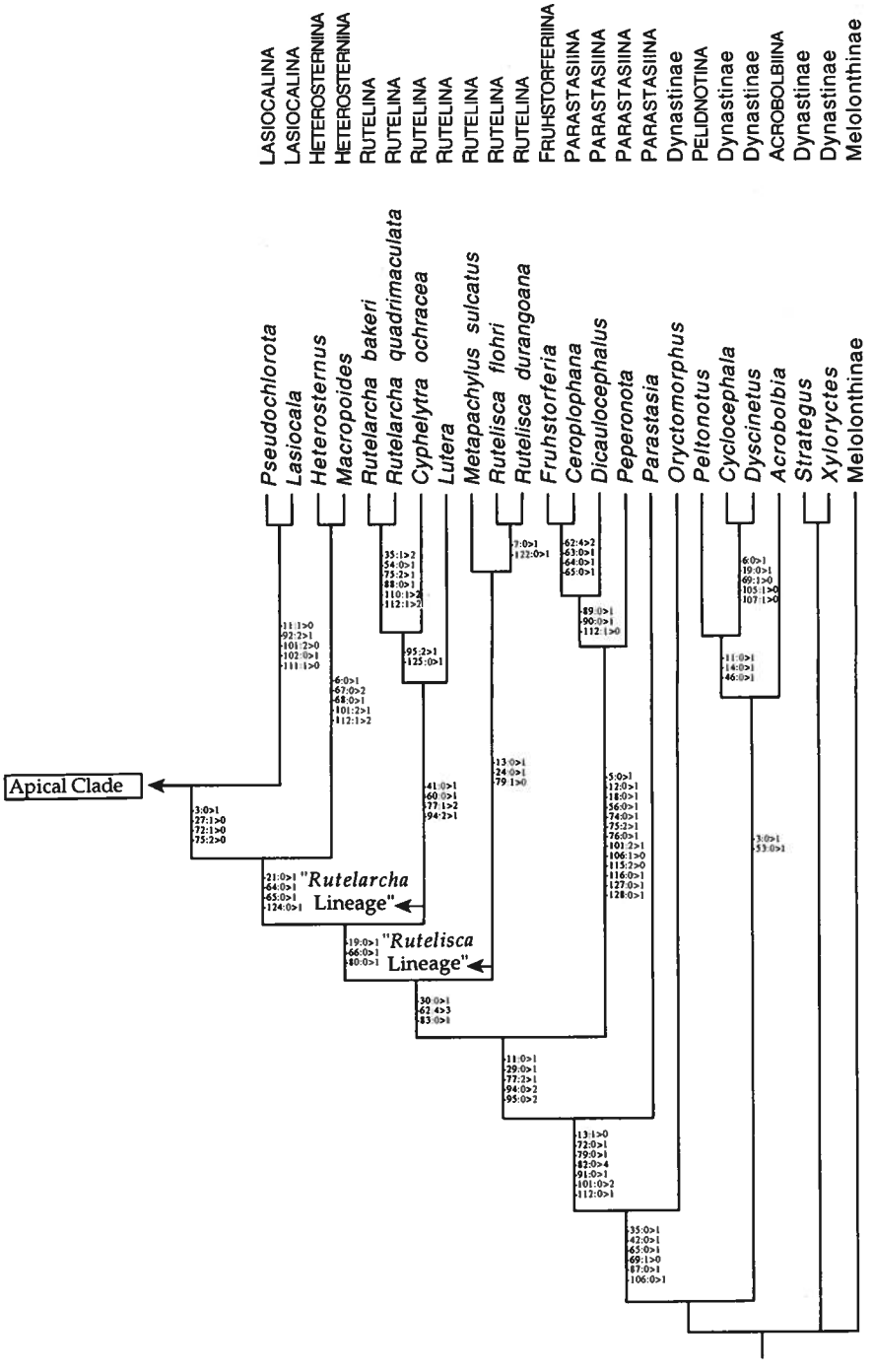
FIGS. 105c. Phylogeny of the Rutelina. Strict consensus tree of six equally parsimonius trees resulting from successive approximation based on rescaled consistency index character weighting scheme and consistency index character weighting scheme.



FIGS. 105d. Phylogeny of the Rutelina. Strict consensus tree of six equally parsimonius trees resulting from successive approximation based on retention index character weighting scheme.



FIGS. 105e. Phylogeny of the Rutelina (this and opposite page). Strict consensus tree of six equally parsimonius trees resulting from successive approximation based on retention index character weighting scheme. Numbers on branches of the tree indicate unambiguous character state changes. The genus *Microrutela* is transferred from synonymy with the genus *Rutela*. The generic names *Sphaerorutela* and *Plesiorutela* are described as new in this work.


LASIOCALINA
LASIOCALINA
HETEROSTERNINA
HETEROSTERNINA
RUTELINA
RUTELINA
RUTELINA
RUTELINA
RUTELINA
RUTELINA
FRUHSTORFERIINA
PARASTASIINA
PARASTASIINA
PARASTASIINA
PARASTASIINA
Dynastinae
PELIDNOTINA
Dynastinae
Dynastinae
ACROBOLBIINA
Dynastinae
Dynastinae
Melolonthinae
Pseudochlorota
Lasiocala
Heterosternus
Macropoides
Rutelarcha bakeri
Rutelarcha quadrimaculata
Cyphelytra ochracea
Lutera
Metapachylus sulcatus
Rutelisca flohri
Rutelisca durangoana
Fruhstorferia
Ceroplophana
Dicaulocephalus
Peperonota
Parastasia
Oryctomorphus
Peltonotus
Cyclocephala
Dyscinetus
Acrobolbia
Strategus
Xyloryctes
Melolonthinae
Apical Clade
"Rutelarcha Lineage"
"Rutelisca Lineage"

However, because exemplars of all dynastine tribes were not included in the analysis, I believe that transferring these genera to a specific tribe (such as the Cyclocephalini) is premature. Additional character analyses will be focused at adequately addressing the tribal placement of these genera in the subfamily Dynastinae.

The phylogenetic analysis also demonstrated that the subtribe Fruhstorferiina (Appendix 2), which includes only species in the genus *Fruhstorferia*, is paraphyletic. The clade that includes the genera *Fruhstorferia*+*Ceroplophana*+*Dicaulocepalus*+*Peperonota* is robustly supported by ten derived characters. The subtribe Parastasiina, as currently delimited, includes the three latter genera plus the genus *Parastasia*. The relationship of the genus *Parastasia* to other groups is ambiguous, but all hypotheses demonstrate that the genus is not part of the *Fruhstorferia*+*Ceroplophana*+*Dicaulocepalus*+*Peperonota* clade. Thus, the subtribe Parastasiina, as currently delimited, is also not monophyletic.

Based on the results of the analysis, the "*Rutela* lineage" is a paraphyletic group comprised of three subtribes: Rutelina, Pelidnotina, and Antichirina. Genera that are currently members of the Pelidnotina occur in two lineages; the "*Rutela* lineage" and the clade that includes *Cylcocephala, Dyscinetus*, and *Acrobolbia*. Exemplar genera that are currently placed in the subtribe Antichirina are also part of the "*Rutela* lineage" but are not a distinct clade within it. For example, *Telaugis* (Antichirina) is the most basal member of the "*Rutela* lineage;" *Calomacraspis* and *Macraspis* (both Antichirina) form the sister lineage to the "*Rutela* A" clade.

Two subtribes were supported by derived characters: Heterosternina and Lasiocalina. The exemplar genera of Heterosternina (*Macropoides* and *Heterosternus*) share four derived characters and one derived reversal; the Lasiocalina (*Pseudochlorota* and *Lasiocala*, the only members of the subtribe) share two derived characters and three derived reversals.

The hypothesized relationships among the exemplar genera of the subtribe Areodina were equivocal. All analyses demonstrated that *Cotalpa* and *Paracotalpa* are sister taxa (supported by two derived reversals). However, the relationship of the genus *Parabyrsopolis* with these areodine genera was not supported. *Parabyrsopolis* was hypothesized to be more closely related to the tribe Anomalini (Figs. 105c-e); this relationship was supported by one (Fig. 105c) or two (Fig. 105d) derived character reversals.

Taxonomic Conclusions Based on Cladistic Analysis

The results of the analyses clearly demonstrate the inadequacies of the current classification of the Rutelinae. Based on character and parsimony analyses, members of the subtribe Rutelina do not form a monophyletic group. Although the current classification is "traditional," it is not consistent with the hypothesized phylogeny of the group. The current classification is, in fact, misinformative and logically inconsistent. Due to the artificial nature of the current classification, our ability to test evolutionary hypotheses is seriously inhibited for these taxa. I recommend classification changes based on the hypothesized phylogenetic relationships in Fig. 105e. Alterations that I suggest change the current classification as little as possible, yet, at the same time, they are consistent with the phylogeny.

Because the analysis of the tribe Rutelini was not inclusive of all taxa, I believe that a new classification of all Rutelini is premature. The phylogenetic analysis does, however, provide robust evidence that many subtribes in the Rutelini are not demonstrably monophyletic. This circumstance leaves me with three options: (1) dispensing with the subtribal category within the tribe Rutelini (across the board) because this taxonomic category contains information that is not consistent with the phylogeny, (2) maintaining the category of subtribe if the phylogenetic analysis provided evidence that the group was monophyletic and dispensing with the

subtribe if the analysis demonstrated that it was non-monophyletic, or (3) creating new subtribal categories for all monophyletic groups of taxa that are supported in the phylogenetic analysis. In order to create the fewest alterations in the classification, I elect option 2: maintaining the category of subtribe if the phylogenetic analysis provided evidence that the group was monophyletic and dispensing with the subtribe if the analysis demonstrated that it was non-monophyletic. Subtribes that are not supported by the phylogenetic analysis are eliminated until phylogenetic analyses provide synapomorphic characters for this taxonomic level. Based on the phylogenetic analysis I also propose new genera for the paraphyletic genus *Rutela*.

The fate of the generic-level taxa and subtribes of Rutelini is discussed below. These classification changes are based on the phylogenetic analysis and Fig. 105e. Classification changes are summarized in Appendices 4 and 5.

Genus *Rutela* Latreille.—The phylogenetic analysis indicated that the genus *Rutela*, as currently delineated, is paraphyletic. The "*Rutela* lineage" is hypothesized to include "*Rutela* A", *Cnemida, Calomacraspis, Macraspis*, "*Rutela* B", "*Rutela* C", and "*Rutela* D". Within the genus *Rutela* (as currently delineated), four subgroups were identified. Each of these groups is monophyletic, and I treat these as distinct genera: "*Rutela* A"=*Rutela* Latreille; "*Rutela* B"=*Microrutela* F. Bates (transferred from synonymy with *Rutela*); "*Rutela* C"=*Sphaerorutela* Jameson, new genus; and "*Rutela* D"=*Plesiorutela* Jameson, new genus. The taxonomic history of each genus is discussed in this work and each genus is revised.

Genus *Peltonotus* Burmeister.—This genus is currently placed in the subtribe Pelidnotina. The phylogenetic analysis provided evidence that the taxon is more closely related to the subfamily Dynastinae. I am transferring this genus from the subtribe Pelidnotina to the subfamily Dynastinae. Based on the exemplar dynastine taxa in the analysis, this genus may be a member of the tribe Cyclocephalini. Future analyses will address its placement in the Dynastinae.

Genus *Acrobolbia* Ohaus and subtribe Acrobolbiina.—*Acrobolbia macrophylla* Ohaus is the sole member of its genus and the subtribe Acrobolbiina. The phylogenetic analysis demonstrated that the taxon is more closely related to the subfamily Dynastinae. I am eliminating the subtribe Acrobolbiina and transferring the genus *Acrobolbia* to the subfamily Dynastinae. The phylogenetic analysis indicated that this genus may be a member of the tribe Cyclocephalini. Future analyses will examine the position of this genus in the subfamily Dynastinae.

Subtribe Rutelina.—All taxa that are currently placed in this group were used in the phylogenetic analysis. This taxon is not a monophyletic group. As currently delineated members are in three separate lineages. I am eliminating this subtribe.

Subtribes Pelidnotina, Antichirina, Fruhstorferiina, Parastasiina.—Based on the exemplars included in the phylogenetic analysis, these subtribes are not monophyletic. I am eliminating these subtribes.

Subtribes Didrepanephorina and Desmonychina.—Exemplars of these taxa were not available for character analysis. Based on a preliminary examination of the only species in the subtribe Desmonychina, *D. humeralis* Arrow, I hypothesize that it is closely related to the genera *Parastasia* and *Oryctomorphus*. Based on preliminary examination of one of the two species in the genus *Didrepanophorus, D. bifalcifer*, I hypothesize that this genus is closely related to the clade that includes *Fruhstorferia, Peperonota, Ceroplophana*, and *Dicaulocephalus*.

Subtribe Lasiocalina.—As currently defined, this taxon includes two genera, *Lasiocala* and

Pseudochlorota, both of which were studied in the analysis. The phylogenetic analysis supported the monophyly of this subtribe. The clade is supported by three derived characters. The subtribe Lasiocalina is maintained in this work.

Subtribe Heterosternina.—Exemplar taxa from the subtribe Heterosternina (as currently delimited [Morón 1983, 1987]) included *Heterosternus* and *Macropoides*. Nine additional genera are currently placed in this subtribe (Morón 1987). Based on the few exemplar genera in the analysis, the subtribe seems to be a monophyletic group supported by five characters. However, additional analyses of the group are required to corroborate monophyly of the group. I am maintaining the subtribe Heterosternina until such research is conducted.

Subtribe Areodina.—Exemplar taxa from the subtribe Areodina (as currently delimited) included *Cotalpa*, *Paracotalpa*, and *Parabyrsopolis*. Seven additional genera are currently placed in the subtribe (Jameson 1990). Based on the exemplar taxa, the monophyly of the subtribe is equivocal. Previous phylogenetic analyses of all genera of Areodina (Jameson 1990) hypothesized that the group was monophyletic, however, this was based on one symplesiomorphic character. The phylogenetic analysis in this work also demonstrates that the subtribe is more closely related to the tribe Anomalini than to taxa in the tribe Rutelini. Although these data are in conflict with the current classification, I am maintaining the subtribe Areodina within the tribe Rutelini until additional analyses are conducted.

TAXONOMIC TREATMENT OF THE *RUTELA* GENERIC GROUPS

Phylogenetic analyses indicate that the genus *Rutela*, as currently delineated (*sensu* Machatschke 1972 and Kuijten 1988, 1992), is paraphyletic. However, four monophyletic groups were identified, and I treat these as distinct genera. These genera are: *Rutela* Latreille, *Microrutela* (F. Bates), *Plesiorutela* Jameson (new genus), and *Sphaerorutela* Jameson (new genus). These taxa are part of a clade that includes the genera *Cnemida*, *Macraspis*, and *Calomacraspis*. The basal lineages of the *Rutela* generic group clade are the *Pelidnota*, *Homonyx*, and *Chrysina+Plusiotis* lineages. The *Rutela* generic group clade is separated from these lineages based on the following characters: elytral epipleuron contiguous with dorsal surface of elytra; pronotum lacking basal bead. The following key will allow separation and identification of genera that are recognized in this work as derived taxa in the *Rutela* generic group clade (*Plesiorutela*, *Sphaerorutela*, *Microrutela*, *Rutela*, *Cnemida*, *Calomacraspis*, and *Macraspis*). Future studies will place an emphasis on the systematics of the entire "*Rutela* lineage." For keys to tribes and of Rutelinae and subtribes of Rutelini (as previously defined) see Jameson 1990.

KEY TO THE GENERA OF THE *RUTELA* GENERIC GROUPS

1. Scutellum at base planar and extending anteriorly beneath pronotum (Figs. 106a, e, f, g) 5
1′. Scutellum at base entirely declivous or declivous laterally and planar medially (Figs. 106b-d) 2

2. Base of scutellum declivous laterally and planar medially (Fig. 106b). Apex of mesotibia with spiniform tooth (Fig. 107d) . . . . . *Microrutela* (page 127)
2′. Base of scutellum entirely declivous (Figs. 106c,d). Apex of mesotibia without spiniform tooth (Figs. 107a-c) 3

3. Length of the scutellum about equal in length to elytral suture. Apex of metatibia with spinose setae (Fig. 109a) . . . . . *Macraspis* (not treated here; lacking modern revision)
3′. Length of the scutellum less than length of elytral suture. Apex of metatibia without spinose setae 4

4. Elytral suture about 3 times length of scutellum; scutellum nearly twice as wide as long. Unguitractor plate hidden (*e.g.*, Fig. 108a) ... *Sphaerorutela*, new genus (page 111)
4'. Elytral suture about 5 times length of scutellum; scutellum width slightly greater than length. Unguitractor plate exposed beyond base of claws, lacking setae (Fig. 108b) ..... *Plesiorutela*, new genus (page 147)

5. Apex of the metatibia straight and with many spinose setae (Fig. 109b). Mandibles rounded on external edge ..... *Calomacraspis* (treated in Jameson *et al.* 1994)
5'. Apex of the metatibia bi-emarginate, with or without corbel (Figs. 109c, d). Mandibles bidentate on external edge 6

6. Posterior border of pronotum tri-emarginate (Fig. 106g) ..... *Cnemida* (treated in Jameson 1996)
6'. Posterior border of pronotum rounded or straight (Figs. 106a, e) ..... *Rutela* Latreille (page 51)

Clave para los Generos del Grupo Generico *Rutela*

1. Base del escutelo aplanada, con la porción anterior extendida bajo el pronoto (Figs. 106a, e, f, g) 5
1'. Base del escutelo situada totalmente en declive o con declives laterales y la porción media aplanada (Figs. 106b, d) 2

2. Base del escutelo con la parte media plana y con declives laterales (Fig. 106b). Apice de la mesotibia con un diente espiniforme (Fig. 107d) ..... *Microrutela* (pág. 127)
2'. Base del escutelo enteramente en declive (Figs. 106c, d). Apice de la mesotibia sin diente espiniforme (Figs. 107a-c) 3

3. Escutelo casi con la misma longitud de la sutura elitral. Apice de la metatibia con sedas espiniformes (Fig. 109a) ..... *Macraspis* (no incluído en este trabajo, requiere una revisión moderna)
3'. Escutelo más corto que la sutura elitral. Apice de la metatibia sin sedas espiniformes 4

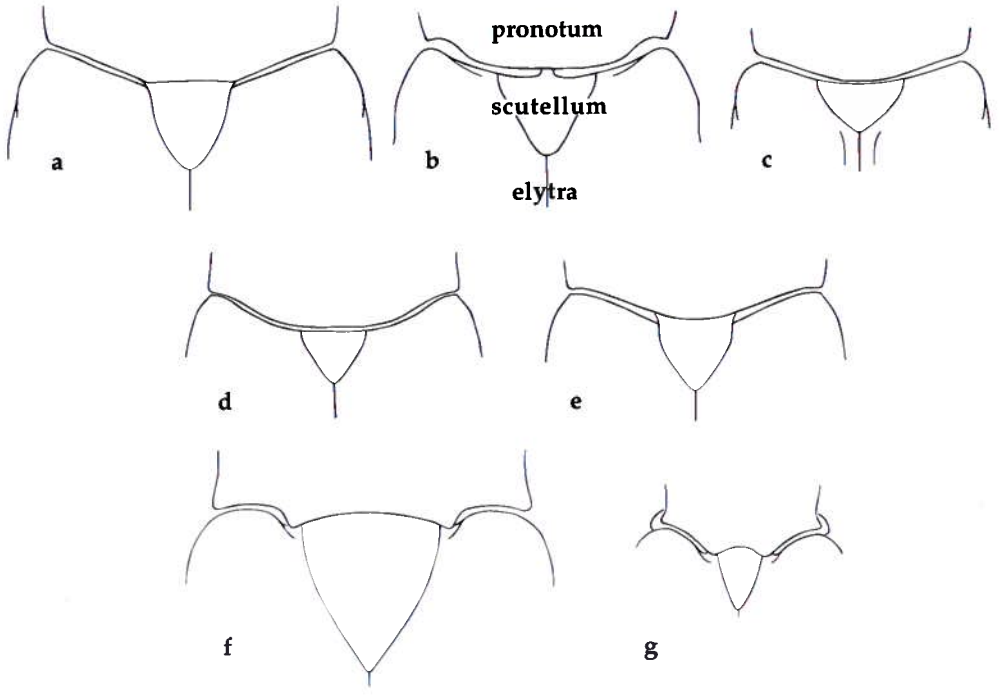
4. Sutura elitral casi tres veces más larga que el escutelo; escutelo casi dos veces más ancho que largo. Placa del unguitractor oculta (v.g. Fig. 108a) ..... *Sphaerorutela* nuevo género (pág. 111)
4'. Sutura elitral casi cinco veces más larga que el escutelo; escutelo ligeramente más ancho que largo. Placa del unguitractor expuesta más allá de la base de las uñas, y carente de sedas (Fig. 108b) ..... *Plesiorutela* nuevo género (pág. 147)

5. Apice de la metatibia recto y con numerosas sedas espiniformes (Fig. 109b). Borde exterior de las mandíbulas redondeado ..... *Calomacraspis* (tratado en Jameson *et al.* 1994)
5'. Apice de la metatibia bi-emarginado, con o sin saliente (Figs. 109c, d). Borde exterior de de las mandíbulas bidentado 7

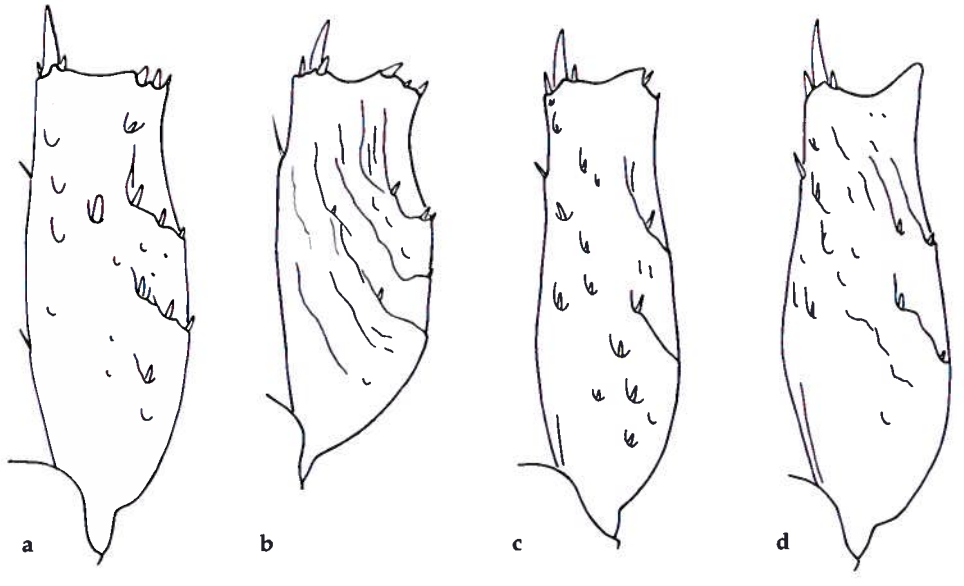
6. Borde posterior del pronoto tri-emarginado (Fig. 106g) ..... *Cnemida* (tratado en Jameson 1996)
6'. Borde posterior del pronoto redondeado o recto (Figs. 106a, e) ..... *Rutela* Latreille (pág. 51)

INTRODUCTION TO THE GENUS *RUTELA* LATREILLE

The genus *Rutela* (*e.g.*, Figs. 30-60, 110, cover) is the nominate genus of the subfamily Rutelinae (*e.g.*, Figs. 1-84). Species in the genus are brightly colored, often with contrasting patterns of black with red, orange, or tan. As defined here, the genus *Rutela* Latreille includes 17 species (two of which are new) and two subspecies. Species are distributed in the West Indies, Central America, and South America and are primarily found in lowland and mid-elevation tropical forests. Adults beetles are moderate to large in size (1-2 cm) and are found on flowers and vegetation.



FIGS. 106a-g. Dorsal view of pronotal, elytral, and scutellar base showing form of pronotal base and form of scutellum. 106a, *Rutela*; 106b, *Microrutela*; 106c, *Sphaerorutela*; 106d, *Pleisiorutela*; 106e, *Rutela*; 106f, *Calomacraspis*; 106g, *Cnemida*.



FIGS. 107a-d. Mesotibia showing form of the apex. 107a, *Plesiorutela*; 107b, *Sphaerorutela*; 107c, *Rutela*; 107d, *Microrutela*.

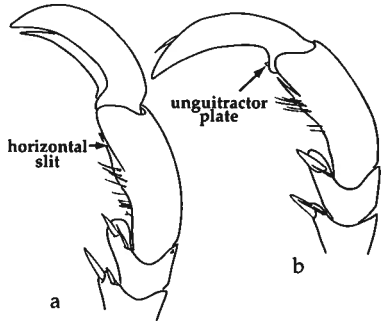
Taxonomic History of the Genus *Rutela*

According to Latreille (1802), the word "*rutela*" in ancient times was used to describe "a larva that eats trees," although Gemminger and Harold (1869) incorrectly attributed the name *Rutela* to mean "reddish" in color (*rutilo*). Latreille (1802) established the genus *Rutela* to bring together species in the older, collective genera described by authors such as Linnaeus, Olivier, and Fabricius. Such taxa as *Scarabaeus lineola* Linnaeus 1767, *Gmelin ephippium* 1788 Linnaeus, *Melolontha dorcyi* Olivier 1789, and *Cetonia glabrata* Fabricius 1781 were combined in the genus *Rutela*.

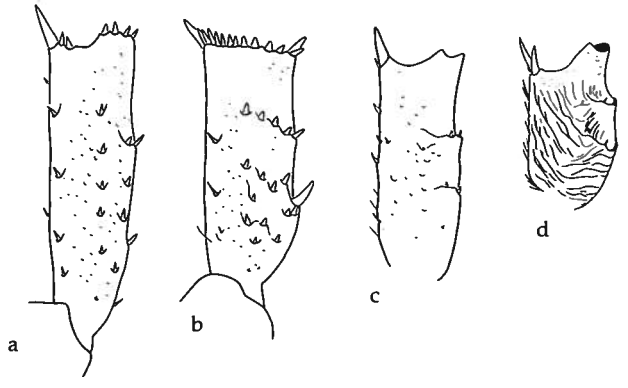
The only synonym of the genus *Rutela* is *Diabasis* Hoffmannsegg. The genus *Diabasis* was proposed by Hoffmannsegg (1817) for a potpourri of species that were assigned, at that time, to the genera *Rutela, Pelidnota, Trichius (=Cnemida)*, and *Cetonia (=Pelidnota)*. The type species for the genus *Diabasis* (by subsequent designation) was *R. lineola* (L.). Because the generic name *Rutela* had taxonomic priority, the name *Diabasis* was used infrequently.

Three species were described by Gistel (1850, 1857) in the genus *Rutela*, but these names were not included in catalogs to the Rutelinae (Ohaus 1918; Machatschke 1972) and have evidently been overlooked. However, Blackwelder (1944) listed *Rutela caesarea* Gistel as occurring in Colombia. Blackwelder's citation led me to two additional species described by Gistel, *Rutela tristis* and *Rutela runica*. Based on Gistel's descriptions, these three names refer to species of *Pelidnota* and should be transferred to this genus.

Ohaus (1918, 1934) proposed three "species groups" for the genus *Rutela* based on the dimensions of the scutellum: scutellum wider than long, scutellum as wide as long, or scutellum longer than wide. I have found that these groups have no utility. For example, Ohaus' "*striata*-group" included the species *R. antiqua* Ohaus (=*R. striata antiqua* Olivier), *R. glabrata* (Fabr.), *R. laeta* (Weber), and *R. striata* (Olivier). According to Ohaus, these species possess a scutellum that is "longer than wide." The average width to length ratio for these species is 0.96:1.00. Because the average ratio is nearly as wide as long, species in Ohaus' "*lineola*-group" (defined by the scutellum with "width equal to



Figs. 108a-b. Ventrolateral view of metatarsomeres 3 to 5 showing unguitractor plate weakly exposed (b) or hidden (a). 108a, *Rutela*; 108b, *Plesiorutela*.



Figs. 109a-d. Ventral view of the metatibia showing form of the apex. 109a, *Macraspis*; 109b, *Calomacraspis*; 109c, *Rutela*; 109d, *Cnemida*.

length") are not recognizable. It is interesting to note that Ohaus believed that *Microrutela* F. Bates (a genus proposed based on the dimensions of the scutellum) was an unjustified genus because the dimensions of the scutellum fluctuate within the group.

Natural History of the Genus *Rutela*

Species of *Rutela* are diurnal and are found on flowers, fruits, and vegetation. Individuals are most abundant during the rainy season (Ohaus 1908; Paulian 1947; pers. observ.). According to Lacordaire (1830: 271), *Rutela* species have the "habits of *Macraspis*, except one never finds them in large groups." Adults tend to be most active in the early morning, feeding and flying near their host plants (personal observation). They are wary and are able to take flight quickly. In the late morning and early afternoon, adults can be found resting on vegetation, but they are still very alert. I am not aware of any methods that are effective at trapping *Rutela* species. Light traps have occasionally attracted adults, but this is probably incidental. Species of *Rutela* have been collected in association with many species of plants, either feeding or resting (Appendix 6). Based on the limited host plant data, it appears that most species of *Rutela* feed on a variety of plant species.

Larvae of *Rutela* are found in rotting wood, as are those of other known rutelines. The larva of *Rutela formosa* Burmeister was described by Ritcher (1966), and I describe the larva of *Rutela dorcyi* in this work. Adults and/or larvae have been recorded from the rotting wood of: *Artocarpus* sp. (Urticeae), *Bursera* sp. (Burseraceae), *Conocarpos* sp. (Combretaceae), *Ficus* sp. (Moraceae), *Inga* sp. (Fabaceae), *Mangifera* sp. (Anacardiaceae), *Metopium* sp. (Annonaceae), *Simarouba* sp. (Simaroubaceae), and *Tabebuia* sp. (Bignoniaceae).

Ohaus (1908) briefly described the natural history of two species of *Rutela* as a result of his travels in Ecuador. He observed a female of *Rutela dimorpha* laying eggs approximately one meter off the ground in "tough" wood that he guessed may be a species of *Ficus*. In this wood, he observed exit holes of scolytid beetles. In similar wood nearby he observed the larvae and pupae of what he believed was *Rutela dimorpha*. Ohaus also observed the larvae, pupae, and newly emerged adults of *Rutela histrio* in the wood of fallen trees.

Most members of the genus *Rutela* are strikingly colored; black with yellow, tan, orange, or red. In most animals, these colors advertise that the animal is unpalatable or is dangerous. Because the larvae of *Rutela* feed on decaying wood and adults seemingly feed on a variety of palatable host plants, it is unlikely that secondary compounds from the food plants cause the beetles to be unpalatable such that visual predators such as birds would be deterred. Adults are unable to harm predators or give off foul or toxic smells (personal observation). It is possible that species of *Rutela* may gain protection due to mimicry, but this has not been documented.

Genus RUTELA Latreille

(Figs. 30-60, 110, cover, Maps 1-5)

Rutela Latreille 1802: 151. Type species *Rutela lineola* (Linnaeus).

Diabasis Hoffmannsegg 1817: 14 . Type species *Rutela lineola* (Linnaeus).

Type species. *Scarabaeus lineola* Linnaeus 1767: 552. Fixed by subsequent designation (Latreille 1802: 151).

Description. Scarabaeidae: Rutelinae: Rutelini. Form: (Figs. 30-60, cover) Form subovate, sides subparallel, propygidium in most species exposed beyond elytra, pygidium exposed, apex of elytra broadly rounded (Figs. 30-60). Length from apex of clypeus to apex of pygidium 10.0-25.0 mm; width at mid-elytra 5.0-13.0 mm. *Head:* Frons in lateral view nearly flat to weakly concave, clypeus in lateral view nearly flat to weakly convex. Surface of frons and clypeus variably punctate to striate, in most species more

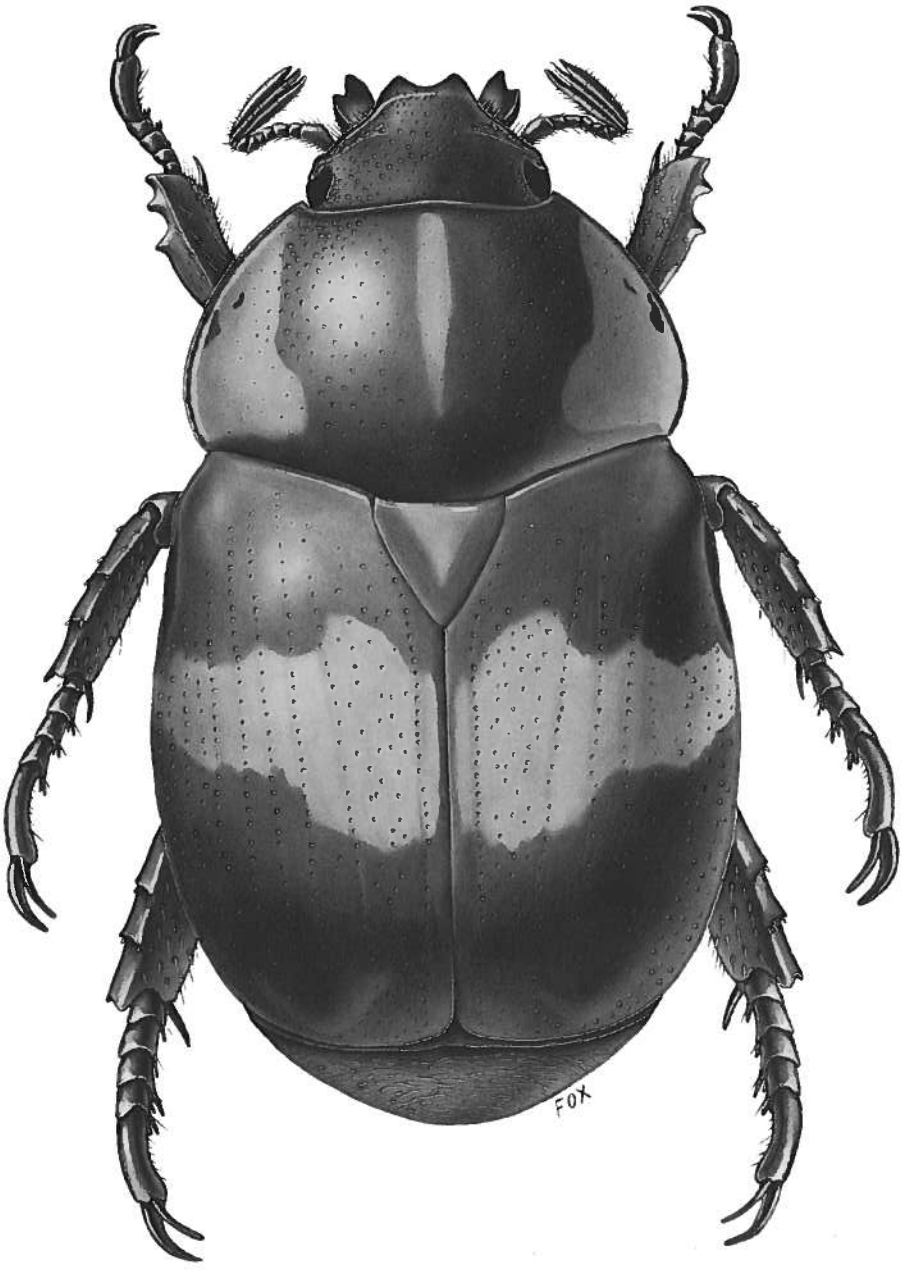
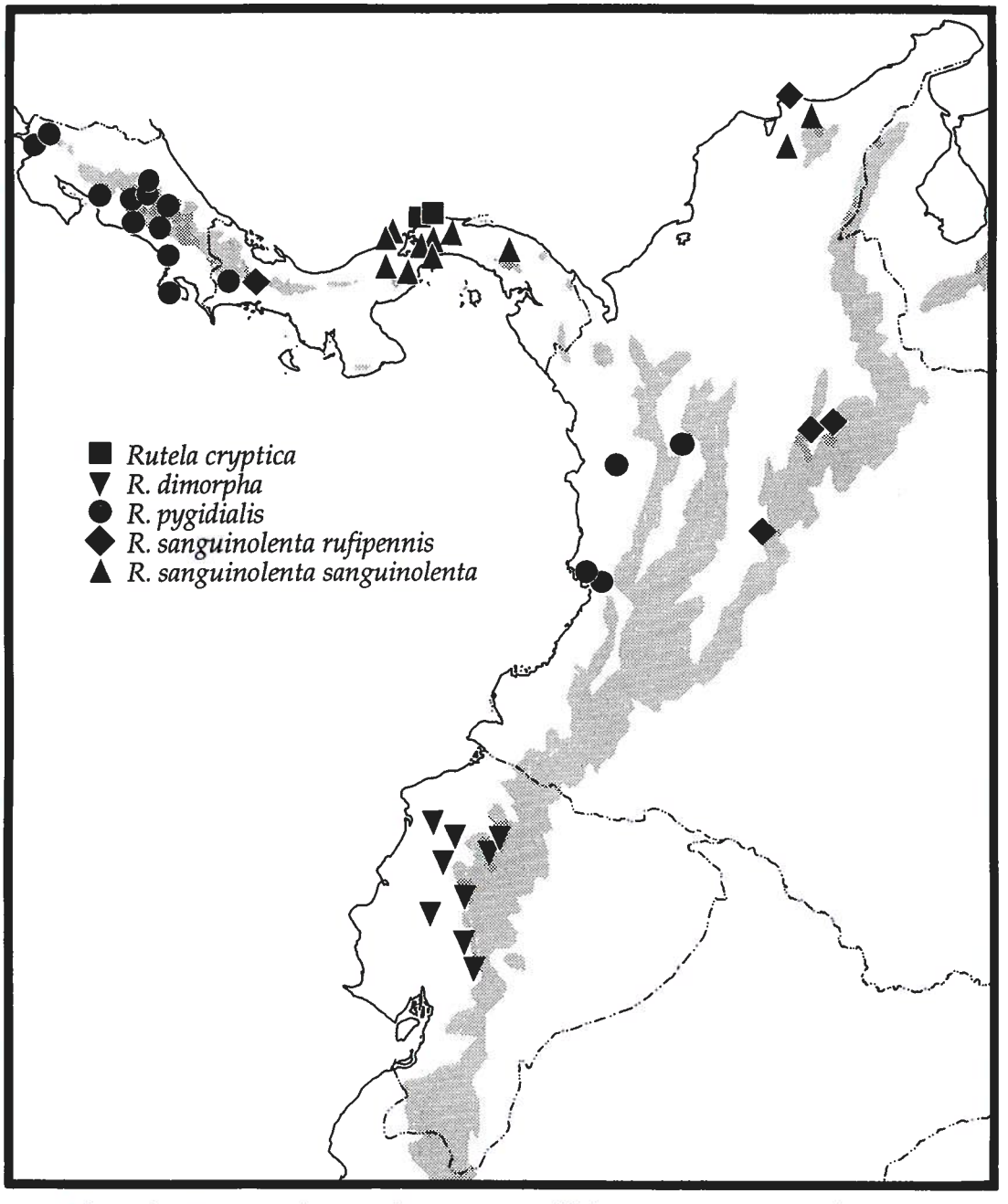
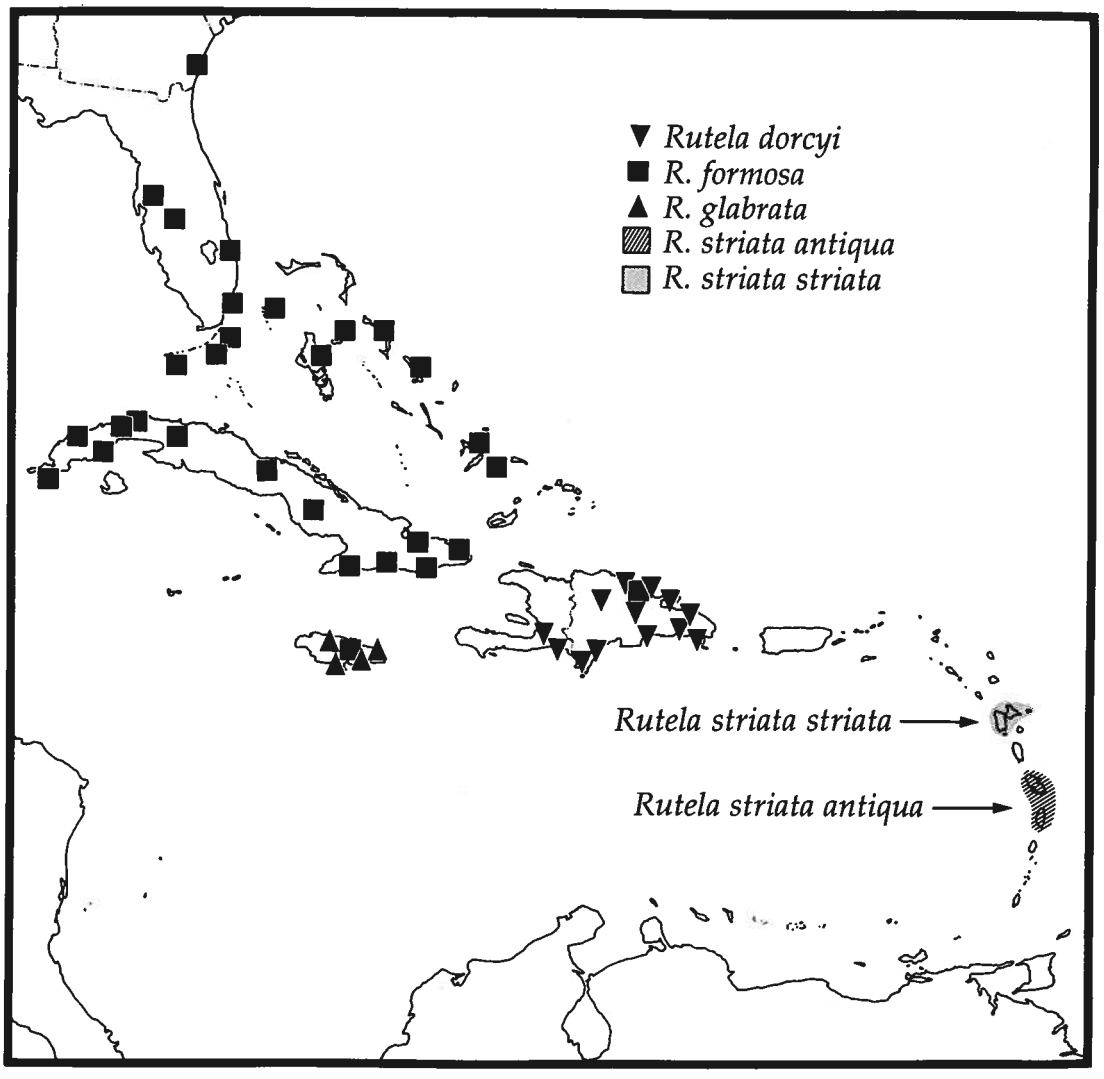


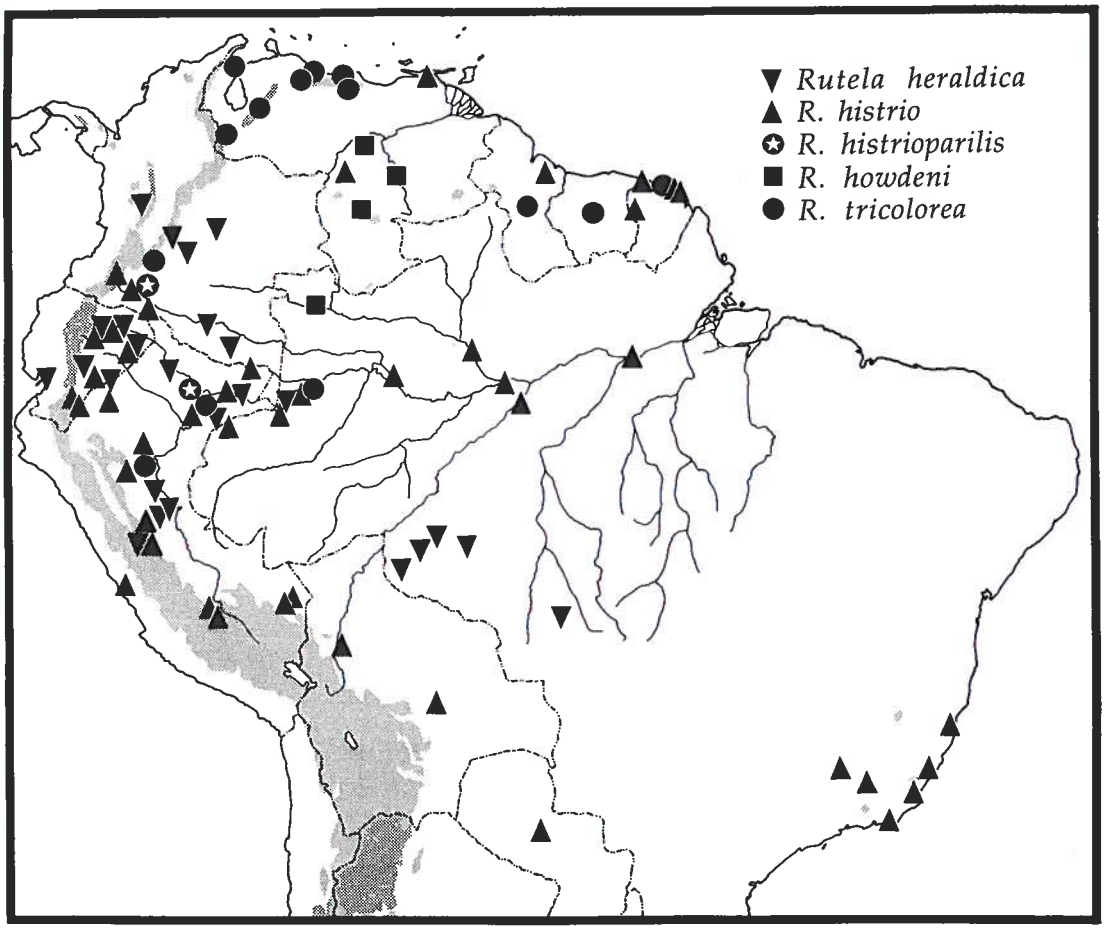
FIG. 110. Dorsal habitus of *Rutela howdeni* Jameson, new species.



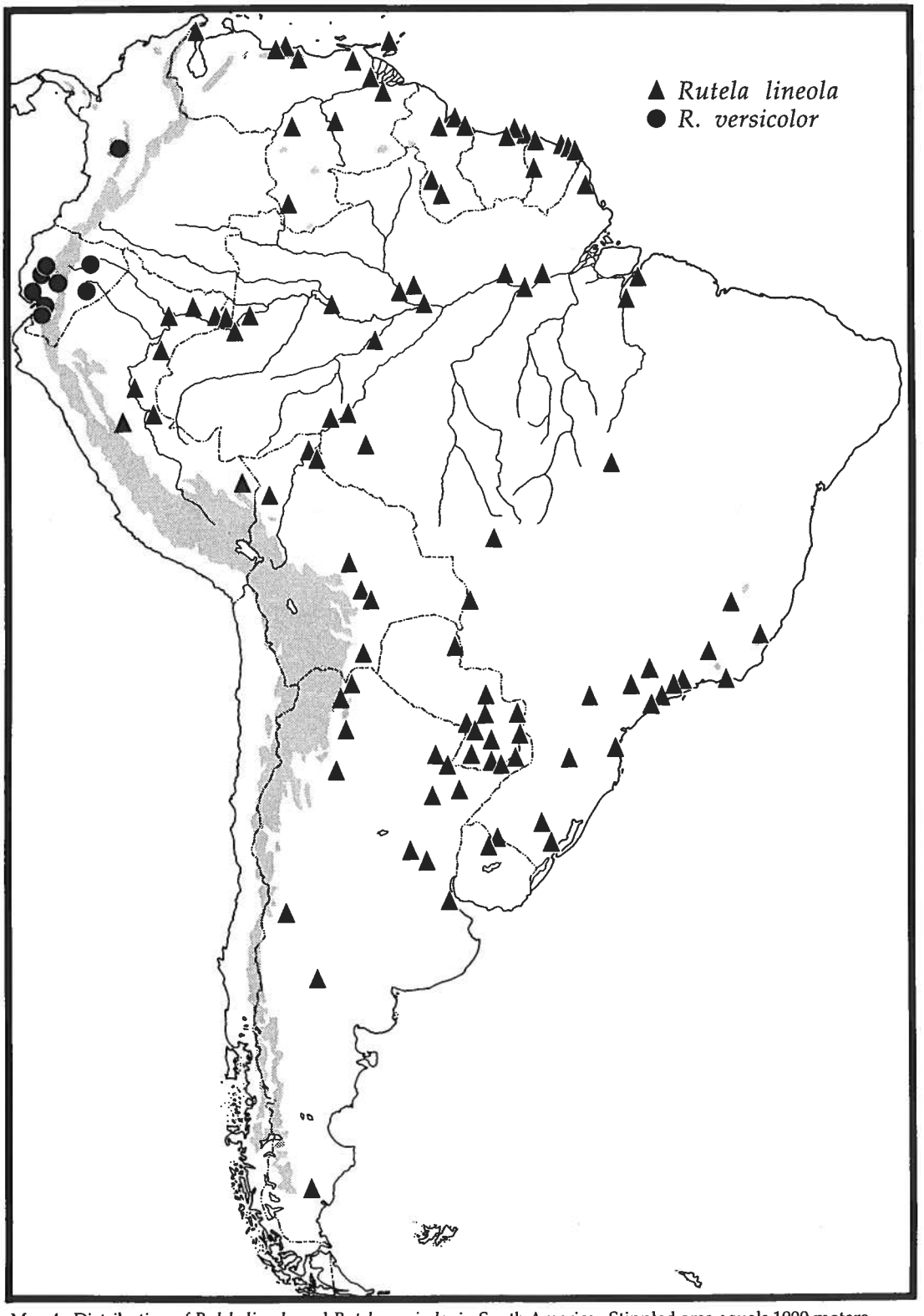
Map 1. Distribution of *Rutela cryptica, Rutela dimorpha, Rutela pygidialis, Rutela sanguinolenta sanguinolenta,* and *Rutela sanguinolenta rufipennis* in Costa Rica, Panama, and northwestern South America. Stippled area equals 2000 meters.



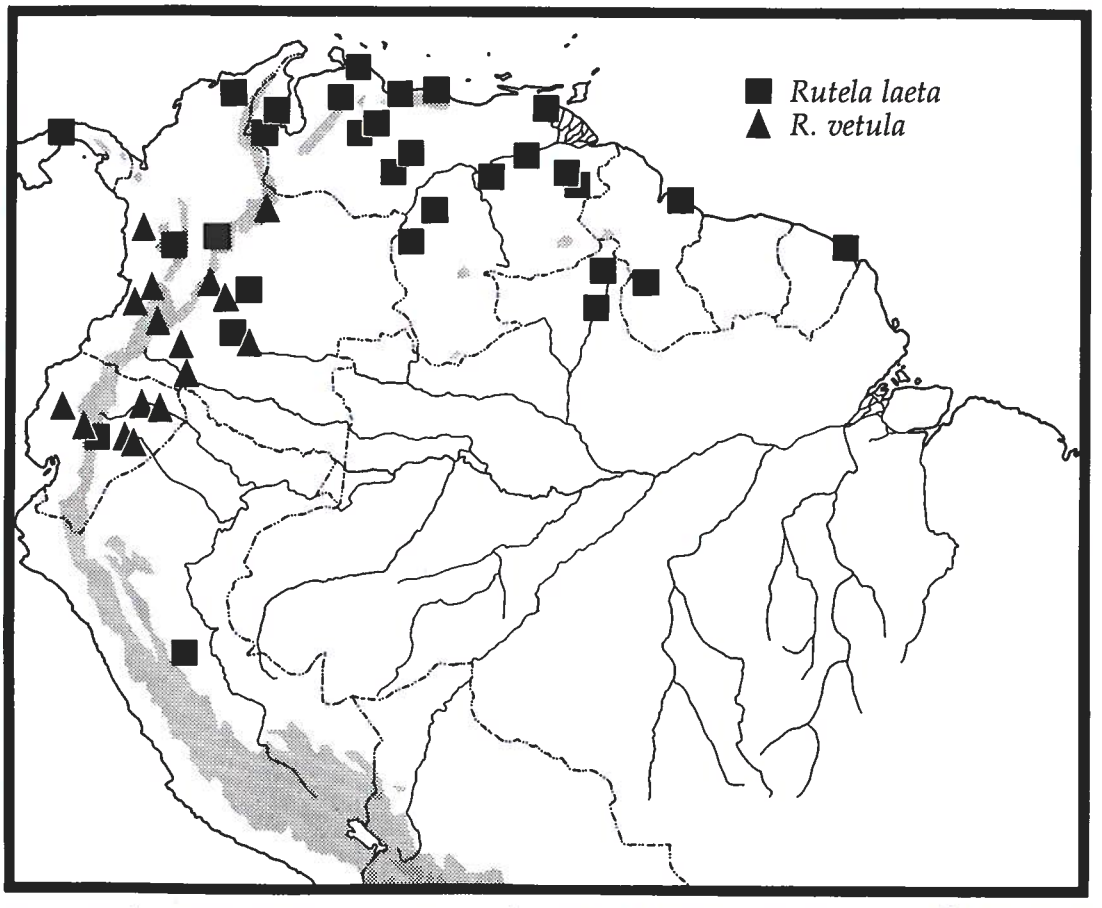
Map 2. Distribution of *Rutela dorcyi*, *Rutela formosa*, *Rutela glabrata*, *Rutela striata striata*, and *Rutela striata antiqua* in the Caribbean region and the southeastern United States.



Map 3. Distribution of *Rutela heraldica, Rutela histrio, Rutela histrioparilis, Rutela howdeni,* and *Rutela tricolorea* in South America. Stippled area equals 1000 meters.



Map 4. Distribution of *Rulela lineola* and *Rutela versicolor* in South America. Stippled area equals 1000 meters.



Map 5. Distribution of *Rutela laeta* and Rutela *vetula* in northern and central South America. Stippled area equals 1000 meters.

heavily sculptured in female. Clypeal apex bisinuate, weakly reflexed, beaded; bead incomplete or complete at middle; apex more attenuated in most females. Interocular width equals 4.0-6.0 transverse eye diameters. Frontoclypeal suture incomplete (about length of 1 eye canthus). Mandibles with 2 recurved, apical teeth; 2-3 inner, scissorial teeth; broad molar region. Labrum bisinuate at apex. Maxilla with 6 teeth; 1 apical, 2 medial, and 3 basal. Mentum bisinuate at apex. Antenna 10-segmented, club 3-segmented, subequal to segments 1-7 combined. *Pronotum:* Basal margin broadly rounded (weakly produced posteriorly at middle) with lateral margin weakly rounded (Fig. 106e) or basomedially (anterior to scutellum) weakly arcuate, basolaterally feebly angled anteriorly with margin weakly angulate (Fig. 106a). Surface variably punctate; punctures minute or large, simple or ocellate. Bead at anterior margin complete or incomplete at middle. *Scutellum:* Width approximately equal to length (width ranges from 0.80 to 1.15 times as wide as length). Base not declivous at elytral base (Figs. 106a, e). *Mesepimeron:* Base exposed (base of elytral humerus produced anteriorly beyond base of mesepimeron) (Fig. 111a) or hidden (base of elytral humerus not produced anteriorly beyond base of mesepimeron) (Fig. 111b). *Elytra:* Surface striate, subcostate, or smooth; striae (if present) variably impressed, longitudinal, furrowed or not, punctate or not; if punctate,

punctures simple, umbilicate, ocellate, or elongate. Intervals punctate or not. Epipleuron at basal margin rounded, without shelf, beaded at apex; apical margin narrowed, exposing lateral tergites; middle of disc thickened and flange-like or not in female. Sutural length from 2.0 to 4.0 times length of scutellum; weakly divergent at apex, with or without spiniform, apical tooth. Apex of elytra weakly rounded, beaded. *Tergites:* Narrowly exposed laterad of elytral margin, unicolorous or bicolorous. *Propygidium:* Partially exposed or not, surface punctate, setigerous or not. *Pygidium:* Shape subtriangular. Length (at middle) 1.0-3.5 times length of propygidium. In lateral view, evenly convex or nearly flat. Surface variably sculptured (often differs between male and female), impunctate, punctate, strigulate, striate, with or without setae. Apex quadrate, trapezoidal, evenly rounded, or acutely rounded; external edges produced (quadrate) or not. *Venter:* Prosternal keel triangular in posterior view, apex blunt, produced at about 35° with respect to dorsal surface to level of protrochanter. Mesometasternal keel in ventral view rounded or acuminate, apex broad or acute, weakly produced (to apex of mesocoxae) or strongly produced (to procoxae); ventral surface flat or decurved in lateral view. Sternites 1-4 subequal in length (male and female); sternite 5 subequal to 2.5 times as long as sternite 4 (may differ between male and female); sternite 6 from 1.5-2.5 times as long as sternite 4 (may differ between male and female), concave or not, apex eroded or not. Last sternite emarginate, sinuate, quadrate, or rounded at subapex; region from emargination to apex less sclerotized; subapex with variable sculpturing and setae; subapical corners (either side of emargination) produced or not. In lateral view, male sternites somewhat concave, female sternites flat or weakly convex. *Legs:* Protibia with 3 teeth equally or subequally separated in apical third to fourth of tibia, basal tooth slightly removed or not; inner base without incised area (Fig. 95f). Protarsomere 5 of male a little longer than tarsomeres 1-4. Foreclaws of male simple; external claw as long as tarsomeres 4-5, twice as thick as internal claw, 2-3 times wider than internal claw, subapical tooth present. Foreclaws of female simple, subequal in size. Unguitractor plate and associated setae hidden (all legs). Mesotibia more robust in female; sides subparallel, widest at middle, or widest at basal 1/3; external edge with 1-2 carinae (more pronounced in female); apex with 1 medial tooth variably produced to tarsomere 1-3; apex medially with 2 spurs and various spinulae. Mesotarsomere 4 of male at apex with median, lobe-like projection between 2 apical spinulae; simple in female. Mesotarsal claws of male with external claw simple, twice as thick and twice as wide as inner claw; claws of female simple, external claw subequal to 1.5 times as thick, and subequal to 1.5 times as wide as inner claw. Metatibia with sides subparallel, widest at middle, or widest at basal 1/3; external edge with 1-2 carinae (more pronounced in female); apex with variably produced corbel (male), without spinulae or setae; inner, apical spur in female robust (Fig. 98a) or not (Fig. 98b). Metatarsomere 4 of male with median, lobe-like projection between 2 apical spinulae; simple in female. *Metatrochanter:* Posterior border variably produced beyond posterior border of femur or not; apex spur-like, lobe-like, rounded, or quadrate. *Metacoxa:* Apex laterally acute or square. *Hind Wing:* Well-developed hooks on precostal membrane present. Vein AA_{1+2} extending beyond juncture of AA and AA_{3+4} (Fig. 93a). *Metendosternite:* In posterior view, Y-shaped, robust, with 2 apical arms (Fig. 103a). *Male Genitalia:* Symmetrical or asymmetrical, diagnostic. *Female Genitalia:* Not diagnostic.

Diagnosis. Members of the genus *Rutela* differ from other genera in the tribe Rutelini by the following characters (see Jameson [1990] for key to tribes and subtribes of Rutelinae): frontoclypeal suture obsolete medially, pronotum at base lacking basal bead, clypeus with apex semicircular or subtrapezoidal, apex of metatibia without small spinules on

ventrolateral edge, epipleuron lacking horizontal shelf.

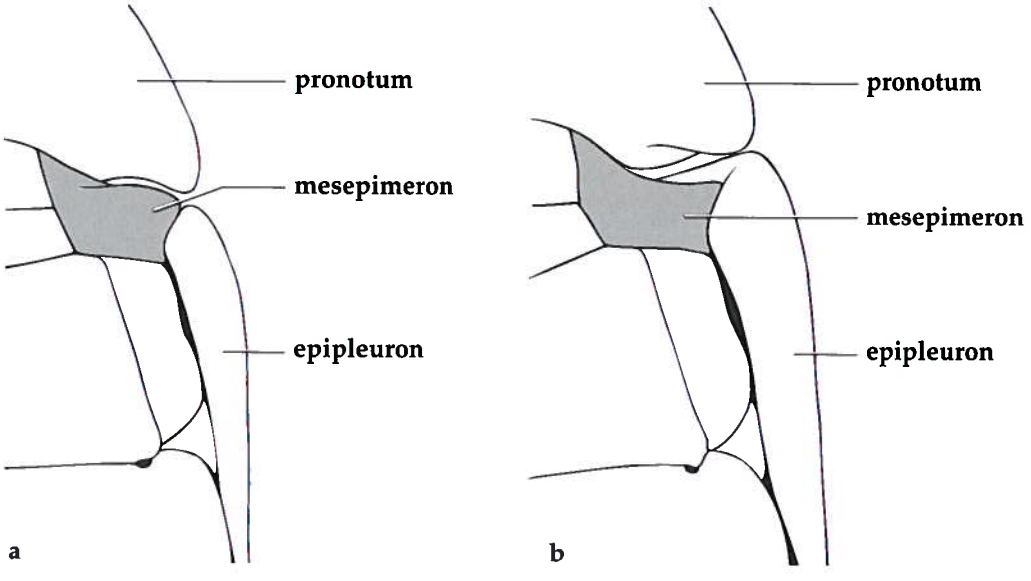
Rutela is separated from *Sphaerorutela, Microrutela, and Plesiorutela* by the following characters: 1) form of the scutellum subequal in width and length (scutellum nearly twice as wide as long in *Sphaerorutela;* width about 1.25 times as wide as long in *Microrutela;* width about 1.20 times greater than length in *Plesiorutela*); 2) scutellar base planar with base of elytra (scutellar base entirely declivous in *Sphaerorutela* and *Plesiorutela;* scutellar base declivous either side of midline in *Microrutela*); 3) sutural stria punctate (sutural stria an impressed, longitudinal line in *Sphaerorutela;* punctate in *Microrutela;* lacking in *Plesiorutela*); 4) mesotibia with medial tooth (lacking medial tooth or spiniform tooth in *Sphaerorutela* and *Plesiorutela;* spiniform tooth present in *Microrutela*); 5) meso- and metatarsomere 4 of male with lobe-like projection between apical spinulae (spiniform projection in *Sphaerorutela;* lobe-like projection in *Microrutela* and *Plesiorutela*); 6) mesometasternal keel distinctly produced and acuminate (weakly produced and rounded apically in *Sphaerorutela* and *Plesiorutela;* distinctly produced in *Microrutela*); 7) mandibular teeth apical (apicolateral in *Sphaerorutela;* apical in *Microrutela* and *Plesiorutela*); 8) anterior pronotal bead incomplete at middle (complete in *Sphaerorutela* and *Plesiorutela;* incomplete at middle in *Microrutela*); 9) mesometasternum without horizontal suture (present in *Sphaerorutela, Microrutela,* and also *Plesiorutela*).

Distribution (Maps 1-5). United States (southeastern states), West Indies, Central America, and South America. Found at elevations ranging from sea level to 1,500 m.

Key to the Species and Subspecies of *Rutela*

1. Elytral color metallic green throughout. Male genitalia as in Fig. 112m ..... *R. laeta* (Weber)

1'. Elytral color testaceous, reddish-orange, castaneous, or black, with or without various maculae 2



Figs. 111a-b. Lateral view of the mesepimeron and base of the elytra showing the mesepimeron exposed beyond the base of the elytra (a) or hidden by the base of the elytra (b). 111a, *Rutela lineola;* 111b, *Rutela vetula.*

2. Elytra entirely castaneous or black, subcostate with well defined, longitudinal, punctate striae. Male genitalia as in Figs. 112p-q 3
2'. Elytra not as above. Male genitalia not as in (Figs. 112p-q) 4

3. Apex of mesometasternal projection (ventral view) broadly acuminate, margins not compressed at sub-apex (Fig. 113a). Lateral surface of frons with punctures separated by at least one puncture distance. Male genitalia as in Fig. 112p. Guadeloupe, Montserrat, Cuba ..... *Rutela striata striata* (Olivier)
3'. Apex of mesometasternal projection (ventral view) acuminate, margins compressed at sub-apex (Fig. 113b). Lateral surface of frons with punctures confluent or nearly so (punctures separated by less than 1 puncture distance). Male genitalia as in Fig. 112q. Martinique and St. Lucia .... *Rutela striata antiqua* Ohaus

4. Pronotal surface shining and uniformly, minutely punctate. Caribbean 5
4'. Pronotal surface with small, obvious punctures at least laterally. Not Caribbean 7

5. Elytra without obvious pattern. Tergites, pygidium, and sternites unicolorous (castaneous with green reflection). Male genitalia as in Fig. 112e. .... *R. glabrata* (Fabr.)
5'. Elytra with obvious pattern. Tergites, pygidium, and sternites bicolored, castaneous or dark metallic green with testaceous or tan markings. Male genitalia not as in Fig. 112e 6

6. Pronotum testaceous or tan with 6 longitudinal, parallel, castaneous or black maculae (Fig. 33). Base of elytral humerus not produced anteriorly beyond base of mesepimeron (Fig. 111a). Male genitalia as in Fig. 112c ..... *R. dorcyi* (Olivier)
6'. Pronotum testaceous or tan with dark, metallic green or castaneous maculae (Fig. 34), without distinct longitudinal stripes. Base of elytral humerus produced anteriorly beyond base of mesepimeron (Fig. 111b). Male genitalia as Fig. 112.... *R. formosa* Burm.

7. Pronotum with apical bead complete ... 8
7'. Pronotum with apical bead obsolete medially 14

8. Pygidium without numerous, minute setae (at 25 X). Pronotum with 2, longitudinal, black maculae that extend from apex to base. Tergites laterally black or castaneous with light-colored maculae 9
8'. Pygidium with numerous, minute setae (at 25 X). Pronotum entirely black, black only on disc, or with 2 large, black maculae that do not reach base. Tergites laterally black or castaneous, without light-colored maculae 10

9. Pronotum with black maculae subequal in width to medial tan, testaceous, or orange macula. Tergites 3 and 4 bicolored laterally. Male genitalia as in Fig. 112f .... *R. heraldica* (Perty)
9'. Pronotum with black maculae broader than medial tan, testaceous, or orange macula. Tergites 1 through 4 bicolored laterally. Male genitalia as in Fig. 112l .... *R. howdeni* Jameson, n. sp.

10. Metatrochanter at middle with posterior margin weakly produced beyond posterior margin of femur (Fig. 114d) 11
10'. Metatrochanter at middle without posterior margin produced beyond posterior margin of femur (Fig. 114e) 12

11. Elytra of male black with reddish-orange, basomedial, transverse macula that is *shorter* than length of scutellum (Fig. 30). Apex of mesometasternal keel acuminate with margins weakly compressed at sub-apex (Fig. 113d). Male genitalia as in Fig. 112a .... *R. cryptica* Jameson, n. sp.
11'. Elytra of male black with a reddish orange, basomedial macula that is *longer* than length of scutellum (Fig. 51). Apex of mesometasternal keel broadly acuminate, margins not compressed at sub-apex (Fig. 113c).

Male genitalia as in Fig. 112o .... *R. sanguinolenta sanguinolenta* Waterhouse

12. Elytra of male and female entirely reddish orange. Pronotal disc entirely black. Male genitalia as in Fig. 112o (indistinguishable from *R. sanguinolenta sanguinolenta*) .... *R. sanguinolenta rufipennis* Waterhouse
12'. Elytra not entirely reddish orange, instead elytra reddish-orange with transverse black band, black with central tan macula, or entirely tan. Pronotal disc entirely black or with 2 black maculae. Male genitalia not as Fig. 112o 13

13. Elytra (male and female) reddish orange basally and apically with transverse, black band at mid-disc (Fig. 50). Pronotal disc (male and female) black. Male genitalia as in Fig. 112b (indistinguishable from *R. dimorpha*) ..... *R. pygidialis* Ohaus
13'. Elytra of male black or castaneous, with a tan macula from base to mid-disc. Elytra of female entirely tan. Pronotal disc black or castaneous (male) or with 2, black maculae that do not reach base (female). Male genitalia as in Fig. 112b (indistinguishable from *R. pygidialis*) ..... *R. dimorpha* Ohaus

14. Elytra chestnut brown or light brown, without pattern. Sutural stria and margin castaneous or black (Fig. 59). Male genitalia as in Fig. 112t ..... *R. versicolor* Latreille
14'. Elytra with pattern or not, black or castaneous with variable tan or testaceous markings. Male genitalia not as Fig. 112t 15

15. Base of elytral humerus produced anteriorly beyond base of mesepimeron (Fig. 111b). Elytra black with tan or testaceous maculae that form a V-shaped pattern (Fig. 60). Male genitalia as in Fig. 112u .... *R. vetula* Ohaus
15'. Base of elytral humerus not produced anteriorly beyond base of mesepimeron (Fig. 111a). Elytra black or castaneous with variable tan or testaceous markings, but not V-shaped (not as in Fig. 60). Male genitalia not as in Fig. 112u 16

16. Metatrochanter with posterior border produced beyond posterior border of femur; apex produced and spur-like, rounded, or quadrate (Figs. 114a-b) 17
16'. Metatrochanter without posterior border produced beyond posterior border of femur (Fig. 114e) 18

17. Posterior margin of metatrochanter with apex spur-like (male, Fig. 114a) or weakly rounded (female, Fig. 114b). Elytral punctures simple, not ocellate. Male genitalia as in Fig. 112n ..... *R. lineola* (L.)
17'. Posterior margin of metatrochanter with apex quadrate (male, Fig. 114c) or weakly rounded (female, Fig. 114b). Elytral punctures ocellate. Male genitalia as in Fig. 112k . ..... *R. histrioparilis* Jameson, n. sp.

18. Pronotal disc laterad of midline with large punctures separated by 0-1 puncture diameters. Pygidial apex in female weakly produced, rounded. Male genitalia as in Figs. 112g-j ..... *R. histrio* Sahlberg
18'. Pronotal disc laterad of midline with moderate-sized punctures separated by 2-6 puncture diameters. Pygidial apex of female weakly produced, acute. Male genitalia as in Figs. 112r-s ..... *R. tricolorea* Ohaus

Clave para las Especies y Subespecies de *Rutela*

1. Elitros de color verde metálico en toda su extensión. Genital masculino como en la Fig. 112m ..... *R. laeta* (Weber)
1'. Elitros de color testáceo, anaranjado rojizo, castaño o negro, con o sin manchas de extensión y forma variadas 2

2. Elitros completamente castaños o negros, subcostados, con estrías longitudinales punteadas y bien definidas. Genital masculino como en la Figs. 112p-q. *R. striata* (Olivier) (en parte) 3
2'. Elitros con otras características. Genital masculino diferente a la Figs. 112p-q 4

3. En vista ventral, el ápice de la proyección mesometaesternal se aprecia anchamente acuminado, con los márgenes no comprimidos preapicalmente (Fig. 113a). Superficie lateral de la frente con puntuación separada por al menos el diámetro de un punto. Genital masculino como en la Fig. 112p. Guadeloupe, Montserrat, Cuba..... *R. striata striata* (Olivier)

3'. En vista ventral, el ápice de la proyección mesometaesternal es acuminado, con los márgenes comprimidos preapicalmente (Fig. 113b). Superficie lateral de la frente con puntuación confluente o casi confluente (puntos separados por menos del diámetro de un punto). Genital masculino como en la Fig. 112q. Martinica y Santa Lucía..... *R. striata antiqua* Ohaus

4. Superficie pronotal brillante con puntuación diminuta y uniforme. Especies del Caribe..... 5

4'. Superficie pronotal con puntuación obvia. Especies no caribeñas..... 7

5. Elitros testáceo sin patrones de manchas obvias. Terguitos, pigidio, y esternitos de un solo color (castaño con reflejos verdes). Genital masculino como en la Fig. 112e..... *R. glabrata* (Fabr.)

5'. Elitros testáceo con patrones de manchas obvias. Terguitos, pigidio, y esternitos bicolores, castaños a verde metálico obscuro con marcas testáceas o de color ante. Genital masculino diferente a la Fig. 112e..... 6

6. Pronoto testáceo o color ante con 6 manchas longitudinales, paralelas, castañas o negras (Fig. 33). Base de los húmeros elitrales no proyectada anteriormente más allá de la base del mesepimeron (Fig. 111a). Genital masculino como en la Fig. 112c..... *R. dorcyi* (Olivier)

6'. Pronoto testáceo o color ante con manchas obscuras, verde metálico o castaño, sin franjas longitudinales aparentes (Fig. 33). Base de los húmeros elitrales proyectada anteriormente más allá de la base del mesepimeron (Fig. 111b). Genital masculino como en la Fig. 112d..... *R. formosa* Burm.

7. Pronoto con el márgen apical completo..... 8

7'. Pronoto con el márgen apical incompleto en su parte media..... 14

8. Pigidio sin sedas diminutas numerosas (a 25 X). Pronoto con manchas longitudinales negras que se extienden del ápicea la base. Lados de los terguitos negros o castaños, con manchas de color claro.... 9

8'. Pigidio con sedas diminutas numerosas (a 25 X). Pronoto completamente negro, solo con el disco negro o con dos manchas negras grandes que no alcanzan la base. Lados de los terguitos negros o castaños sin manchas de color claro..... 10

9. Pronoto con las manchas negras similares en ancho a las manchas mediales amarillentas, rojizas o anaranjadas. Tergitos 3 y 4 bicoloros lateralmente. Genitalia masculino como en la Fig. 112f..... *R. heraldica* (Perty)

9'. Pronoto con las manchas negras mas anchas que las manchas amarillentas, rojizas o anaranjadas. Tergitos 1 a 4 bicoloros lateralmente. Genitalia masculino como en la Fig. 112l..... *R. howdeni* Jameson, n. sp.

10. Parte media del márgen posterior del metatrocánter poco proyectada más allá del márgen posterior del fémur (Fig. 114d)... 11

10'. Parte media del márgen posterior del metatrocánter proyectada más allá del márgen posterior del fémur (Fig. 114e)... 12

11. Elitros de los machos negros con una mancha transversal basimediana anaranjada rojiza que es más corta que la longitud del escutelo (Fig. 30). Apice de la quilla mesometaesternal acuminada con los márgenes poco comprimidos preapicalmente (Fig. 113d). Genital masculino como en la Fig. 112a..... *R. cryptica* Jameson, n. sp.

11'. Elitros de los machos negros con una mancha basimediana anaranjada rojiza que es más larga que el escutelo (Fig. 51). Apice

de la quilla mesometaesternal ampliamente acuminada, con los márgenes con comprimidos preapicalmente (Fig. 113c). Genital masculino como en la Fig. 112o . . . . . *R. sanguinolenta sanguinolenta* Waterhouse

12. Machos y hembras con los élitros completamente anaranjado rojizos. Disco pronotal completamente negro. Genital masculino como en la Fig. 112o (indistinguible de *R. s. sanguinolenta*) . . . . . *R. sanguinolenta rufipennis* Waterhouse
12'. Elitros anaranjado rojizos con bandas transversales negras, o negros con una mancha central castaña o completamente de color ante. Disco pronotal completamente negro o con dos manchas negras. Genital masculino diferente al de la Fig. 112a 13

13. Machos y hembras con la mitad basal de los élitros anaranjado rojiza y la mitad apical con una franja ancha, transversal negra (Fig. 50). Disco pronotal en machos y hembras completamente negro. Genital masculino como en la Fig. 112b (indistinguible de *R. dimorpha*) . . . . . *R. pygidialis* Ohaus
13'. Machos con los élitros negros o castaños, con una mancha de color ante desde la base hasta la mitad del disco elitral. Hembras con los élitros completamente de color ante. Disco pronotal de los machos completamente negro o castaño, mientras que en las hembras tiene dos manchas negras que no alcanzan la base. Genital masculino como en la Fig. 112b (indistinguible de *R. pygidialis*) . . . . . *R. dimorpha* Ohaus

14. Elitros de color pardo castaño o pardo claro, sin patrones de manchas. Estría sutural y márgen castaño o negro (Fig. 59). Genital masculino como en la Fig. 112t . . . . . *R. versicolor* Latreille
14'. Elitros negros o castaños con patrones de manchas o sin ellos, con marcas variables de color ante o testáceo. Genital masculino diferente a la Fig. 112t 15

15. Base del húmero elitral proyectada anteriormente más allá de la base del mesepimeron (Fig. 111b). Elitros negros con manchas de color ante o testáceo que forman un patrón en forma de "V" (Fig. 60). Genital masculino como en la Fig. 112u . . . . . *R. vetula* Ohaus
15'. Base del húmero elitral no proyectada anteriormente más allá de la base del mesepimeron (Fig. 111a). Elitros negros o castaños con manchas variables de color ante o testáceo, pero no dispuestas en forma de "V" (diferente a la Fig. 60). Genital masculino diferente a la Fig. 112u. 16

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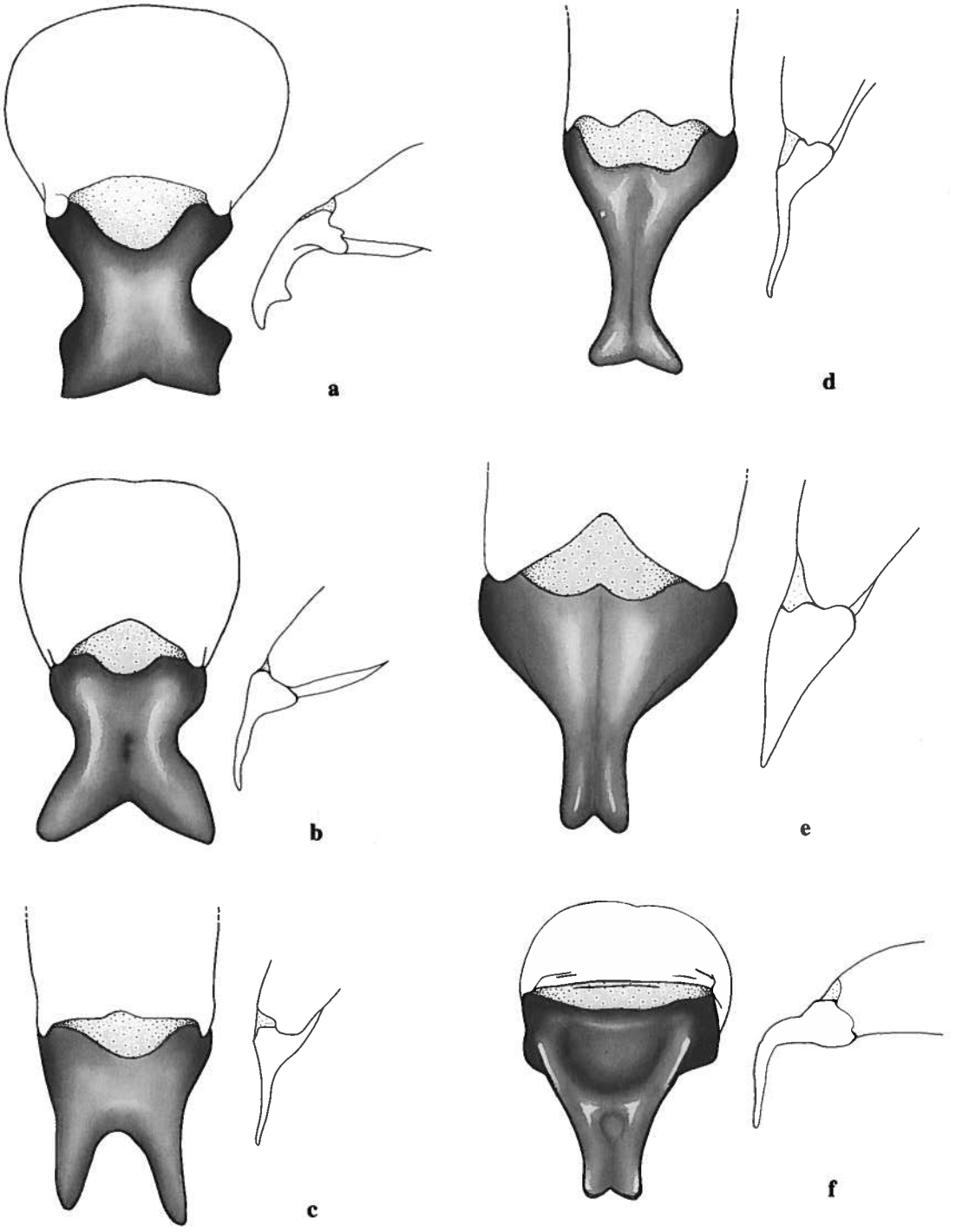
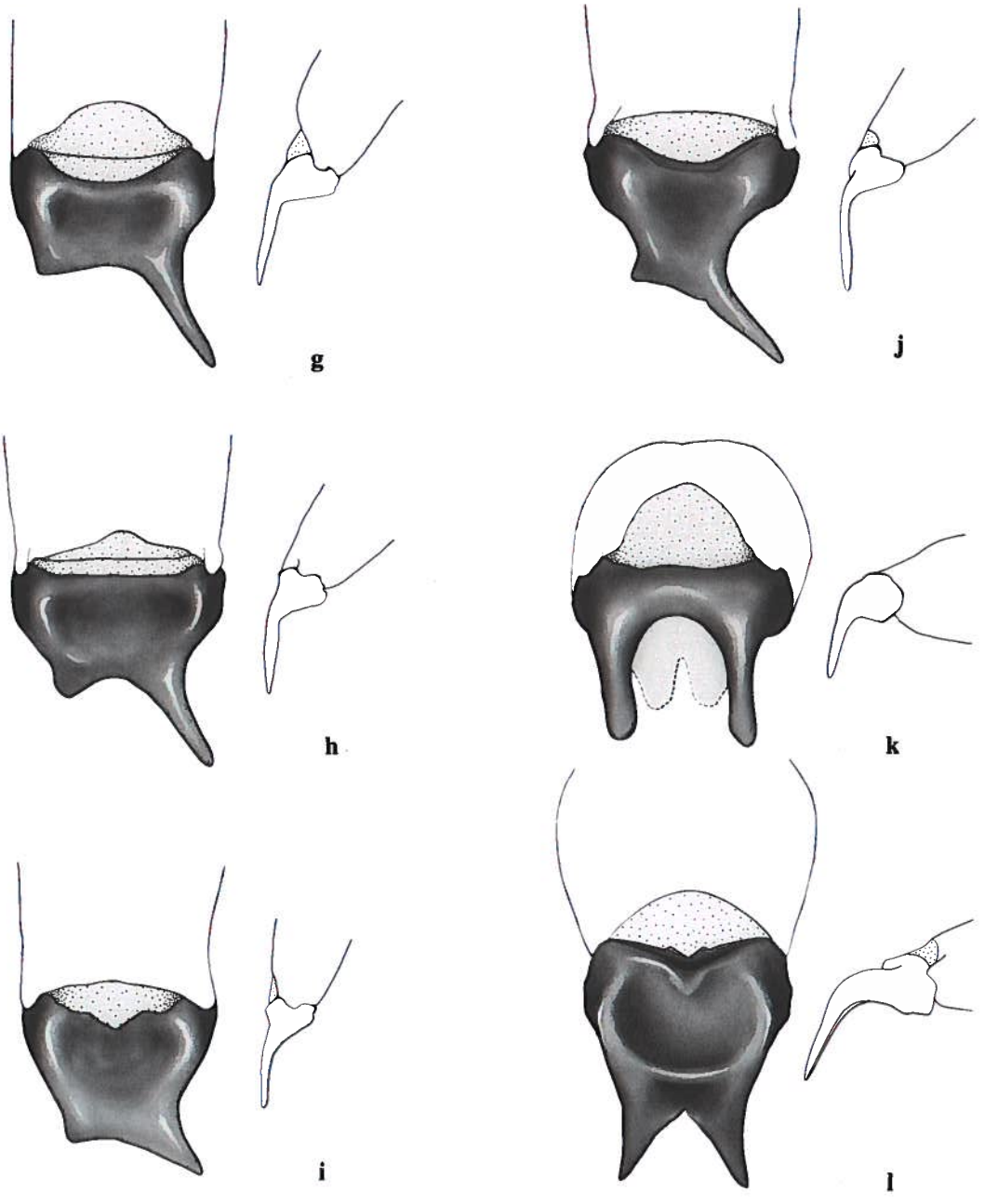
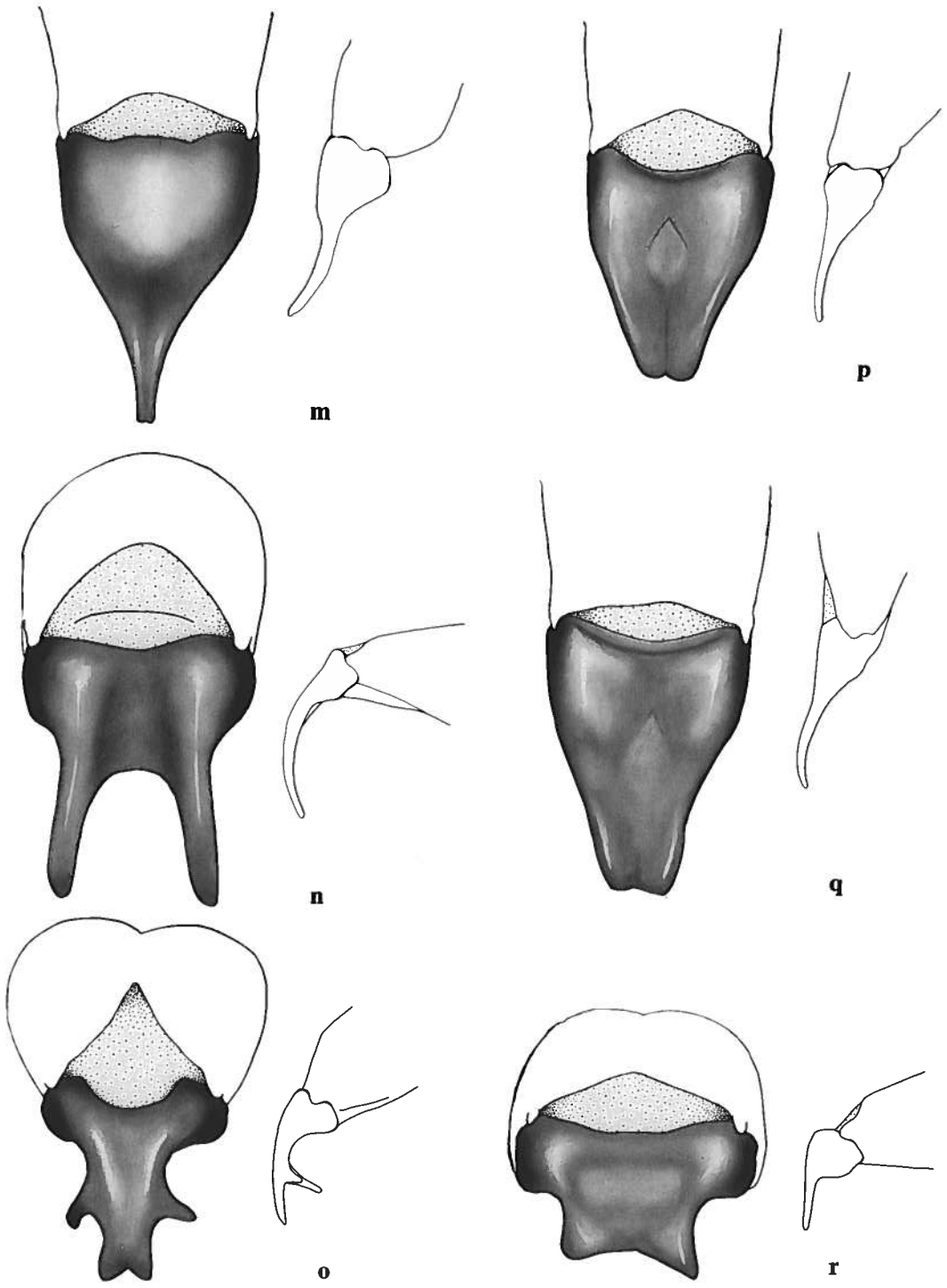
18. Disco pronotal con puntos grandes a los lados de la línea media, separados entre sí por una distancia no mayor a su diámetro. Apice pigidial de la hembra escasamente proyectado, redondeado. Genital masculino como en la Figs. 112g-j. . . . *R. histrio* Sahlberg
18'. Disco pronotal con puntos de tamaño moderado a los lados de la línea media, separados entre sí por una distancia de dos a seis de sus diámetros. Apice pigidial de la hembra escasamente proyectado, agudo. Genital masculino como en la Figs. 222r-s . . . . . *R. tricolorea* Ohaus



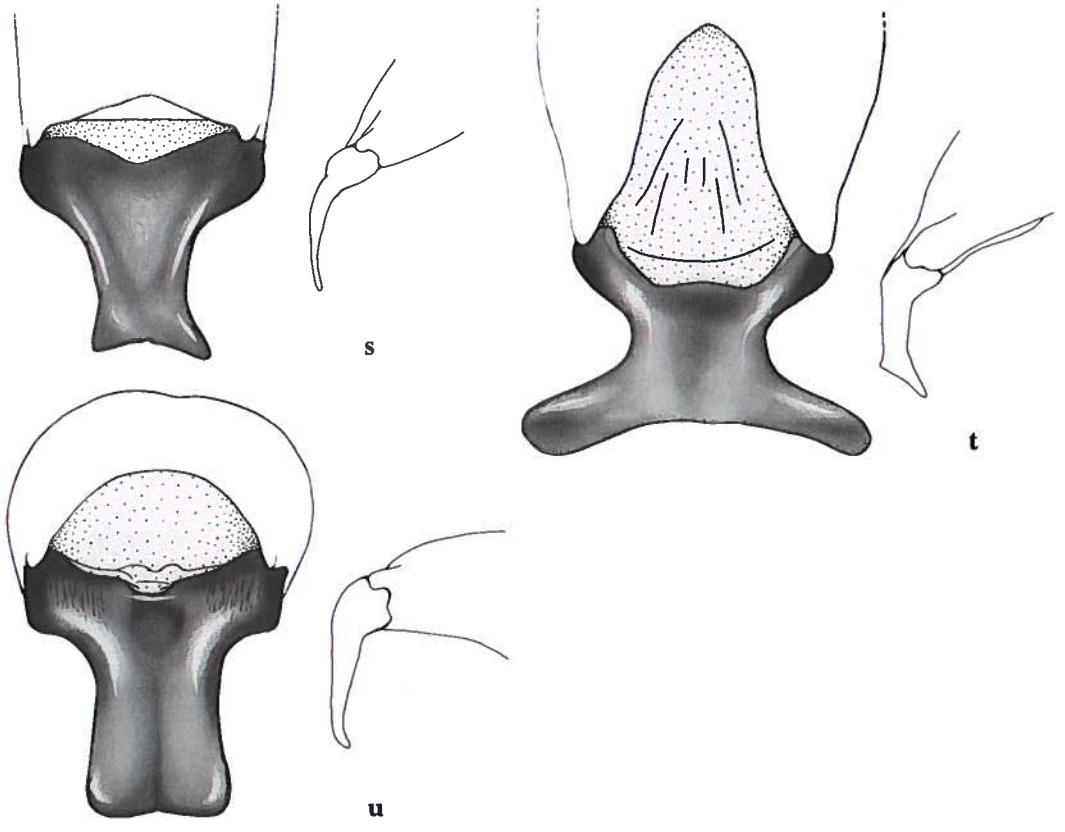
FIGS. 112a-f. Dorsal view of the parameres of *Rutela* species (reduced lateral view on right side). 112a, *Rutela cryptica*; 112b, *Rutela dimorpha* and *Rutela pygidialis*; 112c, *Rutela dorcyi*; 112d, *Rutela formosa*; 112e, *Rutela glabrata*; 112f, *Rutela heraldica*.



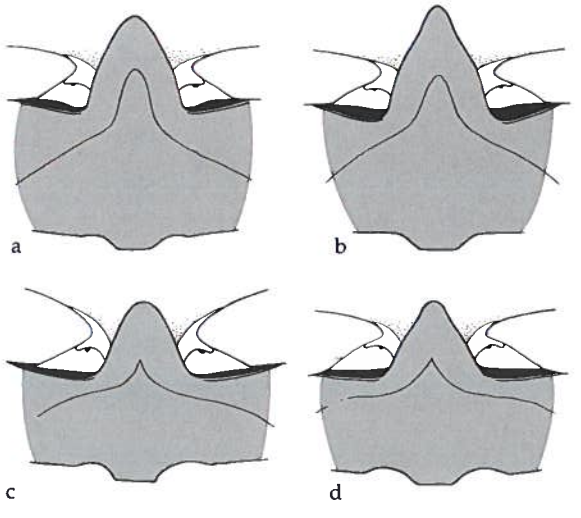
FIGS. 112g-l. Dorsal view of the parameres of *Rutela* species (reduced lateral view at right). 112g-j, *Rutela histrio*; 112k, *Rutela histrioparilis*; 112l, *Rutela howdeni*.



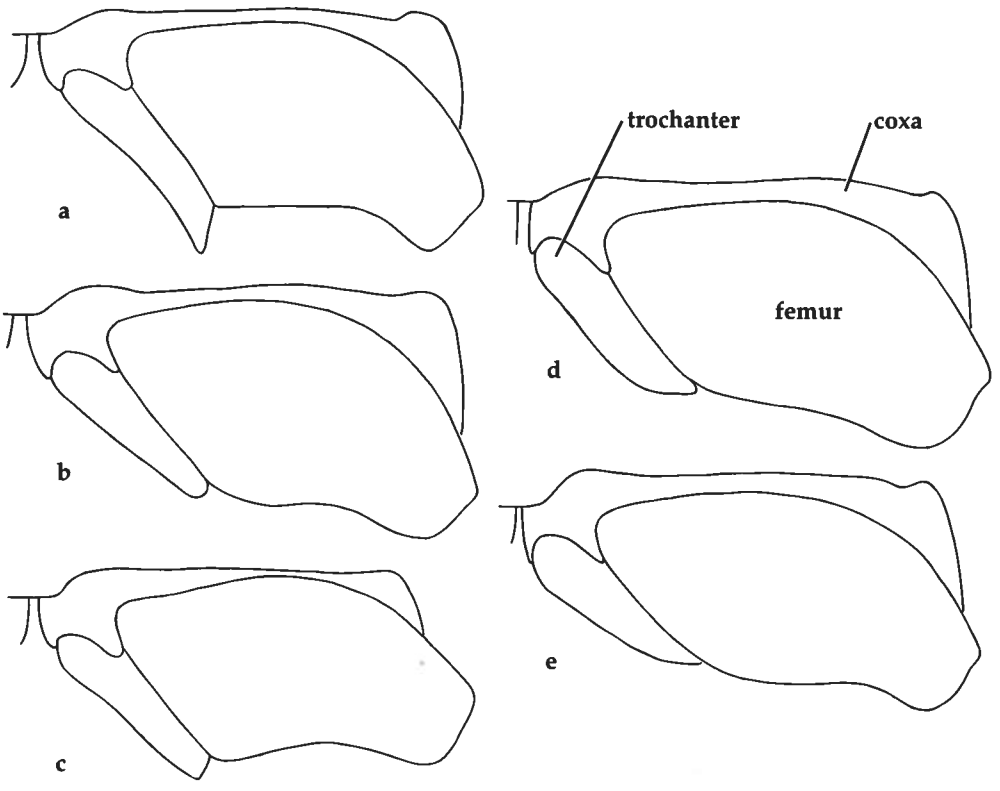
FIGS. 112m-r. Dorsal view of the parameres of *Rutela* species (reduced lateral view at right). 112m, *Rutela laeta*; 112n, *Rutela lineola*; 112o, *Rutela sanguinolenta sanguinolenta* and *Rutela sanguinolenta rufipennis*; 112p, *Rutela striata striata*; 112q, *Rutela striata antiqua*; 112r, *Rutela tricolorea*.



FIGS. 112s-t. Dorsal view of the parameres of *Rutela* species (reduced lateral view at right). 112s, *Rutela tricolorea*; 112t, *Rutela versicolor*; 112u, *Rutela vetula*.



FIGS. 113a-d. Ventral view of the metasternum showing the mesometasternal projection broadly acuminate (a, c) or acuminate with margins compressed at the subapex (b, d). 113a, *Rutela striata striata*; 113b, *Rutela striata antiqua*; 113c, *Rutela sanguinolenta sanguinolenta*; 113d, *Rutela cryptica*.



FIGS. 114a-e. Ventral view of left metacoxa, metatrochanter, and metafemur showing apex of metatrochanter produced beyond posterior border of the femur (a-d) or not produced (e). 114a, *Rutela lineola*, male; 114b, *Rutela lineola*, female; 114c, *Rutela histrioparilis*, male; 114d, *Rutela sanguinolenta sanguinolenta*; 114e, *Rutela sanguinolenta rufipennis*.

Rutela cryptica Jameson, NEW SPECIES
(Figs. 30, 112a, 113d, 114d; Map 1)

Type Material (holotype, allotype, and two female paratypes). Holotype from BCRC deposited at UNSM labeled a) "Portobelo, Panamá, Prov. de Colón, 19.VI.77, Col: D. Engelman," b) "feeding on bull horn acacia," c) my holotype label; male genitalia card-mounted. Allotype from BCRC deposited at UNSM, labeled as male. One female paratype deposited at BCRC labeled as holotype and allotype. One female paratype deposited at HAHC (to be deposited in CMNC) labeled a) "Panama, 4 km W Garrote, 19.VI.1977, H.A. Hespenheide," b) "H. & A. Howden Collection," c) my paratype label.

Holotype. Male. Length 16.7 mm. Width 9.5 mm. *Color*: (Fig. 30) Pronotum with disc black, shining; margin with reddish orange macula. Elytra shining black with reddish orange macula at base and extending to mid-scutellum, macula not extending to lateral margin. Ventral surface black with testaceous or cream-colored markings. Tergites laterally unicolorous, black. *Head:* Surface of frons moderately densely punctate, more dense apically, weakly strigate basolaterally; punctures .01-.03 mm. Clypeus moderately densely punctate (base and apex), punctures transverse and confluent on disc and sides; punctures .02-.03 mm. Clypeal apex reflexed, bisinuate, beaded; bead lacking at middle. Interocular width 5.0 transverse eye diameters. *Pronotum:* Basal margin broadly

rounded, lateral margin weakly rounded (Fig. 106e). Surface moderately densely punctate, less dense at base; punctures at base, margin, and midline minute and small mixed, smaller punctures .01-.02 mm; punctures laterad of midline larger and minute mixed, larger punctures .02-.10 mm. Bead complete anteriomedially. *Scutellum:* Slightly wider than length (W to L ratio equals 1.0:0.85). *Mesepimeron:* Base of mesepimeron exposed beyond elytral humerus. *Elytra:* Surface with weakly impressed, punctate, longitudinal striae; 1 next to suture, 3 mesad of humerus (2 lateral-most striae poorly defined); punctures .02-.05 mm, shallow, a few at apex ocellate. Interval between stria 1 and 2 broad, moderately densely punctate; intervals mesad of humerus narrow, punctures .02-.05 mm. Surface laterad of humerus with 2 striae (not reaching apex or base) and random punctures; punctures .02-.05 mm. Apex of elytra weakly rounded, beaded. Sutural length about 4.0 times length of scutellum, apex weakly divergent. *Propygidium:* Partially exposed, surface densely punctate; punctures .01-.05 mm, setose; setae minute, tawny. *Pygidium:* Length (at middle) about 2.5 times length of propygidium. In lateral view evenly convex. Surface with vermiform, setose strigae (strigae less defined at apex); strigae becoming concentric toward apex; setae on disc short, tawny, decumbant, moderately dense; setae at margin moderately long, sparse, tawny. Apical margin weakly sinuate. *Venter:* Mesometasternal keel (in ventral view) with apex acuminate and margins weakly compressed at pre-apex, produced weakly beyond mesocoxae to insertion of prosternal keel; ventral surface in lateral view flat. Sternites 1-4 subequal in length; sternite 5 about 2 times as long as 4; sternite 6 about 1.5 times length of 4. Last sternite at subapex truncate, beaded, surface weakly strigate. *Legs:* Protibia with basal tooth weakly removed from 2 apical teeth. Mesotibia with sides subparallel, external edge with weak apical and basal carinae; apex with medial tooth produced to base of tarsomere 2, 1 spinula laterad of inner spurs and 3 spinulae laterad of medial tooth. Metatibia widest in basal 1/3, external edge with weak apical and basal carinae; apex with corbel produced to apex of tarsomere 1. *Metatrochanter:* Posterior border weakly thickened beyond posterior border of femur, lateral edges nearly parallel, apex rounded. *Parameres:* Fig. 112a.

Allotype. Female. Length 16.7 mm. Width 9.1 mm. Differs from holotype in the following respects: *Color:* Elytral color reddish orange. *Head:* Surface of frons moderately densely punctate (base) to densely punctate (apex and margins), basolaterally strigate; punctures .01-.05 mm. Clypeus densely punctate (base) to transversely punctate and confluently punctate (apex, disc, and margin); punctures .01-.05 mm. *Pronotum:* Surface moderately densely punctate, less dense at base; punctures mixed, moderate to large (.02-.10 mm) and minute. *Pygidium:* Surface with vermiform, setose, strigae; strigae becoming semiconcentric toward apex. Apical margin randomly punctate; punctures .01-.05 mm, some setigerous; setae moderate in length, rufous. Apical margin broadly rounded, not distinctly produced, external edges narrowly, quadrately produced. *Venter:* Sternite 6 about 2.5 times as long as sternite 4. Last sternite at subapex weakly sinuate; beaded; surface weakly strigate. Mesotibia with carinae on external edge more pronounced; 2 spinulae laterad of inner spurs and 2 spinulae laterad of medial tooth. Metatibia with carinae on external edge more pronounced; inner, apical spur robust.

Paratypes (two females). Length 16.2-16.5 mm. Width 9.2 mm. Differ from allotype in the following respects: *Color:* Elytral color entirely reddish-orange or elytra reddish orange with medial, transverse, black or nearly black macula. *Pygidium:* Apical margin with external edges narrowly, quadrately produced.

Diagnosis. *Rutela cryptica* has a sexually dimorphic elytral pattern. The males have a

narrow, basal, reddish orange macula that extends to the mid-scutellum. Females have two elytral morphotypes; either entirely reddish orange or reddish orange with a medial, transverse, black macula. Based only on dorsal pattern, *R. cryptica* could be confused with *R. sanguinolenta sanguinolenta*, *R. pygidialis*, or *R. sanguinolenta rufipennis*. *Rutela cryptica* is distinguished from *R. pygidialis* and *R. sanguinolenta rufipennis* by the posterior border of the metatrochanter that is weakly produced (metatrochanter not produced in *R. pygidialis* and *R. sanguinolenta rufipennis*). *Rutela cryptica* is separated from *R. sanguinolenta sanguinolenta* by the more acuminate mesometasternal projection (Fig. 113d) (mesometasternal projection not compressed at subapex in *R. sanguinolenta sanguinolenta*, Fig. 113c). Males of *R. cryptica* are separated from *R. sanguinolenta sanguinolenta* based on the narrow, basal, reddish-orange elytral macula that extends to the mid-scutellum (elytra all reddish-orange in *R. sanguinolenta rufipennis*; reddish-orange with a medial, transverse, black or nearly black macula in *R. pygidialis*; or reddish-orange macula produced to mid-elytra in *R. sanguinolenta sanguinolenta*) and by the form of the male genitalia.

Distribution. Caribbean side of Panama. No recorded elevation.

Locality Data (Map 1). 4 specimens examined from BCRC, HAHC.

PANAMA (4). COLÓN (4): Portobelo, Garrote (4 km W).

Temporal Data. June (4).

Remarks. The strict consensus tree based on unweighted characters before redundant taxa were filtered (Fig. 105a) showed that *R. cryptica* and *R. sanguinolenta sanguinolenta* are sister taxa. Phylogenetic hypotheses that are based on unweighted characters after redundant taxa are filtered (Fig. 105b) and weighted characters (Figs. 105c-e) demonstrated that *R. cryptica* and *R. sanguinolenta sanguinolenta* are part of a polytomy that also includes *R. pygidialis*.

Rutela cryptica and *R. sanguinolenta sanguinolenta* both occur in the central region of Panama, but *R. cryptica* may be isolated from *R. sanguinolenta sanguinolenta* by Cerro Bruja (979 meters; directly south of the type localities) and by the Serrania de San Blas. Additional collecting may reveal that *Rutela cryptica* occurs in the region north of the Serrania de San Blas.

Label data indicate that *R. cryptica* has been observed feeding on *Acacia cornigera* (L.) (Fabaceae). Other natural history information is lacking for the species.

Etymology. The Greek word, "*krypsis*" means concealment. *Rutela cryptica* is nearly identical to *R. sanguinolenta sanguinolenta* and could be easily mistaken for that taxon.

Rutela dimorpha Ohaus
(Figs. 31, 32, 112b; Map 1)

Rutela dimorpha Ohaus 1903: 233. Lectotype, lectoallotype, and three paralectotypes at ZMHB. Male lectotype labeled a) "Equateur, La Chima," b) "M. de Mathan, 1er Semestre 1893," c) "Rutela dimorpha type Ohs" (red label, handwritten), d) my lectotype label; mouthparts, male genitalia, and internal sac card mounted. Female lectoallotype labeled a) "Balzapamba, (Ecuad.), R. Haensch S.," b) Rutela female symbol dimorpha cotype Ohs" (red label, handwritten), c) my lectoallotype label. Three paralectotypes (two female, one male) with identical data labeled a) "Equateur, La Chima," b) "M. de Mathan, 1er Semestre 1893," c) "Rutela dimorpha Ohaus" (red label, handwritten), d) my paralectotype labels. One invalid type (female) at FREY labeled a) "Bucay, 300m, F. Ohs, II.6.05," b) "Rutela dimorpha Ohaus cotype female symbol" (red label, handwritten), c) my label indicating invalid type status. Two invalid types (one male, one female) at ZMHB both labeled a) "W. Ecuador, Quevedo O.V.B.," b) "Rutela dimorpha female symbol cotype Ohs" (red label, handwritten), c) my

label indicating that the specimens are invalid types (see discussion under remarks).

Description. Length 10.6-16.1 mm. Width 6.5-10.3 mm. *Color:* (Figs. 31, 32) Sexually dimorphic color pattern. Pronotum in male with disc black, margins tan or testaceous. Pronotum in female tan or testaceous with black macula laterad of midline. Elytra in male shining black with tan or testaceous macula at base extending to mid-disc, not extending to margins. Elytra in female shining tan or testaceous. Ventral surface black with testaceous or cream-colored maculae. Tergites laterally unicolorous, black or nearly black. *Head:* Surface of frons moderately densely punctate, more dense apically and laterally, basolaterally strigulate; punctures .01-.05 mm. Surface of clypeus densely punctate (at base) to confluently punctate (at apex); punctures .01-.05 mm. Clypeal apex bisinuate, weakly reflexed, beaded; bead incomplete or complete at middle. Interocular width about 6.0 transverse eye diameters. *Pronotum:* Basal margin broadly rounded, lateral margin weakly rounded (Fig. 106e). Surface densely punctate (dark regions) and moderately densely punctate (light regions); punctures mixed, larger punctures more dense in dark regions, smaller punctures in light regions, .01-.10 mm. Bead complete anteriomedially. *Scutellum:* Width about equal to length. *Mesepimeron*: Base of mesepimeron exposed beyond elytral humerus. *Elytra:* Surface with weakly impressed punctate, longitudinal striae; 1 next to suture, 4 mesad of humerus; 3-5 laterad of humerus (poorly defined); punctures .01-.06 mm, shallow. Intervals broad, moderately densely punctate, some transverse; punctures .01-.06 mm. Apex of elytra weakly rounded, beaded. Apex of elytral suture weakly divergent, without spiniform tooth. Sutural length about 3.25 times length of scutellum. *Propygidium:* Partially exposed, surface moderately densely punctate; punctures .01-.06 mm, setigerous; setae moderately dense, minute, tawny. *Pygidium:* Length (at middle) about 2.5 times length of propygidium. In lateral view evenly convex. Surface of disc with shallow, vermiform, setose striae; striae becoming semicircular and less impressed toward apex; setae tawny, short. Margin with setose striae; setae moderately long, tawny. Apex of male weakly sinuate; female evenly rounded, not appreciably produced, external edges quadrate. *Venter:* Mesometasternal keel in ventral view at apex weakly acuminate, blunt, produced to middle or insertion of prosternal keel; ventral surface flat in lateral view. Sternites 1-4 subequal in length; sternite 5 about twice as long as 4; sternite 6 of male 1.5 times length of 4, sternite 6 of female about twice as long as 4. Last sternite of female at subapex sinuate, male truncate; apex beaded; surface from mid-disc to base weakly striate. *Legs:* Protibia with 3 teeth equally separated in apical third of tibia. Mesotibia widest in basal 1/4 (male) or 1/3 (female), external edge with basal carinae weak or nearly absent, apical carina weakly produced; apex with medial tooth produced to second tarsomere (more acute in female), 1-2 spinulae laterad of inner spurs, 1-3 spinulae laterad of medial tooth; claws of female with external claw about 1.5 times as thick and 1.5 times as wide as inner claw. Metatibia widest at middle; external edge with basal and apical carinae weakly produced; apex with corbel (male) produced to middle of tarsomere 2; inner, apical spur (female) robust. *Metatrochanter:* Posterior border not produced beyond posterior border of femur. *Parameres:* Fig. 112b.

Diagnosis. *Rutela dimorpha* is sexually dimorphic in its dorsal color pattern. Males of *R. dimorpha* share a similar dorsal pattern with males of *R. cryptica* and males of *R. sanguinolenta sanguinolenta*, but are distinguished by the elytral macula that is tan or testaceous (rather than reddish orange as in *R. cryptica* and *R. sanguinolenta sanguinolenta*) and that extends from the elytral base to the middle of the elytra (rather than extending from the elytral base to mid-disc as in *R. sanguinolenta sanguinolenta* or from the elytral base to mid-scutellum as in *R. cryptica*). Females share a

similar dorsal pattern with *R. glabrata*, but are separated by the coloration of the maculae (black in *R. dimorpha*, dark metallic green in *R. glabrata*) and lateral margin of the elytra (produced ventrally and dark metallic green in *R. glabrata*, not produced ventrally and tan in *R. dimorpha*). Male genitalia are identical to *R. pygidialis*, but elytral coloration and pattern (elytra reddish-orange with a transverse, black band at mid-disc) and lack of sexual dimorphism in *R. pygidialis* will easily separate the species.

Distribution. Ecuador (west side of Andes). Recorded at elevations of 50-650 meters.

Locality Data (Map 1). 43 specimens examined from CASC, CMNH, FMHN, FREY, HAHC, MNHN, QCAZ, ZMHB, ZSMC.

ECUADOR (43). BOLIVAR (1): Balzapamba. CHIMBORAZO (11): Chimbo. COTOPAXI (1): No data. GUAYAS (1): Bucay. LOS RIOS (1): Quevedo (27 mi SW). MANABI (1): Rio Suma. PICHINCHA (11): Alluriquin, Puerto Quito, Rio Palenque, Santo Domingo (47 km S at Rio Palenque Station). NO DATA (16).

Temporal Data. February (4), March (6), April (1), May (1), December (3).

Remarks. Ohaus designated three specimens as types that were added after the original publication of the species (as indicated by the collecting data). I have added labels to each of these specimens that note this invalid type designation.

The male genitalia of *R. dimorpha* are identical to those of *R. pygidialis*, but the species are easily separated by the lack of sexual dimorphism in *R. pygidialis*, the difference in color pattern, and distribution. The shared form of the male genitalia in these species is evidence for a close and fairly recent divergence.

Larvae have not been described, but Ohaus (1908) observed larvae, pupae, and adults in Ecuador. He observed a female that was laying eggs approximately one meter off the ground in "tough" wood that he believed to be *Ficus* sp. (Moraceae). Adults have been collected from *Inga edulis* (Fabaceae).

Rutela dorcyi (Olivier)

(Figs. 33, 112c, 131a-l, 132a-b; Map 2)

Melolontha dorcyi Olivier 1789: 33. Lectotype male (middle specimen), lectoallotype female (left specimen), and one paralectotype male (right specimen) at MNHN in Olivier collection. Type series card-mounted and all labeled "38. Melol., M. Doryci Am. Sept." Specimens maintained in the original Olivier collection, all with my lectotype labels. Invalid neotype designated by F. Chalumeau (1985) at IREC. Specimen labeled a) "Rep. Dom. (Santiago), (La Cumbre po pla), 7.7.78, Chal. & Abud," b) "Rutela dorcyi (Ol.) Dés F.Chalumeau '81, Neotype" (red label); male genitalia extracted and placed on a round, green label.

Cetonia gloriosa Fabricius 1792: 153. Holotype male housed at ZMUC labeled a) "Rutela gloriosa (F.) Det. F. Chalumeau '81," b) "Lectotype" (red label), c) "Rutela dorcyi (Ol.) Dés F. Chalumeau '81," d) "gloriosa" (Fabricius label, handwritten on scrap of paper), e) my holotype label, "Melolontha gloriosa Fabricius (male symbol) det. M. E. Jameson 1994."

Description. Length 12.2-19.1 mm. Width 6.6-10.0 mm. *Color*: (Fig. 33) Elytral shining testaceous to tan with 4 to 8 longitudinal, dark, stripes. Pronotum shining testaceous to tan with 6 longitudinal, dark, stripes. Ventral surface castaneous and/or testaceous with tan maculae. Tergites laterally bicolored, castaneous and/or dark-red with tannish-yellow. *Head:* Frons in male moderately densely punctate, weakly striate basolaterally; punctures minute, .01-.03 mm. Frons in female moderately densely punctate, more dense apically and laterally, weakly strigate at base; punctures larger at apex and margins than at base and on disc, some setose (at apex), .01-.05 mm; setae moderately long, tawny. Clypeus in male moderately densely

punctate; punctures minute, .01-.03 mm. Clypeus in female moderately densely punctate (base) to confluently punctate (apex and sides); punctures .03-.07 mm. Clypeal apex bisinuate, weakly reflexed, weakly beaded. Interocular width about 4.5 transverse eye diameters. *Pronotum:* Form of pronotum basomedially (anterior to scutellum) straight, basolaterally feebly angled anteriorly (Fig. 106a). Surface (male) moderately densely punctate, more dense at apex; punctures minute, .01-.02 mm. Surface (female) moderately densely punctate, more dense laterad of midline and at apex; punctures .01-05 mm. Bead complete anteriomedially. *Scutellum:* Width about equal to length. *Mesepimeron:* Base of mesepimeron exposed beyond elytral humerus. *Elytra:* Surface with (female) or without (male) weakly impressed, punctate or impunctate, longitudinal striae; 0-1 striae next to suture, 0-2 on disc, 0-2 mesad of humerus, 0-2 laterad of humerus. Intervals impunctate, moderately densely punctate, or with randomly scattered, darkened dots (appearing like punctures); punctures .01-.05 mm. Apex of elytra weakly rounded, beaded. ; punctures .01-.05 mm, randomly placed. Sutural length about 3.0 times length of scutellum; apex in male weakly divergent, lacking apical tooth. *Propygidium:* Partially exposed, surface moderately densely punctate; punctures .01-.05 mm. *Pygidium:* Length (in middle) about 2 times length of propygidium, slightly less in females. In lateral view evenly convex. Surface in male moderately densely punctate; punctures minute, .01 mm. Surface in female weakly strigulate (base and margins) and moderately densely punctate (disc and apex); punctures .01-.02 mm, some setose at apex; setae tawny, medium in length. Apical margin in female broadly produced, rounded. *Venter:* Mesometasternal keel in ventral at apex broadly rounded or nearly quadrate, weakly produced beyond mesocoxae; ventral surface flat in lateral view. Sternites 1-4 subequal in length; sternite 5 about twice as long as 4; sternite 6 1.5 times length of 4. Last sternite of female and male at subapex quadrately emarginate; subapex with vermiform strigae; subapical corners in female (either side of the emargination) roundly produced with some setose punctures; setae tawny, medium in length. *Legs:* Protibia with 3 teeth equally separated in apical third to fourth of tibia; basal tooth more removed in female. Mesotibia with sides subparallel, external edge with weak basal and apical carinae (more pronounced in female); apex with medial tooth produced to middle of tarsomere 1 or apex of tarsomere 2 (more acuminate in female), 1-2 spinulae laterad of inner spurs, 2-3 spinulae laterad of medial tooth; claws of female with external claw slightly thicker and slightly wider than inner claw. Metatibia with sides subparallel; external edge with weak apical and basal carinae (more pronounced in female); apex with corbel (male) feebly produced to middle of tarsomere 1; inner, apical spur of female not robust. *Metatrochanter:* Posterior border not produced beyond posterior border of femur. *Parameres:* Fig. 112c.

Diagnosis. *Rutela dorcyi* is most similar to *R. formosa* but is easily separated by the dorsal color pattern (Fig. 33) (the pronotum and elytra have longitudinal, black or nearly black stripes in *R. dorcyi*, whereas in *R. formosa* the maculae of the pronotum and elytra are transversely confluent or oblique and are dark metallic green or castaneous), the lack of a produced elytral flange females of *R. dorcyi* (elytral flange present in females of *R. formosa*), and the apex of the mesepimeron that is not concealed by the base of the elytra (apex of the mesepimeron is concealed in *R. formosa*). In addition to these characters, *R. dorcyi* is easily distinguished from other *Rutela* by the minutely punctate pronotal and elytral surface in the male, apex of the last tergite in the female which is quadrately emarginate with the subapical corners roundly produced, the short and blunt mesometasternal keel, and by the male genitalia.

Distribution. Greater Antilles Islands of Cuba and Hispaniola (Haiti and Dominican Republic) with an incidental record from

Honduras. Recorded from lowland, mesic forests and humid forests at elevations from 10-1200 meters.

Locality Data (Map 2). 141 specimens examined from ANSP, BMNH, CASC, CMNH, CNCI, CUIC, FSCA, HAHC, JEWC, MCZC, MNHN, MNNC, MTEC, TAMU, UNSM, USNM, ZMHB, ZSMC.

CUBA (5). No data.
DOMINICAN REPUBLIC (86). BARAHONA (4): Barahona (4.5 km S, 11 km S), no data. DAJABÓN (5): Villa Anacona. DISTRITO NACIONAL (29): Boca Chica, Santo Domingo, No data. EL SIEBO (4): Hato Mayor (Parque Nacional Los Haitises), Sabana de la Mar. LA ROMANA (8): Guaimati. LA VEGA (8): Constanza, Jarabacoa, Jarabacoa (2 km SE), no data. PEDERNALES (2): La Abeja (38 km NNW Cabo Rojo). PUERTO PLATA (12): La Cumbre, La Cumbre Research Station, Puerto Plata, Puerto Plata (14 km W). SAMANÁ (3): Sanchez, Villa Rivas. SAN CRISTOBAL (3): San Cristobal, Villa Altagracia. SANTIAGO (2): Mata Grande (19°12' N 17°00' W), San José de las Matas. NO DATA (6).
HAITI (44). OUEST (27): Port au Prince, Carrefour. NO DATA (17).
HONDURAS (1). No data.
NO DATA (5).

Temporal Data. April (3), May (18), June (16), July (14), August (3), December (1).

Remarks. Chalumeau (1985) designated a neotype for *Melolontha dorcyi* Olivier. However, the original type series was found in the Olivier Collection at the Museum National d'Histoire Naturelle in Paris. The neotype is invalid. Additionally, Chalumeau (1985) designated a lectotype for *Cetonia gloriosa* Fabricius (a synonym of *Rutela dorcyi*). However, according to Zimsen (1964) and Ole Martin (ZMUC) (personal communication June 1994), only one specimen exists. Thus, the specimen is a *holotype* rather than the lectotype. Also, according to Fabricius (1792), the type locality of *R. dorcyi* was "in Insula St. Domingo," rather than "d'Amerique méridionale" as cited by Chalumeau (1985).

Little is known regarding the natural history of this species. Label data indicate that adults have been collected from rotten logs. Chalumeau (1985) collected *R. dorcyi* from the flowers of the coffee tree (*Coffea arabica* L.). The larva is described in this publication and was collected from rotting wood.

Rutela formosa Burm.
(Figs. 34, 112d, 133a-c; Map 2)

Rutela formosa Burmeister 1844: 383. Lectotype male and paralectotype female designated by Chalumeau (1985) labeled a) "Rutela formosa Burm. Det. F. Chalumeau '78," b) "Lectotype" (red label), c) "MLU Halle WB Zoologie S-Nr. 8/3/9." Paralectotype female designated by Chalumeau (1985) with same label data as lectotype and with mouthparts dissected and card-mounted separately. Both housed at MLUH.

Description. Length 10.4-18.5 mm. Width 5.4-10.3 mm. *Color*: (Fig. 34) Elytra shining testaceous to tan with 6 longitudinal, transversely confluent or oblique stripes; stripes castaneous, rust colored, or dark green. Pronotum shining testaceous to tan with complex discal macula; macula castaneous, rust-colored, or dark green. Ventral surface shining testaceous to tan with castaneous, rust colored, or dark green maculae. Tergites laterally bicolored; testaceous to tan with castaneous, rust colored, or dark green maculae. *Head:* Frons (male) moderately densely punctate, weakly strigate at base; punctures larger at base than at apex, .01-.05 mm. Frons (female) weakly strigate basolaterally, moderately densely punctate (basomedially) to densely punctate (apex and sides); punctures .01-05 mm. Clypeus in male moderately densely punctate; punctures .01-.05 mm. Clypeus in female moderately densely punctate (base) to confluently punctate (apex and sides); punctures .03-.10 mm. Clypeal apex bisinuate, moderately reflexed, beaded. Interocular width about 4.2 transverse eye

diameters. *Pronotum:* Form of pronotum basomedially (anterior to scutellum) straight, basolaterally feebly angled anteriorly (Fig. 106a). Surface in male moderately densely punctate; punctures minute, .01 mm. Surface in female moderately densely punctate; punctures .01-.03 mm. Bead incomplete anteriomedially (male and female) or occasionally complete (female). *Scutellum:* Width about equal to length. *Mesepimeron:* Base of mesepimeron weakly hidden (elytral humerus produced weakly beyond mesepimeron). *Elytra:* Surface with 0-2 weakly impressed, impunctate, longitudinal striae in center of disc. Intervals impunctate, minutely punctate, or with scattered with darkened dots (appearing like punctures). Mid-disc at lateral margin of female with thickened, produced flange. Sutural length about 3.6 times length of scutellum; apex weakly rounded, beaded, weakly divergent, lacking apical tooth. *Propygidium:* Partially exposed or not, surface moderately densely punctate; punctures .01-.05 mm. *Pygidium:* Length (in middle) about 2.5 times length of propygidium. In lateral view evenly convex. Surface (male) with disc impunctate or minutely punctate, apex with few setose punctures; setae medium in length, tawny. Surface (female) strigulate (base and sides) and punctate (apex and disc); punctures .01-.04 mm; apical margin with setose punctures, setae tawny, medium in length. Apical margin of female acutely produced, external edges quadrate. *Venter:* Mesometasternal keel in ventral view at apex broadly rounded or subquadrate, produced to mesocoxae; ventral surface flat in lateral view. Sternites 1-4 subequal in length; sternite 5 about twice as long as 4; sternite 6 about twice as long at 4 . Last sternite of male and female at subapex quadrately emarginate; apex with sparse setose punctures; setae medium in length, tawny; base with weak vermiform striae. *Legs:* Protibia with 3 teeth equally separated in apical third to fourth of tibia; basal tooth more removed in female. Mesotibia widest at middle, external edge with weak apical and basal carinae (more pronounced in female); apex with medial tooth produced to apex of tarsomere 1; 1-3 spinulae laterad of inner spurs, 2 spinulae laterad of medial tooth; claws of female with external claw slightly thicker and slightly wider than inner claw. Metatibia with sides subparallel; external edge with weak apical and basal carinae (more pronounced in female); apex with corbel (male) produced to apex of tarsomere 1 or middle of tarsomere 2; inner, apical spur in female not robust. *Metatrochanter:* Posterior border does not project posterior border of femur. *Parameres:* Fig. 112d.

Diagnosis. Differs from other *Rutela* by the form of the pronotal maculations (Fig. 34), impunctate or minutely punctate pronotal and elytral surface in the male (shared with *R. dorcyi* and *R. glabrata*), produced elytral flange in the female, short and blunt mesometasternal keel (shared with *R. dorcyi*), apex of the mesepimeron which is concealed by the base of the elytron (apex of the mesepimeron is not concealed in *R. dorcyi*), and the form of the male genitalia.

Distribution. Southernmost United States, Bahamas, Greater Antilles Islands (Cuba, Hispaniola, Jamaica), and incidental records from the coastal regions of Mexico, Central America, and South America. Recorded from tropical deciduous forests and lowland forests at elevations of 760-914 meters (although locality data indicate that specimens are also collected near sea level).

Locality Data (Map 2). 486 specimens examined from AMNH, ANSP, BMNH, CASC, CMNH, CNCI, CUIC, DCCC, FMNH, FSCA, HAHC, JEWC, LACM, MCZC, MNHN, MNNC, SEMC, UMRM, UNSM, USNM, ZMHB, ZSMC.

BAHAMAS (23). Andros Islands (12): Fresh Creek, no data. Bimini Islands (3): South Bimini. Cat Island (1): Arthur's Town. Crooked Island (1): no data. Eleuthera Island (1): Rainbow Bay. Nassau (2): Nassau. Plates Cayes (1): no data. No Data (2).

BELIZE (4). No Data.
BRAZIL (3). No Data.
CUBA (244). Camaguey (12): Baragua, Central Jaronú. Cienfuegos (2): Soledad. Granma (12): Belic, Sierra Maestra. Guantanamo (24): Baracoa (El Yunque), Guantanamo, Loma de Gato, no data. Habana (26): La Habana, Marianao. Holgúin (5): Florida Blanca, Mayari (Baie de Nipe), Ramon de la Yaguas, no data. Isla de Pinos (6): Isle of Pines, Nueva Gerona. Matanas (1): Pan de Matanas. Pinar del Rio (7): Guanahacabibes Peninsula, Los Palacios, Sierra de los Organos, no data. Sancti Spiritus (25): Topes (9 km NNW). Santiago de Cuba (10): Santiago, Sierra Maestra, Punta Turquino, no data. No Data (114).
DOMINICAN REPUBLIC (1). Puerto Plata (1): La Cumbre.
FRENCH GUIANA (1). Cayenne (1): Cayenne.
JAMAICA (5): Kingston (2): Kingston. No Data (3).
MEXICO (1). No Data.
USA: FLORIDA (178). Dade Co. (102): Brickell Hammock, Coconut Grove, Elliott Key, Florida Keys, Miami, no data. Hillsborough Co. (1): Lutz. Martin Co. (1): Hobe Sound. Monroe Co. (34): Key Largo, Key Largo (17 mi. NE), Lignumvitae Key, Matecumbe Keys, West Key. Palm Beach Co. (2): Lake Worth. Polk Co. (2): Fort Meade. No Data (36).
USA: GEORGIA (1). Glynn Co. (1): St. Simons Island.
NO DATA (25).

Temporal Data. February (6), March (5), April (29), May (42), June (87), July (64), August (5), October (2).

Remarks. Adults of *R. formosa* have been collected at a variety of plants including *Guaiacum sanctum* L. (Zygophyllaceae), *Cassia* sp. (Fabaceae), *Citrus* sp. (Rutaceae), *Gossypium* sp. (Malvaceae) (cotton), and *Dichrostachys glomerata* Chiov. (Fabaceae). Adults have also been collected from the decaying logs of *Ficus* sp. (Moraceae), *Metopium* sp. (Annonaceae), and *Bursera* sp. (Burseraceae).

The larva of *R. formosa* was described by Ritcher (1966) and was collected from decaying wood.

Rutela glabrata (Fabricius)
(Figs. 35, 36, 112e; Map 2)

Cetonia glabrata Fabricius 1781: 34. Lectotype male at BMNH labeled a) "Type" (round with red circle), b) "2723" (handwritten), c) "glabrata F. 2723" (handwritten), and my lectotype label. Type locality, "in America meridionali."

Rutela jamaicensis Thunberg 1822: 313. Holotype male at UZIU in Thunberg collection with labels a) "Uppsala Univ. Zool. Mus. Thubersami. nr. 3133 Rutela jamaicensis Jamaic. SW. TYP" (red label), b) my holotype label. Type locality Jamaica.

Description. Length 16.6-24.1 mm. Width 8.5-12.9 mm. *Color*: (Figs. 35, 36) Elytral shining testaceous to tan, female with margin castaneous. Pronotum shining testaceous to tan with 1 large, dark, metallic green macula laterad of midline. Ventral surface shining castaneous with rust colored maculae. Tergites laterally unicolorous, castaneous, shining. *Head:* Surface of frons in male sparsely punctate at base, more dense laterally; punctures .01-.03 mm, minute. Surface of frons in female moderately densely punctate; punctures .01-.05 mm, minute (at base) to larger (apex and sides). Clypeus in male moderately densely punctate, punctures .01-.03 mm. Clypeus in female moderately densely punctate (base) to confluently punctate (apex and sides), punctures .03-.05 mm. Clypeal apex biarcuate, weakly reflexed, weakly beaded laterally. Interocular width about 6.3 transverse eye diameters. *Pronotum:* Basal margin of pronotum broadly trapezoidal, margin weakly angulate (Fig. 106a). Surface in male impunctate or minutely punctate; punctures .01 mm (minute), sparse. Surface in female moderately densely punctate; punctures about .01-.02 mm, minute. Bead incomplete anteriomedially (male) or complete (female). *Scutellum:* Width subequal to length. *Mesepimeron:* Base of mesepimeron approximately

even with elytral humerus. *Elytra:* Surface (male) with weakly impressed furrows; 0-3 mesad of humerus (poorly defined). Surface (female) with weakly impressed, punctate, longitudinal striae; 1 next to elytral suture, 0-3 mesad of humerus (poorly defined); punctures .01-.03 mm. Intervals broad, impunctate in male, moderately densely punctate in female; punctures .01-.05 mm. Epipleuron of female produced ventrally from mid-elytra to apex, lateral tergites hidden; produced region castaneous. Apex of elytral suture in male obtuse, with spiniform tooth. Apex in female broadly divergent, lacking spiniform tooth. Sutural length about 3.6 times length of scutellum in male; about 4.0 times length of scutellum in female. *Propygidium:* Partially exposed in male, surface moderately densely punctate; punctures .01-.05 mm. In female mostly hidden. *Pygidium:* Length (at middle) in male about 3 times length of propygidium; in female about 1.4 times length of propygidium. In lateral view, somewhat flat (male) or evenly convex (female). Surface (male) moderately densely punctate, punctures about .01 mm. Surface (female) with weakly impressed, transverse, vermiform striae; striae becoming concentric at apex. Apex of female weakly acute. *Venter:* Mesometasternal keel in ventral view at apex broadly, produced beyond mesocoxae to prosternal keel insertion; ventral surface flat in lateral view. Sternites 1-4 subequal in length; sternite 5 twice length of 4 (male) or 3 times as long as 4 (female), apicomedially eroded and weakly concave; sternite 6 1.5 times width of 4 (male), twice as long as 4 (female). Last sternite of female at subapex quadrately emarginate; beaded; surface weakly striate. *Legs:* Protibia with 3 teeth equally separated in apical third to fourth of tibia. Mesotibia with sides subparallel, external edge with weak apical and basal carinae (obsolete in male); apex with medial tooth produced to apex of tarsomere 2, 1-2 spinulae laterad of inner spurs, 2-3 spinulae laterad of medial tooth; claws of female with external claw slightly thicker and slightly wider than inner claw. Metatibia with sides subparallel in male, widest at apex in female; external edge with weak apical and basal carinae (male), or pronounced carinae (female); apex with corbel (male) feebly produced to middle of tarsomere 1; inner apical spur (female) not robust. *Metatrochanter:* Posterior border does not project beyond posterior border of femur. *Parameres:* Fig. 112e.

Diagnosis. *Rutela glabrata* is easily identified by its dorsal pattern, the pronotal and elytral surface that is minutely punctate in the male, the lateral elytral, margin of the female that is produced ventrally beyond the tergites and is castaneous, the apex of sternite 5 that is concave and eroded at the apex, the apex of the terminal sternite in the female that is quadrately emarginate, and the form of the male genitalia.

Distribution. Known only from Jamaica.

Locality Data (Map 2). 11 specimens examined from BMNH, CASC, IJSM, USNM, ZMHB.

JAMAICA (11). CLAREDON (1): Bath. KINGSTON (1): Kingston. ST. THOMAS (1): Belvedere. TRELAWNY (1): Greenwood. NO DATA (7).

Temporal Data. May (2), July (1).

Remarks. Chalumeau (1985) reported that the type of *Rutela jamaicensis* Thunberg was lost (a synonym of *Rutela glabrata* [Fabr.]). However, I discovered the holotype at the Zoological Museum at Uppsala, Sweden in the Thunberg Collection.

According to Zimsen (1964), two specimens of *R. glabrata* were in the Kiel collection and one specimen was at Copenhagen. I examined one specimen from the British Museum of Natural History and designated it the lectotype. Zimsen reported that the original labels read, "in America meridionali D. Smidt Mus. D. Lund."

The natural history of this species is not known.

***Rutela heraldica* Perty**
(Figs. 37, 38, 112f; Map 3)

Rutela heraldica Perty 1832: 50. Lectotype and paralectotype at ZSMC. Lectotype male labeled a) "Type von Rutela heraldica Perty" (handwritten, orange label), b) "5. Brasilia. Rutela heraldica Perty" (handwritten by Dr. Johannes Rudolph Roth with green, outlined box), c) "Lectoholotypus Rutela heraldica Perty det Dr. G. Scherer 1981." Paralectotype male labeled a) "Brasilien," b) "alte Sammlung," c) "Lectoparatypus Rutela heraldica Perty Dr. G. Scherer, 1981." Type locality "*Habitat in Prov. Piauhiensi*" (Piaui, Brazil).

Description. Length 11.8-16.8 mm. Width 6.4-9.1 mm. *Color*: (Figs. 37-38) Pronotum shining tan, testaceous, or reddish orange with 1 longitudinal, black macula laterad of midline extending from base to apex. Elytra shining tan, testaceous, or reddish orange with black macula extending from elytral base to shoulder and from subapical 1/3 to apex. Ventral surface black or nearly black with tan or cream colored maculae. Tergites 3-4 bicolored laterally, castaneous or black with tan or testaceous markings. *Head:* Surface of frons moderately densely punctate, more dense apically and laterally, weakly strigate basolaterally; punctures .02-.06 mm, some transverse. Clypeus moderately densely punctate (basally) to densely punctate, some punctures confluent at apex; punctures .02-.05 mm. Clypeal apex reflexed, bisinuate, beaded; bead incomplete at middle. Interocular width about 6.0 transverse eye diameters. *Pronotum:* Basal margin broadly rounded, lateral margin weakly rounded (Fig. 106e). Surface moderately densely punctate; punctures minute and .02-.80 mm mixed, larger punctures more dense laterad of midline. Bead complete anteriomedially. *Scutellum:* Width at base about equal to length. *Mesepimeron:* Base of mesepimeron exposed beyond elytral humerus. *Elytra:* Surface with weakly impressed, punctate, longitudinal striae; 1 next to suture, 4 mesad of humerus; 3-4 laterad of humerus (poorly defined); punctures .02-.05 mm, shallow. Interval between stria 1 and 2 broad, moderately densely punctate; punctures .02-.05 mm. Intervals between striae 2-5 and striae laterad of humerus narrow, sparsely punctate, some punctures transverse. Sutural length about 3.0 times length of scutellum; apex weakly rounded, beaded, weakly divergent, lacking spiniform tooth. *Propygidium:* Partially exposed or entirely hidden, surface moderately densely punctate; punctures .01-.05 mm. *Pygidium:* Length (at middle) about 2 times length of propygidium. In lateral view evenly convex. Surface with shallow, vermiform strigae; strigae becoming concentric toward apex (male) or semiconcentric (female); apex with strigae less impressed; margin with setose punctures; setae short to medium in length, tawny. Apical margin in female weakly produced, rounded; external edge quadrate. *Venter:* Mesometasternal keel in ventral view at apex acuminate, apex blunt, produced to insertion or middle of prosternal keel; ventral surface weakly deflexed in lateral view or not (female). Sternites 1-4 subequal in length sternite 5 about 2.5 times as long as 4; sternite 6 in male 1.5 times length of 4, sternite 6 in female about 2.5 times as long as 4. Last sternite in male at subapex quadrate; female broadly, weakly sinuate; base weakly striate; apex with setose punctures; setae short, tawny. *Legs:* Protibia with 3 teeth equally separated in apical third of tibia. Mesotibia widest at basal 1/4, external edge with weak apical and basal carinae (more pronounced in female); apex with medial tooth produced to middle tarsomere 1 or base of tarsomere 2, 1-2 spinulae laterad of inner spurs and 1-2 spinulae laterad of medial tooth; claws of female with external claw about 1.5 times as thick and 1.5 times as wide as inner claw. Metatibia widest at middle; external edge with weakly produced apical and basal carinae; apex with corbel (male) produced to apex of tarsomere 1; inner, apical spur (female) robust. *Metatrochanter:* Posterior border not produced beyond posterior margin of femur. *Parameres:* Fig. 112f.

Diagnosis. *Rutela heraldica* is most similar to *R. howdeni*. The two species are separated based on the narrower, black pronotal and elytral maculae in *R. heraldica* (Figs. 37-38) (maculae are broader in *R. howdeni* [Figs. 39, 110]), tergites 3 and 4 that are laterally bicolored in *R. heraldica* (tergites 1-4 are bicolored in *R. howdeni*), and the form of the male genitalia (Figs. 112f, l). In both species, the apex of the mesotibia in the male possess an acute, mediolateral tooth.

Distribution. Amazon region of South America. Recorded from elevations of 160-400 meters.

Locality Data (Map 3). 79 specimens examined from AMNH, AVEC, BMNH, CNCI, CUIC, DJCC, EGRC, CMNC, FMNH, FREY, HAHC, IMLA, MCZC, MEMU, QBUM, QCAZ, USNM, ZMHB, ZSMC.

BOLIVIA (3). No Data.
BRAZIL (23). Amazonas (9): Benjamin Constant, Rio Caiary, São Paulo de Olivença, no data. Mato Grosso (4): SINOP 12°31'S 55°37'W (BR 163 km 550 to 600), no data. Rondonia (9): Ariquemes, Ariquemes (62 km SW at Fazenda Rancho Grande), vic. Caucalandia (10°32' 62°48'), Ouro Preto do Oeste, no data. No Data (1).
COLOMBIA (8). Amazonas (1): Rio Tacana. Antioquia (1): Valle de Cauca. Caqueta (1): Rio Caqueta. Cundimarca (1): Bogota. Meta (3): Rio Meta, Rio Ocoa, Villavicencio. No Data (1).
ECUADOR (25). Chimborazo (1): Riobamba. Guayas (2): Guayaquil. Morona Santiago (2): Macas. Napo (5): Archidona, Coca, Sucumbios, Tena, no data. Pastaza (7): Rio Cusuimi, Rio Jatun Yacu, Sarayacu. No Data (8).
PERU (17). Huanaco (1): Huanaco. Loreto (14): Contamana, Iquitos, Middle Rio Marañon, Middle Rio Ucayali, Pucallpa, Puyo (150 km SE on Rio Ucayali), Rio Aguaytia, Rio Huallagua, Rio Napo. No Data (2).
NO DATA (3).

Temporal Data. January (4), February (4), March (2), April (4), May (5), June (1), July (1), August (3), September (6), October (9), November (4), December (5).

Remarks. Label data indicate that *R. heraldica* has been collected at light, but this may have been incidental. Larvae are not known.

Rutela histrio Sahlberg
(Figs. 40-43, 112g-j, 115, 116; Map 3)

Rutela histrio Sahlberg 1823: T. 1, F. 5. Holotype female at MZHF with labels a) "Guiana" (handwritten), b) "Thunb.," c) "Thunberg" (handwritten), d) "Mus. Zool. H:fors spec. typ. No. 1106 *Rutela histrio* Sbg.," e) "Mus. Zool. Helsinki Loan No. C-94 236," f) "Holotype *Rutela histrio* Sahlberg det. M.E. Jameson 1994."

Rutela histrio bimaculata Ohaus 1905: 312. Lectotype male at ZMHB with labels a) "Amazones, Tarapote, M. de Mathan, 4e Trimester 1885," b) male genitalia card mounted, c) "Typus!" (red label, handwritten), d) "bimaculata Ohaus" (red label, handwritten), e) my lectotype label. Five paralectotypes with identical collecting data, four at ZMHB, one at ZSMC labeled a) "*R. histrio bimaculata* cotype Ohs." (red label, handwritten), b) my paralectotype labels. **NEW SYNONYMY.**

Rutela histrio cayennensis Ohaus 1905: 312. Lectotype male at ZMHB with labels a) "Cayenne," b) "Typus!" (red label, typed), c) "*R. histrio* subsp. *cayennensis* Ohaus" (red label, handwritten), d) my lectotype label; male genitalia card mounted. Two male paralectotypes (one at ZMHB and one at ZSMC) labeled: a) "Cayenne," b) "*R. histrio cayennensis* cotype Ohs." (handwritten, red label), c) my paralectotype labels. One invalid type at ZMHB labeled: a) "Surinam, Michaelis," b) "*R. histrio cayennensis* cotype Ohs." (red, handwritten), c) "Invalid type det. M. E. Jameson." Two invalid type specimens at ZSMC labeled: "Brasilien, Esp. Santo" and "Miss. Mus., Steyl, Amazonas, Para, Bts.," with Ohaus' cotype labels, "*R. histrio cayennensis* cotype Ohs.," and with label indicating

invalid type status (see discussion). **NEW SYNONYMY.**

Rutela histrio subandina Ohaus 1905: 312. Lectotype male at ZMHB with labels a) "Songo, Yungas, Bolivia," b) "*R. histrio* subsp. *subandina* Ohaus" (red label, handwritten), c) my lectotype label; male genitalia card mounted. Lectoallotype female at ZMHB labeled: a) "Songo, Bolivia," b) female symbol, c) "*R. histrio subandina* cotype Ohs." (red label, handwritten), d) my lectoallotype label. One female paralectotype at ZMHB with data: a) "Peru, Marcapata," b) "*R. histrio subandina* cotype Ohs." (red label, handwritten), c) my paralectotype label. One male paralectotype at ZSMC labeled: a) "Peru, Marcapata," b) with Ohaus' determination labels, "*R. histrio subandina* cotype Ohs.," c) my paralectotype labels. Three invalid types (females) at ZMHB with the collecting data; "Chaquimayo, Peru", "Peru, R. Urubamba", "Yung., Coroico, Boliv., Fassl '08," all with Ohaus' determination labels, "*R. histrio subandina* cotype Ohs." (red label, handwritten), and my label indicating invalid type status. One invalid male type at ZSMC with labels: a) "Amazones, Tarapote, M. de Mathan, 4e Trimester 1885," b) "*R. histrio subandina* cotype Ohs.," c) my label indicating invalid type status (see discussion below). **NEW SYNONYMY.**

Description. Length 10.8-17.4 mm. Width 6.3-9.8 mm. *Color*: (Figs. 40-43) Pronotum weakly shining, castaneous or black with tan macula at midline (from apex to base) and tan macula at margin. Elytra weakly shining black or castaneous with variable maculae (small, round, tan, discal macula; transverse, saddle-shaped, tan macula at mid-disc; elytra tan with margins black or castaneous). Ventral surface castaneous, black, or red-orange with tan, testaceous, or cream colored maculae. Tergites bicolored laterally; black or castaneous with testaceous or tan. *Head:* Surface of frons moderately, densely punctate; punctures .01-.07 mm, less dense on disc, weakly strigate at base. Clypeus moderately densely punctate (at base) to confluently punctate (medially and apically); punctures .02-.06 mm. Clypeal apex bisinuate, reflexed, beaded; bead incomplete or complete at middle. Interocular width about 4.9 transverse eye diameters. *Pronotum:* Form of pronotum basomedially (anterior to scutellum) straight, basolaterally feebly angled anteriorly (Fig. 106a). Surface laterad of midline and mesad of margin (dark regions) moderately densely punctate (at base) to densely punctate (medially and apically), some punctures confluent at apical margin; punctures .01-.10 mm, coarse. Surface at midline and margin (tan regions) moderately densely punctate; punctures .01-.05 mm. Bead incomplete anteriomedially. *Scutellum:* Width about equal to length. *Mesepimeron:* Base of mesepimeron exposed beyond elytral humerus. *Elytra:* Surface with punctate longitudinal rows; 1 next to suture, 4 mesad of humerus; 3-5 laterad of humerus (poorly defined); punctures .01-.06 mm, some ocellate. Interval between stria 1 and 2 broad, moderately densely punctate; punctures .01-.06 mm, some ocellate. Intervals between striae 2 and 5 narrow, sparsely punctate (punctures minute) or transversely wrinkled. Sutural length about 3.4 times length of scutellum; apex of elytra weakly rounded, beaded, weakly divergent, without spiniform tooth. *Propygidium:* Partially exposed, surface moderately densely punctate; punctures .01-.06 mm. *Pygidium:* Length (at middle) about 2.5 times length of propygidium (slightly longer in female). In lateral view evenly convex. Surface with shallow, vermiform strigae; strigae becoming concentric at apex (male) or semicircular (female). Apical margin with a few setae; setae tawny, medium in length. Apical margin in female weakly produced, rounded; external edges weakly quadrate. *Venter:* Mesometasternal keel in ventral view at apex rounded, apex broad and blunt, produced to middle or insertion of prosternal keel; ventral surface weakly deflexed or flat in lateral view. Sternites 1-4 subequal in length; sternite 5 about twice as long as 4; sternite 6 1.5 times length of 4 (male), about 2 times length of 4 (female). Last sternite of female at subapex

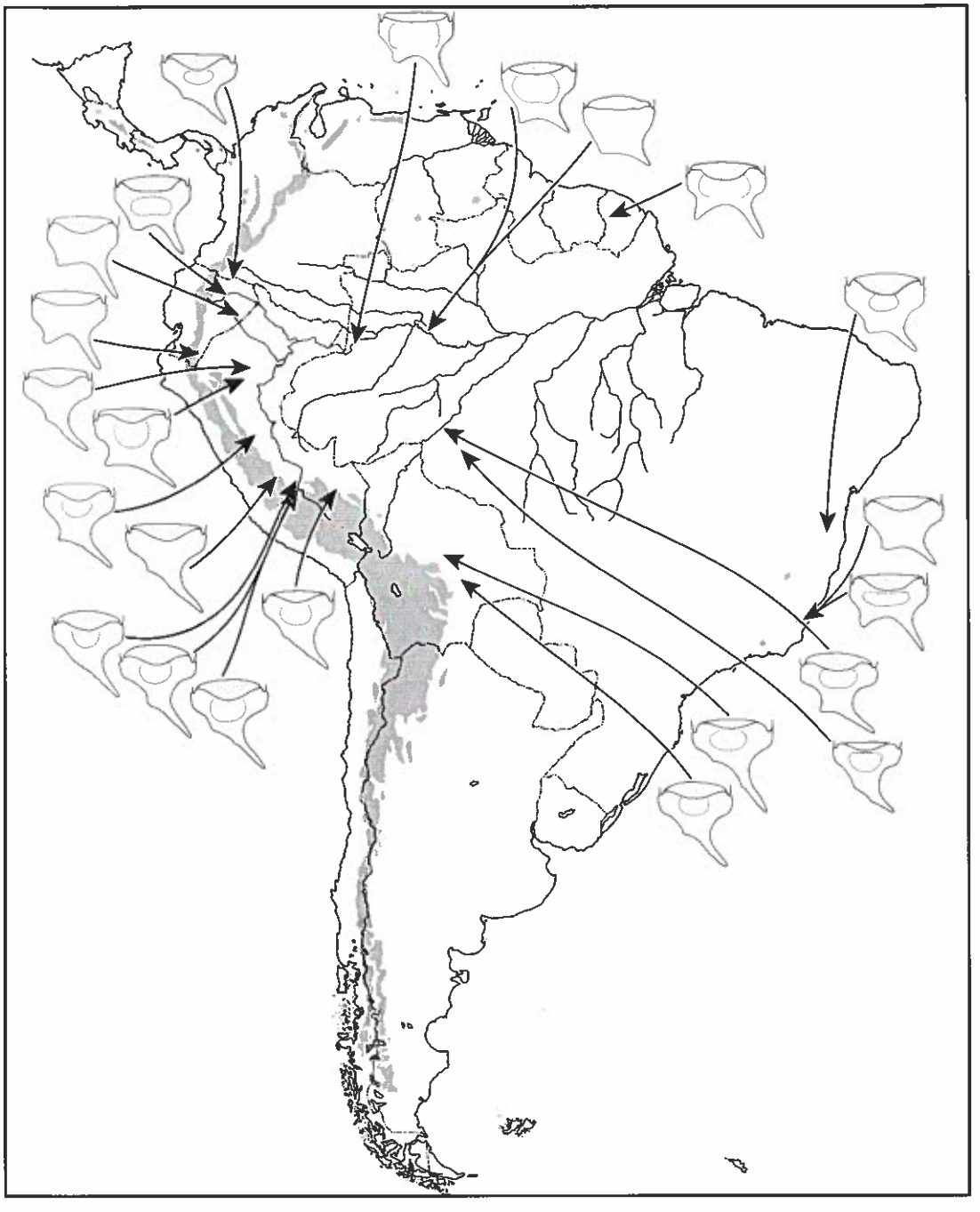


FIG. 115. Between-population variation of male genitalia in *Rutela histrio* across its range in northern South America. Stippled area equals 1000 meters. Dashed line depicts concavity in the parameres.

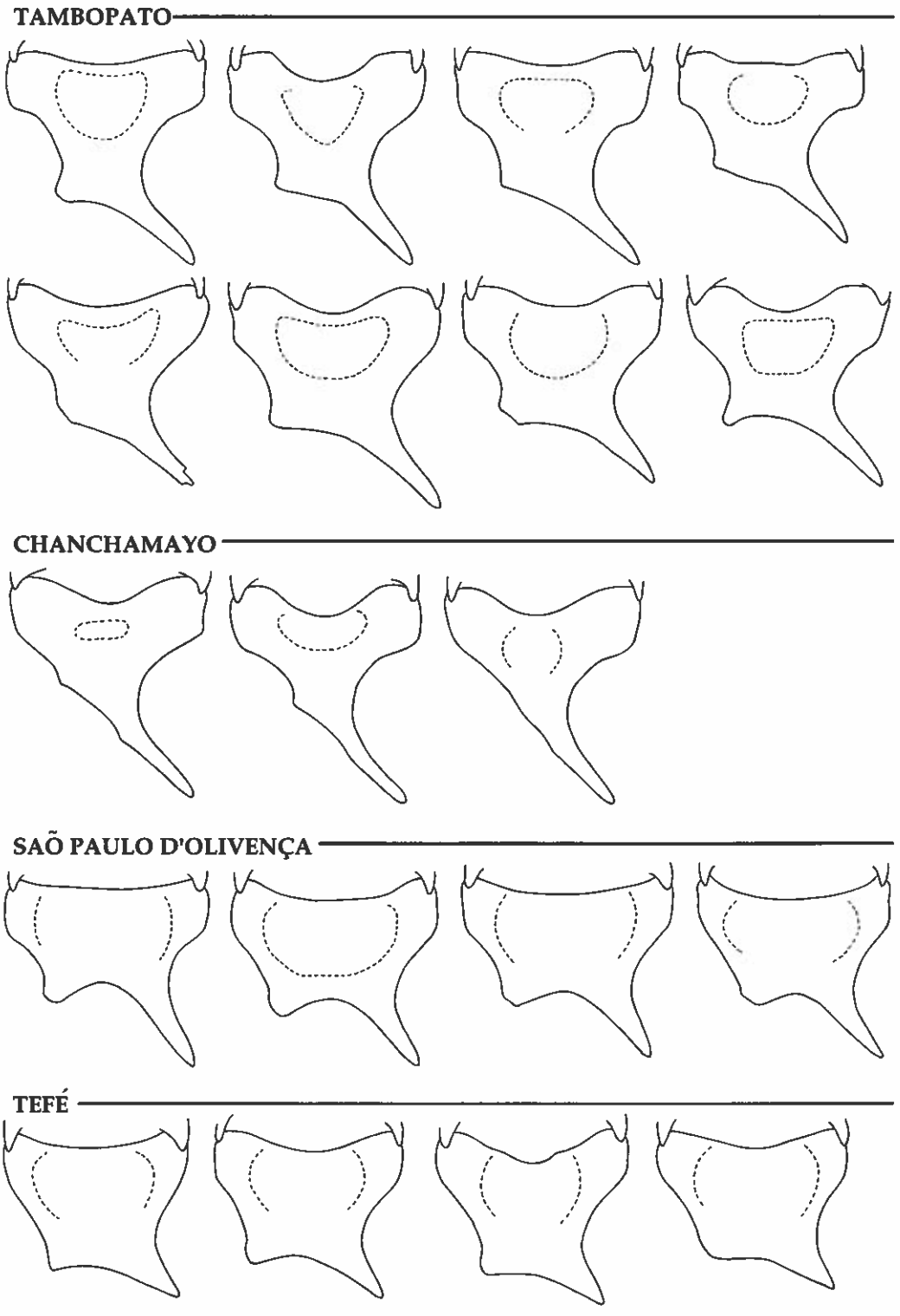


FIG. 116. Within population variation of male genitalia in *Rutela histrio* from: Tambopato, Peru; Chanchamayo, Peru; Saõ Paulo de Olivença, Amazonas, Brazil; Tefé, Amazonas, Brazil. Dashed line depicts concavity in the parameres.

broadly quadrate (weakly trisinuate in male), beaded; surface striate. *Legs:* Protibia with 3 teeth equally separated in apical third of tibia. Mesotibia widest at middle, external edge with weak apical and basal carinae; apex with medial tooth produced to base of tarsomere 2, 1-2 spinulae laterad of inner spurs and 1-2 spinulae laterad of medial tooth; claws of female with external claw about 1.5 times as thick and 1.5 times as wide as inner claw. Metatibia widest at middle, external edge with weak apical and basal carinae; apex with corbel (male) produced to middle of tarsomere 2; inner spur of female robust. *Metatrochanter:* Posterior border not produced beyond posterior border of femur. *Parameres:* Figs. 112g-j, 115, 116.

Diagnosis. Specimens of *R. histrio* are widely variable in coloration, pattern, and form of the male genitalia, but the following characters serve to diagnose the species: 1) posterior border of metatrochanter not produced, 2) mesepimeron exposed beyond elytral base, 3) apical bead of the pronotum incomplete medially, 4) apical margin of pygidium (female) weakly produced, rounded, 5) and male genitalia. Based on dorsal color pattern, some specimens of *Rutela histrio* are easily confused with *R. lineola* and *R. histrioparilis*. However, *R. histrio* is separated based on the posterior border of the metatrochanter which is not produced (in *R. lineola*, the metatrochanter is produced and the apex is spur-like in the male or rounded in the female; in *R. histrioparilis* the metatrochanter is produced and the apex is quadrate), and the male genitalia. Some specimens of *R. histrio* are similar to *R. tricolorea*, but *R. histrio* differs based on the punctation of the pronotum and elytra that is more coarse (punctation fine in *R. tricolorea*), apex of the pygidium in the female which is weakly produced and rounded (in *R. tricolorea* the apex is more acute), and the form of the male genitalia.

Distribution. Broadly distributed throughout tropical South America east of the Andes. Recorded elevation of 91-1900 meters.

Locality Data (Map 3). 322 specimens examined from AMNH, ANSP, AVEC, BMNH, CASC, CMNH, CUIC, FMNH, HAHC, JEWC, LACM, MAMC, MCZC, MNHN, MZHF, QBUM, QCAZ, SEMC, UMRM, USNM, ZMHB.

BOLIVIA (10). Beni (1): Rurrenabaque. Santa Cruz (5): Cuatro Ojos, No data. No Data (4).
BRAZIL (148). Amazonas (66): Benjamin Constant, Manaus, São Paulo de Olivença, Rio Caiary, Rio Negro, Rio Javari, Tefé. Bahia (9): Cachimba, No data. Espirito Santo (26): Linhares, Santa Leopoldina, Tigua, Villa Alegre, No data. Minas Gerais (6): Mar de Hespanha, Represa Rio Grande (Guanabara). Para (21): Canta Galo, Santarem, No data. Rio de Janiero (3): Araruama, No data. No Data (17).
COLOMBIA (4). Caqueta (1): Rio Orteguaza (S of Florencia). Huila (2): Rio Putumayo. Putumayo (1): Rio Putumayo.
ECUADOR (33). Loja (1): Rio Sabanilla. Morona-Santiago (1): Macas. Napo (26): Coca, Palmoviente, Pano, Rio Coca, Sacha. Pastaza (1): Rio Bobonaza. Zamora Chinchipe (3): Zamora (8 km NW), Rio Zamora. No Data (1).
FRENCH GUIANA (16). Cayenne (12): Cayenne, Kaw (Rd. PK-33), Kourou, Kourou (6 km SW), Roches de Kourou. Saint Laurent du Maroni (3): Maroni River, St. Jean. No Data (1).
GUYANA (4). Mazaruni-Potaro (2): Moraballi River, Seroun. No Data (2).
PARAGUAY (1). No Data.
PERU (66). Amazonas (1): Rio Santiago. Junin (14): Jauja, Satipo, Sani Beni, Sani Beni (8 km E Satipo). Huanaco (15): Las Palmas (10 mi SW), Leonpampa Region, Monson Valley, Tingo Maria. Lima (12): Lima, No data. Loreto (7): Rio Ampiyacu, Rio Manatee, Rio Maranon (upper), Rio Yurimaguas, Yarina Cocha. Madre de Dios (5): Puerto Maldonado, Rio Tambopata Biological Reserve (30 km [air] SW Puerto Maldonado). San Martin (3): Achinamisa, Las Minas (20 km SW Roja). No Data (9).

SURINAM (5). No Data.
VENEZUELA (3). BOLIVAR (2): Suapure (Caura River). MONAGAS (1): Caripito.
NO DATA (32).

Temporal Data. January (7), February (14), March (2), April (10), May (14), June (7), July (21), August (9), September (11), October (26), November (26), December (12).

Remarks. *Rutela histrio* displays extreme variability in coloration, dorsal pattern, and form of the male genitalia. Coloration may range from black with tan or testaceous maculae to reddish orange with cream colored maculae. Dorsal pattern of the elytra varies greatly from one, small, tan, discal macula on each elytron to a transverse, saddle-shaped, tan band at mid-disc. Some specimens also have a dorsal elytral pattern that is primarily tan with black margins (Figs. 40-43). Male genitalia are widely variable across the species' range, but all forms follow a basic morphotype (Figs. 112g-j, 115, 116). This variation is observed within populations (Fig. 116) and between populations (Fig. 115).

Ohaus (1905) named three subspecies of *R. histrio* based on elytral coloration and pattern. I treat all of these as conspecific, and thus all are synonyms. Ohaus' *R. histrio cayennensis* was based on the elytral coloration that is primarily dark brown or black with limited yellow maculae. This form is extremely similar in coloration to *R. tricolorea*. Ohaus recorded the species from Cayenne in his original publication, but sometime after 1934 he designated three invalid type specimens from Surinam (Michaelis) and Brazil (Espirito Santo and Pará).

Rutela histrio subandina Ohaus was apparently based on specimens with broad tan or testaceous maculae. Many specimens from the Andes of Bolivia and southern Peru tend to have more broadly distributed testaceous maculae than specimens from other regions. However, the variation observed in the type series of the subspecies is within the range of variation of the species. The pattern of the elytra of some specimens of *R. histrio* in these regions overlaps with the pattern observed in *R. lineola*. According to the original publication, this subspecies was described from Yungas, Bolivia and Marcapata, Peru. Ohaus also placed cotype labels on specimens from: Chaquimayo, Peru; Rio Urubamba, Peru; Tarapote, Peru and; Coroico, Bolivia. One label on a female "cotype" (Coroico, Yungas, Bolivia) was collected in 1908, four years after the 1905 publication.

Rutela histrio bimaculata Ohaus is a distinctive morphotype of *R. histrio* (Fig. 43). Specimens of this morphotype are black (as opposed to castaneous or brown) with the testaceous maculae reduced to one, small, round spot in the center of the elytral disc. Although the morphotype appears fairly consistent in its pattern, it doesn't appear to be a distinct species or subspecies (based on the male genitalia and other morphological characters). All specimens of this morphotype were collected at Tarapoto, Peru, and all were male.

Little natural history is known for *R. histrio*. Ohaus (1908) reported adults, larvae, and pupae in a fallen, hardwood tree at the end of September in Ecuador. Label data indicate that adults have been collected on *Schizolobium parahybum* (Vell.) Blake (Fabaceae), *Inga edulis* Mart. (Fabaceae), and from rotting wood. Lacordaire (1830) observed small numbers of adults on the flowers and leaves of *Mimosa* sp. (Fabaceae).

Rutela *histrioparilis* Jameson, NEW SPECIES
(Figs. 44, 112k, 114c; Map 3)

Type Material (holotype, allotype, and three paratypes). Holotype deposited in HAHC (to be deposited at CMNC) labeled a) "Peru: Loreto Prov., Amazon Safari Camp, Rio Mamón NNW Iquitos, ca. 3°42'S 73°14'W," b) "25.VI.1978, H. A. Hespenheide," c) "H. & A. Howden Collection," d) my holotype label; male genitalia in vial. Allotype deposited at AMNH labeled a) "Colombia, Caqueta: Rio Orteguaza a tributary of Rio Caqueta S. of Florencia, IX-10-1947," b) "L. Ritcher coll. Frank Johnson Donor," c)

my allotype label. Two paratypes (one male, one female) labeled as allotype, deposited at AMNH. One male paratype labeled as allotype deposited at UNSM.

Holotype. Male. Length 12.2 mm. Width 6.8 mm. *Color:* (Fig. 44) Pronotum weakly shining black with narrow, tan stripe at midline and tan macula at margin. Elytral weakly shining, with tan macula from elytral base to near apex. Ventral surface black with tan maculae. Tergites laterally bicolored, black with tan maculae. *Head:* Frons densely punctate, some confluent apically and basolaterally; punctures .01-.05 mm. Clypeal apex bisinuate, weakly reflexed, beaded; bead complete at middle. Interocular width about 7.0 transverse eye diameters. *Pronotum:* Form of pronotum basomedially (anterior to scutellum) straight, basolaterally feebly angled anteriorly (Fig. 106a). Surface moderately densely punctate (in light-colored regions) or densely punctate (in black regions); punctures .01-.10 mm (dark regions, .01-.03 mm (light-colored regions). Bead incomplete anteriomedially. *Scutellum:* Width about equal to length. *Mesepimeron:* Base of mesepimeron exposed beyond elytral humerus. *Elytra:* Surface with longitudinal, punctate striae; 1 next to suture, 4 mesad of humerus; 5 laterad of humerus (reaching neither apex nor base); punctures .02-.10 mm, ocellate, some elongate. Interval between elytral suture and discal striae broad, moderately densely punctate; punctures .02-.10 mm. Sutural length about 4.0 times length of scutellum; apex weakly rounded, beaded, weakly divergent, without weak apical tooth. *Propygidium:* Partially exposed, surface moderately densely punctate at base, weakly strigate at apex; punctures .01-.03 mm. *Pygidium:* Length (at middle) about 2.5 times length of propygidium. In lateral view evenly convex. Surface with shallow, vermiform strigae; strigae semicircular toward apex. *Venter:* Mesometasternal keel in ventral view at apex rounded, blunt, produced to insertion of prosternal keel; ventral surface flat in lateral view. Sternites 1-4 subequal in length; sternite 5 about twice as long as 4; sternite 6 1.5 times length of 4. Last sternite at subapex quadrate; surface striate. *Legs:* Protibia with 3 teeth equally separated in apical third of tibia. Mesotibia with sides subparallel, external edge with obsolete apical and basal carinae; apex with medial tooth produced to middle of tarsomere 2, 1 spinula laterad of inner spurs and 1 spinula laterad of medial tooth. Metatibia with sides subparallel; external edge with weak apical and basal carinae; apex with corbel produced to middle of tarsomere 2. *Metatrochanter:* Posterior border produced beyond posterior border of femur; apex quadrate (Fig. 114c). *Parameres:* Fig. 112k.

Allotype. Female. Length 14.2 mm. Width 7.7 mm. Differs from male holotype in the following respects: *Pygidium:* Apex weakly produced, rounded; external edges quadrate. *Legs:* Protibia with basal tooth slightly removed from apical teeth. Mesotibia at external edge with weak apical and basal carinae. Metatibia with inner, apical spur not robust. *Metatrochanter:* Posterior border weakly produced beyond posterior border of femur; apex not appreciably produced (Fig. 114b).

Paratypes (two males, one female). Length 12.2-14.9 mm. Width 6.8-8.4 mm. Paratypes do not differ appreciably the from holotype and allotype.

Diagnosis. *Rutela histrioparilis* could be confused with *R. lineola* and *R. histrio* because the overall dorsal coloration and pattern of these three taxa is similar. However, *R. histrioparilis* can be recognized by: 1) the produced posterior border of the metatrochanter in the male with the apex truncate in the male or rounded in the female [in *R. lineola* the metatrochanter is produced and the apex is spur-like (male) or rounded (female); in *R. histrio* the metatrochanter is not produced], 2) elytra with large, ocellate punctures (in *R. lineola* the punctures are simple; in *R. histrio* the punctures are ocellate and simple), 3) and form of the male genitalia.

Distribution. Amazon region of Peru and Colombia. No recorded elevation.

Locality Data (Map 3). 5 specimens examined from HAHC, AMNH.

PERU (1). LORETO (1): Amazon Safari Camp (NNW of Iquitos on Rio Mamón).
COLOMBIA (4). CAQUETÁ (4): Rio Orteguaza (S of Florencia).

Temporal Data. June (1), September (4).

Remarks. Natural history is not known for the species.

Etymology. In Latin, the word "*parilis*" means "like or resembling." The specific epithet "*histrioparilis*" refers to the fact that the species closely resembles *Rutela histrio* Sahlberg.

Rutela howdeni Jameson, New Species
(Figs. 39, 110, 112l; Map 3)

Type material (holotype, allotype, and 5 paratypes). Holotype deposited at HAHC labeled a) "Venezuela, Bolivar carret. Caicara, San Juan de Manapiare Km. 210. 300 m. 23-IV-1976", b) male genitalia card mounted, c) "H. & A. Howden Collection ex. A. Martinez Collection", d) my holotype label. Allotype deposited at CUIC labeled a) "Suapure, VENEZ Caura River 8.28.1899 E.A. Klages", b) "*Rutela* sp. E.A. Klages Collection", c) my allotype label. One male paratype deposited at HAHC labeled as holotype and with an additional label, "*Rutela* n. sp. Det. H. F. Howden." One male paratype deposited at UNSM labeled a) "Suapure, VENEZ Caura River V.9.1900 E.A. Klages", b) "*Rutela* sp. E.A. Klages Collection", c) male genitalia card mounted. One female paratype deposited at USNM labeled a) "Venezuela Exp. Territ. Amazonas Upper Cucucunuma Tapara Apr. 20, 1950", b) "J. Maldonado Capriles Coll." One female paratype deposited at USNM labeled a) "Rio Caiary-Uaupes, State of Amazonas, Brazil. IX-1906. H. Schmidt", b) "M. Robinson Collection 1959". One female paratype deposited at CUIC labeled a) "Suapure, VENEZ Caura River 8.14.1899 E.A. Klages", b) "*Rutella* [*sic*] sp. E.A. Klages Collection".

Holotype. Male. Length 14.7 mm. Width 8.6 mm. *Color*: Pronotum with disc and base black (interrupted medially by horizontal line that reaches neither apex nor base), margins testaceous. Elytra shining testaceous with black macula extending from elytral base to basal 1/3 of disc and from subapical 1/3 to apex. Ventral surface black or nearly black with tan or cream colored maculae. Tergites 1-4 bicolored laterally, castaneous with testaceous markings. *Head:* Surface of frons moderately densely punctate, more dense laterally, weakly strigate basolaterally; punctures .02-.06 mm. Clypeus moderately densely punctate at base to densely punctate at apex; punctures .02-.05 mm. Clypeal apex reflexed, bisinuate, beaded; bead incomplete at middle. Interocular width about 6.0 transverse eye diameters. *Pronotum:* Basal margin broadly rounded, lateral margin weakly rounded (Fig. 106e). Surface moderately densely punctate; punctures minute and .02-.80 mm mixed, larger punctures more dense laterad of midline. Bead complete anteriomedially. *Scutellum:* Width about equal to length. *Mesepimeron:* Base of mesepimeron exposed beyond elytral humerus. *Elytra:* Surface with weakly impressed, punctate, longitudinal striae; 1 next to suture, 4 mesad of humerus; 4 laterad of humerus (poorly defined); punctures .02-.05 mm, shallow. Interval between stria 1 and 2 broad, moderately densely punctate; punctures .02-.05 mm. Intervals between striae 2-5 and striae laterad of humerus narrow, sparsely punctate, some punctures transverse. Sutural length about 3.0 times length of scutellum; apex weakly rounded, beaded, weakly divergent, lacking spiniform tooth. *Propygidium:* Partially exposed, surface moderately densely punctate; punctures .01-.05 mm. *Pygidium:* Length (at middle) about 2 times length of propygidium. In lateral view evenly convex. Surface

with weakly impressed vermiform strigae; strigae concentric toward at mid-disc; apex with strigae eroded; margin with sparse setose punctures; setae short to medium in length, tawny. *Venter:* Mesometasternal keel in ventral view at apex acuminate, apex blunt, produced to middle of prosternal keel; ventral surface weakly deflexed in lateral view. Sternites 1-4 subequal in length sternite 5 about 2.5 times as long as 4; sternite 6 1.5 times length of 4. Last sternite at subapex quadrate; base weakly striate; apex with setose punctures; setae short, tawny. *Legs:* Protibia with 3 teeth in apical third of tibia; posterior tooth weakly removed from anterior and middle teeth. Mesotibia widest at basal 1/4, external edge with weak apical and basal carinae; apex with medial tooth produced to base of tarsomere 2, 1 spinula laterad of inner spurs and 1 spinula laterad of medial tooth. Metatibia widest at basal 1/3; external edge with weakly produced apical and basal carinae; apex with corbel produced to base of tarsomere 2. *Metatrochanter:* Posterior border not produced beyond posterior border of femur. *Parameres:* Fig. 112l.

Allotype. Female. Length 15.6 mm. Width 9.5 mm. Differs from male holotype in the following respects. *Color:* Pronotum shining black with orange maculae. Elytra shining orange with black maculae. Ventral surface black with orange maculae. *Head:* Clypeus moderately densely punctate, more dense at apex (some transverse). *Pygidium:* Surface with moderately impressed, vermiform strigae. Apical margin weakly produced, rounded; external edge quadrate. *Venter:* Sternite 6 about 2.5 times as long as 4; Last sternite at subapex broadly, weakly sinuate. *Legs:* Mesotibia with external apical and basal carinae more pronounced. Claws of female with external claw about 1.5 times as thick and 1.5 times as wide as inner claw. Metatibia with inner, apical spur robust.

Paratypes (2 males, 3 females). Length 12.8-15.0 mm. Width 7.3-8.4 mm. Differs from the holotype and allotype in the following respects: *Color:* Pronotum, elytra, and venter shining black with orange, testaceous, or tan maculae. *Elytra:* Surface with 3-4 striae laterad of humerus. *Venter:* Sternite 6 about 2.5 times as long as 4; Last sternite at subapex broadly, weakly sinuate. *Legs:* Mesotibia with 1-2 spinulae laterad of inner spurs and 1-2 spinulae laterad of medial tooth. *Parameres:* Basal fovea less pronounced and apices slightly less divergent than Fig. 112l.

Diagnosis. *Rutela howdeni* (Figs. 39, 110) most closely resembles *R. heraldica*. The broader black pronotal and elytral markings in *R. howdeni*, the bicolored tergites 1-4 in *R. howdeni* (rather than tergites 3 and 4 in *R. heraldica*), and the male genitalia separate the two species. *Rutela howdeni* shares the complete anteriomedial pronotal bead and the apex of the mesotibia in the male with an acute tooth placed mediolaterally with *R. heralidica*.

Distribution. Orinoco Basin region of Venezuela and Brazil.

Locality Data (Map 3). 7 specimens examined from CUIC, HAHC, UNSM, USNM.

BRAZIL (1). AMAZONAS (1): Rio Caiary-Uaupes.
VENEZUELA (6). AMAZONAS (1): Upper Cunucunuma River. BOLIVAR (5): Caicara, Caura River (Suapure).

Temporal Data. April (3), May (1), August (1), September (1).

Remarks. This species was discovered too late in the manuscript process for inclusion in the phylogenetic analysis. However, based on shared characters (mentioned above in "Diagnosis"), I believe that *R. howdeni* and R. *heraldica* are sister species.

The parameres of one damaged male paratype (Suapure, Venezuela) differ slightly from those of the holotype and male paratype from Caicara, Venezuela (Fig. 112l) in that the apices are slightly less divergent and the basal fovea is less pronounced.

The natural history and larvae of this species are not known.

Etymology. This species is named in honor of Dr. Henry F. Howden, scarab systematist *extraordinare*. Throughout my systematics training in Scarabaeidae, Henry has given me advice and support for which I am grateful. Henry drew my attention to this new species by providing two male specimens—the holotype and a paratype. Before examining these male specimens, I had concluded that my short series (which included three females and one damaged male) were variants of *R. heraldica* rather than representatives a distinct species.

Rutela laeta (Weber)
(Figs. 45, 112m; Map 5)

Cetonia laeta Weber 1801: 68. Holotype not located.

Cetonia weberi Schönherr 1817: 143. Replacement name for *Cetonia laeta* Weber.

Description. Length 15.9-23.6 mm. Width 7.8-12.3 mm. *Color:* (Fig. 45) Pronotum weakly shining, tan or testaceous with 1 broad, black or nearly black macula laterad of midline, extending from apex to base. Elytra shining, metallic green. Ventral surface castdddaneous with tan or testaceous maculae. Tergites laterally bicolored, castaneous with testaceous or tan. *Head:* Surface of frons moderately, densely punctate; punctures .01-.05 mm, more dense basolaterally. Clypeus moderately densely punctate (disc) to densely punctate (apex and sides), confluent or not, more dense in female; punctures .01-.05 mm. Clypeal apex bisinuate (more acuminate in female), weakly reflexed, weakly beaded; bead incomplete at apex. Interocular width about 4.5 transverse eye diameters. *Pronotum:* Form of pronotum basomedially (anterior to scutellum) straight, basolaterally feebly angled anteriorly (Fig. 106a). Surface (male) moderately densely punctate, less dense at midline (tan region); punctures .01-.10 mm. Bead incomplete anteriomedially. *Scutellum:* Width about equal to length. *Mesepimeron:* Base of mesepimeron hidden (elytra base produced anteriorly beyond mesepimeron) (*i.e.*, Fig. 111b). *Elytra:* Surface with weakly impressed punctate longitudinal striae; 1 next to suture, 3-4 impressed mesad of humerus (punctures not distinct); 2-3 punctate striae laterad of humerus; punctures .01-.06 mm, shallow, placed 4-12 puncture diameters apart. Intervals broad, moderately densely punctate and/or wrinkled; punctures .01-.06 mm, some transverse; wrinkles transverse, horizontal, or diagonal, placed laterad of humerus and between discal striae. Sutural length about 3.0 times length of scutellum; apex weakly rounded, beaded, weakly divergent, lacking apical tooth. *Propygidium:* Partially exposed or not, surface moderately densely punctate; punctures .01-.05 mm. *Pygidium:* Length (at middle) about 2 times length of propygidium, slightly less in females. In lateral view somewhat flat before rounded apex. Surface with vermiform strigae forming nearly complete concentric circles around apex (male) or semicircles (female), strigae occasionally weaker on disc. Apex in female produced and rounded, external edges trapezoidal. *Venter:* Mesometasternal keel in ventral view at apex acuminate, apex acute, produced to middle or apex of prosternal keel; ventral surface weakly recurved in lateral view. Sternites 1-4 subequal in length; sternite 5 about 1.5 times as long as 4 in male, about twice as long as 4 in female; sternite 6 of male 1.5 times length of 4, about twice as long in female. Last sternite in female trapezoidally emarginate at subapex; subapex in male quadrately emarginate; surface with vermiform strigae (female) or minute punctures (male). *Legs:* Protibia with 3 teeth equally separated in apical third of tibia; basal tooth slightly removed from remaining teeth. Mesotibia with sides subparallel, external edge with nearly obsolete apical and basal carinae; apex with medial tooth produced to apex of tarsomere 1 or base of tarsomere 2 (more acuminate in female), 0-3 spinulae laterad of inner spur and 1 spinula laterad of medial tooth; claws of

female with external claw about 1.5 times as thick and 1.5 times as wide as inner claw. Metatibia with sides subparallel, external edge with weak apical and basal carinae (male) or pronounced carinae (female); apex with corbel (male) produced to middle of tarsomere 2; inner, apical spur in female not robust. *Metatrochanter:* Posterior border not produced beyond posterior border of femur. *Parameres:* Fig. 112m.

Diagnosis. The metallic green elytra serve to easily distinguish *R. laeta* from other species of *Rutela*. Also, the base of the mesepimeron that is hidden by the anteriorly produced elytral base, the terminal sternite of the female that is trapezoidally emarginate, the posterior border of the metatrochanter that is not produced, and the form of the male genitalia serve to identify the species.

Distribution. Northwestern South America. The only recorded elevation for the species is 300 meters.

Locality Data (Map 5). 519 specimens examined from ANSP, BMNH, CASC, CMNH, CNCI, CUIC, EGRC, EMEC, DJCC, CMNC, FMNH, FREY, FSCA, HAHC, LACM, LAGO, MCZC, MLPA, MNHN, QBUM, UNSM, USNM, ZMHB, ZSMC.

BRAZIL (17). Roraima (17): Boa Vista, Rio Surumu.
COLOMBIA (34). Antioquia (21): Puerto Berrío. Magdalena (3): Sevilla. Meta (1): Rio Meta. Valle de Cauca (5): Calima Valley, no data. Vaupes (4): Rio Guayabero.
ECUADOR (2). Chimborazo (1): Pichincha.
FRENCH GUIANA (1). Cayenne (1): Cayenne.
GUYANA (10). East Demerara (1): Georgetown. Mazaruni-Potaro (2): Seroun River. Rupununi (2): Rupununi, Upper River Rupununi. No Data (5).
PANAMA (1). Canal Zone (Panama) (1): No Data.
PERU (1). Huánuco (1): Tingo Maria.
VENEZUELA (430). Amazonas (1): Puerto Ayacucho. Apure (3): San Fernando de Apure. Bolivar (350): Cuidad Bolivar, El Peru, Guasipati, Maripa, Rio Pao, Suapure. Carabobo (1): Puerto Cabello. Cojedes (1): El Baúl. Distrito Federal (4): Caracas. Falcon (1): No data. Guárico (3): Guardatinajas, Guayabul. Lara (1): Sarare. Miranda (10): Guatire Valley. Monagas (5): Barrancas (140 km NE), Las Piedritas, Maturin (42 km SE). Tachira (2): Navay. Zulia (12): Carrasquero, Machiques (79 km S). No Data (36).
NO DATA (23).

Temporal Data. January (2), February (6), March (43), April (14), May (91), June (224), July (15), August (7), September (2), October (26), November (2), December (1).

Remarks. The name *Cetonia weberi* Schönherr was created as a replacement name for *Cetonia laeta* Weber which, at the time, was preoccupied by *Cetonia laeta* Fabr. The type specimen for *Rutela laeta* was not located. According to Olé Martin (ZMUC), it may be lost.

The natural history is unknown for this species. Label data indicate that adults were found on "flowering tree," "river bank vegetation," and "in flight in forest." Larvae are not known.

One specimen of *R. laeta* was recorded from the Panama Canal Zone. This is probably an incidental occurrence.

Rutela lineola (Linnaeus)
(Figs. 46-49, 112n, 114a-b; Map 4)

Scarabaeus lineola Linné 1767: 552. Holotype not located.

Scarabaeus surinama Linné 1767: 552. Holotype not located.

Melolontha unungula Herbst 1790: 160. Holotype not located.

Scarabaeus hesperus Drury 1782: 61. Holotype not located. Removed from subspecies: **NEW SYNONYMY.**

Scarabaeus ephippium Linné 1788: 1576. Holotype not located. Removed from subspecies: **NEW SYNONYMY.**

Description. Length 10.6-16.1 mm. Width 6.5-10.3 mm. *Color*: (Figs. 46-49) Pronotum shining black with narrow, tan or testaceous stripe at midline and tan or testaceous margin. Elytral shining, with variable pattern; entirely black, black with limited tan maculae, or tan with black margins. Ventral surface black with tan or testaceous maculae. Tergites laterally bicolored, black with tan or testaceous maculae. *Head:* Surface of frons moderately densely punctate, more dense at apex, some confluent laterally; punctures .01-.05 mm. Clypeus moderately densely punctate (base) to densely or confluently punctate (apex); punctures .01-.05 mm. Clypeal apex weakly bisinuate, weakly reflexed, beaded; bead incomplete or complete at middle. Interocular width about 5.0 transverse eye diameters. *Pronotum:* Form of pronotum basomedially (anterior to scutellum) straight, basolaterally feebly angled anteriorly (Fig. 106a). Surface moderately densely punctate; punctures .01-.10 mm, lateral punctures larger, discal punctures smaller. Bead incomplete anteriomedially. *Scutellum:* Width about equal to length. *Mesepimeron:* Base of mesepimeron exposed beyond elytral humerus. *Elytra:* Surface with weakly impressed punctate longitudinal striae; 1 next to suture, 4 mesad of humerus; 3-5 laterad of humerus (poorly defined); punctures .01-.06 mm, shallow. Intervals broad, moderately densely punctate, some transverse; punctures .01-.06 mm. Sutural length about 3.25 times length of scutellum; apex weakly rounded, beaded, weakly divergent, with or without weak apical, spiniform tooth. *Propygidium:* Partially exposed, surface moderately densely punctate; punctures .01-.06 mm. *Pygidium:* Length (at middle) about 3 times length of propygidium. In lateral view evenly convex. Surface with shallow, vermiform strigae; strigae in male becoming concentric at apex. Apex in female evenly rounded. *Venter:* Mesometasternal keel in ventral view at apex rounded, blunt, produced to middle or insertion of prosternal keel; ventral surface flat in lateral view. Sternites 1-4 subequal in length; sternite 5 about twice as long as 4; sternite 6 of male 1.5 times length of 4, about twice as long as 4 (female). Last sternite of male at subapex quadrate; base weakly striate. Last sternite of female at subapex weakly, quadrate beaded; middisc to base weakly striate. *Legs:* Protibia with 3 teeth equally separated in apical third of tibia. Mesotibia with sides subparallel, external edge with weak apical and basal carinae (obsolete or not); apex with medial tooth produced to middle of tarsomere 2, 1-2 spinulae laterad of inner spurs and 1-3 spinula laterad of medial tooth; claws of female with external claw about 1.5 times as thick and 1.5 times as wide as inner claw. Metatibia with sides subparallel; external edge with weak apical and basal carinae; apex with corbel (male) produced to middle of tarsomere 2; inner, apical spur in female not robust. *Metatrochanter:* Posterior border (male) produced beyond posterior border of femur; apex spur-shaped, sometimes weakly deflexed (Fig. 114a). Posterior border (female) weakly produced; apex quadrate or rounded (Fig. 114b). *Parameres:* Fig. 112n.

Diagnosis. *Rutela lineola* is the most widely distributed and most commonly collected species in the genus. Based only on dorsal color and pattern, *R. lineola* could be confused with *R. histrio*, *R. tricolorea*, *R. vetula*, and *R. histrioparilis*. The following characters serve to distinguish this species: 1) mesepimeron exposed, 2) posterior border of metatrochanter produced, apex spur-like (male) or rounded (female), 3) elytral punctures simple, 4) elytral pattern not "V" shaped, 5) apex of pygidium (female) rounded, 6) inner metatibial spur (female) not robust, 7) and male genitalia. *Rutela lineola* differs from *R. vetula* by the exposed mesepimeron, dorsal pattern, and male genitalia (in *R. vetula* the mesepimeron is hidden and elytral pattern is V-shaped). It differs from *R. histrio* by the produced metatrochanter in the male and female, lack of robust, apical, metatibial spur in the female, and male genitalia (in *R. histrio* the posterior border of the metatrochanter is not produced and the apical, metatibial spur is robust in the female). It is separated from

R. tricolorea by the rounded pygidial apex in the female, the produced posterior border of the metatrochanter, and the male genitalia (in *R. tricolorea* the apex of the pygidium in the female is acute and the metatrochanter is not produced). It differs from *R. histrioparilis* by the simple elytral punctures, produced metatrochanter with a spur-like apex (male) or rounded apex (female), and male genitalia (in *R. histrioparilis* the elytral punctures are ocellate and the produced metatrochanter with a truncate apex).

Distribution. Widely distributed in South America west of the Andes. Recorded from tropical forests ranging in elevation from 90-1,325 meters.

Locality Data (Map 4). 1,807 specimens examined from AMNH, ANSP, CASC, CMNH, CNCI, CUIC, DCCC, EGRC, FMNH, FSCA, HAHC, INPA, LACM, LAGO, MCZC, MLPA, MNNC, QBUM, QCAZ, SEMC, UMRM, UNAM, UNSM, USNM.

ARGENTINA (162). Buenos Aires (2): Buenos Aires. Chaco (17): Cerrito, Presidente de la Plaza, Resistencia, No data. Corrientes (14): Concepcíon, Paraná, San Rogues, No data. Entre Rios (2): No data. Jujuy (36): Calilegua, Quemado. Mendoza (1): Las Juntas. Misiones (65): El Dorado, Igazu, Loreto, Pindapoy, Posadas de Misiones, San Ignacia, No data. Neuguén (6): Neuguén. Salta (8): Orán, Rosario de Lerma, No data. Santa Cruz (1): Rio Chico. Sante Fe (1): Santa Fe. Tucuman (5): Villa Padre Monti, Yerba Buena, No data. No Data (4).

BOLIVIA (64). Beni (8): Cachuela Esperanza, Guayaramerin, No data. Cochabamba (1): Chapare. La Paz (5): No data. Santa Cruz (47): Las Palmas, Montero, Santa Cruz, Buena Vista, No data. Tarij (1): Villa Montes. No Data (2).

BRAZIL (1055). Amapá (4): Vila Velha. Amazonas (88): Benjamin Constante, Manaus, Reserva Ducke (26 km N Manaus), Rio Negro (14 km from Manaus), Rio Purus, São Paulo de Olivença, Tefé, No data. Espirito Santo (3): No data. Goias (10): Rio Araguaia. Mato Grosso (236): Maracaju, Rio Tapirape, Chapada, No data. Mato Grosso do Sul (2): Corumba. Minas Gerais (3): Passo Quatro, Viçosa. Pará (69): Belém, Itaituba, Mocojuba, Monte Alegre, Santarem, Obidos. Parana (12): Rolândia, No data. Rio de Janiero (15): Guapimirim, Rio de Janiero, No data. Rio Grande do Sul (27): Cochoeira, Pelotas, No data. Rondonia (50): Ariquemes (62 km S at Fazenda Rancho Grande), Porto Velho, Rio Madeira, No data. Santa Catarina (394): Corupa, Nova Teutonia (97°11' 52°23'), Rio Natal, Rio Vermelho, São Francisco, No data. São Paulo (78): Botucatu, Campinas, Caraguatatuba, Cipo, Cosmopolis, Cotia, Estrado Rio (km 47), Itanhaém, Itu, Mogi das Cruces, Pinhal, São Bernardo do Campo, São Paulo, São Jose dos Campos, Teodoro Sampaio. No Data (64).

COLOMBIA (24). Amazonas (20): Leticia. No Data: (4).

COSTA RICA (1). No Data (1).

FRENCH GUIANA (31). Cayenne (20): Cayenne, Roura (44 km SE), Tonate (6 km NW). Saint Laurent du Maroni (11): Maroni River, St. Jean.

GUYANA (9). Berbice (1): New Amsterdam. Demerara (2): Georgetown. Essequibo (3): Kanuku Mts., Rockstone. Rupununi (1): Rio Rupununi. No Data (2).

PARAGUAY (125). Alto Parana (3): No data. Alto Paraquay (1): Fuerte Olimpo. Amambay (1): Pedro Juan Caballero. Central (8): Aregua, Asuncion. Concepcion (7): Tagatiya. Guaíra (7): Villarrica. Itapuá (40): Encarnacion. La Cordillera (12): Caacupé, Caacupé (Inst. Agro. Nac.), SanBernadino. Paraguari (13): Parque Nacional Ybycuí, No data. San Pedro (1): San Pedro. No Data (32).

PERU (136). Huánuco (8): Rio Yuyapichi, Tingo Maria, Tingo Maria Tourist Hotel, Tournavista (on Rio Pachitea). Lima (2): No data. Loreto (122): Caballococha, Explorama Lodge (50-65 mi NNE Iquitos on Rio Amazonas), Iquitos, Middle Rio Ucayali, Rio Tapiche, Pucallpa, Yanamano, Yarina Cocha. Madre de Dios (1): Tambopato Wildlife Res. No Data: (3).

SURINAM (28). MAROWIJNE (1): Moengo. PARAMARIBO (17): Paramaribo. SAMARACCA (3): Groningen. SURINAME (6): Sint-Barbara. NO DATA (1).
TRINIDAD (13). Port of Spain (1), Talporo (3.3 mi SSW) (2), Valencia (1), No data (9).
URUGUAY (7). ARTIGAS (2): Tres Cruces. RIVERA (4): Tranqueras, Valle Platon. TACUAREMBÓ (1): Tacuarembó.
VENEZUELA (118). AMAZONAS (2): San Carlos de Río Negro. ARUGUA (2): Maracay. BOLIVAR (45): Between Upata and Guasipati, Rio Caura, Suapure, No data. DISTRITO FEDERAL (2): Caracas, Caracas Valley. MONAGAS (48): Barrancas (140 km NE), Maturin (60 km SE). ZULIA (14): Maracaibo. NO DATA: (5).
NO DATA (34).

Temporal Data. January (62), February (56), March (46), April (44), May (17), June (44), July (46), August (25), September (16), October (14), November (32), December (160).

Remarks. One Ohaus specimen at the ZMHB was labeled "Rutela lineola v. unicolor" and "type." This name does not appear in the literature and was evidently an unpublished manuscript name. This specimen is a black morphotype of *R. lineola*. *Rutela lineola hesperus* and *R. lineola ephippium* are treated as subspecies of *R. lineola* by Machatschke (1972). Although I have not examined types of these species, I believe that the wide range of variation in *R. lineola* encompasses all morphotypes including *R. lineola ephippium* and *R. lineola hesperus*. I treat these subspecies as synonyms of *R. lineola*.

Rutela lineola is the most commonly collected species in the genus and is found throughout tropical, lowland South America from Venezuela to Rio Chico, Argentina. There is a great amount of variation in dorsal pattern in the species. Variation ranges from elytra entirely black to elytra with limited tan maculae to elytra mostly tan (maculae originating at elytral base and extending to near the elytral apex) (Figs. 46-49). This range of variation is found in populations throughout the species' distribution and does not seem to be an indication of isolated subspecies.

Rutela lineola has been found defoliating flowers and leaves of *Acacia* sp. (Fabaceae), *Hibiscus* spp. (Malvaceae), *Luehea* sp. (Tiliaceae), *Passiflora* sp. (Passifloraceae), and various rosaceous plants (Araújo e Silva *et al.* 1968). Costa Lima (1953) reported *R. lineola* attacking *Mimosa sepiaria* Benth. (Fabaceae), *Luehea divaricata* Mart., *Acacia nigra* Clos., and *Rosa* sp. (Rosaceae). Adults also are known to defoliate a number of economically important plants including cacao (*Theobroma cacao* L., Sterculiaceae) (Remillet 1988 and label data) and cashew (*Anacardium occidentale* L., Anacardiaceae) (Araújo e Silva *et al.* 1968). Label data indicate that adults have been collected from *Senna* sp. (Fabaceae), *Piper* sp. (Piperaceae), *Hyptis brevipes* Poit. (Labitae), *Hibiscus tiliaceus* L. (Malvaceae), *Hibiscus sinensis* Mill. (Malvaceae), *Eryngium* sp. (Ulmaceae), *Sacrocephalus esculentus* Afzel (Rubiaceae), and *Psidium guajava* L. (Myrtaceae).

Adults and larvae have been observed breeding in rotting wood of *Inga* sp. (Fabaceae) although other wood sources are probably also used. Despite the seeming abundance and agricultural importance of this species, the immature stage has not been described.

Rutela pygidialis Ohaus
(Figs. 50, 112b; Map 1)

Rutela pygidialis Ohaus 1905: 310. Holotype male at ZMHB labeled a) "Panama," b) "*Rutela pygidialis* type Ohs" (red label, handwritten), c) my holotype label; male genitalia card mounted. One invalid, male type at ZMHB labeled a) "Colombie, Vallée de Cauca, M. de Mathan 1898," b) "*Rutela pygidialis* cotype Ohs," c) my "invalid type" label; male genitalia card mounted. One invalid female type at ZMHB labeled a) "Mexico, Veracruz," b) "*Rutela* female symbol *pygidialis* cotype Ohs," c) my "invalid type" label. See discussion under remarks for type designations.

Description. Length 13.2-15.8 mm. Width

7.5-9.4 mm. *Color*: (Fig. 50) Pronotum in male with disc black, margins tan or testaceous. Pronotum weakly shining, disc nearly black with margins reddish orange. Elytra reddish-orange, shining with a transverse, medial, black or nearly black macula. Ventral surface black with testaceous or cream-colored markings. Tergites laterally unicolorous, black. *Head:* Surface of frons basally moderately densely punctate, more densely punctate at apex and margins, basolaterally weakly strigate; punctures .01-.05 mm. Clypeus densely punctate basally to confluently punctate apically; punctures .02-.05 mm. Clypeal apex reflexed, bisinuate, beaded; bead incomplete at middle. Interocular width about 7.0 transverse eye diameters. *Pronotum:* Basal margin broadly rounded, lateral margin weakly rounded (Fig. 106e). Surface (male) moderately densely punctate, less dense at base and margins; punctures .02-.07 mm, small and moderate, mixed. Surface (female) moderately densely punctate (base and margins) to densely punctate (apex); punctures small and large mixed, .02-.10 mm. Bead complete anteriomedially. *Scutellum:* Slightly wider than length (width to length ratio equals 1.0:0.91). *Mesepimeron:* Base of mesepimeron exposed beyond elytral humerus. *Elytra:* Surface with weakly impressed, punctate, longitudinal striae; 1 next to suture, 3-4 mesad of humerus (inner striae may be poorly defined); punctures .02-.05 mm, shallow. Intervals moderately densely punctate, occasionally wrinkled; punctures .02-.05 mm. Sutural length about 3.6 times length of scutellum; apex weakly rounded, beaded, weakly divergent. *Propygidium:* Partially exposed or entirely hidden, surface densely punctate; punctures .01-.05 mm, setose; setae minute, tawny. *Pygidium:* Length about 2.5 times length of propygidium. In lateral view evenly convex. Surface of disc with shallow, vermiform, setose strigae; strigae becoming semicircular toward apex; setae of disc short, tawny, decumbant, moderately dense. Apex with strigae less impress. Margin with setose strigae; setae moderately long, tawny, sparse. Apical margin (male) weakly sinuate; female broadly rounded, not appreciably produced, external edges broadly quadrate. *Venter:* Mesometasternal keel in ventral view at apex acuminate, apex blunt, produced to insertion or middle of prosternal keel; ventral surface flat (female) or weakly deflexed (male) in lateral view. Sternites 1-4 subequal in length; sternite 5 about 2 times as long as 4; sternite 6 of male 1.5 times length of 4 , sternite 6 of female 2 times length of 4. Last sternite of female at subapex weakly sinuate. Last sternite of male truncate, beaded, surface weakly strigate. *Legs:* Protibia with 3 teeth equally separated in apical third of tibia, basal tooth slightly removed. Mesotibia widest at basal 1/3, external edge with weak apical carina (obsolete in male), basal carina nearly obsolete; apex with medial tooth produced to apex of first tarsomere or base of second tarsomere; 1-2 spinulae laterad of inner spurs, 1-2 spinulae laterad of medial tooth; claws of female with external claw about 1.5 times as thick and 1.5 times as wide as inner claw. Metatibia widest at middle; external edge with basal and apical carina (more pronounced in female); apex with corbel (male) produced to near apex of first tarsomere; inner, apical spur of female robust. *Metatrochanter:* Posterior border not produced beyond posterior border of femur. *Parameres:* Fig. 112b.

Diagnosis. Based on dorsal color pattern, *R. pygidialis* could be confused with females of *R. sanguinolenta sanguinolenta* and *R. cryptica*. In both males and females of *R. pygidialis* the elytra are reddish orange with a black, transverse band from mid-disc to near the apex. Some females of *R. cryptica* and *R. sanguinolenta sanguinolenta* also have this elytral pattern, but *R. pygidialis* can be separated based on the posterior border of the metatrochanter which is not produced in *R. pygidialis* (the metatrochanter is weakly produced in *R. cryptica* and *R. sanguinolenta sanguinolenta*). Male genitalia are identical to *R. dimorpha*, but *R. pygidialis* is recognized by the dorsal color pattern (in *R. dimorpha* the elytra are black with a tan macula from the base to mid-disc).

Distribution. Pacific side of Costa Rica, northwestern Panama and Chocó and Cauca Valley regions of Colombia. Recorded from 200-1,500 meters elevation.

Locality Data (Map 1). 66 specimens examined from BCRC, BMNH, CASC, CMNH, CNCI, INBC, DJCC, FSCA, MNHN, MUCR, ZMHB, ZSMC, USNM.

COLOMBIA (20). CAUCA (16): Valle de Cauca. CHOCO (1): Quibdo (15 km E). VALLE (2): Buenaventura, Rio Dagua. NO DATA (1).
COSTA RICA (45). ALAJUELA (1): Alajuela. CARTAGO (2): Turrialba. GUANACASTE (9): Dos Tilaran, Parque Nacional Guanacaste (Estacion Maritza), Parque Nacional Guanacaste (Sector Maritza), Parque Nacional Rincon de la Vieja (Estacion Paillas). HEREDIA (4): San Luis, San Rafael, Santo Domingo. PUNTARENAS (10): Bosque Esquinas (Osa Peninsula), Cerillos, El Rodeo, Estacion Biologica Las Alturas (Coto Brus), Puerto Cortes (10 mi NNW). SAN JOSE (8): La Caja, Parque Nacional Braulio Carrillo, Uruca, No data. NO DATA (11).
PANAMA (1). CHIRIQUI (1): No data.

Temporal Data. March (1), April (2), May (15), June (3), July (2), August (2), September (2), October (1), December (1).

Remarks. Two specimens of *R. pygidialis* (one male, one female at INBC) from the Osa Peninsula in Costa Rica lack the black, transverse, elytral band. In all other characteristics, these specimens are identical to *R. pygidialis*. The observed color variation may be indicative of isolation.

Rutela pygidialis exhibits a disjunct distribution. Specimens occur in Costa Rica and western-most Panama and also in the Chocó and Cauca Valleys of eastern Colombia. No specimens have been collected from central and eastern Panama. This disjunction may be a product of historical glacial advance and climate change in the isthmian region that caused isolation of a once contiguous historic population of *R. pygidialis*.

Male genitalia of *R. pygidialis* are identical to *R. dimorpha* (distributed in Ecuador). However, these species are easily separated by overall coloration, the lack of sexual dimorphism in *R. pygidialis*, and distribution. The fact that the male genitalia in *R. pygidialis* and *R. dimorpha* are identical is evidence for a close and probably recent divergence.

Natural history and larvae are not known for the species.

Rutela sanguinolenta Waterhouse
(Figs. 51-54, 112o, 114d-e; Map 1)

Rutela sanguinolenta Waterhouse 1874: 53. Holotype female housed at BMNH labeled a) "Type" (round, with red circle), b) "554," c) "67.45," d) "Rutela sanguinolenta C. Waterh. (*Type*)," e) "Rutela sanguinolenta C. Waterh. (type)" and on back, "Chalcentis go (illegible) Lap. Ocaña Nov. Gran.," f) my holotype label.

Rutela rufipennis Waterhouse 1874: 54. Holotype female at BMNH labeled a) "Type" (round, with red circle), b) "489," c) "67.45," d) "*Rutela rufipennis* Waterh. (Type) Colombia," e) my holotype label. **NEW STATUS.**

Diagnosis of the species. *Rutela sanguinolenta* includes two subspecies, *R. sanguinolenta sanguinolenta* and *R. anguinolenta rufipennis*. The subspecies have identical male genitalia but can be distinguished based on the posterior border of the metatrochanter that is weakly produced in *R. sanguinolenta sanguinolenta* (Fig. 114d) (not produced in *R. sanguinolenta rufipennis*, Fig. 114e), elytral pattern of the male (in *R. sanguinolenta sanguinolenta* the elytra are black with a reddish orange macula; in *R. sanguinolenta rufipennis* the elytra are entirely reddish-orange), elytral pattern of the female (in *R. sanguinolenta sanguinolenta* the elytra are either reddish orange with a central, transverse, black band or entirely reddish orange; in *R. sanguinolenta rufipennis* the elytra are entirely reddish-orange). *Rutela sanguinolenta sanguinolenta* is sexually dimorphic, and females are polymorphic; *Rutela*

sanguinolenta rufipennis is not sexually dimorphic and females are not polymorphic. The red female morphotypes of *R. sanguinolenta sanguinolenta* are separated from *R. sanguinolenta rufipennis* by the weakly produced posterior border of the metatrochanter (not produced in *R. sanguinolenta rufipennis*).

Distribution. Panama to Colombia.

Remarks. *Rutela sanguinolenta sanguinolenta* and *R. sanguinolenta rufipennis* are morphologically very similar, but the subspecies differ in the following features: sexual dimorphism in color pattern, body form robust or not, color pattern, and distribution. Because the distributions for the subspecies appear peripatric, and because genitalia are identical, it is reasonable to assume that the subspecies have not diverged enough to warrant species status.

Phylogenetic hypotheses based on weighted characters (Figs. 105c-e) and unweighted characters with redundant taxa filtered (Fig. 105b) demonstrate that *R. sanguinolenta sanguinolenta, R. sanguinolenta rufipennis, R. cryptica, R. dimorpha,* and *R. pygidialis* are a closely related, polytomous group. The strict consensus tree based on unweighted characters before redundant taxa were filtered (Fig. 105a) does not show that *R. sanguinolenta sanguinolenta* and *R. sanguinolenta rufipennis* are sister taxa. However, this relationship is based on taxonomically (rather than phylogenetically) useful characters. The identical form of the male genitalia in *R. sanguinolenta sanguinolenta* and *R. sanguinolenta rufipennis* indicates that these taxa are sister taxa.

Rutela sanguinolenta sanguinolenta Waterhouse, New Status

(Figs. 51-53, 112o, 114d; Map 1)

Rutela sanguinolenta Waterhouse 1874: 53. Holotype female at BMNH labeled a) "Type" (round, with red circle), b) "554," c) "67.45," d) "Rutela sanguinolenta C. Waterh. (*Type*)," e) "Rutela sanguinolenta C. Waterh. (type)" and on back, "Chalcentis go [illegible] Lap. Ocaña Nov. Gran.," f) my holotype label.

Description. Length 12.6-17.8 mm. Width 7.0-10.5 mm. *Color*: (Figs. 51-53) Sexually dimorphic. Pronotum with disc black, shining; margin with reddish orange macula. Elytra (male) shining black with reddish orange macula at base and extending to mid-disc, macula not extending to margin. Elytra dimorphic in female; entirely reddish orange or reddish-orange with a medial, transverse, black or nearly black band. Ventral surface black with testaceous or cream colored markings. Tergites laterally unicolorous, black. *Head:* Surface of frons moderately densely punctate, some confluent laterally, weakly strigate basolaterally; punctures .01-.05 mm. Clypeus (male) moderately densely punctate (at base) to confluently punctate medially and apically; female densely punctate (base) to confluently punctate; punctures .02-.05 mm. Clypeal apex reflexed, bisinuate, beaded; bead incomplete at middle. Interocular width about 6.0 transverse eye diameters. *Pronotum:* Basal margin broadly rounded, lateral margin weakly rounded (Fig. 106e). Surface moderately densely punctate, more dense apically; punctures of male .01-.03 mm; punctures of female larger at apex, .02-.07 mm. Bead complete anteriomedially. *Scutellum:* Slightly wider than length (width to length ratio equals 1.0:0.85). *Mesepimeron:* Base of mesepimeron exposed beyond elytral humerus. *Elytra:* Surface with weakly impressed, poorly defined, punctate, longitudinal striae; 1 next to suture, 2-4 mesad of humerus; punctures .02-.05 mm, shallow. Intervals between moderately densely punctate, some wrinkled; punctures .02-.05 mm. Surface laterad of humerus with punctures randomly placed; punctures .02-.05 mm. Sutural length about 4.0 times length of scutellum; apex weakly rounded, beaded, weakly divergent. *Propygidium:* Partially exposed or entirely hidden, surface densely punctate; punctures .01-.05 mm, setose; setae minute, blond. *Pygidium:* Length (at middle) about 2.5 times length of propygidium. In lateral view evenly convex.

Surface with shallow, vermiform, setose strigae (less striate at apex); strigae becoming semicircular toward apex; setae of disc minute, tawny, decumbant, moderately dense; setae at margin moderately long, tawny, sparse. Apex of male weakly sinuate; female broadly rounded, not appreciably produced, external edges narrowly quadrate. *Venter:* Mesometasternal keel in ventral view at apex acuminate, blunt, produced weakly beyond mesocoxae to (or before) insertion of prosternal keel; ventral surface flat (female) or weakly deflexed (male) in lateral view. Sternites 1-4 subequal in length; sternite 5 about 2.5 times as long as 4; sternite 6 of male 1.5 times length of 4 , about 2.5 times as long as 4 in female. Last sternite of female at subapex weakly sinuate, male truncate; beaded; surface weakly strigate. *Legs:* Protibia with 3 teeth equally separated in apical third of tibia, basal tooth slightly removed. Mesotibia with sides subparallel (male) or widest in basal 1/3 (female); external edge with weak apical and basal carinae (more pronounced in female); apex with medial tooth produced to apex of tarsomere 1 or to base of tarsomere 2, 1-2 spinulae laterad of inner spurs and 1-2 spinulae laterad of medial tooth; claws of female with external claw about 1.5 times as thick and 1.5 times as wide as inner claw. Metatibia widest at basal 1/3, external edge weak apical and basal carinae; apex with corbel (male) produced to apex of tarsomere 1; inner, apical spur of female robust. *Metatrochanter:* Posterior border weakly produced beyond posterior border of femur, lateral edges nearly parallel (Fig. 114d); apex rounded. *Parameres:* Fig. 112o.

Diagnosis of the subspecies. Elytral color pattern is sexually dimorphic in *Rutela sanguinolenta sanguinolenta*. Males possess a basal, reddish orange macula that extends to the mid-disc; females are also dimorphic and the elytra are either entirely reddish orange or are reddish orange with a transverse, medial, black band. *Rutela sanguinolenta sanguinolenta* is most easily confused with *R. cryptica*. Both species occur in Panama, both are sexually dimorphic, and the color patterns are nearly identical. *Rutela sanguinolenta sanguinolenta* is separated from *R. cryptica* by the apex of the mesometasternal keel that is less acuminate and the sides are not compressed before the apex (the keel is more acuminate and the sides are compressed before the apex in *R. cryptica*), the broad elytral macula in the male that extends to the basal third of the elytral disc (the male elytral macula is narrow and extends only to the mid-scutellum in *R. cryptica*), and by the form of the male genitalia. Based on dorsal color pattern, *Rutela sanguinolenta sanguinolenta* could also be confused with *R. pygidialis* or *R. dimorpha*, but *Rutela sanguinolenta sanguinolenta* differs by the posterior border of the metatrochanter that is weakly produced (not produced in *R. pygidialis* and *R. dimorpha*) and male genitalia. Females of *R. sanguinolenta sanguinolenta* are separated from *R. pygidialis* by the weakly produced posterior border of the metatrochanter (not produced in *R. pygidialis*).

Distribution. Central and eastern Panama and northwestern Colombia. Recorded from elevations ranging from 230-1,219 meters.

Locality Data (Map 1). 171 specimens examined from ARGC, BCRC, BMNH, CASC, CMNH, CNCI, DCCC, EGRC, JEWC, FMNH, FSCA, HAHC, JPHC, LAGO, MCZC, MNHN, SEMC, UNSM, USNM.

COLOMBIA (18). MAGDALENA (8): El Pueblito, NW Sierra de Santa Marta. NO DATA (10). **PANAMA** (153). CANAL ZONE/PANAMA (87): Achiote Road, Barro Colorado Island, Cocoli, Fort Kobbe, Fort San Lorenzo (2 km SW), Galeta Island, Gamboa, La Pita Signal Station Road, Madden Forest Preserve, Parque Nacional Metropolitano, Margarita, Puna Vacamonte, Rodman Ammo Dump, Summit Gardens, Tabernilla. COCLÉ (12): El Vallé. Colón (4): Fort Sherman (1 km NW Pavon Hill). DARIEN (3): Carretera Interamericana at Rio Cañazas. PANAMA (45): Cerro Campana, Cerro Jefe, El Llano (8 to 18 km N), El Llano-Carti Road (kms 7 to 18). NO DATA (2).

Temporal Data. April (3), May (122), June (14), July (8), August (1).

Remarks. Females of *R. sanguinolenta sanguinolenta* are dimorphic; elytra are either entirely reddish orange or reddish orange with a central, transverse black band. Within a single population, both morphotypes are found at approximately the same frequency. One sample (28 males, 12 females from "Panama: Canal Zone, K-1 rd, nr Fort Kobbe, V-19-80, Riley and LeDoux," at EGRC) showed that the morphotype ratio was one to one.

Rutela sanguinolenta rufipennis is distributed on the periphery of the range of *R. sanguinolenta sanguinolenta* (western-most Panama [Chiriqui Valley] and in the Magdalena Valley and Santa Marta regions in Colombia). This distributional pattern may be indicative of intersubspecific interactions or it could be a product of the historical distribution of the taxa.

Rutela sanguinolenta sanguinolenta and *R. sanguinolenta rufipennis* possess identical male genitalia but differ in sexual dimorphism (present in *R. sanguinolenta sanguinolenta*, lacking in *R. sanguinolenta rufipennis*) and overall coloration. The shared form of the male genitalia probably indicate recency of ancestry. The strict consensus tree based on unweighted characters before redundant taxa were filtered (Fig. 105a) does not demonstrate that *R. sanguinolenta sanguinolenta* and *R. sanguinolenta rufipennis* are sister taxa. Instead, it shows that *R. sanguinolenta sanguinolenta* and *R. cryptica* are sister taxa. In my view, this relationship is erroneous and is based on taxonomically useful (rather than phylogenetically useful) characters and overall similarity.

Rutela sanguinolenta sanguinolenta feeds on the foliage of *Inga* spp. (Fabaceae) and *Sterculia glauca* Gentry (Sterculiaceae) (personal observation and label data) where it has been observed with *Microrutela viridiaurata* (Bates). Feeding damage on *Sterculia* showed that adults avoid feeding on leaf veins and the edge of the leaf. I have also observed *Rutela sanguinolenta sanguinolenta* feeding on the young leaves of *Inga cocleensis* Pittier (Fabaceae) where feeding damage follows the same pattern (see cover of monograph).

Label data indicate that *R. sanguinolenta sanguinolenta* has been collected at light, however this is probably incidental. Larvae are not known for the species.

Rutela sanguinolenta rufipennis Waterhouse, New Status

(Figs. 54, 112o, 114e; Map 1)

Rutela rufipennis Waterhouse 1874: 54. Holotype female at BMNH labeled a) "Type" (round, with red circle), b) "489," c) "67.45," d) "*Rutela rufipennis* Waterh. (Type) Colombia," e) my holotype label. **NEW STATUS.**

Description. Length 12.8-15.5 mm. Width 7.1-8.2 mm. *Color*: (Fig. 54) Pronotum with disc black, shining; margin with reddish orange macula. Elytra shining, reddish orange. Ventral surface black with testaceous or cream colored markings. Tergites laterally unicolorous, black. *Head:* Surface of frons moderately densely punctate, more dense apically and laterally, basolaterally strigate; punctures .01-.05 mm. Clypeus densely punctate (at base) to confluently punctate medially and apically; punctures .02-.05 mm. Clypeal apex reflexed, bisinuate, beaded; bead incomplete at middle. Interocular width about 6.0 transverse eye diameters. *Pronotum:* Basal margin broadly rounded, lateral margin weakly rounded (Fig. 106e). Surface moderately densely punctate, less dense at base; punctures large (.02-.07 mm), and minute, mixed. Bead complete anteriomedially. *Scutellum:* Slightly wider than length (width to length ratio equals 1.0:0.85). *Mesepimeron:* Base of mesepimeron exposed beyond elytral humerus. *Elytra:* Surface with punctate, longitudinal striae (not impressed); 1 next to suture, 4 mesad of humerus, 2-3 laterad of humerus; punctures .02-.05 mm. Intervals between stria 1 and 2 fairly broad, moderately densely punctate; punctures .02-.05 mm. Intervals mesad of humerus narrow, not evenly spaced, punctures moderately

dense, punctures .02-.05 mm. Sutural length about 4.0 times length of scutellum; apex weakly rounded, beaded, weakly divergent. *Propygidium:* Partially exposed or entirely hidden, surface densely punctate; punctures .01-.05 mm, setose; setae minute, tawny. *Pygidium:* Length (at middle) about 2.5 times length of propygidium. In lateral view evenly convex. Surface (except at apex) with shallow, vermiform, setose strigae; strigae becoming semicircular toward apex; discal setae minute, tawny, decumbant, moderately dense; setae at margin moderately long, tawny, sparse. Surface at apex punctate, some transverse; punctures .03-.10 mm. Apex of male weakly sinuate; female broadly rounded, not appreciably produced, external edges narrowly quadrate. *Venter:* Mesometasternal keel in ventral view at apex acuminate, blunt, produced weakly beyond mesocoxae to (or before) insertion of prosternal keel; ventral surface flat (female) or weakly deflexed (male) in lateral view. Sternites 1-4 subequal in length; sternite 5 about 2.5 times as long as 4; sternite 6 of male 1.5 times length of 4 , about 2.5 times as long as 4 in female. Last sternite of female at subapex weakly sinuate, male truncate; beaded; surface weakly striate. *Legs:* Protibia with 3 teeth equally separated in apical third of tibia, basal tooth slightly removed. Mesotibia with sides widest in basal 1/3; external edge with weak apical and basal carinae (more pronounced in female); apex with medial tooth produced to apex of tarsomere 1 or to base of tarsomere 2, 1-2 spinulae laterad of inner spurs and 1-2 spinulae laterad of medial tooth; claws of female with external claw about 1.5 times as thick and 1.5 times as wide as inner claw. Metatibia widest at basal 1/3, external edge weak apical and basal carinae; apex with corbel (male) produced to apex of tarsomere 1; inner, apical spur of female robust. *Metatrochanter:* Posterior border not produced beyond posterior border of femur (Fig. 114e). *Parameres:* Fig. 112o.

Diagnosis of the subspecies. *Rutela sanguinolenta rufipennis* is separated from *R. sanguinolenta sanguinolenta* by the non-produced posterior border of the metatrochanter (Fig. 114e) (in *R. sanguinolenta sanguinolenta* the posterior border of the metatrochanter is weakly produced) and by the elytra that are entirely reddish orange in both sexes (in *R. sanguinolenta sanguinolenta*, male elytra are black with a reddish orange macula that extends from the base to mid-disc, female elytra are either entirely reddish orange or reddish orange with a transverse, medial black band). Male genitalia are identical to those of *R. sanguinolenta sanguinolenta*.

Distribution. Northwestern Panama and the Magdalena Valley and Santa Marta area in northern Colombia. Recorded from 1,400 meters elevation.

Locality Data (Map 1). 21 specimens examined from AMNH, CMNH, FMNH, MCZC, MNHN, USNM, ZMHB, ZSMC.

COLOMBIA (19). CUNDIMARCA (11): Bogota, Gananche, No data. MAGDALENA (1): Santa Marta. SANTANDER (3): Landazuri, Velez. NO DATA (4).
PANAMA (2). CHIRIQUI (2): Valle de Chiriqui, No data.

Temporal Data. April (3), October (1), December (1).

Remarks. *Rutela sanguinolenta rufipennis* occurs in western-most Panama (Chiriqui Valley), is absent in central and eastern Panama, and is found in the Magdalena Valley and Santa Marta regions in Colombia. The disjunct distribution may be due to intersubspecific interactions with *R. sanguinolenta sanguinolenta* (populations of which occur in the middle of the range of *R. sanguinolenta rufipennis*) or due to glacial advance and climate change in the isthmian region that caused isolation of a once contiguous historic population of *R. pygidialis*.

Rutela sanguinolenta rufipennis and *R. sanguinolenta sanguinolenta* have identical male genitalia but differ in sexual dimorphism

(lacking in *R. sanguinolenta rufipennis*, present in *R. sanguinolenta sanguinolenta*) and overall coloration. Distributional data for *R. sanguinolenta rufipennis* is scanty but, based on the available data, *R. sanguinolenta rufipennis* appears to be distributed at the edge of the range of *R. sanguinolenta sanguinolenta* in Panama and perhaps is sympatric or peripatric with *R. sanguinolenta sanguinolenta* in northern Colombia.

Natural history and larvae are not known for the species.

Rutela striata (Olivier)

(Figs. 55-56, 112p-q, 113a-b; Map 2)

Cetonia striata Olivier 1789: 79. Holotype male at MNHN in the Olivier collection labeled a) "100. Rut., *R. striata* Am. mer.," b) my holotype label adjacent to the specimen. Neotype (invalide) at IREC designated by Chalumeau (1985) labeled a) "Guadeloupe, St-Sauveur 1.I.'72 Chal.," b) "*Rutela s. striata* (Ol.) Dés F. Chalumeau '80," c) "Neotype" (red label).

Rutela lineaticollis Dejean 1833: 105. (nomen nudum) cited in Chalumeau (1983).

Rutela guadulpensis Laporte 1840: 120. Types not located.

Rutela marginicollis Laporte 1840: 120. Types not located.

Rutela antiqua Ohaus 1922: 325. Holotype male at ZMHB with labels a) "Venezuela, Carupano" (handwritten), b) "Rutela antiqua type Ohs." (handwritten, red label), c) "Holotype Rutela antiqua Ohaus male symbol det. M.L. Jameson 1994" here designated; male genitalia card mounted. Moved to *Rutela striata antiqua*: **NEW STATUS.**

Rutela striata martinicensis Chalumeau and Gruner 1976: 105. Holotype male labeled "Diamant 1-IV-73 (Baraud)." Allotype female labeled "Morne-des-Cadets 11-VII-73 (Cambefort)." Both at IREC. One male paratype at BMNH labeled "Martinique, a Precheûr, 12-8-1973." **NEW SYNONYMY.**

Diagnosis of the species. *Rutela striata* is easily separated from other species in the genus based on its overall dark brown, costate or subcostate elytra; incomplete anteriomedial pronotal bead; laterally bicolored tergites; and male genitalia.

Distribution. Lesser Antilles Islands. Recorded from Guadeloupe and Montserrat (*R. striata striata*) and Martinique and St. Lucia (*R. striata antiqua*).

Remarks. Chalumeau and Gruner (1976) created two subspecies for populations of *R. striata*. Populations distributed in Guadeloupe and Montserrat are *R. striata striata*, and populations in Martinique and St. Lucia are *R. striata antiqua*.

Populations of *R. striata striata* and *R. striata antiqua* are separated by the island of Dominica. Cartwright and Chalumeau (1978), in their survey of the Scarabaeoidea of Dominica, make no mention of *Rutela* on the island.

Results of the phylogenetic analysis indicate that *R. striata striata* and *R. striata antiqua* are sister taxa.

Rutela striata striata (Olivier)

NEW STATUS

(Figs. 55, 112p, 113a; Map 2)

Cetonia striata Olivier 1789: 79. Holotype male MNHN in the Olivier collection labeled a) "100. Rut., R. striata Am. mer.," b) my holotype label adjacent to the specimen, "Holotype. Cetonia striata Olivier male symbol. M. L. Jameson 1994." Invalid neotype designated by Chalumeau (1985) at IREC labeled a) "Guadeloupe, St-Sauveur 1.I.'72 Chal.," b) "Rutela s. striata (Ol.) Dés F. Chalumeau '80," c) "Neotype" (red label).

Rutela guadulpensis Laporte 1840: 120. Types not located.

Rutela marginicollis Laporte 1840: 120. Types not located.

Description. Length 14.6-18.1 mm. Width 7.2-8.9 mm. *Color*: (Fig. 55) Pronotum shining dark brown, margin with testaceous or tan markings extending onto disc. Elytra

shining dark brown, costate. Ventral surface dark brown and/or reddish brown with tan or testaceous markings. Tergites laterally bicolored; dark brown with testaceous or tan markings. *Head:* Frons moderately densely punctate, more dense apically and laterally; punctures .01-03 mm. Clypeus in male moderately densely punctate (disc), more densely punctate laterally and apically; punctures .01-.03 mm. Clypeus in female moderately densely punctate (base) to confluently punctate (apex and sides), disc less punctate; punctures .01-.05 mm. Clypeal apex bisinuate, reflexed, weakly beaded; bead incomplete at middle apex. Interocular width about 4.0 transverse eye diameters. *Pronotum:* Form of pronotum basomedially (anterior to scutellum) weakly arcuate, basolaterally feebly angled anteriorly (Fig. 106a). Surface moderately densely punctate; punctures .01-.05 mm, larger punctures more dense laterad of midline. Bead incomplete anteriomedially. *Scutellum:* Width about equal to length. *Mesepimeron:* Base of mesepimeron approximately even with base of elytral humerus. *Elytra:* Surface subcostate with furrowed, punctate striae; 1 next to the suture, 4 on the disc, and 4-5 (more obscure) laterad of the humerus. Interval between striae 1 and 2 broad, moderately densely punctate; punctures .05-.08 mm, weakly umbilicate or longitudinal; intervals between stria 2 and margin narrow, sparsely punctate. Sutural length about 2.25 times length of scutellum; apex weakly rounded, beaded, weakly divergent, lacking apical tooth. *Propygidium:* Partially exposed or not, surface moderately densely punctate; punctures .01-.05 mm. *Pygidium:* Length (at middle) about 2 times length of propygidium. In lateral view somewhat flat before rounded apex. Surface closely strigulate at base, striae forming concentric circles toward apex (male) or semicircles (female); apex and margin with scattered setae; setae short to medium in length, tawny. Apex in female weakly produced, rounded. *Venter:* Mesometasternal keel in ventral view at apex broadly acuminate, produced to middle or apex of prosternal keel (Fig. 113a); ventral surface flat or weakly reflexed in lateral view. Sternites 1-4 subequal in length; sternites 5-6 about 1.5 times as long as 4. Last sternite of female and male at subapex quadrately emarginate; subapex with scattered setose punctures; setae medium in length, tawny; surface with weak vermiform striae. *Legs:* Protibia with 3 teeth equally separated in apical third to fourth of tibia; basal tooth more removed in female. Mesotibia with sides subparallel, external edge with nearly obsolete apical and basal carinae; apex with medial tooth produced to middle or apex of tarsomere 1; claws of female with external claw slightly thicker and slightly wider than inner claw. Metatibia with sides subparallel, external edge with weak apical and basal carinae (more pronounced in female); apex with corbel (male) produced to apex of tarsomere 1; inner, apical spur in female not robust. *Metatrochanter:* Posterior border not produced beyond posterior border of femur. *Parameres:* Fig. 112p.

Diagnosis of the subspecies. *Rutela striata striata* is separated from *R. striata antiqua* by the elytral punctation that is more costate in *R. striata striata* (less costate in *R. striata antiqua*) and by the apex of the mesometasternal projection that is broadly acuminate (very acuminate with the margins compressed at the sub-apex in *R. striata antiqua*). Male genitalia of *Rutela striata striata* and *R. striata antiqua* are similar, but the parameres of *R. striata striata* are less elongate and more symmetrical.

Distribution. Guadeloupe and Montserrat in the French West Indies (Chalumeau 1985). There are no elevational records.

Locality records (Map 2). 88 specimens examined from AMNH, BMNH, CASC, CNCI, FMNH, FREY, FSCA, HAHC, MCZC, MNHN, MTEC, USNM, ZMHB, ZSMC.

GUADELOUPE (86). Des Bonnes (1), Deshaies (6), Grand Fond (1), Goyave (8 km W) (9), Ilet Kahouanne (2), La Désirade (2), Le

Moule (1), Les Saintes (1), Trois Rivieres (6), No data (57).
NO DATA (2).

Temporal Data. March (2), April (4), May (10), June (5), September (1), October (1), November (1), December (1).

Remarks. Laporte (1840) described *R. marginicollis* and *R. guadelupensis*, both of which are from Guadeloupe. Although neither Chalumeau (1985) nor I have examined types of these species (types were not located), it is likely that both are synonyms of *R. striata striata*.

There are fairly substantial seasonal and host plant information for *R. striata striata* in Guadeloupe. In January, *R. striata striata* is found in relatively low numbers on the flowers of mango (*Mangifera indica* L.) (Anacardiaceae) as well as *Sloanea massoni* Swartz (Elaeocarpaceae) (Chalumeau 1985). In March and April, adults are found on mango, *Chrysobalanus icaco* L. (Chrysobalanaceae), and *Inga dulcis* Mart. (Fabaceae) (Paulian 1947). In October and November adults are found on *Cassia* sp. (Fabaceae).

Larvae are not described, but Chalumeau (1985) reported that larvae feed on the wood of *Tabebuia pallida* Miers (Bignoniaceae), *Simarouba amara* Aubl. (Simaroubaceae), *Mangifera indica* L. (Anacardiaceae), and *Artocarpus* sp. (Urticaceae). Chalumeau (1985) reported adults and pupae from Iles Bay in Montserrat (May 28, 1982) on decaying logs of what was probably *Conocarpus erecta* L. (Combretaceae).

Elevational records are lacking for *R. striata striata*, but Chalumeau and Gruner (1976) and Chalumeau (1977, 1983) reported that adults live up to 900 meters elevation in Guadeloupe.

Rutela striata antiqua Ohaus, New Status
(Figs. 56, 112q, 113b; Map 2)

Rutela antiqua Ohaus 1922: 325. Holotype male at ZMHB with labels a) "Venezuela, Carupano" (handwritten), b) "*Rutela antiqua* type Ohs." (handwritten, red label), c) "Holotype *Rutela antiqua* Ohaus male symbol det. M.L. Jameson 1994;" male genitalia card mounted. **NEW STATUS.**

Rutela lineaticollis Dejean 1833: 105. (*nomen nudum*) cited in Chalumeau (1983).

Rutela striata martinicensis Chalumeau and Gruner 1976: 105. Holotype male at IREC labeled "Diamant 1-IV-73 (Baraud)." Allotype female at IREC labeled "Morne-des-Cadets 11-VII-73 (Cambefort)." One male paratype at BMNH labeled "Martinique, a Precheûr, 12-8-1973." **NEW SYNONYMY.**

Description. Length 17.4-21.7 mm. Width 8.0-10.4 mm. *Color*: (Fig. 56) Pronotum shining dark brown or reddish-brown, margin with testaceous or tan markings. Elytra shining dark brown or reddish brown, subcostate. Ventral surface dark brown or reddish brown with tan or testaceous markings. Tergites laterally bicolored; dark brown or reddish brown with tan or testaceous markings. *Head:* Frons moderately densely punctate (disc) to densely punctate (apically and laterally); punctures .01-05 mm. Clypeus in male moderately densely punctate (base) to densely or confluently punctate (apex); punctures .01-.05 mm. Clypeus in female densely punctate (base) to confluently punctate (disc, apex, and sides); punctures .01-.05 mm. Clypeal apex bisinuate, weakly reflexed, beaded; bead incomplete at middle apex. Interocular width about 4.0 transverse eye diameters. *Pronotum:* Form of pronotum basomedially (anterior to scutellum) weakly arcuate, basolaterally feebly angled anteriorly (Fig. 106a). Surface laterad of midline densely punctate, some confluent; surface at base and margin moderately densely punctate; punctures .01-.07 mm. Bead incomplete anteriomedially. *Scutellum:* Width about equal to length. *Mesepimeron:* Base of mesepimeron approximately even with base of elytral humerus. *Elytra:* Surface subcostate with weakly furrowed, punctate striae; 1 next to the suture, 4 on the disc, and 3-4 feebly punctate striae laterad of the humerus. Interval between striae 1 and 2 broad, with moderately

dense punctures; punctures somewhat umbilicate, shallow, .05-.08 mm; intervals between stria 2 and margin narrow, sparsely punctate. Sutural length about 2.25 times length of scutellum; apex weakly rounded, beaded, weakly divergent, lacking apical tooth. *Propygidium:* Partially exposed or not, surface moderately densely punctate; punctures .01-.05 mm. *Pygidium:* Length (at middle) about 2 times length of propygidium. In lateral view somewhat flat before rounded apex. Surface closely strigulate at base, strigae forming concentric circles toward apex (male) or semicircles (female); apex and margin with scattered setae; setae short to medium in length, tawny. Apex in female weakly produced, rounded. *Venter:* Mesometasternal keel in ventral view at apex acuminate, produced to middle or apex of prosternal keel; sides compressed at sub-apex (Fig. 113b); ventral surface flat or weakly reflexed in lateral view. Sternites 1-4 subequal in length; sternites 5-6 about 1.5 times as long as 4. Last sternite of female and male at subapex quadrately emarginate; subapex with scattered setose punctures; setae medium in length, tawny; surface with weak vermiform striae. *Legs:* Protibia with 3 teeth equally separated in apical third to fourth of tibia; basal tooth more removed in female. Mesotibia with sides subparallel, external edge with nearly obsolete apical and basal carinae; apex with medial tooth produced to middle or apex of tarsomere 1; claws of female with external claw slightly thicker and slightly wider than inner claw. Metatibia with sides subparallel, external edge with weak apical and basal carinae (more pronounced in female); apex with corbel (male) produced to apex of tarsomere 1 or middle of tarsomere 2; inner, apical spur in female not robust. *Metatrochanter:* Posterior border not produced beyond posterior border of femur. *Parameres:* Fig. 112q.

Diagnosis of the subspecies. *Rutela striata antiqua* is distinguished from *R. striata striata* by the reduced elytral punctation and subcostate elytra (elytral punctures and costae more pronounced in *R. striata striata*) and by the apex of the mesometasternal keel that is more acuminate apically with the margins compressed at the sub-apex (mesometasternal keel less acuminate in *R. striata striata* and margins not compressed at the sub-apex). The male genitalia of both subspecies are similar, but the parameres of *R. striata antiqua* are slightly more elongate and asymmetrical than those of *R. striata striata.*

Distribution. Lesser Antilles Islands of Martinique and St. Lucia. No recorded elevations.

Locality records (Map 2). 24 specimens examined from AMNH, BMNH, CASC, MCZC, MNHN, USNM, ZMHB.

MARTINIQUE (19). Diamante (1), Fort de France (1), Le Prêcheur (1), No data (16).
ST. LUCIA (3). No data (3).
NO DATA (2).

Temporal Data. April (1), June (2), July (2), August (1), December (1).

Remarks. In his description, Ohaus (1922) noted that *R. antiqua* was similar to *R. striata.* He separated the two species based on the margin of the pronotum which, in the holotype, is reddish yellow (whereas in *R. striata* the margin is normally tan or yellow). I believe that the color observed in the holotype of *R. antiqua* is probably an artifact of preservation or because the specimen was teneral. Other characters of the holotype (reduced elytral punctation, the acuminate meso-metasternal keel, and the asymmetrical parameres are identical to characters found in *R. s. martinicensis.* I believe that these taxa are conspecific, and *Rutela antiqua* has nomenclatural priority over *R. striata martinicensis.*

There is little natural history known for this subspecies. Chalumeau (1985) reported larvae in *Inga* sp. (Fabaceae). The larvae have not been described.

Rutela tricolorea Ohaus
(Figs. 57-58, 112r-s; Map 3)

Rutela tricolorea Ohaus 1905: 310. Male lectotype at ZMHB labeled a) "Brazil," b) "Typus!" (red label, typed), c) "Rutela tricolorea Ohaus" (red label, handwritten), d) my lectotype label; male genitalia card mounted. Lectoallotype female at ZMHB labeled a) "Brazil," b) "Rutela tricolorea cotype Ohs. female symbol," c) my lectoallotype label; mouthparts card mounted. Six paralectotypes (three females, three males) at ZSMC with collecting data: "Valencia, Venez.," "Venez., Caracas;" "Venez., P. Cabello, Starke S.;" and two specimens labeled "Columbia" (sic); all with cotype labels "Rutela tricolorea Ohs. cotype;" all with my paralectotype labels.

Description. Length 12.9-18.1 mm. Width 7.0-9.9 mm. *Color*: (Figs. 57-58) Pronotum shining dark reddish brown ; testaceous or tan longitudinal macula at midline and at margin. Elytra shining dark reddish brown mixed with castaneous; testaceous or tan macula on disc and/or margin. Ventral surface dark reddish brown mixed with castaneous and with testaceous or tan markings. Tergites laterally bicolored; dark reddish brown and/or castaneous with testaceous or tan maculae. *Head:* Surface of frons moderately, densely punctate; punctures .01-.05 mm, some transverse at base. Clypeus densely punctate, occasionally confluently punctate (middle to apex of clypeus); punctures .01-.05 mm. Clypeal apex bisinuate, reflexed, beaded; bead incomplete or complete at middle. Interocular width about 5.4 transverse eye diameters. *Pronotum:* Form of pronotum basomedially (anterior to scutellum) straight, basolaterally feebly angled anteriorly (Fig. 106a). Surface at base, margins, and at midline moderately densely punctate; punctures .01-.04 mm; surface at midline and at margin (tan or testaceous areas) moderately densely punctate; punctures .02-.07 mm. Bead incomplete anteriomedially. *Scutellum:* Width about equal to length. *Mesepimeron:* Base of mesepimeron exposed beyond elytral humerus. *Elytra:* Surface with faintly impressed punctate rows of longitudinal striae; 1 next to suture, 3-4 mesad of humerus; 2-5 laterad of humerus (poorly defined); punctures .01-.04 mm, shallow. Interval between striae 1 and 2 broad, moderately densely punctate; punctures .01-.04 mm. Intervals between striae 2 and 5 narrow, some with transverse wrinkles or sparse punctures; punctures .01-.03 mm. Intervals laterad of humerus poorly defined. Sutural Length about 3.5 times length of scutellum; apex weakly rounded, beaded, weakly divergent, without apical, spiniform tooth. *Propygidium:* Partially exposed, surface moderately densely punctate; punctures .01-.05 mm. *Pygidium:* Length (at middle) about 2.2 time length of propygidium. In lateral view evenly convex. Surface with shallow, vermiform strigae; strigae becoming semicircular at apex. Margin with a few setose punctures; setae medium in length, tawny. Apex of female weakly produced, weakly acute. *Venter:* Mesometasternal keel in ventral view at apex broadly rounded, produced to middle or insertion of prosternal keel; ventral surface flat in lateral view. Sternites 1-4 subequal in length; sternite 5 about twice as long as 4 (male); sternite 6 (male) subequal in length to sternite 4; sternites 5-6 a little longer than sternite 4 in female. Last sternite of male and female at subapex quadrate; surface weakly striate. *Legs:* Protibia with 3 teeth equally separated in apical third of tibia. Mesotibia widest at middle, external edge with weak apical and basal carinae; apex with medial tooth produced to middle or apex of tarsomere 1, 1 spinula laterad of inner spurs, 1 and occasionally 2 spinulae laterad of medial tooth; claws of female with external claw about 1.5 times as thick and 1.5 times as wide as inner claw. Metatibia widest at middle, external edge with weak apical and basal carinae; apex with corbel (male) produced to apex or middle of tarsomere 1; inner, apical spur (female) not robust. *Metatrochanter:* Posterior border not produced beyond posterior border of femur. *Parameres:* Figs. 112r-s.

Diagnosis. *Rutela tricolorea* could be confused with darker morphotypes of *Rutela histrio*, but it is recognized by the finer punctation of the pronotum and elytra (punctation more coarse in *R. histrio*), the subacute pygidial apex of the female (rounded in *R. histrio*), and male genitalia. *Rutela tricolorea* is also similar to *R. lineola* but is separated by the non-produced posterior border of the metatrochanter [in *R. lineola* the posterior border of the metatrochanter is produced with a spur-like apex (male) or rounded apex (female)] and male genitalia.

Distribution. Northwestern South America. Recorded from 670-1,160 meters elevation.

Locality records (Map 3). 100 specimens examined from AMNH, AVEC, BMNH, CASC, CMNH, FMNH, FREY, HAHC, LACM, MCZC, MNHN, USNM, ZSMC.

BRAZIL (18). AMAZONAS (1): São Paulo de Olivença. NO DATA (17).
CENTRAL AMERICA (1). NO DATA.
COLOMBIA (11). TOLIMA (1): Ibague. NO DATA (10).
FRENCH GUIANA (2). CAYENNE (2): Cayenne.
GUYANA (1). NO DATA.
SURINAM (1). NO DATA.
PERU (4). LORETO (1): Iquitos. SAN MARTIN (1): Tarapoto. NO DATA (2).
VENEZUELA (44). ARAGUA (2): Maracay, Maracay (20 km N at Portochuelo Pass). CARABOBO (4): Puerto Cabello, San Esteban, Valencia. DISTRITO FEDERAL (17): Caracas, Caracas Valley, Maiguetía. MERIDA (1): Merída. TACHIRA (1): San Cristobal (12 km SE). ZULIA (1): Maracaibo. NO DATA (18).
NO DATA (18).

Temporal Data. April (3), May (3), June (1), July (1), September (1).

Remarks. Ohaus (1905: 311) described *R. tricolorea* from "Venezuela, Caracas, Valencia; Columbien; Peru, Iquitos; Brasilien, S. Paulo d'Olivença." Types with label data from Peru and São Paulo d'Olivença were not located, and other paralectotypes may remain to be discovered.

Rutela tricolorea is distributed in northwestern of South America. Ohaus' records from Peru and Brazil may be in error as well as the label data from the lectotype and lectoallotype ("Brazil"). Additional specimens are needed in order to fully understand the distribution of this species. I have seen one specimen labeled "Surinam" and two (lecto- and lectoallotypes) labeled "Brazil". Given the paucity of locality information for this species, it is difficult to assess its true distribution. Only two specimens of *R. tricolorea* were collected since 1950.

Natural history and larvae are unknown for the species.

Rutela versicolor Latreille
(Figs. 59, 112t; Map 4)

Rutela versicolor Latreille 1833: 62. Type not located.

Rutela tricolor Guerín 1839: 55-56. Holotype male at MNHN labeled a) "Tricolor Guérin, Perou, type" (handwritten), b) "Ex. Musaeo Van Lansberge," c) "Muséum Paris ex. coll. R. Oberthür 1952," d) "Rutela tricolor Guérin male symbol Holotype det. M. L. Jameson 1994" (red label), e) "Rutela versicolor Latreille, det. M. L. Jameson 1994."

Description. Length 13.8-18.9 mm. Width 6.9-9.9 mm. *Color*: (Fig. 59) Pronotal disc chestnut brown with lateral testaceous stripe extending from apex to base, margin tan or testaceous. Elytra shining testaceous brown; suture and margin testaceous (female) or castaneous (male). Ventral surface black or castaneous with tan or testaceous maculae. Tergites laterally bicolored; black or castaneous with tan or testaceous markings. *Head:* Surface of frons moderately densely punctate (base) to densely punctate (apex); punctures. 01-.05 mm, some transverse basally. Clypeus moderately densely punctate (base and disc) to confluently punctate (apex and sides); punctures .01-.05 mm. Clypeal

apex bisinuate, weakly reflexed (male) or moderately reflexed (female), beaded (male) or not (female); bead in male incomplete or complete at apex. Interocular width about 4.5 transverse eye diameters. *Pronotum:* Form of pronotum basomedially (anterior to scutellum) straight, basolaterally feebly angled anteriorly (Fig. 106a). Surface moderately densely punctate; punctures minute-.03 mm to midline and .02-.08 mm laterad of midline to margin. Bead incomplete anteriomedially. *Scutellum:* Width about equal to length. *Mesepimeron:* Base of mesepimeron exposed beyond elytral humerus. *Elytra:* Surface with obscure longitudinal rows of punctures; 1 next to suture, 2-3 mesad of humerus (punctures may or may not be in a weakly impressed furrow); 3-5 laterad of humerus; punctures .03-.05 mm, shallow, placed 1-5 puncture diameters apart. Interval between striae 1 and 2 broad, moderately densely punctate; punctures .03-.05 mm; intervals mesad of humerus moderate in width, moderately densely punctate; punctures .03-.05 mm, some transversely wrinkled; intervals laterad of humerus narrow, with or without punctures; punctures .03-.05 mm. Sutural length about 3.2 times length of scutellum; apex weakly rounded, beaded, weakly divergent, lacking apical tooth. *Propygidium:* Partially exposed or not, surface moderately densely punctate; punctures .01-.05 mm, some transversely punctate at apex. *Pygidium:* Length (at middle) about 2 times length of propygidium. Lateral view (male) somewhat flat before rounded apex; evenly convex in female. Surface with vermiform strigae forming concentric circles (male) or semicircles (female) at around apex, margin with setose punctures; setae medium in length, tawny. Apex of female produced, acutely rounded. *Venter:* Mesometasternal keel in ventral view at apex broadly rounded, produced to base or middle of prosternal keel; ventral surface flat or weakly recurved in lateral view. Sternites 1-4 subequal in length; sternite 5 about 1.5 times as long as 4 (male), about twice as long as 4 (female); sternite 6 of male a little longer than 4, about twice as long as 4 in female. Last sternite of female at subapex quadrate (weakly quadrately emarginate in male), beaded; surface weakly striate, apex with setose punctures; setae tawny, short. *Legs:* Protibia with 3 teeth equally separated in apical third of tibia; basal tooth slightly removed from remaining teeth. Mesotibia widest at middle, external edge with weak apical and basal carinae (nearly obsolete in male); apex with medial tooth produced to middle or base of tarsomere 2, 1-3 spinulae laterad of inner spurs and 1-2 spinulae laterad of medial tooth; claws of female with external claw about 1.5 times as thick and 1.5 times as wide as inner claw. Metatibia with sides subparallel, external edge with weak apical and basal carinae; apex with corbel (male) produced to middle of tarsomere 2; inner, apical spur of female not robust. *Metatrochanter:* Posterior border weakly produced beyond posterior border of femur; apex rounded or weakly rounded. *Parameres:* Fig. 112t.

Diagnosis. The dorsal color pattern of *R. versicolor* is diagnostic for this species. Additionally, the exposed mesepimeron (*i.e.*, Fig. 111a), weakly produced posterior border of the metatrochanter (apex rounded), and male genitalia will serve to separate this species from other species of *Rutela*.

Distribution. Ecuador and western Colombia.

Locality Data (Map 4). 79 specimens examined from BMNH, CASC, CMNH, CNCI, DJCC, EMEC, FMNH, FREY, MAMC, MCZC, MNHN, QCAZ, USNM, ZMHB, ZSMC.

BRAZIL (1). No Data.
COLOMBIA (4). Cauca (1): Valle de Cauca. No Data (3).
ECUADOR (59). Chimborazo (1): Pichincha. El Oro (12): Machala, Santa Rosa, No data. Guayas (28): Chonana, Daule, Guayaquil, Isla Puna, No data. Manabi (10): Chucita, Cordillera de Balzar, Crucitas. Napo (1): Coca. Pastaza (1): Canelos. No Data (6).

PERU (2). No Data.
VENEZUELA (1). No Data.
NO DATA (12).

Temporal Data. January (3), February (11), March (3), May (1), June (2), July (1), September (2).

Remarks. Ohaus (1908) collected *R. versicolor* during the rainy season in the coastal cocoa-growing region near Guayaquil, Ecuador. He reported that adults frequented *Mimosa* sp. (Fabaceae). Natural history and larvae are unknown for the species.

Rutela vetula Ohaus
(Figs. 60, 112u; Map 5)

Rutela vetula Ohaus 1913: 509. Lectotype male at ZMHB labeled a) "Ecuador, Cocoa Hänsch," b) "Typus!" (red label, typed), c) "Rutela vetula Ohs." (red label, handwritten), d) my lectotype label. Lectoallotype at ZMHB labeled a) "Coca, (Ecuad.), R. Haensch S.," b) "Rutela vetula Ohs. cotype female symbol" (red label, handwritten), c) my lectoallotype label. Three male specimens at ZMHB erroneously labeled as cotypes by Ohaus with the data: "Colombia" (one specimen) and "Villavicencie, Ost-Columbia" (two specimens); "Rutela vetula cotype Ohs." (handwritten, two with red label, one with a white "Ohaus determin." label); and my labels indicating invalid type designation (see discussion). Two male specimens at ZSMC erroneously labeled as cotypes by Ohaus with the data: "Villavicencie" and "Colombie, Bogota;" "Rutela vetula Ohs. cotype;" and my labels indicating invalid type designation (see discussion below).

Description. Length 16.2-20.3 mm. Width 8.5-10.8 mm. *Color*: (Fig. 60) Pronotum shining black with narrow, tan or testaceous stripe at midline and tan or testaceous margin. Elytral shining black, with V-shaped macula extending from near base to near apex. Ventral surface black with tan or testaceous maculae. Tergites laterally bicolored, black with tan or testaceous maculae. *Head:* Frons moderately densely punctate; punctures randomly dispersed, more dense basally laterally, some transverse (forming strigulae) or confluent; punctures .01-.05 mm. Clypeus densely punctate; punctures .01-.05 mm, larger at apex. Clypeal apex bisinuate, weakly reflexed, beaded; bead complete or incomplete at middle. Interocular width about 5.7 transverse eye diameters. *Pronotum:* Form of pronotum basomedially straight, basolaterally feebly angled anteriorly (Fig. 106a). Surface moderately densely punctate; punctures larger and more dense apically and in dark areas, smaller and less dense at base and in lighter-colored areas; punctures .01-.10 mm. Bead incomplete anteriomedially. *Scutellum:* Width about equal to length. *Mesepimeron:* Base of mesepimeron (elytral humerus produced anteriorly beyond mesepimeron). *Elytra:* Surface with weakly impressed punctate striae; 1 next to suture, 4 mesad of humerus, 3-5 laterad of humerus (poorly defined); punctures .01-.05 mm, shallow. Intervals broad, moderately densely punctate; punctures .01-.05 mm, some transverse at base. Sutural length about 4.10 times length of scutellum; apex weakly rounded, beaded, weakly divergent, without spiniform tooth. *Propygidium:* Partially exposed, surface moderately densely punctate; punctures .01-.05 mm. *Pygidium:* Length (at middle) about 2.2 times length of propygidium. In lateral view, evenly convex. Surface of disc (male) and apex with scattered punctures, some transverse (male); punctures about .02 mm. Surface of disc (female) with vermiform strigae or punctures; strigae becoming concentric at apex; punctures about .02 mm. Apex in female rounded. *Venter:* Mesometasternal keel in ventral view at apex rounded, blunt, produced to base of prosternal keel; ventral surface flat or weakly deflexed in lateral view. Metasternum with posterior margin entirely black. Sternites 1-4 subequal in length; sternite 5 twice as long as 4; sternite 6 1.5 times length of 4 (male) or twice as long (female). Last sternite of female at subapex quadrate, beaded; subapex (male) quadrate, beaded;

surface weakly striate. *Legs:* Protibia with 3 teeth equally separated in apical third of tibia. Tarsomere 5 of male a little longer than tarsomeres 1-4. Mesotibia subparallel at sides, external edge with weak apical and basal carinae (obsolete in male); apex with medial tooth produced to middle of tarsomere 2 (more acuminate in female), 0-1 spinulae laterad of inner spurs, 0-2 spinulae laterad of medial tooth; claws of female with external claw 1.5 times as thick and 1.5 times as wide as inner claw. Metatibia with sides subparallel, external edge with moderate apical and basal carinae; apex with corbel (male) produced to middle of tarsomere 2; inner, apical spur of female not robust. *Metatrochanter:* Posterior border in male produced beyond posterior border of femur in male; apex acute or square. Posterior border in female not appreciably produced beyond femur; apex rounded. *Parameres:* Fig. 112u.

Diagnosis. *Rutela vetula* is most similar in dorsal coloration and pattern to *R. lineola* and *R. histrio*. However, *R. vetula* is easily separated by its V-shaped elytral pattern, the hidden mesepimeron (Fig. 111b) (exposed in *R. lineola* and *R. histrio* [Fig. 111a]), sculpturing of the male pygidium (scattered punctures in *R. vetula* versus striate in *R. lineola* and *R. histrio*), produced posterior border of the metatrochanter (produced in *R. lineola*, but not produced in *R. histrio*), and form of the male genitalia.

Distribution. Colombia, Ecuador, and Peru. Recorded from 465-500 meters elevation.

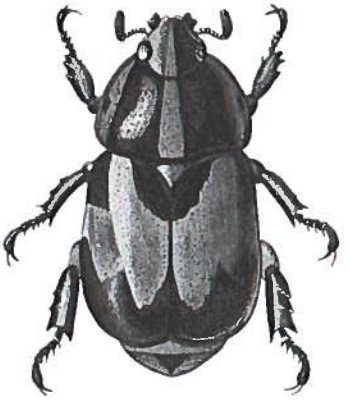
Locality Data (Map 5). 113 specimens examined from AMNH, ANSP, AVEC, BMNH, CMNH, DCCC, DJCC, FSCA, FMNH, LACM, LAGO, MCZC, MNHN, QCAZ, UMRM, UNSM, USNM, ZSMC.

COLOMBIA (52). Boyaca (2): Muzo. Caqueta (2): No data. Choco (2): Quibdó. Cundimarca (2): Bogota. Huila (11): Gigante, Putumayo Valley. Meta (15): Restrepo, Rio Guayuriba, Villavicencio. Putumayo (10): Tres Esquinas (SE on Rio Putumayo), Caucayá. Valle de Cauca (3): Buga, Cali. No Data (5).
ECUADOR (58). Chimborazo (9): Pichincha. Manabi (3): Cordillera de Balzar. Napo (38): Coca, El Tambo, Limon Cocha, Pano, Puerto Napo, Rio Misahuallí, Rio Aguarico, Santa Cecilia. Pastaza (2): Canelos, Puyo. No Data (6).
PERU (3). No Data.

Temporal Data. January (2), February (3), March (11), April (2), May (11), June (5), July (7), August (1), September (7), October (11), November (14), December (8).

Remarks. According to the original description (Ohaus 1913), the type specimens included a single male and single female with label data, "Ost-Ecuador, Coca (R. Hänsch S.)." My lectotype and lectoallotype designations reflect the locality data provided in the original description. Ohaus evidently placed cotype labels on specimens after 1913 (specimens labeled: Colombia, Villavicencie, Bogota). These specimens are not part of the original type series and are invalid type specimens.

Natural history and larvae are unknown for the species.



INTRODUCTION TO THE GENUS *SPHAERORUTELA* JAMESON, NEW GENUS

The new genus *Sphaerorutela*, as proposed here, includes four species that occur in southeastern Brazil, Paraguay, and northeastern Argentina. Members of the genus are small (7 to 12 mm in length), oblong-round, and variable in color and pattern (Figs 74-82, 117). Nothing is known of the natural history of species in the genus, but adults probably feed on foliage and flowers, and larvae probably are found in rotting logs.

The phylogenetic analysis of the *Rutela* generic groups and the character analysis provide evidence that the species in this group form a monophyletic lineage. The lineage differs substantially from other ruteline genera and exhibits several unique characters that justify generic status. Species in the proposed genus were previously placed in Ohaus' (1934) "*Rutela coerulea* group" along with species that are now placed in the genera *Microrutela* and *Rutela*.

Color and pattern vary widely in species in the genus. Because of this, neither of these characters can be used for purposes of identification. The most reliable character for identification is form of the male and female genitalia, puncture size, and clypeal shape. Female gonocoxites are useful in separating *S. sumptuosa* (Ohaus) from *S. coeruleohumeralis* (Ohaus), *S. viridicuprea* (Ohaus), and *S. lauta* (Perty).

Taxonomic History of the Genus *Sphaerorutela*

Members of the genera *Sphaerorutela* and *Microrutela* F. Bates have been part of a long and confused nomenclatural history. Perty (1832) described several species of *Rutela* in the "*Delectus Animalium Articulatorum*," two of which were *Rutela coerulea* Perty (referred to here as *Microrutela coerulea* [Perty]) and *Rutela lauta* Perty (referred to here as *Sphaerorutela lauta* [Perty]). Much confusion has surrounded the history and fate of these two species, and this confusion has resulted in nomenclatural disorder (Fig. 118). Perty (1832) provided a fairly robust Latin description of each of the species that he named as well as a dorsal habitus (in color) of each species. Among other characters, his Latin description defined *R. coerulea* as having irregularly punctate-striate elytra and a produced mesosternum. He defined *R. lauta* as having an impressed sutural stria. These are key characters in separating the genera *Sphaerorutela* and *Microrutela* (respectively). The figures in the "*Delectus Animalium Articulatorum*" also clearly identify the two morphotypes. Perty's description for *R. lauta* (=*Sphaerorutela*), including description of color pattern and the dorsal habitus picture, agrees with Perty's lectotype specimen. The Latin description for *R. coerulea* (=*Microrutela*) matches only the lectotype and not the paralectotype (lectotypes were designated by Scherer (1983)). In fact, the two specimens in the type series belong to different genera: the lectotype to *Microrutela* and the paralectotype to *Sphaerorutela*. Perty obviously understood the differences that distinguished these taxa, but, somewhere through time, the type series for *R. coerulea* became mixed. Many collections from Perty's era were simply a box of specimens, without data labels, without labels indicating "type," and were sometimes disordered. Whatever may have occurred, confusion began when Burmeister (1844), based his concept of *Rutela coerulea* Perty on the *paralectotype* of *R. coerulea* (= *Sphaerorutela*) rather than the lectotype specimen (= *Microrutela*). All of the major workers who followed have also based their concept of *R. coerulea* on Burmeister's description (Fig. 118). Burmeister (1844) transferred *R. coerulea* and *R. lauta* to the genus *Chalcentis* Burmeister, and he incorrectly cited the species name for *R. coerulea* as *R. chalybea*. Although he correctly attributed *R. lauta* to Perty, he attributed the name *R. "chalybea"* to Perty (rather than *R. coerulea*) and called "*chalybea*" a variety of *Chalcentis sphaerica* Burm. Why Burmeister incorrectly cited the name *R. coerulea* and why he called it a variety of *C. sphaerica* remains

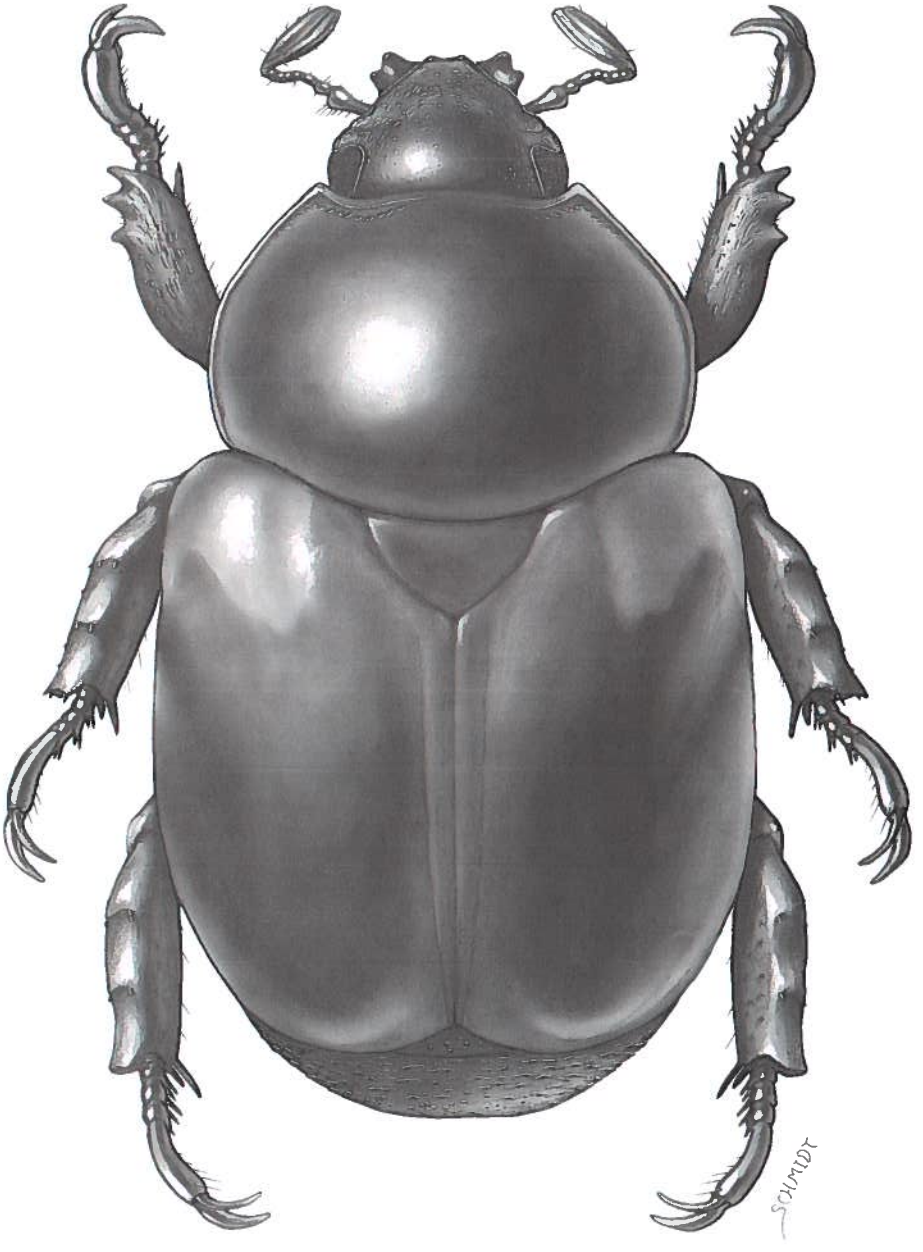


FIG. 117. Dorsal habitus of *Sphaerorutela coeruleohumeralis* (Ohaus).

unknown. Perhaps one of Perty's specimens had a label that read "chalybea" (meaning steel blue, a good descriptor for the color of the paralectotype). The lectotype of *R. coerulea* does bear a label, "Brasilia. 14. *Rutela chalybea* Perty." However, this label was written subsequent to Perty by Roths (ZSMC from 1843 to 1858), and the label indicates Roth's interpretation of the classification at the time (Scherer 1983). Scherer (1983) noted that what the name "chalybea" refers to is debatable.

Lacordaire (1856) used Burmeister's nomenclature and concept of *Chalcentis*. In the genus *Chalcentis*, he included *Chalcentis victima* Burm., *Chalcentis lauta* (Perty), and *Chalcentis sphaerica* Burm. (evidently believing that *C. sphaerica* was a replacement name for *C. "chalybea"* and evidently having no knowledge about the name *R. coerulea*). In 1904, Frederick Bates created the genus *Microrutela* for the species *Chalcentis lauta* and *Chalcentis coerulea* (using the correct species name). Bates followed the division of the genus used previously by Burmeister and Lacordaire and used the length and width of the scutellum to define the genus as unique among the "Rutelides vraies." Bates transferred *Chalcentis coerulea* (Perty) and *Chalcentis lauta* (Perty) to the new genus *Microrutela*. Based on Bates' description of the genus (1904: 250), the scutellum in these two species is "very distinctly wider than long, with the apex pointed or narrowly rounded." Bates' generic concept was founded on Burmeister's incorrect concept of *R. coerulea* (=*Sphaerorutela*) rather than Perty's concept of *R. coerulea* (= *Microrutela*). Inadvertently, Bates proposed a genus based on an incorrect species concept (see discussion under the "Taxonomic History of the Genus *Microrutela*").

In 1913, Ohaus named 15 color forms of *R. coerulea* (*sensu* Burmeister) and used the "purely blue form of Perty" as the nominate form. Judging by specimens in the Ohaus collection (ZMHB), Ohaus examined the type specimens of Perty and of Burmeister. For specimens that Ohaus compared with types, he placed a label "m.d. Type vergl" and the date examined. His specimens for *Chalcentis sphaerica* Burmeister (dated 1897), *R. lauta* Perty (dated 1901), and *R. coerulea* Perty (dated 1901) agree with Burmeister's incorrect concept of *R. coerulea* rather than Perty's concept. In fact, Ohaus' specimen of *R. coerulea* resembles Perty's paralectotype specimen of *R. coerulea* in dorsal facies. Additionally, Ohaus (1934) believed that *R. lauta* was a color variety of *R. coerulea* and synonymized it under *R. coerulea*.

Ohaus' (1913) forms of *R. coerulea* (*sensu* Burmeister) were based on coloration and presence or absence of maculae. Ohaus (1913: 508) proposed the names as a means of examining whether the color varieties were bound to localities; "...ob bestimmte Farbenvarietaten an bestimmte Lokalitäten gebunden sind." Ohaus dissected male genitalia for these varieties (when males were available) but concluded that the variation in the male genitalia was within the basic nominate form: "Die Form des Forceps is recht eigentümlich, aber im wesentlichen bie allen Varietäten die gleiche" (1913: 509). Among Ohaus' 15 varieties, I discovered three distinct species. Although Ohaus proposed the names as "forms," the International Code of Zoological Nomenclature (Article 45g) (Ride *et al.* 1985) states that a name published as a "form" prior to 1961 is considered subspecific and is thus an available name.

Genus *SPHAERORUTELA* Jameson

NEW GENUS

(Figs. 74-82, 117, Map 6)

Type species. *Rutela lauta* Perty 1830: 50. Type here designated.

Description. Scarabaeidae: Rutelinae: Rutelini. *Form* (Figs. 74-82, 117): Ovate, sides broadly rounded, propygidium partially exposed beyond elytra, pygidium exposed, apex of elytra broadly rounded. Length from apex of clypeus to apex of pygidium 7.0-12.0 mm; width at mid-elytra 4.0-7.5 mm. *Head:* Frons in lateral view nearly flat, clypeus in lateral view weakly convex. Surface of frons and clypeus variously sculptured, punctate

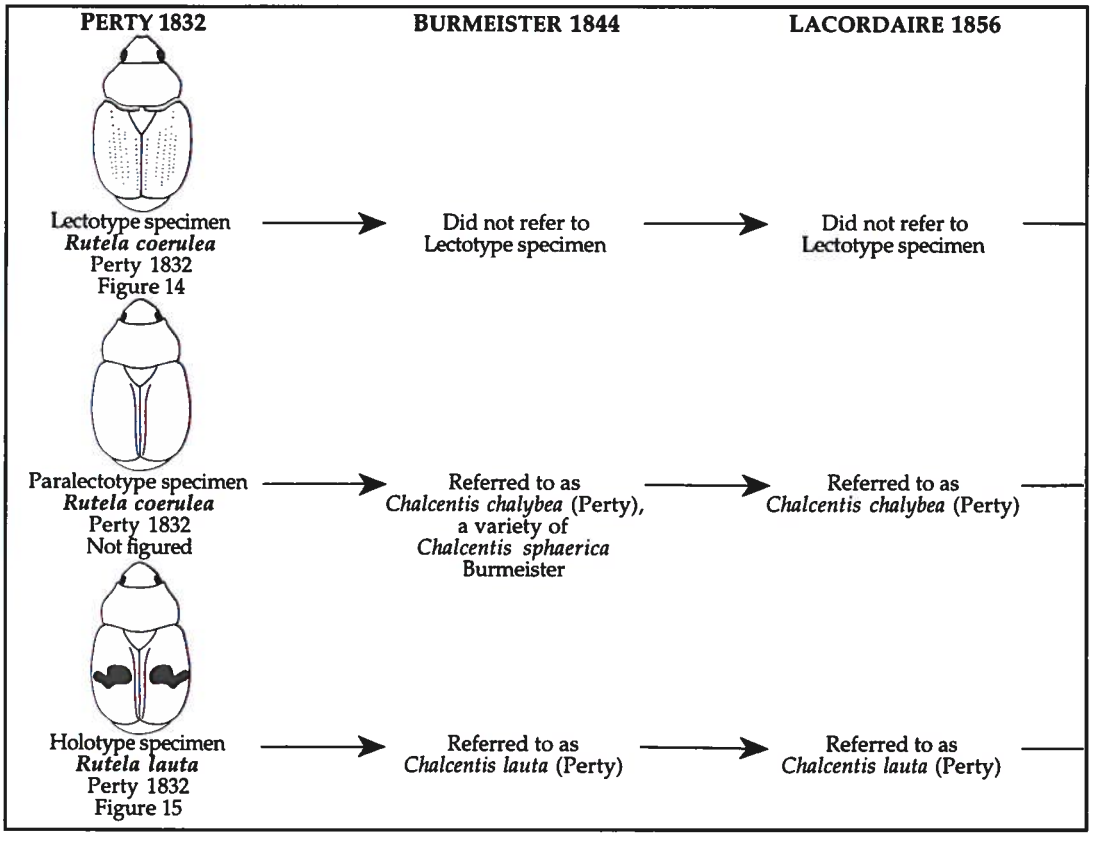
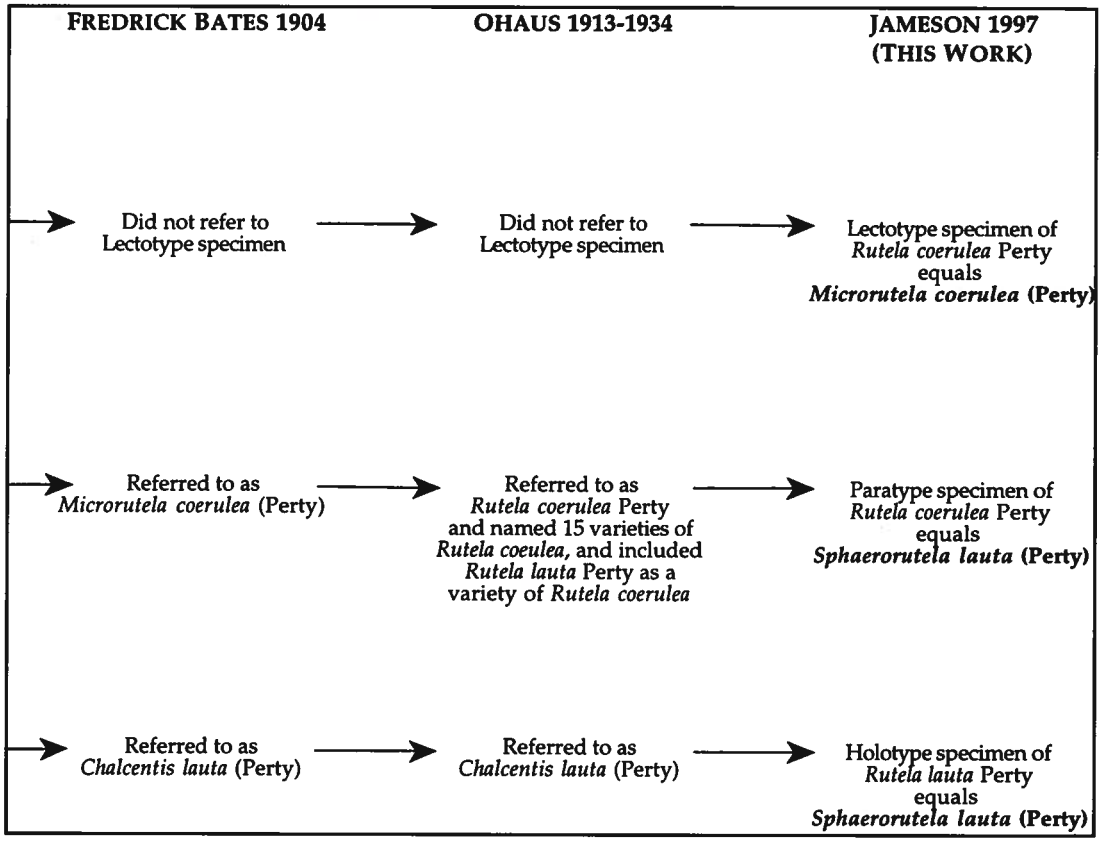
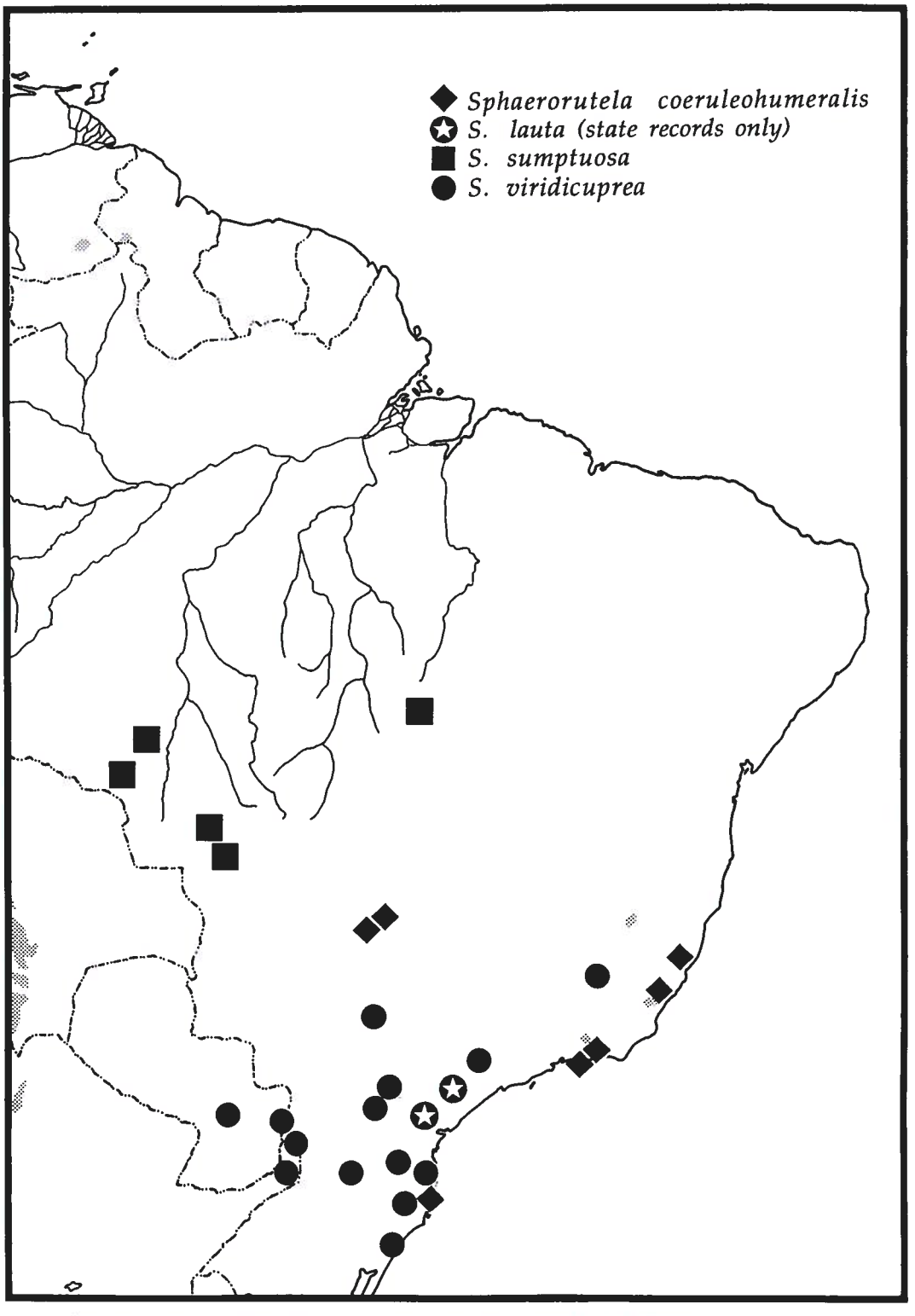


FIG. 118. Flow chart showing the interpretation of *Rutela coerulea* Perty (lectotype and paralectotype specimens) and *Rutela lauta* Perty (holotype) through taxonomic history (this page and opposite page). See "Taxonomic History of *Sphaerorutela*" and "Taxonomic History of *Microrutela*" for details.

to striate, more heavily sculptured in most females. Clypeal apex bisinuate, weakly reflexed, beaded; bead incomplete or complete at middle; apex more produced in female. Interocular width 4.5-5.0 transverse eye diameters. Frontoclypeal suture incomplete (about length of one eye canthus). Mandibles with 2 recurved teeth at lateral apex; 3 inner, scissorial teeth; broad molar region. Labrum truncate at apex. Maxilla with 6 teeth; 1 apical, 2 medial, 3 basal (reduced). Mentum bisinuate at apex. Antenna 10-segmented, club 3-segmented and subequal to segments 1-7 combined. *Pronotum:* Basal margin broadly rounded (weakly produced posteriorly at middle), lateral margin broadly rounded (Fig. 106c). Surface variably punctate. Bead at anterior margin complete at middle. *Scutellum:* Width greater than length (width about 1 3/4 times as wide a length). Base entirely declivous (Fig. 106c). *Mesepimeron:* Base weakly exposed (base of elytral humerus produced anteriorly to before base of mesepimeron). *Elytra:* Surface with impressed, longitudinal sutural stria extending from near base to apex and punctate striae. Intervals punctate; punctures simple. Epipleuron at basal margin rounded, without shelf, with weakly impressed line at base, beaded at apex; apical margin narrowed, exposing tergites laterally. Sutural length 3.0-4.0 times length of scutellum. Apex weakly rounded, beaded. *Tergites:* Narrowly exposed laterad of elytral margin, unicolorous. *Propygidium:* Partially exposed, surface punctate. *Pygidium:* Shape broadly ovoid, marginal angles rounded. Surface striate and punctate (often differs between male and female). Apical margin evenly rounded or truncate. *Venter:* Prosternum with keel



triangular in posterior view, apex blunt, produced to level of protrochanter at about 35° with respect to dorsal surface. Mesometasternal keel in ventral view broadly rounded, weakly produced beyond mesosternal keel; ventral surface flat in lateral view. Sternites 1-4 subequal in length (male and female); sternite 5 2.0-2.5 times as long as sternite 4 (may differ between male and female); sternite 6 1.5-2.5 times as long as sternite 4 (may differ between male and female). Last sternite of male variably sculpted (punctate or striate), quadrate at subapex; subapex to apex less sclerotized. Last sternite of female variably sculptured (punctate or striate), subapical region sclerotized, apex broadly bisinuate. In lateral view male sternites somewhat concave, female sternites flat or weakly convex. *Legs:* Protibia with 3 teeth in apical 1/2 of tibia, basal tooth slightly removed; base without internal incised area. Tarsomere 5 of male subequal to tarsomeres 1-5. Foreclaw of male simple; external claw, as long as tarsomere 5, twice as thick as internal claw, 2 times wider than internal claw; subapical tooth present; foreclaw of female simple, subequal; unguitractor plate and associated setae hidden (all legs). Mesotibia with sides subparallel, weakly convergent at apex; external edge with 1-2 obsolete carinae; apex with weak, medial emargination and 4-8 spinulae; inner apex with 2 spurs. Mesotarsomere 4 of male with weakly produced, median, spiniform projection between 2 apical spinulae; simple in female. Mesotarsal claws of male with external claw simple, twice as thick and twice as wide as inner claw; claws of female simple, external claw subequal to 1.5 times as thick, and subequal to 1.5 times as wide as inner claw. Metatibia with sides subparallel; external edge with or without 1-2 carinae; apex with variably produced corbel (male), without spinulae or setae; inner, apical spur in female not robust.



Map 6. Distribution of *Sphaerorutela* species in Brazil. Stippled area equals 1000 meters.

Metatarsomere 4 of male with weakly produced, median, spiniform projection between 2 apical spinulae; simple in female. *Metatrochanter:* Posterior border not produced beyond posterior border of femur. *Metacoxa:* Lateral apex square or acute. *Hind Wing:* Well-developed hooks on precostal membrane present. Vein AA_{1+2} shortened, extending weakly beyond juncture of AA and AA_{3+4}. *Metendosternite:* In posterior view, Y-shaped, robust, with 2 apical arms. *Male Genitalia:* Symmetrical or asymmetrical, diagnostic. *Female Genitalia:* Diagnostic or not.

Diagnosis. Members of the genus *Sphaerorutela* differ from other genera in the tribe Rutelini by the following characters (see Jameson [1990] for key to tribes and subtribes of Rutelinae): frontoclypeal suture obsolete medially, pronotal base lacking basal bead, clypeus semicircular, apex of metatibia without spinules on ventrolateral edge, epipleuron lacking horizontal shelf. *Sphaerorutela* is separated from *Plesiorutela, Rutela* and *Microrutela* based on the following characters: 1) form of the scutellum nearly twice as wide as long (scutellum subequal in width and length in *Rutela;* width about 1.25 times as wide a length in *Microrutela;* width about 1.20 times as wide as long in *Plesiorutela*); 2) base of scutellum entirely declivous (scutellar base is planar with the base of the elytra in *Rutela;* scutellar base declivous either side of midline in *Microrutela;* scutellar base entirely declivous in *Plesiorutela*); 3) sutural stria an impressed, longitudinal line (sutural stria punctate in *Rutela* and *Microrutela;* lacking in *Plesiorutela*); 4) mesotibia lacking medial tooth or spiniform tooth (medial tooth present in *Rutela;* spiniform tooth present in *Microrutela;* lacking medial tooth or spiniform tooth in *Plesiorutela*); 5) meso- and metatarsomere 4 of the male with a spiniform projection between apical spinulae (lobe-like projection in *Plesiorutela, Rutela,* and *Microrutela*); 6) mesometasternal keel weakly produced and rounded apically (distinctly produced with a more acuminate apex in *Rutela* and *Microrutela;* weakly produced and rounded at apex in *Plesiorutela*); 7) mandibular teeth placed apicolaterally (apically in *Plesiorutela, Rutela,* and *Microrutela*); 8) anterior pronotal bead complete at the middle (incomplete in *Rutela* and *Microrutela,* complete in *Plesiorutela*).

Distribution (Map 6). Southeast Brazil, southeast Paraguay, northeastern Argentina.

Etymology. The genus is named for is spheroidal form and its relationship (historically and phylogenetically) to the genus *Rutela.* The Latin word "*sphaera*" means globe. The name is considered feminine in gender.

Key to the species of *Sphaerorutela* Jameson, new genus

1. Clypeus sinuate laterally and weakly sinuate or truncate at apex (Fig. 120a). Pronotum with punctural size at margin and anterior angles .05-.08 mm diameter. Metatibia of male greatly convergent toward apex (Fig. 121b). Male genitalia as in Fig. 119f . . . . . *S. sumptuosa* (Ohaus)

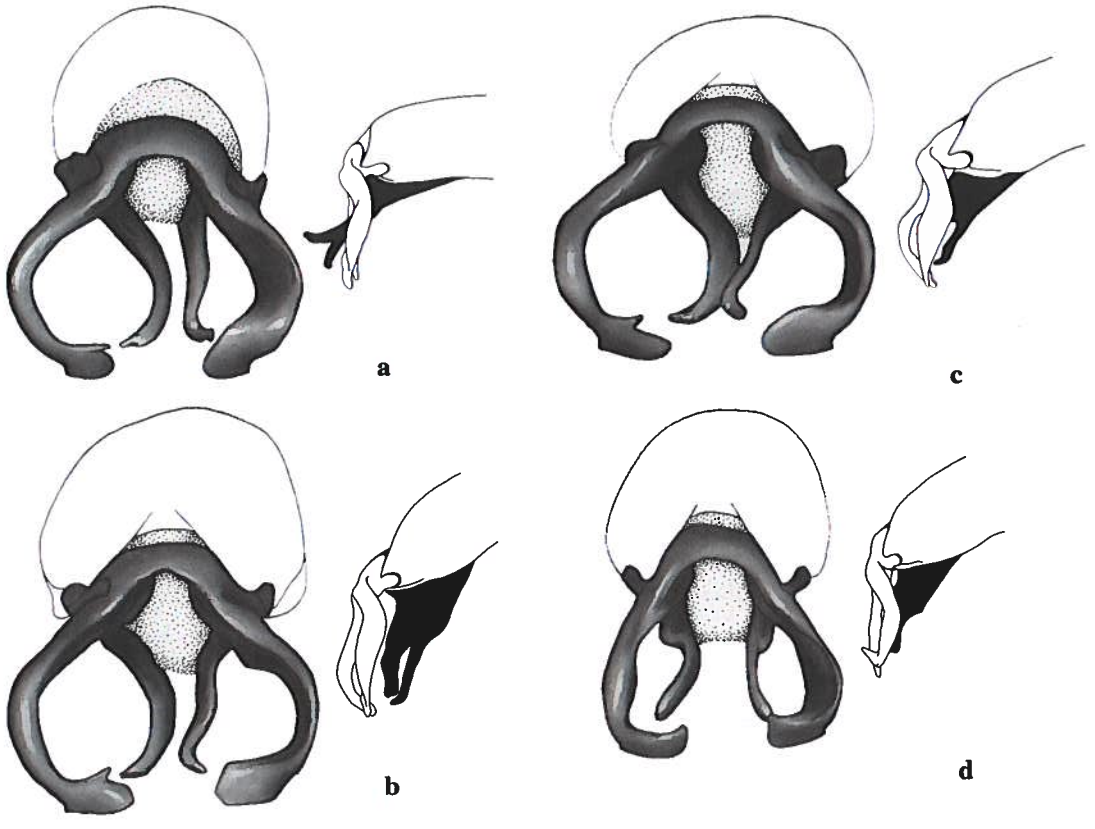
1′. Clypeus semicircular (Fig. 120b). Pronotum with punctural size at margin and anterior angles .01-.04 mm diameter. Metatibia in male with sides subparallel. Male genitalia not as Fig. 119f 2

2. Metasternum at the middle weakly flattened (Fig. 122a). Male and female with pronotal punctural size at margin and anterior angles small (.01-.02 mm diameter). Male genitalia as in Figs. 119g-h . . . . . *S. viridicuprea* (Ohaus)

2′. Metasternum at the middle rounded (Fig. 122 b). Female with punctures larger (.03-.04 mm) or punctural size of male and female smaller (.01-.02 mm diameter). Male genitalia not as in Figs. 119g-h 3

3. Male genitalia as in Figs. 119a-c. Females not distinguishable from *S. lauta* . . . . . *S. coeruleohumeralis* (Ohaus)

3′. Male genitalia as in Figs. 119d-e. Females not distinguishable from *S. coeruleohumeralis* . . . . . *S. lauta* (Perty)



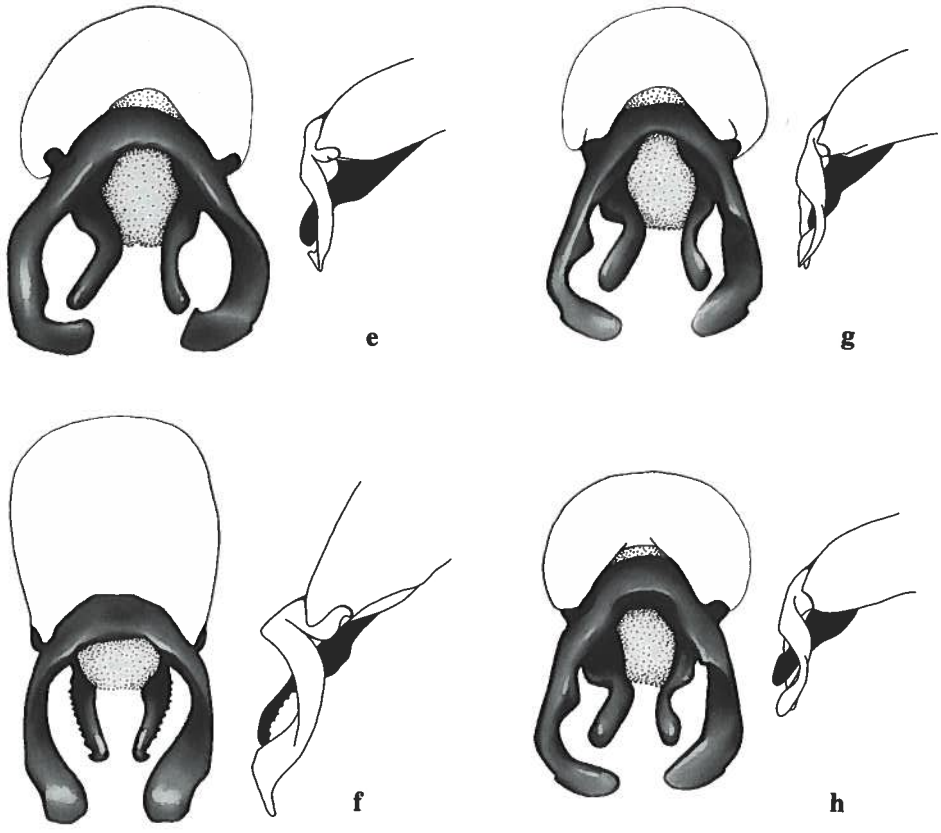
FIGS. 119a-d. Dorsal view of the parameres of *Sphaerorutela* species (reduced lateral view at right). 119a-c, *Sphaerorutela coeruleohumeralis*; 119d, *Sphaerorutela lauta*.

CLAVE PARA LAS ESPECIES DE *SPHAERORUTELA*

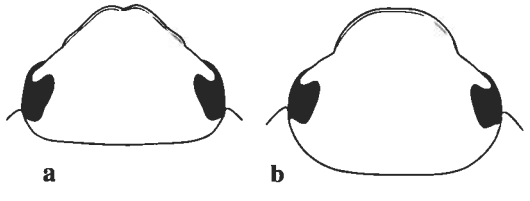
1. Clípeo lateralmente sinuado y con el ápice escasamente sinuado o truncado (Fig. 120a). Angulos anteriores y márgen del pronoto con puntos de .05-.08 mm de diámetro. Metatibia masculina notablemente convergente hacia el ápice (Fig. 123b). Genital masculino como en la Fig. 120f.... *S. sumptuosa* (Ohaus)
1'. Clípeo semicircular (Fig. 120b). Angulos anteriores y márgen del pronoto con puntos de .01-.04 mm de diámetro. Metatibia masculina con los lados casi paralelos. Genital masculino diferente a la Fig. 119f. . 2

2. Parte media del metasternón escasamente aplanado (Fig. 122a). Machos y hembras con puntos pequeños (.01-.02 mm) en los ángulos anteriores y el márgen del pronoto. Genital masculino como en la Figs. 119g-h. . . . . *S. viridicuprea* (Ohaus)
2'. Parte media del metasternón redondeada (Fig. 122b). Hembras con puntos más grandes (.03-.04 mm) o machos y hembras con puntos más pequeños (.01-.02 mm) en los ángulos anteriores y el márgen del pronoto. Genital masculino diferente a la Figs. 119g-h. 3

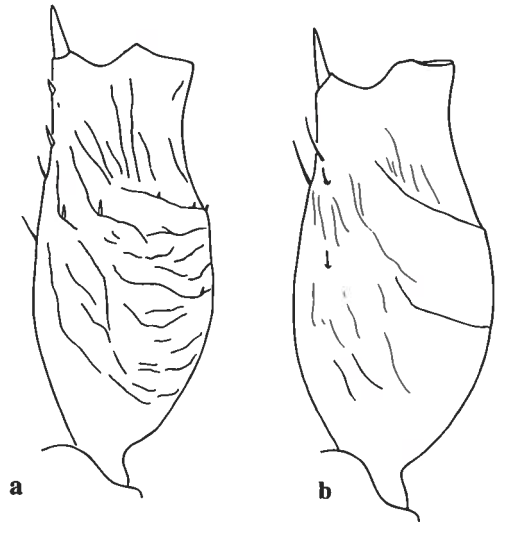
3. Genital masculino como en la Figs. 119a-c. Hembras indistinguibles de *S. lauta*. . . . . *S. coeruleohumeralis* (Ohaus
3'. Genital masculino como en la Figs. 119d-e. Hembras indistinguibles de *S. coeruleohumeralis* . . . . . *S. lauta* (Perty)



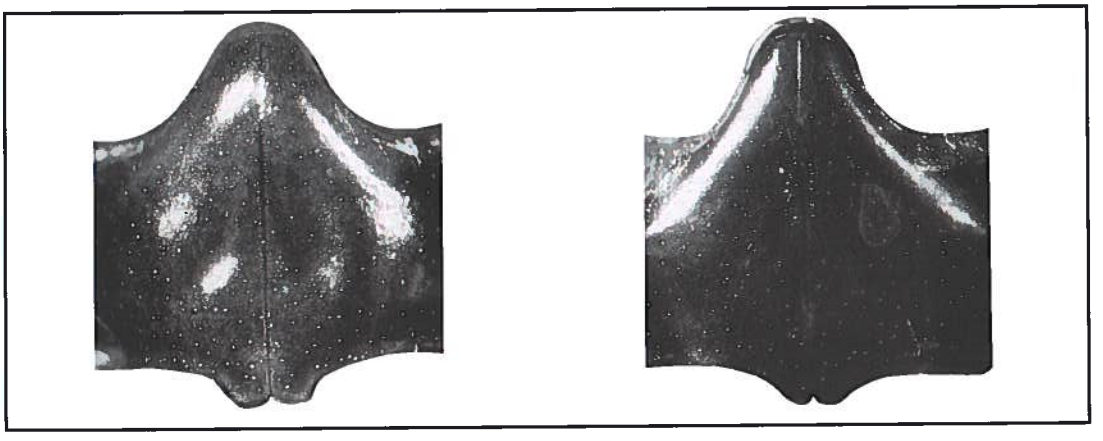
FIGS. 119e-h. Dorsal view of the parameres of *Sphaerorutela* species (reduced lateral view at right). 119e, *Sphaerorutela lauta*; 119f, *Sphaerorutela sumptuosa*; 119g-h, *Sphaerorutela viridicuprea*.



FIGS. 120a-b. Dorsal view of the head showing the clypeal apex weakly sinuate (a) or semicircular (b). 120a, *Sphaerorutela sumptusoa*; 120b, *Sphaerorutela lauta*.



FIGS. 121a-b. Metatibia of the male showing form. 121a, *Sphaerorutela viridicuprea*; 121b, *Sphaerorutela sumptuosa*.



FIGS. 122a-b. Ventral view of the metasternum showing medial region flattened (a) or rounded (b). 122a, *Sphaerorutela viridicuprea*; 122b, *Sphaerorutela coeruleohumeralis*.

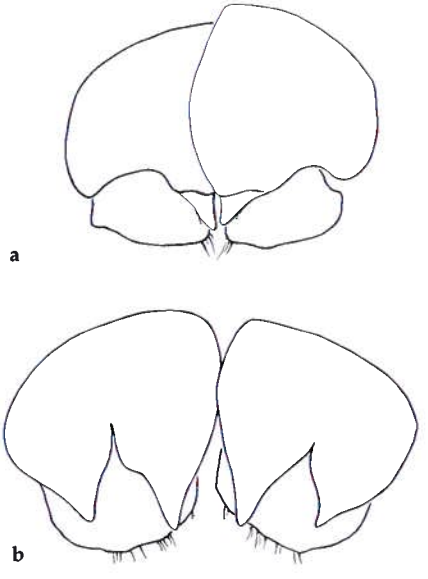
Sphaerorutela coeruleohumeralis (Ohaus), NEW COMBINATION, NEW STATUS
(Figs. 74-76, 117, 119a-c, 123a; Map 6)

Rutela coerulea (var.) *coeruleohumeralis* Ohaus 1913: 508. Lectotype and lectoallotype at ZMHB. Lectotype male labeled a) "Jatahy, Prov. Goyas, Brésil," b) "typus!" (red label), c) "v. *coeruleohumeralis* Ohaus" (red label), d) my lectotype label; male genitalia card mounted. Lectoallotype female labeled a) "Jatahy, Prov. Goyas, Brésil," b) female symbol, c) "*R. coeruleohumeralis* cotype Ohs" (red label), d) my lectoallotype label. **NEW COMBINATION, NEW STATUS.**

Rutela coerulea (var.) *atrohumeralis* Ohaus 1913: 509. Holotype female at ZMHB labeled a) "Jatahy, Prov. Goyas, Bresil," b) female symbol, c) "typus!" (red label), d) "v. *atrohumeralis* Ohaus" (red label), e) my holotype label. **NEW SYNONYMY.**

Rutela coerulea (var.) *rubripennis* Ohaus 1913: 509. Holotype male at ZMHB labeled a) "Jatahy, Prov. Goyas, Brésil," b) "typus!" c) "v. *rubripennis* Ohaus" (red label), d) my holotype label; mouth parts and male genitalia card mounted. **NEW SYNONYMY.**

Description. Length 7.6-11.7 mm. Width 4.8-7.0 mm. *Color:* (Figs. 74-76) Head, pronotum, elytra, pygidium, and venter shining blue, green, bronze-green, ferruginous, or black, with or without pronotal macula (pronotum ferruginous with central, blue or black macula) and/or elytral macula (elytra blue or black with rufous or orange macula at mid-disc or at humerus). *Head:* Surface of frons laterally and basolaterally strigate, disc moderately densely punctate, mid-apex densely punctate (male) or punctostrigate (female); punctures .01-.02 (base) to .02-.05 (apicomedially). Surface of clypeus transversely



FIGS. 123a-b. Female gonocoxites, caudal view. 123a, *Sphaerorutela coeruleohumeralis, S. viridicuprea, S. lauta*; 123b, *Sphaerorutela sumptuosa*.

punctate (base) to strigate (apex); punctures .02-.05 mm. Clypeus semicircular; apex in male weakly reflexed; apex in female weakly parabolic, strongly reflexed. Interocular width about 4.7 transverse eye diameters. *Pronotum:* Surface of male moderately densely punctate; punctures .01-.02 mm. Surface of female moderately densely punctate; discal punctures .01-.02 mm, punctures at margin and anterior angle .03-.04 mm. *Elytra:* Disc and sides moderately densely punctate; punctures minute to .01 mm. Sutural length about 3.5 times length of scutellum. *Propygidium:* Partially exposed or entirely hidden, surface punctate (apex to middle) to punctostrigate (middle to base); punctures .03-.05 mm, some setigerous at base; setae rufous, minute. *Pygidium:* Shape broadly ovoid. Surface from base to mid-disc or apex moderately densely, transversely strigulate; apex punctate; punctures .01-.03 mm, some transverse. Ventral margin with sparse setae; setae medium in length, rufous. Apical margin (female) weakly quadrate; male broadly, weakly sinuate. *Venter:* Metasternum at middle rounded. Last sternite of male at subapex broadly, weakly sinuate (female weakly tri-sinuate); surface with weak, vermiform striations. *Legs:* Protibia with 3 teeth, basal tooth slightly removed from apical teeth. Foreclaw of male with larger claw as long as tarsomeres 1-5, 3 times as wide as smaller claw (measured at middle), anterior edge broadly rounded from base to apex. Foreclaw of female with claws simple, subequal. Mesotibia of male widest at middle, inner edge straight (convergent at apical 1/3), external edge weakly rounded from base to apical 1/3, weakly carinate at apical 1/3. Mesotibia of female with internal and external edges weakly carinate; external edge with 1 carina in basal 1/4, 1 in mid-tibia; internal edge with 1 subapical carina. Apex weakly produced at middle (to middle or apex of tarsomere 1), with spinulae; 1 spinula laterad of inner, apical spurs, 1-3 at middle, 1-2 at lateral margin. Metatibia of male subparallel from basal 1/3 to apex, external edge weakly rounded from base to basal 1/3 of tibia, weakly carinate; 1 carina in basal 1/3, 1 in apical 1/3. Metatibia of female widest at middle, sides carinate and with spurs; external edge with 1 weak carina in basal 1/3, 1 carina in apical 1/3; inner edge with 2-3 spurs in apical 1/2. Apex of male without spinulae or setae, corbel weakly produced to middle of tarsomere 1. Apex of female with or without spinulae at external edge; 0-1 at middle, 0-1 at external edge. *Metacoxa:* Lateral apex quadrate (female), acuminate (male). *Gonocoxites:* Fig. 123a. *Parameres:* Figs. 119a-c.

Diagnosis. *Sphaerorutela coeruleohumeralis* is distinguished from *S. sumptuosa* by its semicircular (male) or parabolic (female) clypeal apex, form of the metatibia in the male (sides subparallel in *S. coeruleohumeralis;* sides convergent toward apex in *S. sumptuosa*), surface of the pronotum that is medially and apically finely punctate (punctures .01-.02 mm in *S. coeruleohumeralis* versus .05-.08 mm in *S. sumptuosa*), and male genitalia. *Sphaerorutela coeruleohumeralis* is distinguished from *S. viridicuprea* by the metasternum that is rounded at the middle (flattened at the middle in *S. viridicuprea*), foreclaw of the male with the larger claw 3 times as wide as the smaller claw (2 times as wide as the smaller claw in *S. viridicuprea*), surface of the pronotum at the margin and anterior angle in the female with punctures .03-.04 mm (punctures in *S. viridicuprea* smaller, .01-.02 mm), and form of the male genitalia. *Sphaerorutela coeruleohumeralis* and *S. lauta* are indistinguishable except by the male genitalia.

Distribution. The provinces of Goias, Bahia, Rio de Janiero, and Santa Catarina in Brazil. Recorded from 800 to 1,000 meters elevation.

Locality Data (Map 6). 127 specimens examined from BMNH, MNHN, QBUM, ZMHB.

BRAZIL (117). Bahia (6): S. Antonio da Barra. Espirito Santo (1): Santa Leopoldina. Goias (89): Jatahi, Rio Verde. Rio de Janiero (20): Cavalcanti, Corcovado, Tijuca, No data. Santa Catarina (1): Blumenau.

NO DATA (10).

Temporal Data. November (2), December (10).

Remarks. *Sphaerorutela coeruleohumeralis* was originally described as one of Ohaus's (1913) 15 color varieties of *Rutela coerulea* (*sensu* Burmeister). Although Ohaus dissected male genitalia, and he was aware of some variation in the form of the parameres, he believed that the variation was within the basic "*coerulea*" form. *Sphaerorutela atrohumeralis* and *S. rubripennis* possess the same characteristics as *S. coeruleohumeralis*, but *S. coeruleohumeralis* has page priority, and, as such, retains the name for the species.

Natural history and larvae are unknown for the species.

Sphaerorutela lauta (Perty)
New Combination, New Status
(Figs. 77, 119d-e, 123a; Map 6)

Rutela lauta Perty 1830: 50, T. 10, f. 15. Holotype female at ZSMC labeled a) "type von Rutela lauta Perty" (Hans Kulzer label, orange), b) "13. Brasilia. Rutela lauta Prty." (Dr. Johannes Rudolph Roth label, white with green box), c) "Holotypus Rutela lauta Perty det. Dr. G. Scherer 1981." Type locality, "*in montibus Prov. Minarum.*" **NEW COMBINATION, NEW STATUS.**

Chalcentis sphaerica Burmeister 1844: 50. Holotype not examined. **NEW SYNONYMY.**

Rutela coerulea var. *atrorufipes* Ohaus 1913: 508. Holotype female at ZMHB labeled a) "Brazil, E.S. Paulo," b) female symbol, c) "typus!" (red label), d) "v. atrorufipes Ohaus" (red label, handwritten). **NEW SYNONYMY.**

Rutela coerulea var. *coeruleooxydata* Ohaus 1913: 508. Holotype female at ZMHB labeled a) "Brazil, E.S. Paulo," b) female symbol, c) "typus!" (red label), d) "v. cupreooxydata Ohaus" (red label, handwritten). **NEW SYNONYMY.**

Rutela coerulea var. *coeruleorufipes* Ohaus 1913: 508. Holotype male at ZMHB labeled a) "Brazil, E.S. Paulo," b) "typus!" (red label), c) "v. coeruleorufipes Ohaus" (red label, handwritten); male genitalia card mounted. **NEW SYNONYMY.**

Rutela coerulea var. *coeruleovirens* Ohaus 1913: 508. Holotype female at ZMHB labeled a) "Brazil, E.S. Paulo," b) female symbol, c) "typus!" (red label), d) "v. coeruleovirens Ohaus" (red label, handwritten). **NEW SYNONYMY.**

Description. Length 8.8-9.8 mm. Width 4.9-5.8 mm. *Color*: (Fig. 77) Head, pronotum, elytra, pygidium, and venter shining blue, green, or black. *Head:* Surface of frons laterally and basolaterally punctostrigate, disc moderately densely punctate, mid-apex densely punctate (male) or punctostrigate (female); punctures .01-.02 (base) to .02-.05 (apicomedially). Surface of clypeus transversely punctate (base) to strigate (apex); punctures .02-.05 mm. Clypeus semicircular; apex in male weakly reflexed; apex in female weakly parabolic, strongly reflexed. Interocular width about 4.7 transverse eye diameters. *Pronotum:* Surface of male moderately densely punctate; punctures .01-.02 mm. Surface in female moderately densely punctate; discal punctures .01-.02 mm, punctures at margin and anterior angle .03-.04 mm. *Elytra:* Disc and sides moderately densely punctate; punctures minute-.01 mm. Sutural length about 3.5 times length of scutellum. *Propygidium:* Partially exposed or entirely hidden, surface punctate (apex to middle) to punctostrigate (middle to base); punctures .03-.05 mm. *Pygidium:* Shape broadly ovoid. Surface from base to mid-disc or apex moderately densely, transversely strigulate; apex punctate; punctures .01-.03 mm, some transverse. Ventral margin with sparse setae; setae medium in length, tawny. Apical margin in female weakly quadrate; male broadly, weakly sinuate. *Venter:* Metasternum at middle rounded. Last sternite in male at subapex broadly, weakly sinuate (female weakly tri-sinuate); surface with weak, vermiform striations. *Legs:* Protibia with 3 teeth, basal tooth slightly removed from apical teeth. Foreclaw in male with larger claw as long as

tarsomeres 1-5 combined, 2 times as wide as smaller claw (measured at middle), anterior edge broadly rounded from base to apex. Foreclaw in female with claws simple, subequal. Mesotibia of male widest at middle, inner edge straight (convergent at apical 1/3), external edge weakly rounded from base to apical 1/3, weakly carinate at apical 1/3. Mesotibia of female with internal and external edges weakly carinate; external edge with 1 carina in basal 1/4, 1 in mid-tibia; internal edge with 1 subapical carina. Mesotibial apex weakly produced at middle (to middle or apex of tarsomere 1), with spinulae; 1 spinula laterad of inner, apical spurs, 1-2 at middle, 1-2 at lateral margin. Metatibia of male subparallel from basal 1/3 to apex, external edge weakly rounded from base to basal 1/3 of tibia, carinae obsolete. Metatibia of female widest at middle, sides carinate and with spurs; external edge with 1 weak carina in basal 1/3, 1 carina in apical 1/3; inner edge with 2-3 spurs in apical 1/2. Apex of male without spinulae or setae, corbel weakly produced to middle of tarsomere 1. Apex of female with or without spinulae at external edge; 0-1 at middle, 0-1 at external edge. *Metacoxa:* Lateral apex quadrate (female), acuminate (male). *Gonocoxites:* Fig. 123a. *Parameres:* Figs. 119d-e.

Diagnosis. *Sphaerorutela lauta* is separated from *S. sumptuosa* by the form of the clypeal apex (semicircular in *S. lauta*; sides sinuate, apex weakly sinuate or truncate in *S. sumptuosa*), form of the metatibia in the male (subparallel in *S. lauta*; convergent toward apex in *S. sumptuosa*), pronotum with punctures at the margin and anterior angles (.01-.02 mm in *S. lauta*; .05-.08 mm in *S. sumptuosa*), and form of the male genitalia. *Sphaerorutela lauta* is separated from *S. viridicuprea* by the form of the metasternum that is rounded in the middle (flattened in *S. viridicuprea* [Fig. 122a]), pronotum of female with punctures at the margin and anterior angle that are .03-.04 mm (punctures .01-.02 mm in female *S. lauta*), and form of the male genitalia. Based on external characters, *S. lauta* is difficult to separate from *S. coeruleohumeralis*. Male genitalia are diagnostic for the species, but females are not distinguishable from *S. coeruleohumeralis*.

Distribution. Known only from southeastern Brazil in the states of Parana and São Paulo.

Locality Data (Map 6). 18 specimens examined from MNHN, ZMHB, ZSMC.

BRAZIL (18). PARANA (2): No data. SÃO PAULO (13): No data. NO DATA (3).

Temporal Data. No data.

Remarks. The name *Rutela coerulea* Perty (now *Microrutela coerulea*) was previously, and erroneously, used for *S. lauta* (see discussion under "Taxonomic History of the genus *Microrutela*"). Several names have been proposed for the taxon, including *Chalcentis sphaerica* Burmeister. Ohaus referred to *S. lauta* as a variety of *R. coerulea* (thus resulting in a new status for the name). The varietal names *R. coerulea* var. *atrorufipes* Ohaus, *R. coerulea* var. *coeruleooxydata* Ohaus, *R. coerulea* var. *coeruleorufipes* Ohaus, and *R. coerulea* var. *coeruleovirens* are synonyms of *S. lauta*, and *S. lauta* has nomenclatural priority.

The natural history and larvae are unknown for this species.

Sphaerorutela sumptuosa (Ohaus)
NEW COMBINATION, NEW STATUS
(Figs. 78-79, 119f, 120b, 121b, 123a; Map 6)

Rutela coerulea var. *sumptuosa* Ohaus 1913: 509. Lectotype and lectoallotype at ZMHB. Lectotype male labeled a) "Mato Grosso, Zobrys,"b) "typus!" (red, typed), c) "v. *sumptuosa* Ohaus" (red, handwritten); male genitalia card mounted. Lectoallotype female labeled a) " Mato Grosso, Zobrys," b) female symbol, c) "*R. coerulea* v. *sumptuosa* cotype Ohs." (red, handwritten). **NEW COMBINATION, NEW STATUS.**

Rutela (Microrutela) martinsi Martínez and Martínez 1992: 603-605. Holotype male at

Museo Argentino de Ciencias Naturales, Buenos Aires, Argentina (MACN), labeled "Brazil, Minas Gerais: Sinópolis, X-1976, M. Alvarenga col." Allotype female labeled as male in HAHC (to be deposited at CMNC). **NEW SYNONYMY.**

Description. Length 9.9-10.7 mm. Width 5.8-6.7 mm. *Color*: (Figs. 78-79) Head, pronotum, and elytra unicolorous or bicolorous; if bicolored, head, pronotum, and basal 1/2 of elytra shining black, apical 1/2 of elytra ferruginous; if unicolorous, head, pronotum, and elytra shining blue, green, green-bronze, or black. Pygidium, venter, and appendages red-brown or castaneous with metallic green reflection. *Head:* Surface of frons at sides and at base strigate, disc moderately densely punctate to punctostrigate (apicomedially); punctures .02-.05 mm, larger at apex. Clypeal surface punctostrigate at base to rugosely strigate at apex; punctures .01-.03 mm. Clypeus weakly sinuate at lateral margin, weakly sinuate or truncately rounded at apical margin, apex weakly reflexed (Fig. 120a); apex of female bisinuate, strongly reflexed, more acuminate than male. Interocular width about 4.7 transverse eye diameters. *Pronotum:* Surface of moderately densely punctate; punctures .01-.05 mm (basally) to .05-.08 mm (medially and apically). Margin with narrow band of transverse strigae. *Elytra:* Surface with 1 weakly impressed, longitudinal line next to suture (extending from near base to apex); 3 poorly defined striae on disc (reaching neither apex nor base); 3-4 poorly defined striae laterad of humerus (at mid-elytron); punctures sparse, .01-.07 mm, some longitudinal. Intervals broad, sparsely, minutely punctate. Sutural length about 3.5 times length of scutellum. *Propygidium:* Partially exposed or entirely hidden, surface densely, transversely punctostrigate. *Pygidium:* Shape broadly ovoid. Surface at base and ventral margins densely, transversely strigulate; surface at apical disc and ventral disc punctate; punctures .01-.08 mm, some transverse. Ventral margin with sparse setae; setae medium in length, tawny. Apical margin of female weakly quadrate; male broadly, weakly sinuate. *Venter:* Metasternum at middle rounded. Last sternite of male at subapex broadly, weakly sinuate (female weakly tri-sinuate); surface with weak, vermiform striations. *Legs:* Protibia with 3 teeth, basal tooth slightly removed from apical teeth. Foreclaw of male with larger claw as long as tarsomeres 1-5 combined, 2 times as wide as smaller claw (measured at middle), anterior edge subparallel to posterior edge. Foreclaw of female with claws simple, subequal. Mesotibia of male widest at middle, inner edge weakly divergent from base (weakly convergent in apical 1/3), external edge broadly rounded from base to mid-tibia, lacking carinae. Mesotibia of female with 1, medial, weakly produced, external carina and 1, subapical, moderately produced inner carina. Apex weakly produced at middle (to middle or apex of tarsomere 1), with spinulae; 1 spinula laterad of inner, apical spurs, 2 at middle, 1-2 at lateral margin. Metatibia of male widest at middle, external edge broadly rounded from base to mid-tibia, lacking carinae (Fig. 121b). Metatibia of female widest at middle and apex, sides carinate and with spurs; external edge with 1 carina in basal 1/3, 1 carina in apical 1/3; inner edge with 1 spur in basal 1/3, 1 spur in apical 1/3. Apex of male without spinulae or setae, corbel weakly produced to middle of tarsomere 1. Apex of female with 1 spinula at apex of external edge (in corbel). *Metacoxa:* Lateral apex quadrate. *Gonocoxites:* Fig. 123b. *Parameres:* Fig. 119f.

Diagnosis. *Sphaerorutela sumptuosa* is separated from other species in the genus by the shape of the metatibia in the male that is convergent toward the apex (Fig. 121b) (metatibia subparallel in other species, Fig. 121a), form of the clypeus that is sinuate laterally and weakly sinuate or truncate at the apex (Fig. 120a) (clypeus semicircular in other species, Fig. 120b), the pronotum with punctures at the margin and anterior angles that are .05-.08 mm (.01-.04 mm in other species), the metasternum that is rounded at the middle

(flattened in *S. viridicuprea*, Fig. 122a), and form of the male genitalia.

Distribution. Western Brazil in the states of Mato Grosso, Minas Gerais, and Rondonia.

Locality Data (Map 6). 16 specimens examined from BCRC, BMNH, LAGO, MNHN, QBUM, WBWC, ZMHB.

BRAZIL (16). MATO GROSSO (11): Cuiabá, Diamantino (upper Rio Arinos), Reserva Humboldt, Vila Vera, 12°50'S 51°47'W, No data. MINAS GERAIS (2): Sinópolis. RONDONIA (3): Caucalandia, Fazenda Rancho Grande (62 km SW Ariquemes).

Temporal Data. September (1), October (7).

Remarks. *Sphaerorutela sumptuosa* was named by Ohaus as a color variety of *R. coerulea* (*sensu* Burmeister). Although Ohaus dissected the male genitalia of *S. sumptuosa*, he believed that the variation in the parameres was within the range of variation of the nominate form of the species.

Martínez and Martínez (1992) named *Rutela martinsi* based on its unique male genitalia. They were unaware, however, that *S. sumptuosa* Ohaus was identical to their new species. *Rutela sumptuosa* Ohaus has nomenclatural priority over *Rutela martinsi*.

Larvae and natural history are unknown.

Sphaerorutela viridicuprea (Ohaus)
NEW COMBINATION, NEW STATUS
(Figs. 80-82, 119g-h, 122a, 123a; Map 6)

Rutela coerulea form *viridicuprea* Ohaus 1913: 508. Lectotype male at ZSMC labeled a) "Paraguay, S. Bernadino," b) male symbol, c) "R. coerulea v. viridicuprea cotype Ohs." (red label), d) "Staatssammlung München, 1975 Erwerb coll. Machatschke," e) my lectotype label. Lectoallotype female at ZMHB labeled a) "S. Catarina, Joinville, P. Schmalz S," b) female symbol, c) "R. coerulea v. viridicuprea type Ohs" (red label), d) my lectoallotype label. Paralectotype female at ZMHB labeled a) "Brésil, Etat de Sao Paulo," b) female symbol, c) "typus!" (red label), d) "v. viridicuprea Ohaus" (red label), e) my paralectotype label. **NEW COMBINATION, NEW STATUS.**

Rutela coerulea form *atra* Ohaus 1913: 508. Lectotype female at ZMHB labeled a) "Indiana, S. Paulo, 5-XI-34. Coll. Zellibor-Hauff," b) "R. coerulea v. atra Ohs. cotype" (red label), c) my lectotype label. Additional paralectotypes not located. **NEW SYNONYMY.**

Rutela coerulea form *cruenta* Ohaus 1913: 508. Lectotype male at ZSMC labeled a) "Paraguay, Mollinaque, 12.1925," b) leg card mounted, c) "R. coerulea v. cruenta cotype Ohs," (red label), d) "Staatssammlung München, 1975 Erweb coll. Machatschke," e) my lectotype label; male genitalia card mounted. Lectoallotype female at ZMHB labeled a) "Brazil, E.S. Paulo," b) female symbol, c) "typus!" (red label), d) "v. cruenta Ohaus" (red label), e) my lectoallotype label. **NEW SYNONYMY.**

Rutela coerulea form *ephippiata* Ohaus 1913: 508. Holotype female at ZMHB labeled a) "Brasilien, St. Catharina," b) "ex. museo Obërthur," c) female symbol, d) "typus!" (red label), e) "v. ephippiata Ohaus" (red label), f) my holotype label. **NEW SYNONYMY.**

Rutela coerulea form *flavovittata* Ohaus 1913: 508. Lectotype male and lectoallotype female at ZMHB. Lectotype male labeled a) "Rio Grande d. S.," b) "R. coerulea v. flavovittata cotype Ohs," c) my lectotype label; male genitalia card mounted, mouth parts card mounted. Lectoallotype female labeled a) "S. Catarina, Joinville, P. Schmalz S," b) female symbol, c) "typus!" (red label), d) "v. flavovittata Ohaus," d) my lectoallotype label. **NEW SYNONYMY.**

Rutela coerulea form *phalerata* Ohaus 1913: 508. Holotype male at ZMHB labeled a) "Brasilien, St. Catarina," b) "typus!" (red label), c) "v. phalerata Ohaus" (red label), d) my holotype label; male genitalia card mounted. **NEW SYNONYMY.**

Rutela coerulea form *stapiata* Ohaus 1913: 509. Holotype female at ZMHB labeled a) "Hohenau, Alto Parana," b) female symbol,

c) "typus!" (red label), d) "v. stapiata Ohaus" (red label), e) my holotype label. **NEW SYNONYMY.**

Description. Length 8.0-11.3 mm. Width 4.6-6.5 mm. *Color*: (Figs. 80-82) Head, pronotum, elytra, pygidium, and venter shining blue, green, bronze-green, ferruginous, or black with or without pronotal macula (pronotum ferruginous with central, blue or black macula) and/or elytral macula (elytra rufous, green, blue, or black with rufous or orange macula at mid-disc). *Head:* Surface of frons laterally and basolaterally strigate, disc moderately densely punctate, more dense apicomedially; punctures .01-.02 (base) to .03-.07 (apex and sides). Surface of clypeus densely punctate (base) to strigate (apex); punctures .03-.07 mm. Clypeus semicircular; apex of male weakly reflexed; apex of female weakly parabolic, strongly reflexed. Interocular width about 4.7 transverse eye diameters. *Pronotum:* Surface moderately densely punctate; punctures .01-.02 mm, some transverse in anterior angles. *Elytra:* Disc and sides moderately densely punctate; punctures minute-.01 mm. Sutural length about 3.5 times length of scutellum. *Propygidium:* Partially exposed or entirely hidden, surface punctate (apex) to punctostrigate (base); punctures .02-.03 mm. *Pygidium:* Shape broadly ovoid. Surface from base to mid-disc or apex moderately densely, transversely strigulate; apex punctate; punctures .01-.03 mm, some transverse. Ventral margin with sparse setae; setae medium in length, rufous. Apical margin of female weakly quadrate; male broadly, weakly sinuate. *Venter:* Metasternum at middle weakly flattened. Last sternite of male at subapex broadly, weakly sinuate (female weakly trisinuate); surface with weak, vermiform striations. *Legs:* Protibia with 3 teeth, basal tooth slightly removed from apical teeth. Foreclaw of male with larger claw as long as tarsomeres 1-5 combined, 2 times as wide as smaller claw (measured at middle), anterior edge subparallel to posterior edge. Foreclaw of female with claws simple, subequal. Mesotibia of male widest at middle, inner edge straight (convergent at apical 1/3), external edge weakly rounded from base to apical 1/3, weakly carinate at apical 1/3. Mesotibia of female with inner and external edges carinate; external edge with 1 at basal 1/4, 1 at middle; inner edge with 1 subapical carina. Apex weakly produced at middle (to middle or apex of tarsomere 1), with spinulae; 1 spinula laterad of inner, apical spurs, 1-2 at middle, 1-2 at lateral margin. Metatibia of male subparallel from basal 1/3 to apex, external edge weakly rounded from base to basal 1/3 of tibia, weakly carinate; 1 carina in basal 1/3, 1 in apical 1/3. Metatibia of female widest at middle, sides carinate and with spurs; external edge with 1 weak carina in basal 1/3, 1 carina in apical 1/3; inner edge with 2-3 spurs in apical 1/2. Apex of male without spinulae or setae, corbel weakly produced to middle of tarsomere 1. Apex of female without spinulae at external edge. *Metacoxa:* Lateral apex quadrate (male), weakly acuminate (female). *Gonocoxites:* Fig. 123a. *Parameres:* Figs. 119g-h.

Diagnosis. *Sphaerorutela viridicuprea* is distinguished from other species in the genus by the metasternum that is flattened in the middle (rounded in other species) (Fig. 122), the pronotum of the female with punctures at the margin and anterior angle that are small, .01-.02 mm (punctures larger in female *S. coeruleohumeralis* [.03-.04 mm] and *S. sumptuosa* [about .05-.08 mm]), clypeal apex that is semicircular (sinuate at the sides and weakly sinuate in *S. sumptuosa* or semicircular at the apex in *S. lauta* and *S. coeruleohumeralis*), and form of the male genitalia.

Distribution. Southeast Brazil, northeast Argentina, southeast Paraguay.

Locality Data (Map 6). 137 specimens examined from AMNH, BCRC, MNHN, ZMHB, ZSMC.

ARGENTINA (16). MISIONES (15): Santa Maria, No data. No Data (1).

BRAZIL (100). MINAS GERAIS (14): Vila Rica (=Ouro Prêto). PARANA (64): Arapongas, Iguacu National Park, Rolândia, No data. RIO GRANDE DU SUL (3): Mundo Novo, No data. SANTA CATARINA (16): Joinville, Lajes, Mafra, Nova Teutonia, Rio Natal, No data. SÃO PAULO (3): Guarulhos, Indiana.
PARAGUAY (9). ALTO PARANA (2): Puerto Bertoni, No data. LA CORDILLERA (4): San Bernadino. NO DATA (3).
NO DATA (12).

Temporal Data. January (5), February (7), March (2), May (1), September (12), October (10), November (23), December (32).

Remarks. *Sphaerorutela viridicuprea* was originally described as one of Ohaus's (1913) 15 color varieties of *Rutela coerulea* (*sensu* Burmeister). Ohaus believed that the interspecific variation in the male genitalia was within the basic "*coerulea*" form. *Sphaerorutela flavovittata, S. cruenta, S. phalerata, S. stapiata, S. atra,* and *S. ephippiata* possess the same characteristics as *S. viridicuprea,* but *S. viridicuprea* has page priority, and, as such, retains the name for the species. Among the synonyms of *S. viridicuprea* was a single specimen labeled "R. coerulea v. sellata cotype Ohs." This name was not published and is not a valid name.

Natural history and larvae are unknown for the species.

INTRODUCTION TO THE GENUS *MICRORUTELA* F. BATES

Species in the genus *Microrutela* are among the jewels of the New World Rutelini. They are glittering metallic and lavishly colored. If not for the small size of species in the genus and their extreme rarity, they would compete with species in the genus *Plusiotis* for beauty. The genus includes seven species (three of which are new) that are distributed from Costa Rica to central South America. The genus is most diverse in the Amazon Basin region where five of the seven species occur.

Adults are moderate-sized (about one centimeter) and are metallic blue, green, gold, violet, turquoise, or shining tan (Figs. 61-73, 124). Very little is known of the natural history of the group. Adults are diurnal and have been observed on vegetation during the day. The only known food plant is *Sterculia glauca* Gentry (Sterculiaceae) (pers. observ.). Females are not known for *M. coerulea* (Perty), and males are not known for *M. vidua* Jameson, new species. The larva of *M. viridiaurata* was reared on *Vitex cooperi* Standl. (Verbenaceae) and is described in this publication.

TAXONOMIC HISTORY OF THE GENUS *MICRORUTELA*

The genus *Microrutela* was proposed by Frederick Bates (1904) for two species that had previously been placed in the genus *Chalcentis* Burmeister. Frederick Bates (1904: 250) founded the genus for species that possessed a scutellum that "is very distinctly wider than long . . ." An unfortunate twist of taxonomic history now revises Bates' generic concept (Fig. 118).

When Burmeister (1844) created the genus *Chalcentis,* he divided the genus into two groups: *Chalcentis victima* Burm. forming one subset and *Chalcentis lauta* (Perty) [originally *Rutela lauta*] along with *Chalcentis sphaerica* Burm. [= *Rutela coerulea* Perty] forming the other subset. The two groups were defined based on the form of the mesometasternal process, clypeus, and scutellum. Lacordaire (1856: 353) noted the disparity in the characters that Burmeister used to separate these taxa and found it difficult to believe that Burmeister chose to place these taxa together, ". . . il y a lieu de s'étonner que M. Burmeister, qui crée si facilement des genres, ait associé cet insecte [*Chalcentis victima*] aux deux précédents [*Chalcentis lauta* and *Chalcentis sphaerica*]." Based partially on Lacordaire's observation, Bates created the genus *Microrutela* for species in the genus *Chalcentis* that possessed a scutellum that is wider than long. Bates transferred *Chalcentis lauta* and *Chalcentis coerulea* (the name that had nomenclatural

priority over Burmeister's *Chalcentis sphaerica*) to *Microrutela*, leaving *Chalcentis* monotypic with only *Chalcentis victima*.

The genus *Microrutela* was not recognized by Ohaus as a valid taxon. In 1913, Ohaus described several color varieties of *Rutela coerulea*, but he neglected to discuss the generic status of the group and its relation to *Microrutela*. This was probably due to lack of communication between England (Bates' home land) and Germany (Ohaus' home land) during World War I. In 1915, Ohaus synonymized the genus *Microrutela* under the genus *Rutela*, and he discussed three species groups within the genus: the "*Rutela coerulea* group," the "*Rutela lineola* group," and the "*Rutela striata* group." In the *coerulea* group, Ohaus placed *Rutela viridiaurata* (referred to here as *Microrutela viridiaurata*) and *Rutela coerulea* (referred to here as *Sphaerorutela coerulea* but what Bates referred to as *Microrutela coerulea*). These two taxa possess very different scutellar forms: the scutellum of *Microrutela* is slightly wider than long, and the scutellum of *Sphaerorutela* is nearly twice as wide as long. Ohaus placed these two very different species with differing scutellar forms in the same group. Based on the taxa that Ohaus included in the group, Ohaus must have believed that the form of the scutellum was not an important feature. Ohaus (1915: 259) synonymized Bates' genus because he believed that the form of the scutellum "fluctuates within a single species group." Regardless of this, however, Ohaus (1934) applied this character in his key to species groups and even defined his groups based on the form of the scutellum.

However, unknown to Bates, Lacordaire, and Ohaus, Burmeister's concept of *R. coerulea* Perty was erroneous (see discussion under "Taxonomic History of the genus *Sphaerorutela*") (Fig. 118). Perty's collection included two specimens in the type series for *Rutela coerulea*: the lectotype (which agrees with Perty's description) and the paralectotype (which does not agree with Perty's description; instead the specimen more readily agrees with the description of *Rutela lauta*, the next species described in Perty [1832]). Due to an unexplainable mishap, Burmeister's concept of *R. coerulea* was based not on the lectotype specimen but on the paralectotype specimen (referred to here as *Sphaerorutela lauta*). Perty's (1832) description clearly stated that *R. coerulea* possessed punctate elytra (a feature not found in *S. lauta*) and the dorsal habitus figures within the "*Delectus Animalium Articulatorum*" distinctly separate Perty's *R. coerulea* (=*Microrutela coerulea*) from *R. lauta* (=*Sphaerorutela lauta*). Regardless of these data, all previous concepts of *R. coerulea* have been based on Burmeister's erroneous concept of the species.

Because the type species of the genus *Microrutela* is *Rutela coerulea* Perty, Bates' generic concept is tied to Perty's concept of *R. coerulea*. Bates' concept of the species (along with Burmeister, Lacordaire, Ohaus, and Machatschke) actually referred to species that possess a scutellum that is nearly twice as wide as it is long. This character describes *R. lauta* Perty and the paralectotype of *R. coerulea* Perty (but *not* the lectotype of *R. coerulea* Perty).

I am resurrecting the genus *Microrutela* F. Bates, and I am applying the generic concept to the type species of the genus, *R. coerulea* Perty (the lectotype specimen). Blackwelder (1967: 529) stated that, in the case of a mis-identified genotype, ". . . the genotype is the species *named*, not some other species that may have been in the author's mind or is now in his collection." According to the International Code of Zoological Nomenclature (1985), in the case of a mis-identified type species, the case must be referred to the Commission in order to designate the type species that will "best serve the stability and universality of nomenclature" (Article 70b). In compliance with these rules, I have forwarded my claim to the International Commission of Zoological Nomenclature, and I am following Blackwelder's advice that the type species of the genus is the species named and not an inherited concept of the species.

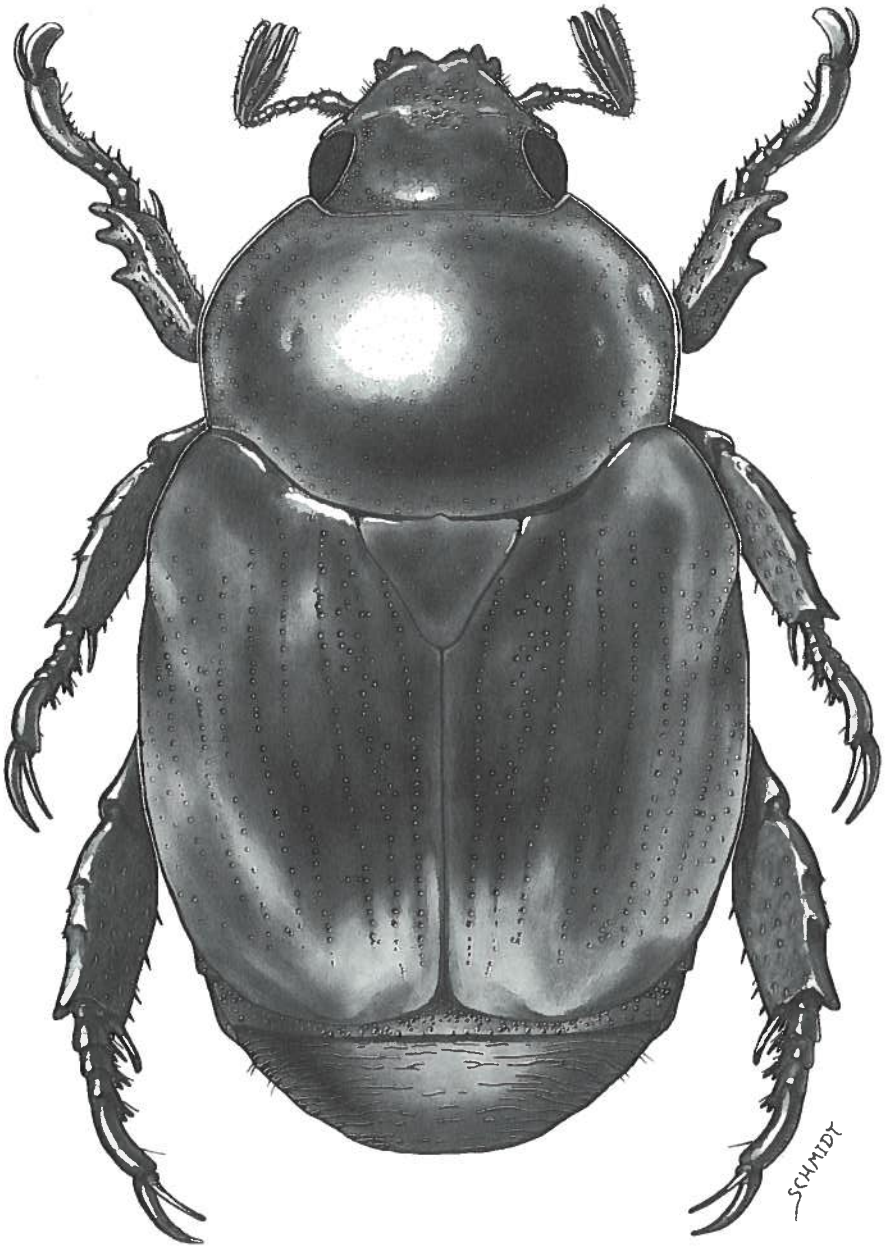


FIG. 124. Dorsal habitus of *Microrutela viridiaurata* (H. Bates), male.

Genus *MICRORUTELA* F. Bates
NEW STATUS
(Figs. 61-73, 124; Map 7)

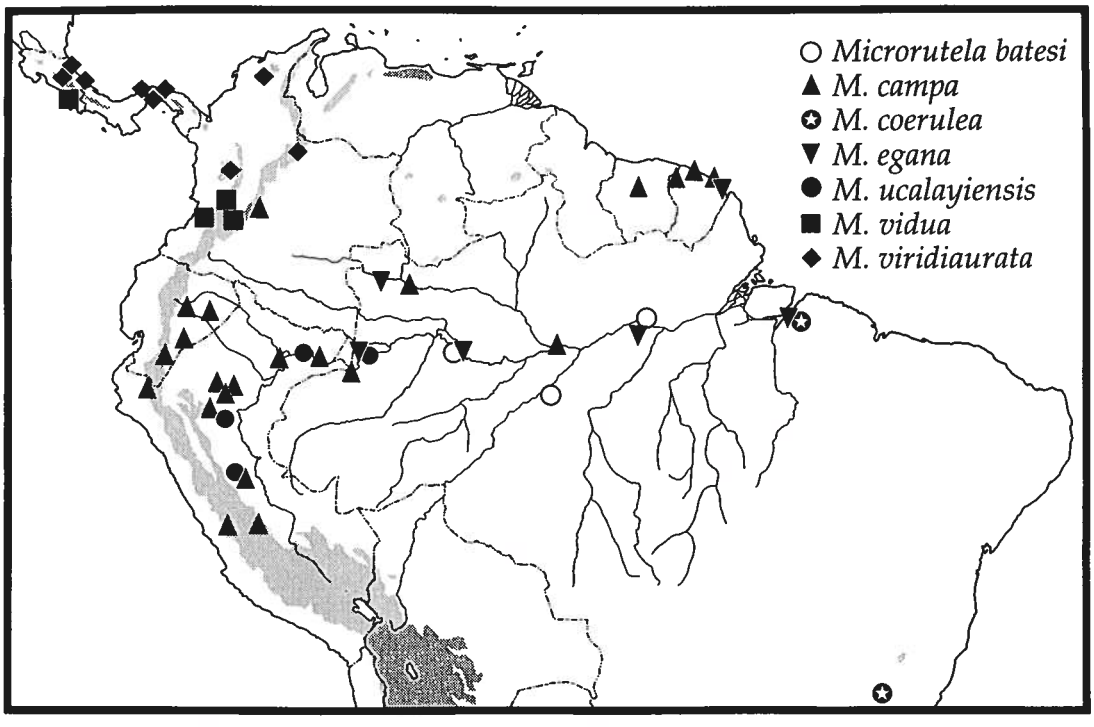
Microrutela F. Bates 1905: 250. **NEW STATUS.**

Type species. *Rutela coerulea* Perty 1832: 50. Fixed by F. Bates 1905: 250.

Description. Scarabaeidae, Rutelinae, Rutelini. *Form:* (Figs. 61-73, 124) Form subovate, sides subparallel, propygidium partially exposed beyond elytra, pygidium exposed, apex of elytra broadly rounded. Length from apex of clypeus to apex of pygidium 8.5-14.5 mm; width at mid-elytra 4.0-8.0 mm. *Head:* Frons in lateral view nearly flat at base, apex at middle weakly concave (apicomedial depression), clypeus in lateral view weakly convex. Surface of frons and clypeus variously sculptured, minutely punctate to striate, more heavily sculptured in most females. Clypeal apex bisinuate, weakly reflexed, beaded; bead incomplete (females) or complete (males) at middle; apex more produced in female. Interocular width 4.0-5.0 transverse eye diameters. Frontoclypeal suture incomplete (about length of one eye canthus). Mandibles with 2 recurved, apical teeth; 3 inner, scissorial teeth; broad molar region. Labrum weakly bisinuate or truncate at apex. Maxilla with 6 teeth; 1 apical, 2 medial, 3 basal. Mentum bisinuate at apex. Antenna 10-segmented, club 3-segmented and subequal to segments 1-7 combined. *Pronotum:* Form of pronotum at base broadly rounded, broadly sinuate before basal angle; lateral margin broadly rounded (Fig. 106b). Surface variably punctate. Bead at anterior margin incomplete at middle. *Scutellum:* Width slightly greater than length (width about 1.25 times as wide a length). Base declivous either side of midline; midline planar with elytral base (Fig. 106b). *Mesepimeron:* Base weakly exposed (base of elytral humerus produced anteriorly beyond base of mesepimeron). *Elytra:* Surface with punctate striate, longitudinal striae, punctures simple or ocellate. Intervals punctate, punctures simple or ocellate. Epipleuron at basal margin rounded, without shelf, beaded at apex; apical margin narrowed, exposing tergites laterally. Sutural length 2.0-3.0 times length of scutellum. Apex weakly rounded, beaded. *Tergites:* Narrowly exposed laterad of elytral margin, unicolorous. *Propygidium:* Partially exposed, surface punctate. *Pygidium:* Shape subtriangular with apex and marginal angles rounded. Surface strigate and punctate (often differs between male and female). Apical margin evenly rounded (males and females) or bisinuate (females). *Venter:* Prosternal keel triangular in posterior view, apex blunt, produced to level of protrochanter at about 35° with respect to dorsal surface. Mesometasternal keel in ventral view acuminate, apex rounded, produced to base of prosternal keel; ventral surface flat or decurved in lateral view. Sternites 1-4 subequal in length (male and female); sternite 5 subequal to 2.5 times as long as sternite 4 (may differ between male and female); sternite 6 1.5-2.5 times as long as sternite 4 (may differ between male and female). Last sternite of male variably sculptured (punctate or striate), quadrate at subapex; subapex to apex less sclerotized. Last sternite of female variably sculptured (punctate or striate), subapical region sclerotized, apex quadrately emarginate or trisinuate. In lateral view male sternites weakly concave, female sternites flat or weakly convex. *Legs:* Protibia with 3 teeth in apical third of tibia; basal tooth slightly removed; base without internal incised area. Tarsomere 5 of male a little longer than tarsomeres 1-4 combined. Foreclaw of male simple; external claw as long as tarsomere 5, twice as thick as internal claw, 2-3 times wider than internal claw, subapical tooth present; foreclaw of female simple, subequal. Claws (all legs) with unguitractor plate and associated setae hidden. Mesotibia with sides subparallel or widest at base or middle, convergent toward narrowed apex; external edge with or without 1-2 carinae; apex with produced, spiniform tooth and spinulae; inner apex with 2 spurs. Male with mesotarsomere 4 with weakly produced, median,

lobe-like projection between 2 apical spinulae; simple in female. Mesotarsal claws of male with external claw simple, twice as thick and twice as wide as inner claw; claws of female simple, external claw subequal to 1.5 times as thick, and subequal to 1.5 times as wide as inner claw. Metatibia with sides subparallel or widest at base or middle, convergent toward narrowed apex (more narrowed in male); external edge with or without 1-2 carinae; apex with variably produced corbel (male), without spinulae or setae; inner, apical spur in female not robust. Metatarsomere 4 of male with weakly produced, median, lobe-like projection between 2 apical spinulae; simple in female. *Metatrochanter:* Posterior border not produced beyond posterior border of femur. *Metacoxa:* Lateral apex quadrate or acute. *Hind Wing:* Well-developed hooks on precostal membrane present. Vein AA_{1+2} shortened, extending weakly beyond juncture of AA and AA_{3+4}. *Metendosternite:* In posterior view, Y-shaped, robust, with 2 apical arms. *Male Genitalia:* Symmetrical or asymmetrical, always diagnostic. *Female Genitalia:* Diagnostic.

Diagnosis. Members of the genus *Microrutela* differ from other genera in the tribe Rutelini by the following characters (see Jameson [1990] for key to tribes and subtribes of Rutelinae): frontoclypeal suture obsolete medially, pronotal base lacking basal bead, clypeus semicircular, apex of metatibia without spinules on ventrolateral edge, epipleuron lacking horizontal shelf. *Microrutela* is separated from *Sphaerorutela*, *Plesiorutela*, and *Rutela* based on the following characters: 1) form of the scutellum in which the width is about 1.25 times as wide as the length (scutellum is subequal in width and length in *Rutela*; scutellum nearly twice as wide as long in *Sphaerorutela*; scutellum about 1.20 times as wide as long in *Plesiorutela*); 2) the scutellar base that is planar with the base of the elytra at the midline and declivous laterad of the midline (scutellar base entirely declivous in *Plesiorutela* and *Sphaerorutela*; scutellum planar with the elytral base in *Rutela*); 3) sutural stria punctate (sutural stria



Map 7. Distribution of *Microrutela* species in Central and South America. Stippled area equals 1000 meters.

an impressed, longitudinal line in *Sphaerorutela;* punctate, in *Rutela;* lacking in *Plesiorutela*); 4) mesotibia with a produced, spiniform tooth (lacking medial tooth or spiniform tooth in *Plesiorutela* and *Sphaerorutela;* medial tooth [not spiniform tooth] present in *Rutela*); 5) meso- and metatarsomere 4 of the male with a lobe-like projection between apical spinulae (spiniform projection in *Sphaerorutela;* lobe-like projection in *Plesiorutela* and *Rutela*); 6) mesometasternal projection distinctly produced and acuminate (weakly produced and rounded apically in *Plesiorutela* and *Sphaerorutela;* appreciably produced in *Rutela*); 7) mandibular teeth placed apically (apicolaterally in *Sphaerorutela;* apically in *Plesiorutela* and *Rutela*); 8) pronotal base in which the basal angle is broadly sinuated (angulate in the genera *Sphaerorutela* and *Rutela;* broadly sinuated in *Plesiorutela*); 9) anterior pronotal bead incomplete at the middle (complete in *Plesiorutela* and *Sphaerorutela;* incomplete at the middle in *Rutela*).

Distribution (Map 7). Central America (Panama and Costa Rica) and central and northern South America.

Key to the species of *Microrutela* F. Bates

1. Foretarsus with external claw twice as thick as internal claw. Terminal sternite less sclerotized from subapex to apex, subapex quadrate. **Males** (males of *Microrutela vidua*, n. sp. Jameson are not known) 2
1′. Foretarsus with claws subequal in thickness. Terminal sternite entirely sclerotized, apex trisinuate or quadrate. **Females** (females of *Microrutela coerulea* (Perty) are not known) 7

Males:

2. Pygidium entirely strigate 3
2′. Pygidium with strigae at midline or at apex interrupted, effaced, or lacking 4

3. Pronotum with apical and lateral punctural size .02 to .05 mm in diameter. Parameres as Fig. 125a ..... *M. batesi* Jameson, n. sp.
3′. Pronotum with apical and lateral punctural size minute to .03 mm in diameter. Parameres as Fig. 125g ..... *M. ucalayiensis* Jameson, n. sp.

4. Pronotum with apical and lateral punctural size minute to .02 mm in diameter ... 5
4′. Pronotum with apical and lateral punctural size .03 to .05 mm in diameter 6

5. Parameres as Fig. 125f ..... *M. egana* (Ohaus)
5′. Parameres as Fig. 125e ..... *M. coerulea* (Perty)

6. Metatibia with 2 well defined carinae on external edge (Fig. 126a). Parameres as Figs. 125b-d ..... *M. campa* (Ohaus)
6′. Metatibia with 2 obsolete carinae on external edge (Fig. 126b). Parameres as Fig. 125h ..... *M. viridiaurata* (H. Bates)

Females:

7. Terminal sternite bi-emarginate (*i.e.*, Fig. 127d) 8
7′. Terminal sternite quadrate (*i.e.*, Figs. 127 a-c) 10

8. Pronotum with apical and lateral punctural size .03-.05 mm in diameter. Gonocoxites as Fig. 128c ..... *M. egana* (Ohaus)
8′. Pronotum with apical and lateral punctural size minute to .02 mm in diameter. Gonocoxites not as Fig. 128c 9

9. Gonocoxites as Fig. 128b ..... *M. campa* (Ohaus)
9′. Gonocoxites as Fig. 128f ..... *M. viridiaurata* (H. Bates)

10. Apical margin of pygidium bisinuate (Fig. 127a). Gonocoxites as Fig. 128a ..... *M. batesi* Jameson, n. sp.
10′. Apical margin of pygidium rounded (Figs. 127b-c). Gonocoxites not as Fig. 128a 11

11. Pronotum with apical and lateral punctural size minute to .02 mm. Gonocoxites as Fig. 128e ..... *M. vidua* Jameson, n. sp.
11'. Pronotum with apical and lateral punctural size .02-.05 mm. Gonocoxites as Fig. 128d ..... *M. ucalayiensis* Jameson, n. sp.

Clave para las especies de *Microrutela* F. Bates

1. Protarsos con la uña externa dos veces más gruesa que la uña interna. Esternito terminal menos esclerotizado del subápice al ápice, con el subápice cuadrangular. **Machos** (machos de *M. vidua* n. sp. Jameson desconocidos) 2
1'. Protarsos con las uñas casi iguales en grosor. Esternito terminal enteramente esclerotizado, con el ápice trisinuado o cuadrangular. **Hembras** (hembras de *M. coerulea* (Perty) desconocidas) 7

Machos:
2. Pigidio enteramente estrigado..... 3
2'. Pigidio con las strigae interrumpidas, borradas o ausentes en la línea media o hacia el ápice 4

3. Pronoto con los puntos apicales y laterales de .02 a .05 mm de diámetro. Parámeros como en la Fig. 125a ..... *M. batesi* Jameson, n. sp.
3'. Pronoto con los puntos apicales y laterales diminutos, cuando más de .03 mm de diámetro. Parámeros como en la Fig. 125g ..... *M. ucalayiensis* Jameson, n. sp.

4. Pronoto con los puntos apicales y laterales diminutos, cuando más de .02 mm de diámetro 5
4'. Pronoto con los puntos apicales y laterales de .03 a .05 mm de diámetro..... 6

5. Parámeros como en la Fig. 125f ..... *M. egana* (Ohaus)
5'. Parámeros como en la Fig. 125e ..... *M. coerulea* (Perty)

6. Metatibia con dos carinas bien definidas sobre el borde externo (Fig. 126a). Parámeros como en la Figs. 125b-d ..... *M. campa* (Ohaus)
6'. Metatibia con dos carinas poco definidas sobre el borde externo (Fig. 126b). Parámeros como en la Fig. 125h ..... *M. viridiaurata* (H. Bates)

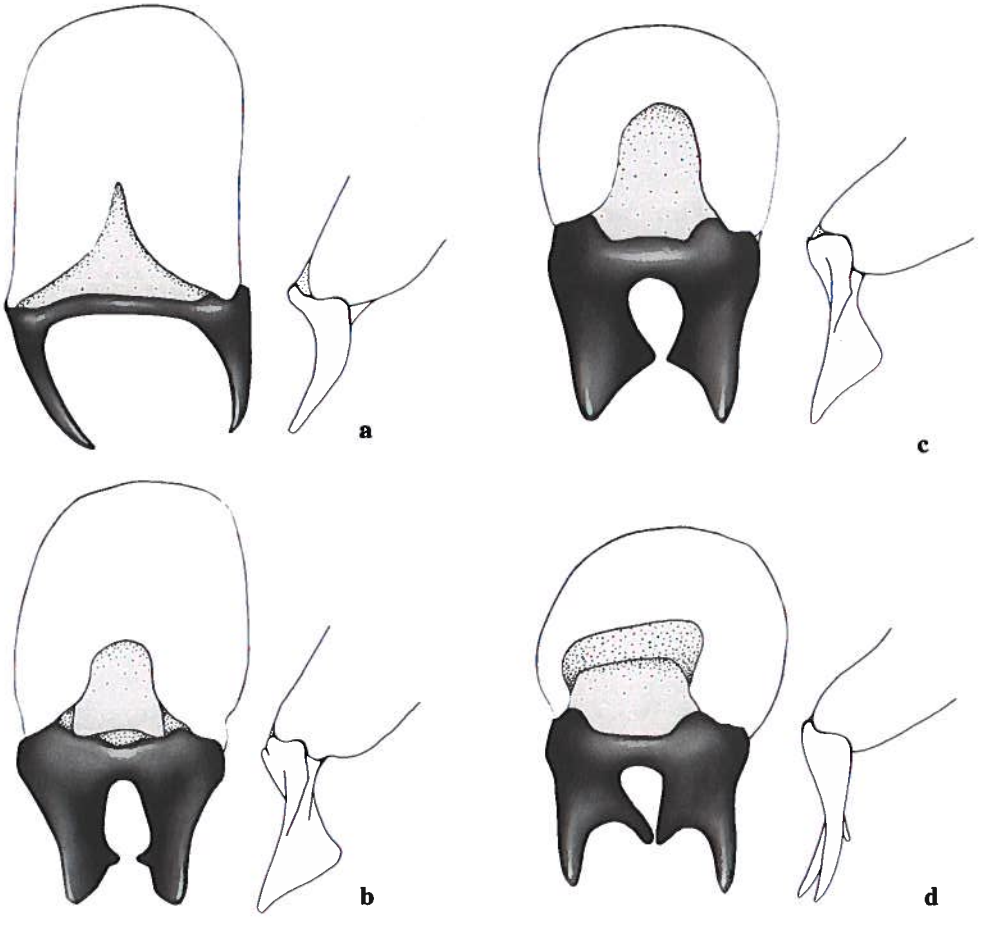
Hembras:
7. Esternito terminal bi-emarginado (v.g. Fig. 127d) 8
7'. Esternito terminal cuadrangular (v.g. Figs. 127a-c) 10

8. Pronoto con los puntos apicales y laterales de .03 a .05 mm de diámetro. Gonocoxitos como en la Fig. 128c ..... *M. egana* (Ohaus)
8'. Pronoto con los puntos apicales y laterales diminutos, cuando más de .02 mm. Gonocoxitos diferentes a la Fig. 128c 9

9. Gonocoxitos como en la Fig. 128b ..... *M. campa* (Ohaus)
9'. Gonocoxitos como en la Fig. 128f ..... *M. viridiaurata* (H. Bates)

10. Borde apical del pigidio bisinuado (Fig. 127a). Gonocoxitos como en la Fig. 128a ..... *M. batesi* Jameson, n. sp.
10'. Borde apical del pigidio redondeado (Figs. 127b-c). Gonocoxitos como en la Fig. 128a 11

11. Puntos apicales y laterales del pronoto diminutos, cuando más de .02 mm de diámetro. Gonocoxitos como en la Fig. 128e ..... *M. vidua* Jameson, n. sp.
11'. Puntos apicales y laterales del pronoto con .02 a .05 mm de diámetro. Gonocoxitos como en la Fig. 128d ..... *M. ucalayiensis* Jameson, n. sp.

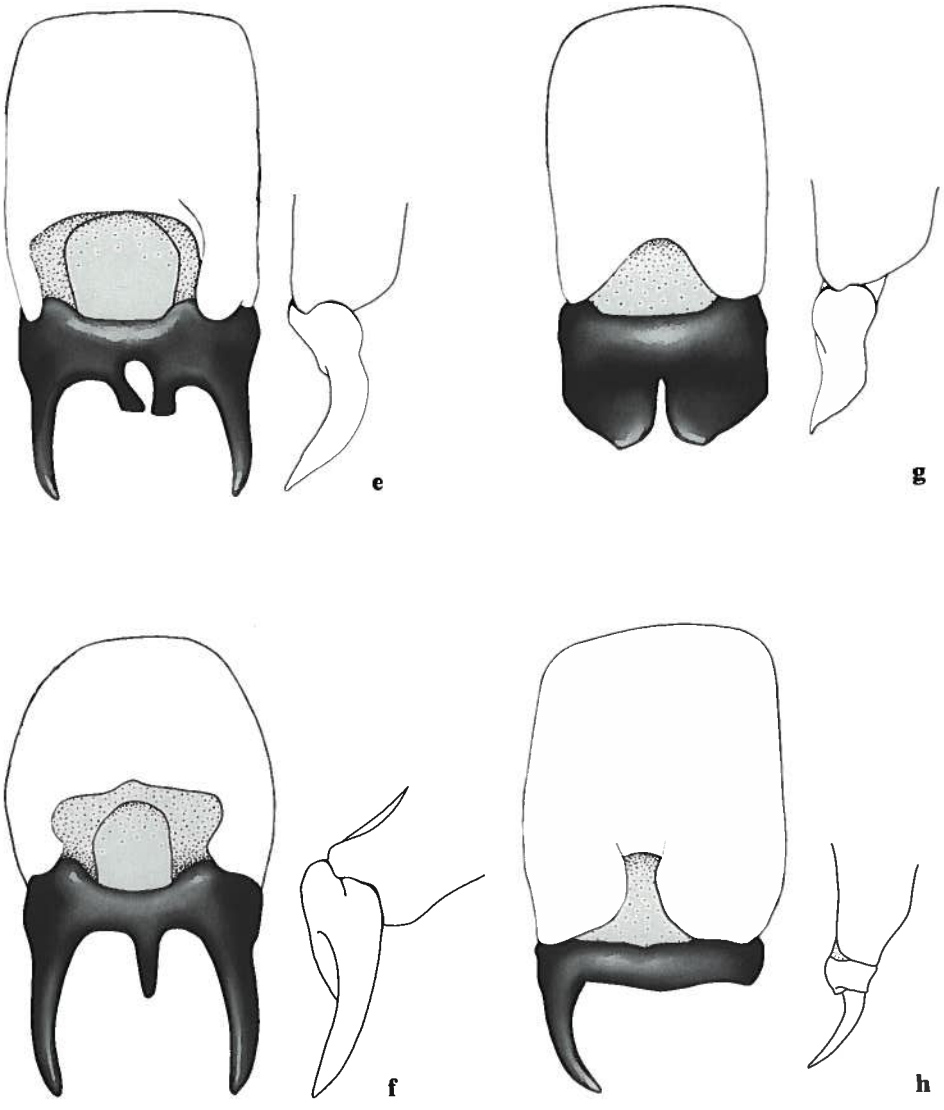


FIGS. 125a-h. Dorsal view of the parameres of *Microrutela* species (lateral view at right). 125a, *Microrutela batesi*; 125b-d, *Microrutela campa*.

***Microrutela batesi* Jameson, NEW SPECIES**
(Figs. 61-62, 125a, 127a, 128a; Map 7)

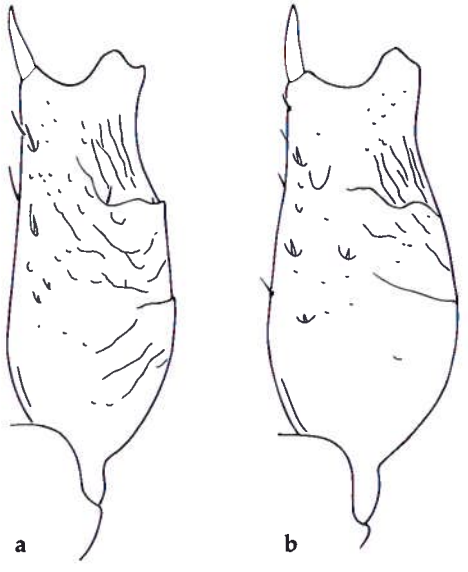
Type Material (holotype, allotype, and eight paratypes [three males, five females]). Holotype male and allotype female at MNHN. Holotype labeled a) "Obidos, Amaz.," b) "Rut. in cop.," c) "Ex Musaeo H.W. Bates 1892;" male genitalia card mounted. Allotype labeled a) "Obidos, Amaz.," b) "Ex Musaeo H.W. Bates 1892." Two paratypes (one male, one female) labeled as allotype, deposited at MNHN. Two paratypes (one male, one female) labeled as allotype, deposited at UNSM. One female paratype at MNHN labeled a) "Teffé (ega), Amazones, M. de Mathan, 3 trimestre 1878." One male paratype at MNHN labeled a) "Amazones. Manicoré. ex. Strg." Two female paratypes at BMNH: one labeled a) "Amazon. Bates," b) "19967," c) "Fry Coll. 1905-100;" the other labeled a) "Amazon. Bates," b) "24979," c) "Fry coll. 1905-100."

Holotype Male. Length 8.9 mm. Width 4.8 mm. *Color*: (Fig. 61) Dorsally light brown with disc of head and pronotum and elytral margins black with dark green reflections; pygidium light brown with green reflections; venter light brown with castaneous maculae

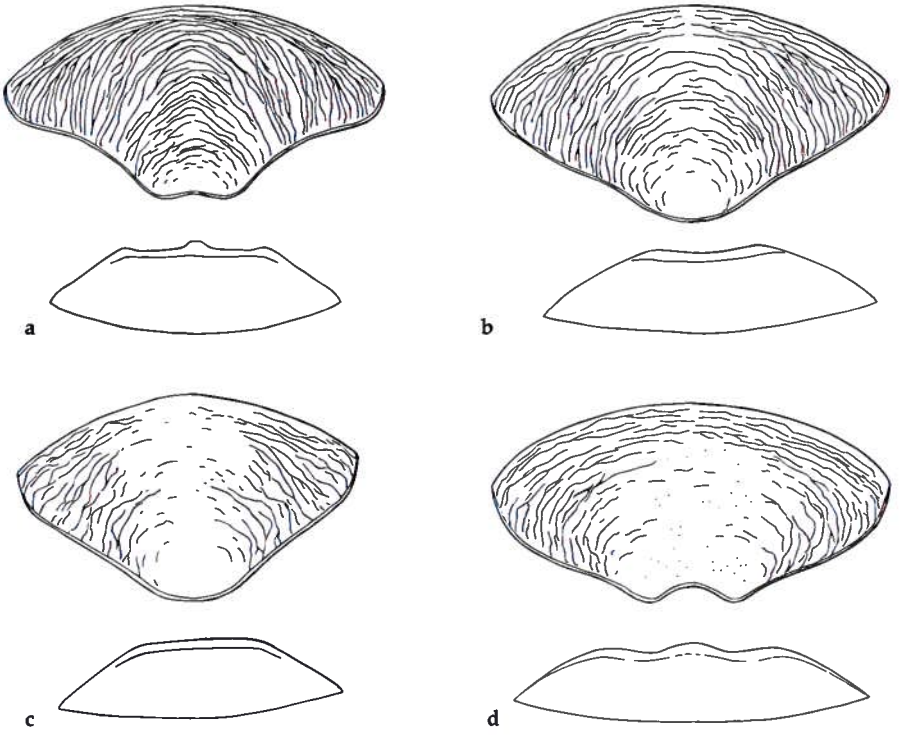


FIGS. 125a-h. Dorsal view of the parameres of *Microrutela* species (lateral view at right). 125e, *Microrutela coerulea*; 125f, *Microrutela egana*; 125g, *Microrutela ucalayiensis*; 125h, *Microrutela viridiaurata*.

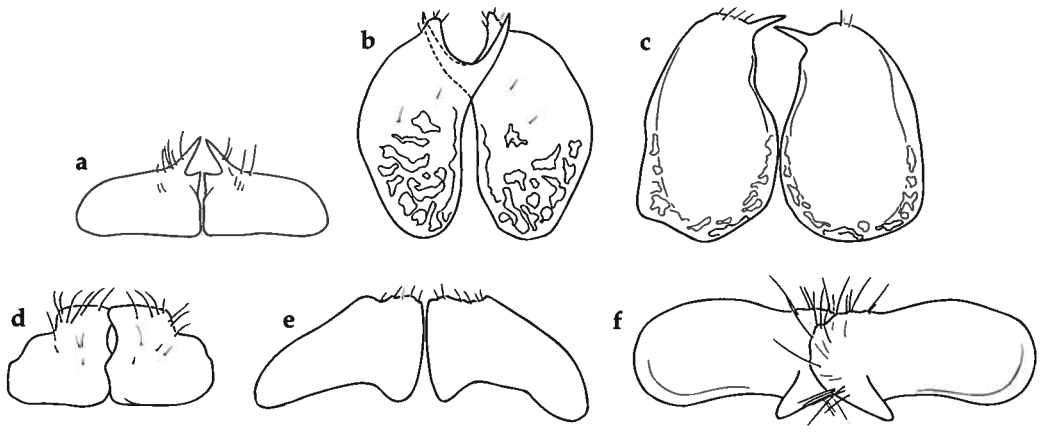
and green reflections. *Head:* Surface of frons at mid-disc moderately densely punctate, base and sides densely punctate, basolaterally strigate; punctures .01-.04 mm. Apicomedial depression densely punctate, some transverse; punctures .02-.04 mm. Surface of clypeus densely punctate; punctures .01-.04 mm, some transverse. Interocular width equals about 4.5 transverse eye diameters. *Pronotum:* Surface basomedially and at midline sparsely punctate (punctures .01-.02 mm), laterally and anteriorly moderately densely punctate (punctures .02-.05 mm). Lateral disc at middle with 1 fovea posterior to anterior angle. *Scutellum:* Slightly wider than length (width to length ratio equals 1.0:0.92). *Elytra:* Surface with weakly impressed, punctate, longitudinal striae; 1 next to suture, 4 mesad of humerus, 4 laterad of humerus (poorly defined); punctures .02-.03



FIGS. 126a-b. Ventrolateral view of metatibia of the male. 126a, *Microrutela campa*; 126b, *Microrutela viridiaurata*.



FIGS. 127a-d. Dorsal view of the pygidium (above) and ventral view of the terminal sternite (below) of the female showing form of the apical margin. 127a, *Microrutela batesi*; 127b, *Microrutela ucalayiensis*; 127c, *Microrutela vidua*; 127d, *Microrutela viridiaurata*.



FIGS. 128a-f. Gonocoxites of *Microrutela* species. 128a, *Microrutela batesi;* 128b, *Microrutela campa;* 128c, *Microrutela egana;* 128d, *Microrutela ucalayiensis;* 128e, *Microrutela vidua;* 128f, *Microrutela viridiaurata.*

mm, ocellate. Interval between stria 1 and 2 broad, moderately densely punctate; punctures .02-.03 mm ocellate with minute-.01 mm punctures intermixed; intervals between striae 2-5 and striae laterad of humerus narrow, sparsely punctate, punctures minute-.01 mm. Sutural length about 2.4 times length of scutellum. *Propygidium:* Partially exposed, surface at base sparsely punctate (punctures minute-.01 mm); basal 1/3 to apex densely punctate, punctures .01-.03 mm. *Pygidium:* Surface with vermiform strigae throughout, becoming concentric toward apex. Margin with sparse, moderately long, tawny setae. *Venter:* Sternites 1-4 subequal in length; sternite 5 about 2 times as long as 4 ; sternite 6 about 1.5 times as long as sternite 4 (to subapex). Last sternite at subapex broadly, quadrately emarginate; surface of disc with weakly impressed striae, more impressed laterally. *Legs:* Mesotibia with sides subparallel, external edge without carinae. Mesotibial apex with produced, spiniform tooth mediolaterally and spinulae; spiniform tooth produced to base of tarsomere 2; apex with 1 spinula laterad of inner spurs and 2 spinulae laterad of spiniform tooth. Metatibia widest at middle, weakly converging to apex, external edge with weak basal carina (at basal 1/3) and moderately pronounced apical carina (at apical 1/3). Metatibial apex with corbel produced to base of tarsomere 2. *Metacoxa:* Lateral apex square. *Parameres:* Fig. 125a.

Allotype. Female. Length 10.7 mm. Width 5.3 mm. Differs from male holotype except in the following respects: *Color* (Fig. 62): Dorsally and ventrally light brown with weak green reflections; base of frons castaneous and pronotum (at midline and near margin) with longitudinal, castaneous maculae. *Head:* Surface of frons at mid-disc densely punctate. *Elytra:* Surface with 5 longitudinal, punctate striae mesad of humerus. *Pygidium:* Surface with vermiform strigae throughout, becoming semicircular toward apex. Apex weakly produced, apical margin narrowly bisinuate (Fig. 127a); apices acutely rounded. *Venter:* Sternite 6 about as long as sternite 4. Last sternite broadly, quadrately emarginate; surface strigate. *Legs:* Mesotibia with 1 weak carina in basal 1/3, 1 weak carina in apical 1/3. Mesotibial apex with spiniform tooth produced to middle of tarsomere 2. *Gonocoxites:* Fig. 128a.

Paratypes (2 males, 5 females). Length 8.9-10.8 mm. Width 4.5-5.6 mm. Differ from holotype and allotype in the following respects: *Color*: Males—Head, pronotum, and elytra shining dark green or castaneous with green reflections; pygidium and venter light brown with green reflections *or* dorsally light

brown with disc of head and pronotum and elytral margins black with green reflections; pygidium light brown with green reflections; venter light brown with castaneous maculae and green reflections. Females—Dorsally and ventrally light brown with weak green reflections; base of frons castaneous and pronotum (at midline and near margin) with longitudinal, castaneous maculae *or* head, pronotum, and elytra shining dark green or castaneous with green reflections; pygidium and venter light brown with green reflections. *Head:* Surface of frons at apicomedial depression punctostrigate or confluently punctate.

Diagnosis. The entirely strigulate pygidium, quadrately emarginate terminal sternite in the female, pygidium with apical margin narrowly bisinuate in the female, pronotal punctation that is sparsely punctate at midline and midbase (punctures .01-.02) and moderately dense laterally and anteriorly (punctures .02-.05 mm) serve to distinguish the species. *Microrutela batesi* is most similar to *Microrutela ucalayiensis* but is separated by larger pronotal punctures laterally and anteriorly (.02-.05 mm) in *M. batesi* and smaller in *M. ucalayiensis* (.01-.03 mm), form of the female gonocoxites, and form of the parameres.

Distribution. Known only from Tefé, Manicore, and Obidos in the Brazilian Amazon. No recorded elevation.

Locality records (Map 7). 10 specimens examined from BMNH, MNHN.

BRAZIL (10). AMAZONAS (4): Manicore, Tefé, No data. PARÁ (6): Obidos.
Temporal Data. Unknown.

Remarks. The localities where this species has been collected are all on white water Amazon River drainage.

Larvae and natural history are unknown.

Etymology. *Microrutela batesi* is named in honor of Henry Walter Bates (1825-1892) for his contributions to the knowledge of Neotropical Scarabaeidae and Coleoptera, his contributions to Amazonian exploration, and his contributions toward evolutionary theory. Eight of the nine specimens in the type series are from the Bates collection and were probably collected by Bates.

Microrutela campa (Ohaus)
NEW COMBINATION
(Figs. 63-64, 125b-d, 126a, 128b; Map 7)

Rutela campa Ohaus 1922: 325. Holotype male at ZMHB labeled a) "Chanchamayo, Peru," b) "typus!" (red label), c) "Rutela campa Ohs." (red label), d) my holotype label. **NEW COMBINATION.**

Description. Length 9.1-13.4 mm. Width 5.2-7.4 mm. *Color*: (Figs. 63-64) Dorsally and ventrally metallic blue, dark blue, blue-green, turquoise, green, green with rufous undertones, or gold with rufous undertones. *Head:* Surface of frons sparsely punctate (male) or moderately densely punctate (female), basolaterally strigulate; punctures .01-.03 mm, some transverse; apicomedial depression moderately densely punctate or densely punctate, some transverse, punctures .01-.03 mm. Surface of clypeus densely punctate (disc) to moderately densely punctate (sides and apex); punctures .01-.03 mm. Interocular width about 4.1 transverse eye diameters. *Pronotum:* Surface of male and female sparsely punctate; punctures minute-.02 mm (smaller punctures at base). Lateral disc at middle with 1-2 foveae; 1 posterior to anterior angle, 1 posterior to eye (may be absent). *Elytra:* Surface with punctate, longitudinal striae; 1 next to suture, 4 mesad of humerus, 3-4 laterad of humerus (poorly defined); punctures .02-.05 mm, ocellate. Interval between stria 1 and 2 broad, moderately densely punctate; punctures .02-.05 mm, ocellate with simple, minute-.01 mm punctures intermixed; intervals between striae 2-5 and striae laterad of humerus narrow, sparsely punctate, punctures minute-.01 mm, simple. *Propygidium:* Partially exposed or entirely hidden; surface

from base to middle densely punctate (punctures .04-.06 mm), surface at apex moderately densely punctate (punctures .01-.02 mm). *Pygidium:* Surface at base, sides, and disc with vermiform strigae, becoming concentric toward apex; apex of male sparsely punctate, some transverse, punctures .01-.02 mm; apex of female strigulate or transversely punctate. Margin with sparse, moderately long, tawny setae. Apical margin of female broadly bisinuate (Fig. 127d), apices acutely rounded. *Venter:* Sternites 1-4 subequal in length in male and female; sternite 5 about 2 times as long as 4 in male, about 2.0 times as long as 4 in female; sternite 6 of male about equal in length to sternite 4 (to subapex); sternite 6 of female about 2 times as long as 4. Last sternite of male at subapex quadrate; surface of disc sparsely punctate, sides with sparse striae; punctures .01 mm. Last sternite of female at apex broadly, weakly trisinuate; surface striate. *Legs:* Mesotibia widest at middle, converging toward apex; external edge of male without carinae; external edge of female with 1 weak carina in basal 1/3 and 1 weak carinae in apical 1/3; apex with produced, spiniform tooth and spinulae; spiniform tooth placed mediolaterally and produced to apex of tarsomere 1 or middle of tarsomere 2; 0-1 spinulae placed laterad of inner spurs and 1-2 spinulae placed laterad of spiniform tooth. Metatibia of male widest in basal 1/3, converging to narrowed apex, external with carina in apical 1/3; metatibia of female widest at middle, external edge with 1 carina in basal 1/3 and 1 carina in apical 1/2 (Fig. 126a). Metatibial apex with corbel (male) produced to apex of tarsomere 1. *Metacoxa:* Lateral apex quadrate or weakly acute. *Parameres:* Fig. 125b. *Gonocoxites:* Fig. 128b.

Diagnosis. *Microrutela campa* is very similar to *M. viridiaurata* and *M. vidua* and is best identified using the male genitalia and female gonocoxites. *Microrutela campa* differs from *M. coerulea* and *M. egana* by the pronotal punctures which are minute to .02 mm (larger in *M. egana* and *M. coerulea* [.02-.03 mm at base, .03-.05 mm at apex]), and differs from *M. batesi* and *M. ucalayiensis* by the apex of the pygidium that is punctate (entirely strigulate in *M. batesi* and *M. ucalayiensis*).

Distribution. Throughout the Amazon River Basin region from Peru, Ecuador, and Colombia in the west to Surinam and French Guiana in the east.

Locality records (Map 7). 51 specimens examined from AMNH, BMNH, BCRC, CASC, CMNH, MCZC, MNHN, QBUM, USNM, ZMHB, ZSMC.

BRAZIL (4). AMAZONAS (4): Benjamin Constant, Saõ Gabriel da Cachoeira, Manaus.
COLOMBIA (1). CUNDIMARCA (1): Medina.
ECUADOR (9). LOJA (3): Loja. MORONA SANTIAGO (3): Macas. NAPO (1): Tena (17 km SW). PASTAZA (1): Sarayacu. NO DATA (1).
FRENCH GUIANA (19). CAYENNE (4): Cayenne, Roches de Kourou, Sinnamary. SAINT LAURENT DU MARONI (7): Les Hattes, St. Jean, No Data. NO DATA (8).
PERU (17). HUANUCO (2): Cushi, Mayobamba. JUNIN (2): Chanchamayo. LIMA (1): M. Sani Beni. LORETO (6): Iquitos, Pebas, Rio Huallaga (Upper), Yurimaguas (near). PIURA (2): Quiroz. SAN MARTIN (3): Tarapoto. NO DATA (1).
SURINAM (1). NO DATA.

Temporal Data. April (1), May (2), July (7), August (1), September (1), October (2), November (2), December (2).

Remarks. Ohaus (1922) noted that the species was named for the region where the type specimen was collected, "Campa-Indianern," near Chanchamayo, Peru.

The natural history is unknown for this species.

Microrutela coerulea (Perty)
NEW COMBINATION
(Figs. 65, 125e; Map 7)

Rutela coerulea Perty 1832: 50, T. 50, f. 14. Lectotype and paralectotype at ZSMC. Lectotype male labeled a) "Type von *Rutela coerulea* Perty" (Hans Kulzer label, orange), b) "14. Brasilia *Rutela chalybea*. Perty" (Dr. Johannes Rudolpha Roth label, white with green box), c) "Lectoholotypus *Rutela coerulea* Perty det. D. G. Scherer 1981;" male genitalia card mounted. Paralectotype male labeled a) "Brasilien," b) "alte Sammlung," c) small, round, green label, d) "Lectoparatypus *Rutela coerulea* Perty Dr. G. Scherer 1981," e) my determination label indicating that this specimen is *Sphaerorutela lauta* (Perty); male genitalia card mounted. See discussion under comments. Type locality "*Hab. inter S. Pauli civitatem et Villam riccam*" (between São Paulo [Brazil] and Vila Rica [=Ouro Prêto, Brazil]). **NEW COMBINATION.**

Description. Length 10.0-10.4 mm. Width 5.6-5.8 mm. *Color*: (Fig. 65) Dorsally shining dark blue with green and violet reflections; ventrally metallic blue-green. *Head:* Surface of frons at base and on disc sparsely punctate, punctures .01-.03 mm; apicomedial depression densely punctate, some transverse, punctures .01-.05 mm. Surface of clypeus on disc densely punctate, some transverse; surface apically and laterally moderately densely punctate; punctures .02-.05 mm. Interocular width about 4.1 transverse eye diameters. *Pronotum:* Surface with moderate sized and minute punctures, mixed; moderate sized punctures .02 mm (at middle and base) to .05 mm (at sides and apex); minute punctures less than .01 mm, moderately dense. Lateral disc at middle with 1-2 foveae; 1 posterior to anterior angle, 1 posterior to eye (may be absent). *Scutellum:* Slightly wider than length (W to L ratio equals 1.0:0.80). *Elytra:* Surface with punctate, longitudinal striae; 1 next to suture, 4 mesad of humerus, 4 laterad of humerus (poorly defined); punctures .02-.05 mm, ocellate. Interval between stria 1 and 2 broad, moderately densely punctate; punctures ocellate, .02-.05 mm with simple, minute-.01 mm punctures intermixed; intervals between striae 2-5 and striae laterad of humerus narrow, sparsely punctate, punctures, simple, minute-.01 mm. Sutural length about 2.2 times length of scutellum. *Propygidium:* Partially exposed or entirely hidden; surface at base densely punctate, apex moderately densely or sparsely punctate; punctures .04-.05 mm. *Pygidium:* Surface at base, sides, and disc with vermiform strigae, becoming concentric toward apex; mid-disc with strigae partially effaced or not; apex punctate, punctures .01-.02 mm. Margin with sparse, moderately long, tawny setae. *Venter:* Sternites 1-4 subequal in length; sternite 5 about 2.5 times as long as 4; sternite 6 about equal in length to sternite 4 (to subapex). Last sternite at subapex broadly, quadrate; surface of disc punctate, margins weakly striate; punctures .01-.02 mm, moderately dense. *Legs:* Mesotibia widest at middle, converging toward apex; external edge without carinae; apex with produced, spiniform tooth mediolaterally and spinulae; spiniform tooth produced to apex of tarsomere 1 or base of tarsomere 2; 1 spinulae laterad of inner spurs and 1-2 spinulae laterad of spiniform tooth. Metatibia widest at middle, converging to apex, external edge with carinae; 1 in basal 1/3 (nearly obsolete) and 1 in basal 1/3. Metatibial apex with corbel (male) produced to apex of tarsomere 1. *Metacoxa:* Lateral apex acute. *Parameres:* Fig. 125e.

Diagnosis. *Microrutela coerulea* is very similar to *M. egana* and is best identified using the male genitalia and female gonocoxites. *Microrutela coerulea* is separated from *M. batesi* and *M. ucalayiensis* by the apex of the pygidium which is punctate (rather than entirely strigulate as in *M. batesi* and *M. ucalayiensis*) and from *M. viridiaurata*, *M. campa*, and *M. vidua* by the pronotal punctures that are moderate and moderately large (in *M. viridiaurata*, *M. campa*, and *M. vidua* the pronotal punctures are small or minute in size [less than .02 mm]).

Distribution. Known from Minas Gerais and Pará, Brazil. One specimen was from "America Meridional."

Locality records (Map 7). 3 specimens examined from BCRC, MNHN, ZSMC.

BRAZIL (3). MINAS GERAIS (1): Ouro Prêto (near). PARA (2): Utinga, No data.
NO DATA (1).

Temporal Data. April (1).

Remarks. The type series for *Rutela coerulea* Perty included the lectotype (referred to here as *Microrutela coerulea*) and a paralectotype (referred to here as *Sphaerorutela lauta*). Previously, the general concept of *Rutela coerulea* Perty was based, erroneously, on *Sphaerorutela lauta* Perty (see discussion under *Sphaerorutela*). The confusion began with Burmeister's incorrect interpretation of the species which was based on the paralectotype rather than the lectotype specimen (Fig. 118). Subsequent authors (Lacordaire, F. Bates, Ohaus, Machatschke) also used Burmeister's incorrect concept of *Rutela coerulea* Perty.

The type locality for the species was "between Sao Paulo and Vila Rica" (Perty 1832). According to Papavero (1973), Vila Rica is an old name for Ouro Prêto, Minas Gerais, Brazil.

Only male specimens of *Microrutela coerulea* are known. Females that are associated with males of *M. coerulea* will probably possess moderate-sized pronotal punctures (.02-05 mm or larger) and the gonocoxites will probably be unique. Larvae and natural history are also unknown for the species.

Microrutela egana (Ohaus)
NEW COMBINATION
(Figs. 66-67, 125f, 128c; Map 7)

Rutela egana Ohaus 1922: 325. Lectotype and lectoallotype at ZMHB. Lectotype male labeled a) "Amazon. Ega. Bates," b) "typus!" (red label), c) "Rutela egana Ohaus" (red label), d) my lectotype label; male genitalia card mounted. Lectoallotype female labeled, a) "Brésil, Amazone. Bocce do Teffé," b) "typus!" (red label), c) "R. egana Ohaus" (red label), d) my lectoallotype label. **NEW COMBINATION.**

Description. Length 9.2-11.3 mm. Width 5.6-6.5 mm. *Color*: (Figs. 66-67) Variable: dorsally and ventrally metallic blue, dark blue, or black; or head, pronotum, and elytra gold with rufous undertones, venter metallic blue; or head and pronotum dark blue, elytra rufous, pygidium and venter opalescent, metallic blue. *Head:* Surface of frons at base and on disc sparsely punctate or moderately densely punctate, strigulate basolaterally; punctures .01-.02 mm; apicomedial depression densely punctate or rugopunctate; punctures .01-.03 mm. Surface of clypeus densely punctate on disc, moderately densely punctate apically and laterally; punctures .01-.03 mm. Interocular width about 4.3 transverse eye diameters. *Pronotum:* Surface moderately densely punctate; punctures .02-.03 mm at base, .03-.05 mm at apex. Lateral disc at middle with 1-2 foveae; 1 posterior to anterior angle, 1 posterior to eye (may be absent). *Elytra:* Surface with punctate, longitudinal striae; 1 next to suture, 4 mesad humerus, 4 laterad of humerus (poorly defined); punctures .02-.07 mm, ocellate. Interval between stria 1 and 2 broad, moderately densely punctate; punctures .02-.05 mm, ocellate with simple, minute-.01 mm punctures intermixed; intervals between striae 2-5 and striae laterad of humerus narrow, sparsely punctate, punctures simple, minute-.01 mm. *Propygidium:* Partially exposed or entirely hidden. Surface moderately densely punctate to densely punctate; punctures .04-.06 mm. *Pygidium:* Surface at base, sides, and disc with vermiform strigae, becoming concentric toward apex in male, semicircular toward apex in female. Apex of male sparsely punctate, punctures .01-.02 mm, some transverse near disc. Margin with sparse, moderately long, tawny setae. Apical margin of female broadly bisinuate; apices acutely rounded. *Venter:* Sternites 1-4 subequal in length in male and

female; sternite 5 about 2 times as long as 4 in male, about 2.5 times as long as 4 in female; sternite 6 of male about equal in length to sternite 4 (to subapex); sternite 6 of female about 1.5 times as long as 4. Last sternite of male at subapex quadrate; surface of disc with sparse, transverse punctures, margins with sparse striae. Last sternite of female at apex broadly trisinuate; surface striate. *Legs:* Mesotibia widest at middle, converging toward apex; external edge of male without carinae; external edge of female with obsolete carina at basal 1/3 and apical 1/3; apex with spiniform tooth and spinulae; spiniform tooth placed mediolaterally and produced to apex of tarsomere 1 or base of tarsomere 2; 0-1 spinulae placed laterad of inner spurs and 1-2 placed laterad of spiniform tooth. Metatibia widest at middle, converging at apex (less so in female), external edge with 1 obsolete carina in basal 1/3 and 1 carina in apical 1/3. Metatibial apex with corbel (male) produced to apex of tarsomere 1. *Metacoxa:* Lateral apex acute. *Parameres:* Fig. 125f. *Gonocoxites:* Fig. 128c.

Diagnosis. *Microrutela egana* is best identified using the male genitalia and female gonocoxites. *Microrutela egana* is similar to *Microrutela coerulea*, both of which have moderately densely punctate pronota with moderate and moderately large punctures (.02-.03 mm at base, .03-.05 mm at apex). The genitalia, however, are diagnostic for both species. *Microrutela egana* is separated from *M. batesi* and *M. ucalayiensis* by the punctate apex of the pygidium (entirely strigulate in *M. batesi* and *M. ucalayiensis*) and from *M. viridiaurata*, *M. campa*, and *M. vidua* by the moderate and moderately large pronotal punctures (in *M. viridiaurata*, *M. campa*, and *M. vidua* the pronotal punctures are small or minute in size [less than .02 mm]).

Distribution. Amazon River area in Brazil as well as French Guiana.

Locality records (Map 7). 23 specimens examined from AMNH, BCRC, BMNH, CMNH, MNHN, QBUM, ZMHB.

BRAZIL (22). AMAZONAS (14): São Paulo de Olivença, Tefé, Uaupés. PARÁ (7): Belem, Juruti, Marco de Legua, No data. NO DATA (1). **FRENCH GUIANA** (1). CAYENNE (1): Cayenne.

Temporal Data. March (1), April (1), May (2), August (1), October (1), November (1).

Remarks: Ohaus named *Microrutela egana* after the collecting locality of the holotype, Ega (now Tefé), Brazil along the Amazon River.

Natural history and larvae are unknown.

Microrutela ucalayiensis Jameson
NEW SPECIES
(Figs. 68-69, 125g, 127b, 128d; Map 7)

Type Material (holotype, allotype, and three paratypes [one male, two females]). Holotype male at FSCA labeled, a) "Tingo Maria, Leoncio Prado Prov., El. 600 meters," b) "Cueva de laas Pavas, El 700 Meters, 8 km. South." Allotype female from BCRC deposited to UNSM labeled a) "Peru: Huanuco, Leoncampa region, December 1937, F. Woytkowski." One paratype male at MNHN labeled "Amazones, Tarapote, M. de Mathan, 4e Trimester 1885" with male genitalia card mounted. One female paratype at CMNH labeled a) "S. Paulo de Olivença, Brazil, S. Klages," b) "Jan. 1923," c) "Carn. Mus. Acc. 7324," d) "Rutela egana Ohaus" (unknown determiner), e) "Ohaus determ. Rutela egana female symbol Ohs." One female paratype at AMNH labeled a) "Upper Rio Maranon, Peru, III.1.29, F6093," b) "H. Bassler Collection, Acc. 33591."

Holotype. Male. Length 8.9 mm. Width 5.0 mm. *Color*: (Fig. 68) Head, pronotum, and elytra shining dark green with tan margins and 1, large, tan macula in center of disc. Venter tan with green reflections. *Head:* Surface of frons at mid-disc moderately densely punctate, base and sides densely punctate,

basolaterally strigate; punctures .01-.03 mm. Apicomedial depression punctostrigate; punctures .02-.03 mm. Surface of clypeus densely punctate; punctures .01-.04 mm, some transverse. Interocular width about 4.5 transverse eye diameters. *Pronotum:* Surface of male basomedially and at midline sparsely punctate (punctures minute-.01 mm), laterally and anteriorly moderately densely punctate (punctures .01-.03 mm). Surface of female sparsely punctate at base and midline (punctures .01-.03 mm), moderately densely punctate apically and laterally (punctures .03-.06 mm). Disc laterally at middle with 1 fovea posterior to anterior angle. *Scutellum:* Slightly wider than length (width to length ratio equals 1.0:0.82). *Elytra:* Surface with weakly impressed, punctate, longitudinal striae; 1 next to suture, 5 mesad of humerus (fifth stria poorly defined), 4 laterad of humerus (poorly defined); punctures .02-.03 mm, ocellate. Interval between stria 1 and 2 broad, moderately densely punctate; punctures .02-.03 mm, ocellate with minute to .01 mm punctures intermixed; intervals between striae 2-5 and striae laterad of humerus narrow, sparsely punctate, punctures minute to .01 mm. Sutural length about 2.9 times length of scutellum. *Propygidium:* Partially exposed, surface at base and apex moderately densely punctate (punctures minute-.02 mm); mid-disc densely punctate, punctures .01-.06 mm. *Pygidium:* Surface with vermiform strigae throughout, strigae becoming concentric toward apex. Margin with sparse, moderately long, tawny setae. *Venter:* Sternites 1-4 subequal in length; sternite 5 about twice as long as 4; sternite 6 about as long as sternite 4 (to subapex). Last sternite at subapex broadly, quadrately emarginate; surface of disc striate. *Legs:* Mesotibia with sides subparallel, external edge without carinae. Mesotibial apex with produced, spiniform tooth mediolaterally and spinulae; spiniform tooth produced to middle of tarsomere 1; 1 spinula laterad of inner spurs and 2 spinulae laterad of spiniform tooth. Metatibia widest at middle, weakly converging to apex, external edge with weak basal carina (at basal 1/3) and moderately pronounced apical carina (at apical 1/3). Metatibial apex with corbel produced to apex of tarsomere 1. *Metacoxa:* Lateral apex quadrate. *Parameres:* Fig. 125g.

Allotype. Female. Length 11.0 mm. Width 5.8 mm. As holotype except in the following respects: *Color:* Fig. 69. *Head:* Surface of frons at mid-disc moderately densely punctate (punctures .01-.03 mm), base and sides densely punctate (punctures .01-.05 mm). Apicomedial depression densely punctate; punctures .03-.06 mm. Surface of clypeus densely punctate; punctures .02-.04 mm. *Pronotum:* Surface basomedially and at midline sparsely punctate (punctures .01-.02 mm intermixed with minute punctures), laterally and anteriorly moderately densely punctate (punctures .02-.09 mm, intermixed with minute punctures). *Propygidium:* Surface densely punctate; punctures minute-.06 mm. *Pygidium:* Surface with vermiform strigae, apex punctostrigate; becoming semicircular toward apex. Apex weakly produced, apical margin broadly rounded (Fig. 127b); apices acutely rounded. *Venter:* Sternite 6 about 1.5 times as long as sternite 4. Last sternite broadly, quadrately emarginate; surface strigate. *Legs:* Mesotibia widest at middle. *Gonocoxites:* Fig. 128d.

Paratypes (2 females). Length 9.1-11.0 mm. Width 4.7-6.0 mm. Differ from the holotype and allotype in the following respects: *Color*: Head, pronotum, and elytra castaneous, black, or dark blue with green reflections, margins light brown. Pygidium and venter light brown or castaneous with green reflections. *Head:* Apicomedial depression rugopunctate; punctures .03-.06 mm. *Pronotum:* Margin with weak strigulae.

Diagnosis. *Microrutela ucalayiensis* differs from other species of *Microrutela* by a pygidium that is entirely strigulate in the male. The broadly rounded apical margin of the pygidium in the female is also diagnostic. *Microrutela ucalayiensis* is most similar to *Microrutela batesi*, and both have an entirely

strigulate pygidium but are separated by the lateral and anterior punctures of the pronotum (in *M. ucalayiensis* the punctures are .01 to .03 mm whereas in *M. batesi* they are .02-.05 mm), pygidium with apical margin broadly rounded in the female of *M. ucalayiensis* (narrowly bisinuate in the female of *M. batesi*), female gonocoxites, and parameres.

Distribution. The upper Amazon Basin region in Peru and Brazil. Recorded from 600-700 meters elevation.

Locality records (Map 7). 5 specimens examined from AMNH, BCRC, CMNH, FSCA, MNHN.

BRAZIL (1). AMAZONAS (1): São Paulo de Olivença.
PERU (4). HUÁNUCO (2): Leoncampa Region, Tingo Maria (8 km S at Cueva de las Pavas). LORETO (1): Rio Maranon (upper). SAN MARTIN (1): Tarapoto.

Temporal Data. January (1), March (1), June (1), December (1).

Remarks. Nothing is known about the natural history of this species.

Etymology. The specific epithet, "*ucalayiensis*," refers to the region of the Rio Ucalayi in Peru where four of the five type specimens were collected.

Microrutela vidua Jameson
NEW SPECIES
(Figs. 70-71, 127c, 128e; Map 7)

Type Material (holotype and five paratypes). Holotype female at CMNH labeled a) "Costa Rica," b) "Carn. Mus. Acc. 2275," c) "Rutela viridiaurata Bates" (determiner unknown). One female paratype at UNSM labeled a) "Costa Rica," b) "68," c) "Carn. Mus. Acc. 2275," d) "Ohaus determ. Rutela viridiaurata H. Bts." One female paratype at MNHN labeled a) "Colombia (Cauca), Distrito Pereira, Roman M. Valencia, 1886." One female paratype at MNHN labeled a) "Colomb.," b) "Ex Musaeo A. Salle 1897." One female paratype at MNHN labeled "Nouv. Grenade, Santa Rosa entre S. Francisco & Carthago (Etat de Cauca), Eujenio Garzon, Août 1878." One female paratype at ZMHB labeled a) "Columb., Rio Dagua," b) "Ohaus determ. Rutela viridiaurata H. Bts. female symbol."

Holotype. Female. Length 11.8 mm. Width 6.7 mm. *Color:* (Figs. 70-71) Dorsum violet with goldish-green undertones, venter goldish-green. *Head:* Surface of frons at base and on disc sparsely punctate, basolaterally strigulate, punctures .01-.02 mm; apicomedial depression moderately densely punctate, punctures .01-.03 mm. Surface of clypeus moderately densely punctate; punctures .01-.03 mm. Interocular width about 4.5 transverse eye diameters. *Pronotum:* Surface sparsely punctate; punctures minute-.01 mm. Disc laterally at middle with 1-2 foveae; 1 posterior to anterior angle, 1 posterior to eye. *Elytra:* Surface with punctate, longitudinal striae; 1 next to suture, 4 mesad of humerus, 4 laterad of humerus (poorly defined); punctures .02-.05 mm, ocellate. Interval between stria 1 and 2 broad, moderately densely punctate; punctures .02-.05 mm ocellate with minute-.01 mm punctures intermixed; intervals between striae 2-5 and striae laterad of humerus narrow, sparsely punctate, punctures minute-.01 mm. *Propygidium:* Partially hidden; surface at base and apex moderately densely punctate, occasionally confluently punctate; mid-disc densely punctate; punctures .04-.06 mm. *Pygidium:* Surface at base, sides, and disc with vermiform strigae, some strigae interrupted at midline; strigae becoming semicircular toward apex; apex with sparse punctures; punctures about .01 mm. Margin with sparse, moderately long, tawny setae. Apical margin of female weakly produced, rounded (Fig. 127c). *Venter:* Sternites 1-4 subequal in length; sternite 5 about twice as long as 4 ; sternite 6 of female about twice as long as 4. Last sternite of female at apex quadrate; surface striate. *Legs:* Mesotibia

widest at middle, converging toward apex; external edge without carinae; apex with spiniform tooth and spinulae; spiniform tooth mediolateral and produced to apex of tarsomere 1 or base of tarsomere 2; apex with 1 spinula laterad of inner spurs and 2 spinulae placed laterad of spiniform tooth. Metatibia of female widest in basal 1/3, external edge with 1 weak carina in basal 1/3 and 1 (more pronounced) carina in basal 1/2. *Metacoxa:* Apex laterally weakly acute. *Gonocoxites:* Fig. 128e.

Paratypes (5 females). Length 10.8-12.2 mm. Width 5.9-6.8 mm. Differ from female holotype in the following respects: *Color:* Dorsally and ventrally shining dark green or castaneous with blue reflections. *Pronotum:* Surface with punctures minute-.02 mm. *Legs:* Mesotibial apex with spiniform tooth produced to apex of tarsomere 1 or middle of tarsomere 2. *Metacoxa:* Lateral apex acute or weakly acute.

Diagnosis. Males of *M. vidua* are not known, but they will probably possess unique parameres. Females of *M. vidua* are very similar to *M. viridiaurata* and *M. campa* and are best identified using the female gonocoxites. *Microrutela vidua* differs from *M. coerulea* and *M. egana* by the pronotal punctures that are minute to .02 mm (larger in *M. egana* and *M. coerulea* [.02-.03 mm at base, .03-.05 mm at apex]) and differs from *M. batesi* and *M. ucalayiensis* by the apex of the pygidium that is punctate (entirely strigulate in *M. batesi* and *M. ucalayiensis*).

Distribution. Costa Rica and Colombia.

Locality Data (Map 7). 6 specimens examined from MNHN, ZMHB, CMNH.

COLOMBIA (4). TOLIMA (1): Pereira. VALLE (2): Cartago, Rio Dagua. NO DATA (1).
COSTA RICA (2). NO DATA.

Remarks. *Microrutela vidua* is known only from females. Males of this species will probably possess minute pronotal punctures (similar to *M. viridiaurata* and *M. campa*), will probably have the pygidial strigae interrupted at the mid-disc (not effaced as in *M. viridiaurata*), and will probably have unique parameres. *Microrutela vidua* may occur peripatrically or sympatrically with *M. viridiaurata*.

I considered the possibility that females of *M. vidua* could be the unknown females of *M. coerulea*. However, females that are associated with males of *M. coerulea* will probably possess moderate-sized punctures, whereas *M. vidua* has minute pronotal punctures. Also, based on the limited distributional data for the species, it appears that the species are geographically separated.

Etymology. The species epithet, "*vidua*," is Latin for widow and refers to the fact that males of the species are not known.

Microrutela viridiaurata (Bates)
NEW COMBINATION
(Figs. 72-73, 124, 125h, 126b, 127d, 128f; Map 7)

Rutela viridiaurata Bates 1888: 272. Holotype female housed at MNHN labeled a) "Costa Rica," b) "H.W. Bates, Biol. Cent. Amer." (Bates' label), c) "*viridiaurata* Bates type!" (handwritten, white label), d) my holotype label; female genitalia card mounted. **NEW COMBINATION.**

Description. Length 9.5-14.1 mm. Width 5.2-7.8 mm. *Color*: (Figs. 72-73, 124) Dorsally and ventrally metallic blue, blue-green, turquoise, green, green with rufous undertones, gold, or violet with green or gold undertones. *Head:* Surface of frons at base and on disc sparsely punctate, punctures .01-.02 mm; apicomedial depression moderately densely punctate or densely punctate, some transverse, punctures .01-.03 mm. Surface of clypeus moderately densely punctate; punctures .01-.03 mm. Interocular width about 4.3 transverse eye diameters. *Pronotum:* Surface of male sparsely punctate; punctures minute-.01 mm; surface of female sparsely punctate; punctures

minute-.02 mm. Lateral disc at middle with 1-2 foveae; 1 posterior to anterior angle, 1 posterior to eye (may be absent). *Scutellum:* Slightly wider than length (W to L ratio equals 1.0:0.85). *Elytra:* Surface with punctate, longitudinal striae; 1 next to suture, 4 mesad of humerus, 3-4 laterad of humerus (poorly defined); punctures .02-.05 mm, ocellate. Interval between stria 1 and 2 broad, moderately densely punctate; punctures .02-.05 mm ocellate with minute-.01 mm punctures intermixed; intervals between striae 2-5 and striae laterad of humerus narrow, sparsely punctate, punctures minute-.01 mm. Sutural length about 2.6 times length of scutellum. *Propygidium:* Partially exposed or entirely hidden, surface at base densely punctate, occasionally confluently punctate; apex moderately densely or sparsely punctate; punctures .04-.06 mm. *Pygidium:* Surface at base, sides, and disc with vermiform strigae; strigae effaced at midline, becoming concentric toward apex; apex of male without strigae or punctures, apex of female with sparse punctures, some transverse, punctures .01-.02 mm. Margin with sparse, moderately long, tawny setae. Apical margin of female broadly bisinuate (Fig. 127d); apices acutely rounded. *Venter:* Sternites 1-4 subequal in length in male and female; sternite 5 about twice as long as 4 in male, about 2.5 times as long as 4 in female; sternite 6 of male about equal in length to sternite 4 (to subapex); sternite 6 of female about twice as long as 4. Last sternite of male at subapex broadly, quadrately emarginate; surface of disc without strigae or punctures, sides with shallow strigae. Last sternite of female at apex broadly trisinuate; surface strigate. *Legs:* Mesotibia widest at middle, converging toward apex; external edge with obsolete carinae; 1 in basal 1/3 and 1 in basal 1/2. Mesotibial apex with produced, spiniform tooth mediolaterally and spinulae; spiniform tooth produced to apex of tarsomere 1 or base of tarsomere 2; 0-1 spinulae laterad of inner spurs and 1-2 spinulae laterad of spiniform tooth. Metatibia of male widest in basal 1/4, converging to narrowed apex, external edge lacking carinae (Fig. 126b); metatibia of female widest at middle, external edge with 1 carina in basal 1/3 and 1 carina in basal 1/2. Metatibial apex with corbel (male) produced to apex of tarsomere 1. *Metacoxa:* Lateral apex quadrate in male, weakly acute in female. *Parameres:* Fig. 125h. *Gonocoxites:* Fig. 128f.

Diagnosis. *Microrutela viridiaurata* is similar to *M. campa* and *M. vidua* and is best identified using the male genitalia and female gonocoxites. *Microrutela viridiaurata* differs from *M. coerulea* and *M. egana* by the pronotal punctures that are minute to .02 mm (larger in *M. egana* and *M. coerulea* [.02-.03 mm at base, .03-.05 mm at apex]) and differs from *M. batesi* and *M. ucalayiensis* by the apex of the pygidium that is punctate (entirely strigulate in *M. batesi* and *M. ucalayiensis*).

Distribution. Panama, Costa Rica, and Colombia. Recorded from 100-300 meters.

Locality records (Map 7). 62 specimens examined from BCRC, CASC, DCCC, FMNH, FREY, FSCA, HAHC, INBC, JEWC, MNHN, USNM, ZMHB.

COLOMBIA (9). Antioquia (4): Valle de Cauca. Boyaca (1): Muzo. Magdalena (1): No data. No Data (3).
COSTA RICA (13). Cartago (1): Turrialba. Heredia (2): Parque Nacional Braulio Carrillo (Estacion Magasay). Limón (10): Amubri, Bananito, Cariari (30 km N, Sector Cocori, Finca E. Rojas), Estacion Hitoy Cerere, Parque Nacional Tortuguero (Estacion Cuatro Esquinas, Cedrales Finca Montaña Grande), Puerto Viejo (5 km SE), Reventazon, No data.
PANAMA (38). Canal Zone (1): Barro Colorado Island. Colón (1): Santa Rita Ridge. Panama (36): El Llano-Carti Road (km 7 to 18), Cerro Azul.
NO DATA (2).

Temporal Data. April (2), May (36), June (8), July (3), August (1), September (1), December (1).

Remarks. Label data indicate that adults have been collected at light (probably incidental) and in fallen trees. Adults were collected on leaves of *Sterculia glauca* Gentry (Sterculiaceae) with individuals of *Rutela sanguinolenta sanguinolenta* Waterhouse.

The holotype specimen was initially feared lost, but it was discovered at the Museo Nacional d'Histoire Naturelle in Paris (MNHN) among the unidentified Rutelinae.

One larva was collected and reared on *Vitex cooperi* Standl. (Verbenaceae) and is described in this publication.

INTRODUCTION TO THE GENUS *PLESIORUTELA* JAMESON, NEW GENUS

The genus *Plesiorutela* is proposed here to accommodate a single species, *Rutela specularis* Bates (Figs. 83-84, 129). The lack of shared, derived characters and several autapomorphic characters that are observed in *Rutela specularis* preclude placement of this species in any other genus. Due to some overall similarities with the genus *Pelidnota*, it is possible that some species that are currently placed in the genus *Pelidnota* also belong to this new genus. Although I am hesitant to create a monotypic genus, there are currently no genera of Rutelini that exhibit the features observed in *R. specularis*.

Plesiorutela shares several character states with *Pelidnota*: the declivous base of the scutellum, clypeal apex, exposed unguitractor plate, and recurved metasternum. It differs from *Pelidnota* by the rounded elytral epipleuron (the epipleuron is shelf-like in *Pelidnota*), the absence of a pronotal basal bead (present in most species of *Pelidnota*), and the exposed unguitractor plate that lacks apical setae (apex with two setae in *Pelidnota*).

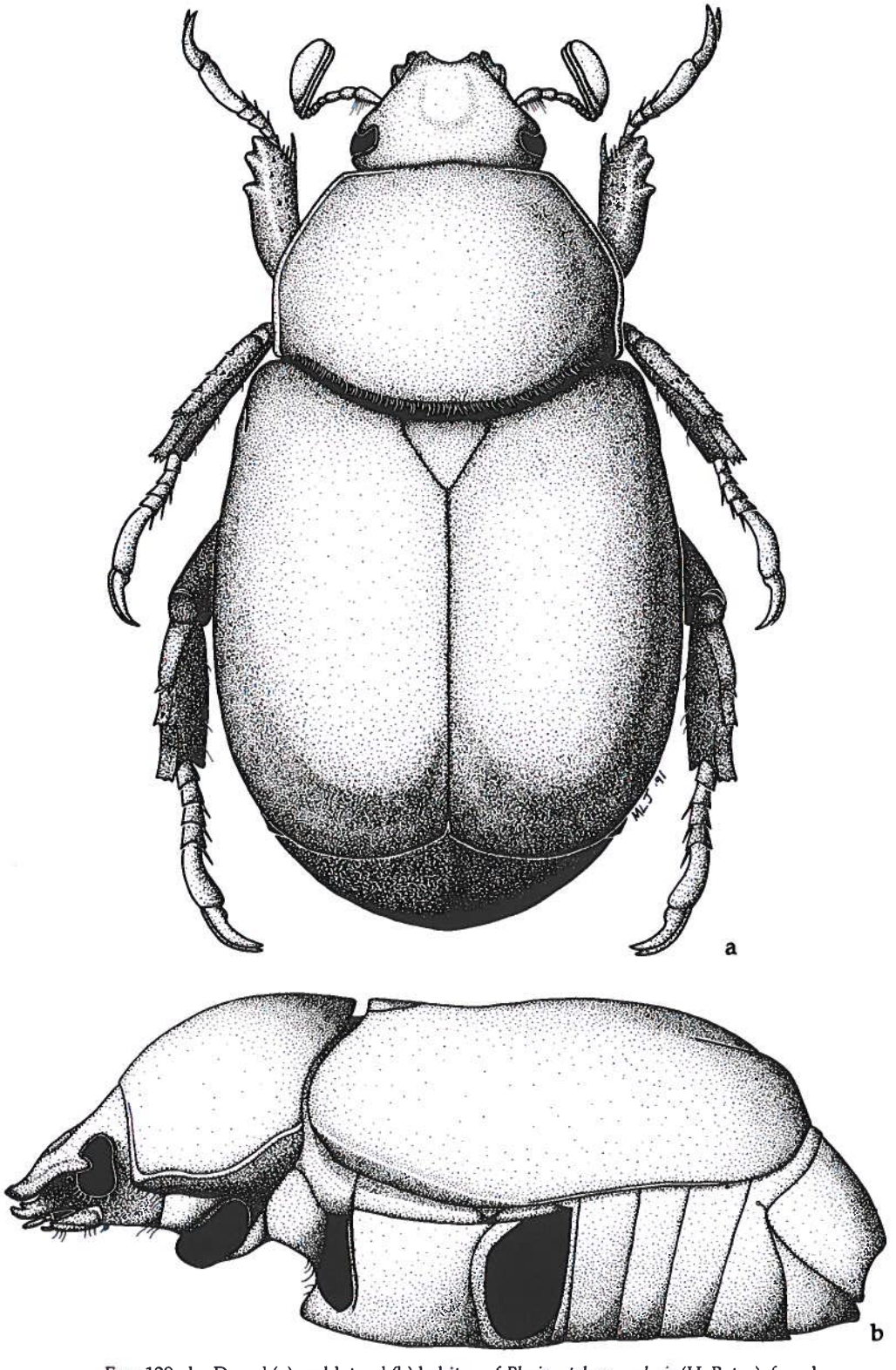
The genus shares some character states with other genera in the *Rutela* generic groups (*Rutela, Sphaerorutela,* and *Microrutela*) but is most similar to the genus *Sphaerorutela* based on a scutellum that is entirely declivous at the base, recurved metasternum, form of the mesotibia, and pronotum that has a complete apical bead. *Plesiorutela* shares fewer features with *Rutela* and *Microrutela*. *Plesiorutela* shares the presence of a lateral pronotal fovea and size of the scutellum with *Microrutela*. With the genus *Rutela*, *Plesiorutela* shares the form of the clypeus.

In addition to these shared character states, *R. specularis* possesses several unique features. These autapomorphic character states include the form of the pygidium in the female (apex from mid-disc to apical margin perpendicular to the plane of the body), the exposed unguitractor plate that lacks setae, the length of the elytra with reference to the length of the scutellum (shorter than *Pelidnota*, but longer than *Microrutela, Rutela*, or *Sphaerorutela*), and the lack of elytral striae. Because no current taxon includes these unusual character states, and due to overall lack of concordance in synapomorphic states with other genera of Rutelini, I propose the genus *Plesiorutela*.

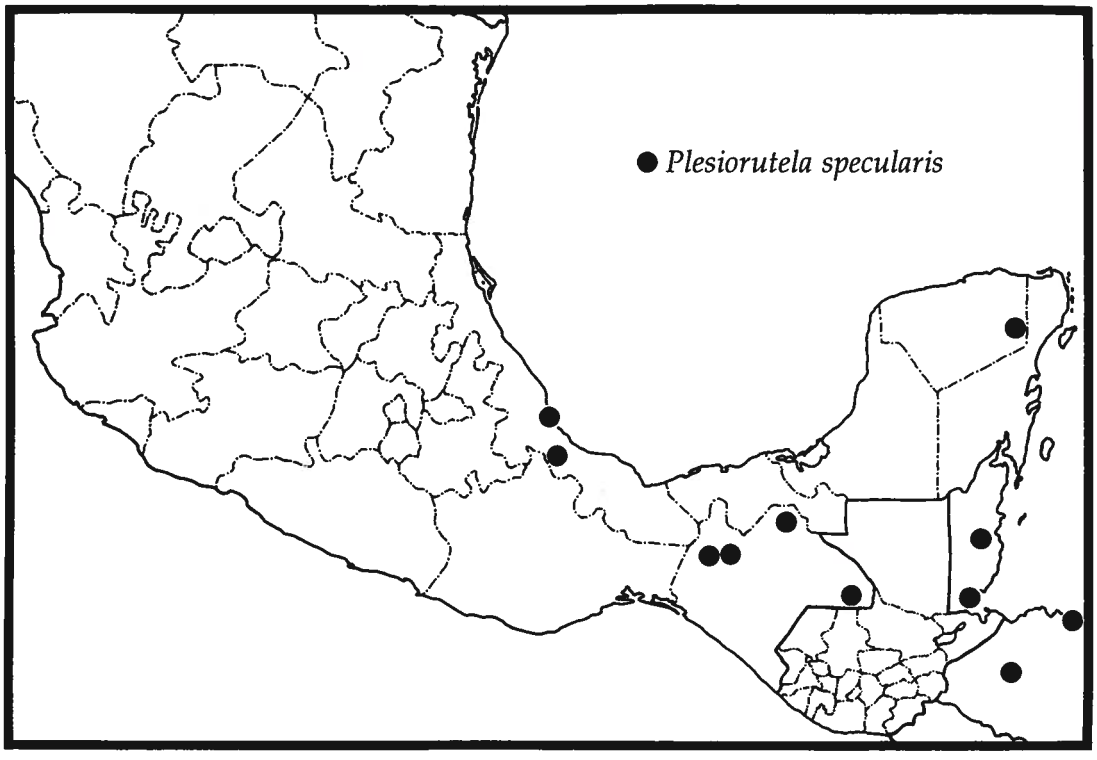
Genus *PLESIORUTELA* Jameson
NEW GENUS
(Figs. 83-84, 129; Map 8)

Type species. *Rutela specularis* H. Bates 1888: 271. Type here designated.

Description. Scarabaeidae: Rutelinae: Rutelini. *Form:* (Figs. 83-84, 129) Subovate, sides subparallel, propygidium partially exposed beyond elytra or not, pygidium exposed, apex of elytra broadly rounded. Length from apex of clypeus to apex of pygidium 12.0-20.0 mm; width at mid-elytra 6.0-11.0 mm. *Head:* Frons in lateral view nearly flat, clypeus in lateral view weakly convex. Surface of frons and clypeus variously sculptured, punctate to strigate, more heavily sculptured in most females. Clypeal apex beaded, emarginate medially with 2 apicolateral, produced teeth; teeth truncate. Interocular width 6.0-7.0 transverse eye diameters. Frontoclypeal suture incomplete (about the length of one eye canthus). Mandibles with 2 recurved teeth



FIGS. 129a-b. Dorsal (a) and lateral (b) habitus of *Plesiorutela specularis* (H. Bates), female.



Map 8. Distribution of *Plesiorutela specularis* in southern Mexico, Belize, and Honduras.

at lateral apex; 3 inner, scissorial teeth; broad molar region. Labrum truncate at apex. Maxilla with 6 teeth; 1 apical, 2 medial, 3 basal (reduced). Mentum bisinuate at apex. Antenna 10-segmented, club 3-segmented and subequal to segments 1-7 combined. *Pronotum:* Form of pronotum with basal margin broadly rounded, broadly sinuate before basal angle (Figs. 106d, 129a). Surface variably punctate. Bead at anterior margin complete or weakly effaced at middle; lacking basal bead. *Scutellum:* Width slightly greater than length (width about 1.20 times as wide a length). Base entirely declivous and weakly curved posteriorly (Fig. 129a). *Mesepimeron:* Base hidden (base of elytral humerus produced anteriorly beyond base of mesepimeron). *Elytra:* Surface punctate, lacking well-defined striae; punctures simple. Epipleuron at basal margin rounded, without shelf; apical margin narrowed, exposing lateral tergites; beaded from metacoxa to elytral apex. Sutural length from 4.5 to 5.5 times length of scutellum. *Tergites:* Narrowly exposed laterad of elytral margin, unicolorous. *Propygidium:* Partially exposed, surface punctate. *Pygidium:* Shape broadly ovoid, broadly rounded in male; female with discal area abruptly concave to apical margin (Fig. 129b). Surface strigate and punctate. Apical margin sinuate (male) or quadrately produced (female). *Venter:* Prosternal keel triangular in posterior view, apex blunt, produced to level of protrochanter at about 35° with respect to dorsal surface. Mesometasternal keel in ventral view broadly rounded, weakly produced beyond mesosternal keel; ventral surface flat lateral view. Sternites 1-4 subequal in length (male and female); sternite 5 1.5 to 2.0 times as long as sternite 4 ; sternite 6 from 1.5 to 2.0 times as long as sternite 4. Last sternite of male punctate or striate, quadrate at subapex; subapex to apex less sclerotized. Last sternite of female punctate or striate, subapical region sclerotized, apex quadrately emarginate. In lateral view male sternites somewhat concave, female sternites flat or weakly convex. *Legs:* Protibia with 3 teeth

in apical 1/3 of tibia, basal tooth slightly removed; base without internal incised area. Tarsomere 5 of male slightly longer than tarsomeres 1-5. Foreclaw of male simple; external claw, as long as tarsomere 5, twice as thick as internal claw, 2 times wider than internal claw; subapical tooth present; foreclaw of female simple, subequal. Claws (all legs) with unguitractor plate exposed beyond base of claws, lacking setae. Mesotibia with sides subparallel, weakly convergent at apex; external edge with 1-2 carinae; apex with weak, medial emargination and 4-8 spinulae laterad of emargination; inner apex with 2 spurs. Mesotarsomere 4 of male with produced, median, lobe-like projection between 2 apical spinulae; simple in female. Mesotarsal claws of male with external claw simple, twice as thick and twice as wide as inner claw; claws of female simple, external claw subequal to 1.5 times as thick, and subequal to 1.5 times as wide as inner claw. Metatibia with sides subparallel; external edge with 1-2 carinae; apex with variably produced corbel (male), without spinulae or setae; inner, apical spur in female robust. Metatarsomere 4 of male with weakly produced, median, spiniform projection between 2 apical spinulae; simple in female. *Metatrochanter:* Posterior border not produced beyond posterior border of femur. *Metacoxa:* Lateral apex quadrate. *Hind Wing:* Well-developed hooks on precostal membrane present. Vein AA_{1+2} shortened, extending weakly beyond juncture of AA and AA_{3+4}. *Metendosternite:* In posterior view, Y-shaped, robust, with 2 apical arms. *Male Genitalia:* Symmetrical, diagnostic.

Diagnosis. Members of the genus *Plesiorutela* differ from other genera in the tribe Rutelini by the following characters (see Jameson [1990] for key to tribes and subtribes of Rutelinae): frontoclypeal suture obsolete medially, pronotal base lacking basal bead, clypeus semicircular, apex of metatibia without spinules on ventrolateral edge, epipleuron lacking horizontal shelf. *Plesiorutela* is separated from *Sphaerorutela*, *Rutela* and *Microrutela* based on the following characters: 1) form of the scutellum that is about 1.20 times as wide as long (scutellum nearly twice as wide as long in *Sphaerorutela*; subequal in width and length in *Rutela*; width about 1.25 times as wide a length in *Microrutela*); 2) unguitractor plate exposed (unguitractor plate hidden in *Rutela, Microrutela,* and *Sphaerorutela*); 3) apex of the pygidium in the female flattened from the mid-disc to the apical margin (rounded in *Rutela, Microrutela,* and *Sphaerorutela*); 4) presence of a lateral, pronotal fovea (absent in *Rutela* and *Sphaerorutela*; one to two fovea present in *Microrutela*); 5) the scutellar base that is entirely declivous (scutellar base is planar with the base of the elytra in *Rutela*; scutellar base declivous either side of midline in *Microrutela;* base entirely declivous in *Sphaerorutela*); 6) sutural stria absent (with an impressed, longitudinal sutural stria in *Sphaerorutela*; punctate sutural stria in *Rutela* and *Microrutela*); 7) mesotibia lacking medial tooth or spiniform tooth (medial tooth present in *Rutela*; spiniform tooth present in *Microrutela*; lacking a medial tooth or spiniform tooth in *Sphaerorutela*); 8) meso- and metatarsomere 4 of the male with a lobe-like projection between apical spinulae (spiniform projection in *Sphaerorutela*; lobe-line projection in *Rutela* and *Microrutela*); 9) mesometasternal keel weakly produced and rounded apically (distinctly produced with a more acuminate apex in *Rutela* and *Microrutela*; weakly produced and rounded apically in *Sphaerorutela*); 10) mandibular teeth placed apically (apicolaterally in *Sphaerorutela*; apically in *Rutela* and *Microrutela*); 11) anterior pronotal bead that is complete at the middle (incomplete in *Rutela* and *Microrutela*; complete in *Sphaerorutela*).

Distribution (Map 8). Mexico, Belize, Honduras.

Etymology. The Greek word "*plesios*" means close. In scientific usage today, "*plesio*" also means "primitive." The genus name *Plesiorutela* indicates the close relationship with

the genus *Rutela* and the hypothesis that the new genus is more "primitive" than *Rutela*. The name is considered feminine in gender.

Plesiorutela specularis (H. Bates)
NEW COMBINATION
(Figs. 83-84, 129, 130; Map 8)

Rutela specularis H. Bates 1888: 271. Lectotype and paralectotype at BMNH. Lectotype male labeled a) "Type," (round with red circle), b) "sp. figured," c) "Playa Vicente," d) "Mexico, Salle Coll.," e) "Rutela specularis Bates," f) "B.C.A. Coll. II (2)." Paralectotype male labeled a) "Playa Vicente," b) "Mexico. Sallé Coll.," c) "Rutela specularis Bates" (Bates' handwriting), "B.C.A. Coll. II (2)." Lectoallotype female at MNHN labeled a) "Playa Vicente," b) "Mexico, Salle Coll.," c) "H.W. Bates Biol. Amer. Cent. Amer.," d) "Muséum Paris ex. coll. R. Oberthur 1952." **NEW COMBINATION.**

Description. Length 14.5-18.7 mm. Width 7.4-10.2 mm. *Color*: (Figs. 83-84, 129) Dorsal surface shining, black with dark red maculae or entirely black, ventral surfaces shining black. *Head:* Surface of frons laterally and basolaterally weakly strigulate, disc moderately densely punctate, more dense apicomedially; punctures .02 (base and mid-disc) to .05 (apex and sides). Surface of clypeus densely punctate to rugopunctate; punctures .02-.07 mm. Interocular width about 6.5 transverse eye diameters. *Pronotum:* Surface sparsely punctate; punctures minute-.02 mm. *Elytra:* Surface sparsely punctate, lacking striae; punctures minute-.01 mm. Sutural length about 5.0 times length of scutellum. *Propygidium:* Partially exposed or entirely hidden, surface densely punctostrigate (base) to moderately densely punctostrigate (apex); punctures .05-.07 mm, shallow. *Pygidium:* Shape broadly ovoid; male in lateral view broadly rounded, female abruptly declivous and weakly concave from middle to apical margin (Fig. 129b). Surface of base weakly strigulate, strigulae effaced at middle; mid-disc to apex punctate, some transverse; punctures .01-.02 mm. Margin with sparse to moderately dense setae; setae medium in length, tawny. Apical margin of female quadrately produced; male broadly, weakly sinuate. *Venter:* Sternite 5 about 1.5 times as long as sternite 4 in male; about twice as long as sternite 4 in female. Last sternite of male at subapex quadrately emarginate; surface at sides weakly strigulate. Last sternite of female weakly quadrately emarginate; surface at sides weakly strigulate. *Legs:* Mesotibia widest at apical 1/3, external edge carinate in basal 1/3 and apical 1/3. Mesotibial apex weakly emarginate at middle and with spinulae; 4-6 spinulae placed laterad of emargination to side. Metatibia of male widest at middle, external edge with carinae; 1 weak carina in basal 1/3, 1 in apical 1/3. Metatibia of female widest at middle, external edge with carina in basal 1/3 and apical 1/3. Apex with corbel (male) not appreciably produced. *Metacoxa:* Lateral apex quadrate. *Parameres:* Fig. 130.

Diagnosis. *Plesiorutela specularis* is monotypic and is distinguished from others in the *Rutela* generic groups based on the following autapomorphs: 1) unguitractor plate exposed beyond base of claws and lacking setae;

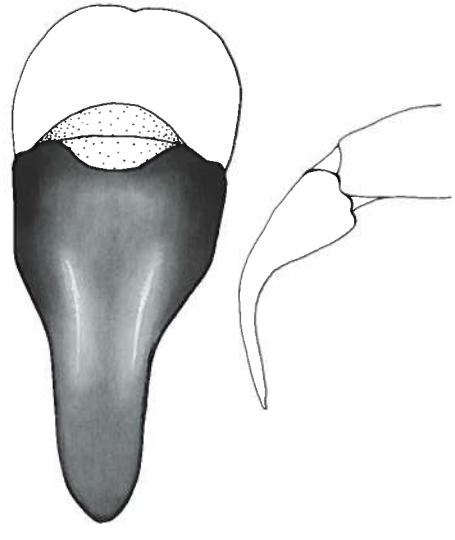


FIG. 130. Dorsal view of the parameres of *Plesiorutela specularis* with lateral view in inset.

2) female pygidium in lateral view flattened horizontally; 3) elytra lacking striae; 4) form of the scutellum which is about 1.20 times as wide as long ; 5) presence of one lateral, pronotal fovea. Members of the species are either black or black with dark red, oblique maculae. Male genitalia are also diagnostic.

Distribution. Southern Mexico, Belize, and northern Honduras. Recorded from tropical lowland rain forest.

Locality Data (Map 8). 28 specimens examined from AMNH, BCRC, BMNH, CNCI, DBTC, EMEC, FMNH, HAHC, MAMC, MNHN, USNM, ZMHB.

BELIZE (3). Stann Creek District (1): Middlesex. Toledo (2): Punta Gorda.
HONDURAS (4). Atlantida (2): La Cieba. Cortés (2): Lago Yojoa.
MEXICO (20). Chiapas (5): Boca de Chajul, El Aguacero, Palenque (5 km S, 10 km S), Tuxtla Gutierrez. Quintana Roo (4): Nuevo X-Can, X-Can. Veracruz (11): Cotaxtla, Cotaxtla Experimental Station, Estacion de Biologia Tropical UNAM Los Tuxtlas, Playa Vicente, no data.
NO DATA (1).

Temporal Data. April (2), May (1), June (10), July (7), August (1), September (1), December (1).

Remarks. One specimen of *P. specularis* (black form) was labeled by Ohaus as the cotype of *Rutela pygidialis* (housed at ZMHB). This label was probably placed on the specimen mistakenly.

The two color forms of *P. specularis* (entirely black or black with dark red maculae) co-occur and are not gender specific. From my limited number of specimens, it appears that the black and red form is twice as prevalent as the black form.

Specimens of the black form of *P. specularis* have been collected with *Macraspis aterrima* from the flowers of *Guazuma ulmifolia* Wall. (Sterculiaceae) (Brett Ratcliffe and Don Thomas, pers. comm.). *Macrapis aterrima* is also a shining black scarab and is approximately the same size as *P. specularis*. Although specimens of *Macraspis* were present in high numbers, there were very few specimens of *Rutela specularis* collected at the same time. Adults have been collected at lights.

Morón et al. (1985) collected one larva of *P. specularis* from rotting wood at an elevation of 110 meters. The larva was obtained on April 30, pupated June 6, and emerged as an adult on July 6. The adult emerged deformed and tan in color (as if teneral). Larvae have not been described.

LARVAE OF THE *RUTELA* GENERIC GROUPS

Larvae of only three species in the *Rutela* generic groups are known, and two of these are described in this publication. The larva of *Rutela formosa* Burmeister was described by Ritcher (1966), and I describe the third instar larva of *Rutela dorcyi* and *Microrutela viridiaurata*. In addition, the first pupa is described for the genus *Rutela* based on the pupa of *Rutela dorcyi*.

The key to the larvae of the American genera of Rutelini is modified as follows to include *Platyrutela* (Morón and Solís in press) and *Microrutela*.

Key to the American Genera of Rutelini Based on Third-Stage Larvae (Modified from Jameson *et al.* 1994 and Jameson 1996)

1. Left mandible with 2 teeth in scissorial region (including sharp tip) 4
1'. Left mandible with 3 well-defined teeth in scissorial region 2

2. Lacinia of maxilla with 1 uncus (well-developed or reduced) 12
2'. Lacinia of maxilla with 2 or 3 unci 3

3. Lacinia of maxilla with 2 unci (subequal in size or 1 reduced and represented by a short, stout seta) 9

3'. Lacinia of maxilla with 3 unci, subequal in size ..... *Platyrutela*

4. Epipharynx with plegmata well developed. Septula present 5
4'. Epipharynx without plegmata. Septula absent 6

5. Septula short, ovate. Lacinia of maxilla with 2 unci, subequal in size. Maximal width of cranium 3.6 mm ..... *Calomacrapis*
5'. Septula elongate, extended across venter of last segment and lower anal lip. Lacinia of maxilla with 1 reduced uncus. Maximal width of cranium 4.9 mm ..... *Parastasia*

6. Abdominal spiracles 1-6 subequal in size to abdominal spiracles 7-8 7
6'. Abdominal spiracles 1-6 smaller or larger in size than abdominal spiracles 7-8 8

7. Stridulatory area of mandibles with approximately 7 stridulatory ridges in basal two-thirds ..... *Rutela*
7'. Stridulatory area of mandibles with approximately 20 stridulatory ridges in basal two-thirds ..... *Microrutela*

8. Spiracles of abdominal segments VII and VIII noticeably larger than preceding spiracles. Tarsal claws slightly reduced. Maximal width of cranium 5.8 mm ..... *Paracotalpa*
8'. Spiracles of abdominal segments VI, VII, and VIII noticeably smaller than preceding spiracles. Tarsal claws not reduced. Maximal width of cranium 6.9 mm ..... *Cotalpa*

9. Septula irregularly defined on lower anal lip. Lacinial unci different in size; internal unci reduced, truncate, with a short stout seta. Maximal width of cranium 5.6 mm ..... *Rutelisca*
9'. Septula absent. Lacinial unci subequal in size. Maximal cranial width variable ... 10

10. Epipharynx with epizygum. Spiracles of abdominal segments VII and VIII similar in size to preceding spiracles. Maximal width of cranium variable 11

10'. Epipharynx without epizygum. Spiracles of abdominal segments VII and VIII noticeably larger than preceding spiracles. Maximal width of cranium 7.0 mm ..... *Pelidnota*

11. Last antennal segment with 7-13 dorsal sensory spots. Maximal width of cranium 10.0 mm ..... *Chrysina*
11'. Last antennal segment with 2-5 dorsal sensory spots. Maximal width of cranium 6.0-7.2 mm ..... *Plusiotis*

12. Clithra of epipharynx present, symmetrical ..... *Cnemida*
12'. Clithra of epipharynx absent 13

13. Last antennal segment with 4-6 dorsal sensory spots. Metathoracic tarsal claws reduced and weakly sclerotized relative to pro- and mesothoracic claws. Maxillary stridulatory area with row of 8 large, sharp, pointed, recurved teeth. Maximal width of cranium 6.0 mm ..... *Macraspis*
13'. Last antennal segment with 2 dorsal sensory spots. Metathoracic tarsal claws subequal in size and similarly sclerotized relative to pro- and mesothoracic claws. Maxillary stridulatory area with row of 5-6 small, sharp, pointed, recurved teeth. Maximal width of cranium variable 14

14. Lobes of respiratory plate separated. Maxillary stridulatory area with a row of 6 teeth. Fore- and mesotarsal claws with 2-5 long, stout setae. Maximal width of cranium 6.0-8.0 mm ..... *Macropoides*
14'. Lobes of respiratory plates contiguous. Maxillary stridulatory area with row of 5 teeth. Fore- and mesotarsal claws with 2 long, stout setae. Maximal width of cranium variable 15

15. Metathoracic tarsal claws reduced. Spiracles of abdominal segments I-VIII progressively smaller. Head capsule dark reddish-brown. Maximal width of cranium 9.0 mm ..... *Heterosternus*

15'. Metathoracic tarsal claws not reduced. Spiracles of abdominal segments I-V progressively smaller and segments VI-VIII progressively larger. Head capsule bicolored, dark brown to reddish-yellow. Maximal width of cranium 5.0 mm ..... *Parisolea*

Larvae of *Rutela*

Only the third instar larvae of *R. dorcyi* (described in this publication) and *R. formosa* have been described for the genus *Rutela*. Adults and/or larvae have been recorded from the rotting wood of: *Artocarpus* sp. (Urticeae), *Bursera* sp. (Burseraceae), *Conocarpos* sp. (Combretaceae), *Ficus* sp. (Moraceae), *Inga* sp. (Fabaceae), *Mangifera* sp. (Anacardiaceae), *Metopium* sp. (Annonaceae), *Simarouba* sp. (Simaroubaceae), and *Tabebuia* sp. (Bignoniaceae).

Larvae of *Rutela* are most similar to *Cnemida* (Jameson 1996b) and *Microrutela*. *Cnemida* and *Rutela* share the following characteristics: antenna with well-defined scape; labrum oval; 2 to 3 frontal setae; ocelli absent; epipharynx lacking zygum and epizygum; pedium and gymnoparia well defined; plagmatia lacking; and respiratory plate with a maximum of 18 holes across any width. Larvae of *Cnemida* differ from *Rutela* based on the following characters: antenna with 3 dorsal sensory spots (4 in *Cnemida*); width of labrum wider than long (subequal to length in *Cnemida*); left mandible with 2 scissorial teeth (3 in *Cnemida*); epipharynx without clithra and beak-like haptomeral process (both present in *Cnemida*); and claws with 2 apical setae on pro- and mesothoracic legs and 2 or 3 on metathoracic legs (1 seta on all legs in *Cnemida*).

Based on the larva of *M. viridiaurata*, larvae of *Rutela* are also similar to those of *Microrutela* and share the following characteristics: antenna with well-defined scape; labrum oval; ocelli absent; epipharynx lacking zygum and epizygum, pedium and gymnoparia well defined, plegmatia lacking. The larvae of *Rutela* differ from those of *Microutela* based on the following characters: stridulatory area of mandible with approximately 7 stridulatory ridges (approximately 20 in *Microrutela*); antenna with 3 ventral sensory spots (4 in *Microrutela*) and with rounded apex (nipple-shaped in *Microrutela*); and left mandible with 2 scissorial teeth (3 in *Microrutela*).

Third Instar Larva of *Rutela dorcyi* (Olivier)

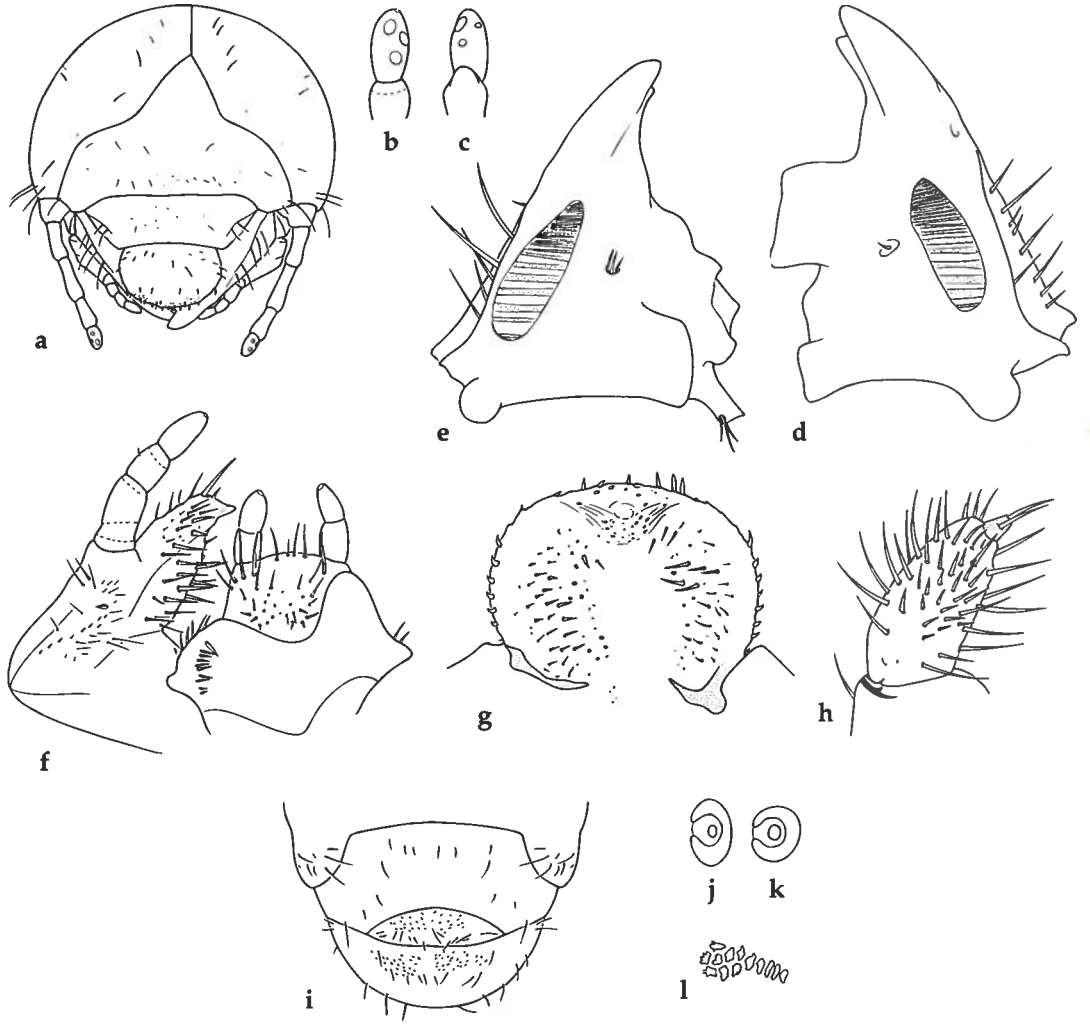
(Figs. 131a-l)

The larva of *R. dorcyi* is the second species described in the genus *Rutela*, and the description of the pupa of *R. dorcyi* is the first pupa described in the genus. Terminology used for the larval description follows Ritcher (1966).

Four third instar larvae, one cast skin of a third instar larva, one pupa, and adults of *R. dorcyi* were collected by M. A. Ivie, D. S. Sikes, and W. Lanier (MTEC) from deep within a rotten log that was about 18 inches in diameter (pers. comm. Ivie 1996). According to Ivie, the wood was moderately dry and soft. Three specimens are housed at MTEC and one at UNSM with the following data: "Dom. Rep.: Prov. Hato Mayor, Par. Nac. Los Haitises W. of Sabana de la Mar, bosque humido, Los Haitises, 16 Apr., 1992, in rotten log, M. A. Ivie, D. S. Sikes, and W. Lanier."

Description third instar larva. *Cranium* (Fig. 131a): Width of head capsule 4.3 mm. Surface finely alutaceous, reddish-yellow, mandibles piceous. Frontoclypeal suture and clypeofrontal suture distinct. Epicranium with five dorsoepicranial setae on each side; frons with 1 long anterior frontal seta and 2 smaller setae; anterior frontal angle with 2 moderately long setae; exterior frontal angle with 1 long seta; posterior frontal region with 1 long seta and 2 smaller setae arranged in a transverse row. Ocellus absent. *Clypeus:* Form trapezoidal. Surface sparsely, setigerously punctate; setae moderately long, tawny; preclypeus and postclypeus with minute punctures; lateral margins with 2 tawny, long

setae on each side. *Labrum:* Form subovate, symmetrical. Base and disc sparsely, setigerously punctate; punctures shallow; setae robust, moderately long. Sub-apical margin with 4 coarse, shallow, setigerous punctures, evenly spaced; setae moderately long, brown. Apex densely punctate; punctures moderately large, setigerous; setae thick, short. *Antenna* (Figs. 131b-c): 4-segmented and with well- defined scape; scape half length of antennal segment 1, segments 1-3 subequal in length, segment 4 two-thirds length of segment 3. Apical segment oval with 3 dorsal sensory spots (Fig. 131b) and 3 ventral sensory spots (Fig. 131c). *Right Mandible* (Fig. 131d): Form falcate. Scissorial region with 2 scissorial teeth (second tooth reduced), separated by a narrow scissorial notch. Lateral face with 6-8 long, brown setae. Dorsal surface with feeble arc of about 10 dorsomolar setae. Venter (internal surface) with elongate-oval stridulatory area with ridges progressively shorter at apex, basal two-thirds with 7 broad ridges (progressively shorter toward



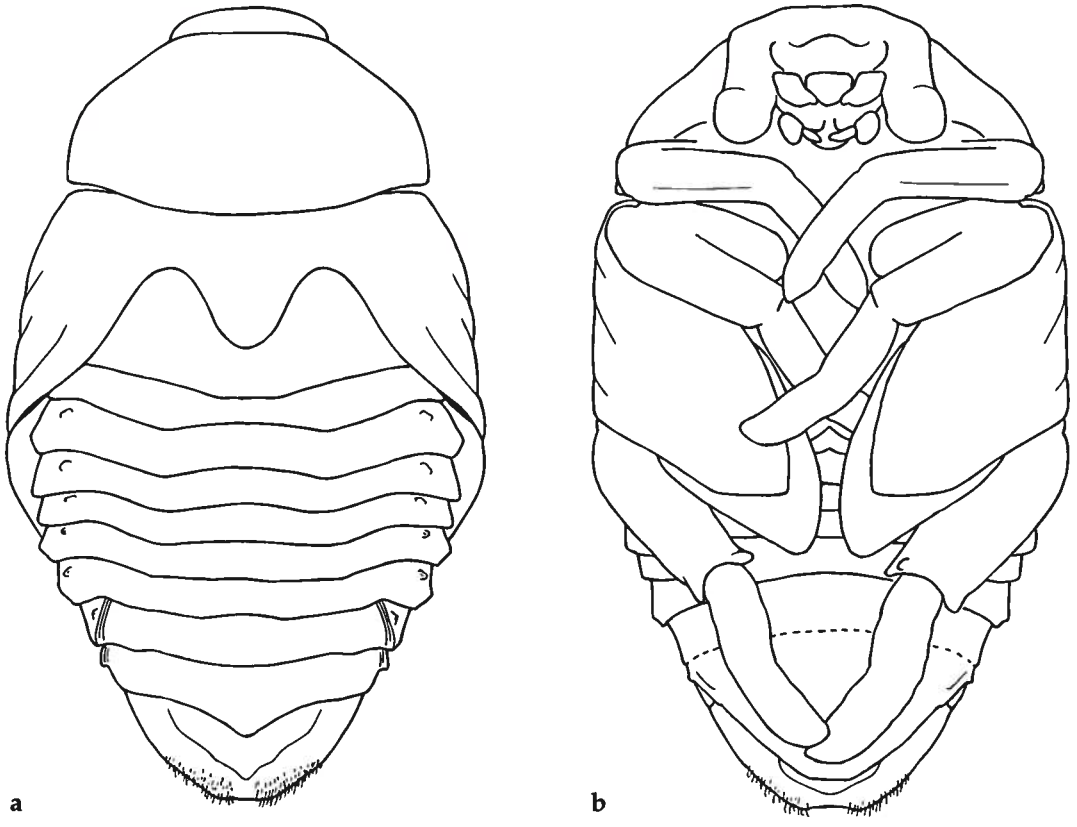
FIGS. 131a-l. *Rutela dorcyi*, third-instar larva. 131a, Frontal view of cranium; 131b-c, dorsal and ventral views, respectively, of apical antennal segments; 131d-e, ventral aspect of right and left mandibles, respectively; 131f, dorsal aspect of maxilla and labium; 131g, epipharynx; 131h, form of the claw; 131i, venter of last abdominal segment; 131j-k, thoracic and abdominal spiracles, respectively; 131l, form of the holes in the respiratatory plate.

apex), apical third with many short ridges; molar area broad, poorly defined, calx produced, brustia with 6 moderately long setae; ventral process broad, well developed; basolateral angle with preartis. *Left mandible* (Fig. 131e): Form falcate. Scissorial region with 2 scissorial teeth (second tooth reduced), separated by a narrow scissorial notch. Lateral face with 6-8 long, brown setae. Dorsal surface with a line of about 10 dorsomolar setae. Venter (internal surface) with elongate-oval stridulatory area with ridges progressively shorter at apex; basal two-thirds with 8 broad ridges (progressively shorter toward apex), apical third with many short ridges; molar area with 1 broad, oval lobe; basolateral angle with preartis. *Maxilla* (Fig. 131f): Cardo subrectangular. Stipes larger than wide. Lacinia with many stout setae and 1 vestigial uncus at subapex. Galea with many stout setae and uncus. Palp 4-segmented, segment 1 half length of segment 2, segments 2-3 subequal. Stridulatory area with 8-9 curved spines and anterior truncate process. *Labium* (Fig. 131f): Surface with moderately long setae. Internal surface of glossa with moderately dense, moderately long setae. Hypopharyngeal sclerome asymmetrical, concave, right side with raised tubercle, left side with stout setae at margin and on discal region. *Epipharynx* (Fig. 131g): Form subovoval, symmetrical. Haptomerum with weak tubercle and about 20 stout setae. Zygum and epizygum absent. Acanthoparia with 7-8 stout, recurved spines. Plegmatia lacking. Gymnoparia present. Chaetoparia with about 40 stout setae; setae long at middle, shorter at margins. Pedium well defined. Haptolachus incomplete; nesium and crepsis lacking; sensory cone poorly developed with 4 sensory pits. Dexiotorma elongate. Laeotorma with broad, posteriorly produced pternotorma. *Legs*: Subequal in length. Trochanter, femur, and tibiotarsus with numerous, stout, moderately long setae. Claws (Fig. 131h) yellowish-brown, conical, apex blunt with 2 setae; 1 seta at apex, 1 seta at sub-apex. *Body vestiture:* Thorax sparsely setose; abdominal segments 1-6 with moderately dense, robust setae; abdominal segments 7-10 sparsely setose. Prescutum of meso- and metathorax with 14-16 moderate and moderately long setae on disc. Scutellum of pro- and mesothorax with 5-10 short to moderately long setae; metathorax with about 40 short, stout setae. Abdominal segments 1-6 divided into annulets; prescutum with 70-80 short, stout setae and 4 long setae near posterior margin; scutum with 160-200 short, stout setae (some longer laterally) and 8-10 long setae near posterior margin; scutellum with 160-180 short, stout setae and 6-8 long setae near posterior margin. Abdominal segment 7-9 not divided into annulets, each with sparse, long setae in transverse rows. Abdominal segment 10 with sparse setae; dorsal impressed line absent; venter (Fig. 131i) without palidia, teges or septula; anal lip curved, setigerous; apex with 30-40 short, stout, weakly curved setae, base with 20-26 moderately long setae. *Spiracles* (Figs. 131j-k): Thoracic spiracle (.50 mm high, .30 mm wide) slightly larger than abdominal spiracles including last spiracle (.40 mm high, .30 mm wide) (Fig. 131j); abdominal spiracles 1-7 similar in size (about .30 mm high, .28 mm wide) (Fig. 131k). Respiratory plates C-shaped and surrounding conical bulla (Fig. 131l), holes irregular (outer margin) or oval (inner margin), 11-16 holes across diameter of plate; distance between lobes of plate less than dorsoventral diameter of bulla.

Remarks. The third instar larvae of *R. dorcyi* and *R. formosa* are separated by 5 dorsoepicranial setae (2 in *R. formosa*), galea with one well-developed uncus and one vestigial uncus (lacking in *R. formosa*), and lacinia lacking uncus (one vestigial uncus in *R. formosa*).

Pupa of *Rutela dorcyi* (Olivier)
(Figs. 132a-b)

One pupa *R. dorcyi* was collected by M. A. Ivie, D. S. Sikes, and W. Lanier (MTEC) in conjunction with larvae and adults. The specimen is housed at MTEC with the following data: "Dom. Rep.: Prov. Hato



FIGS. 132a-b. *Rutela dorcyi*, pupa. 132a, dorsal view; 132b, ventral view.

Mayor, Par. Nac. Los Haitises W. of Sabana de la Mar, bosque humido, Los Haitises, 16 Apr., 1992, in rotten log, M. A. Ivie, D. S. Sikes, and W. Lanier."

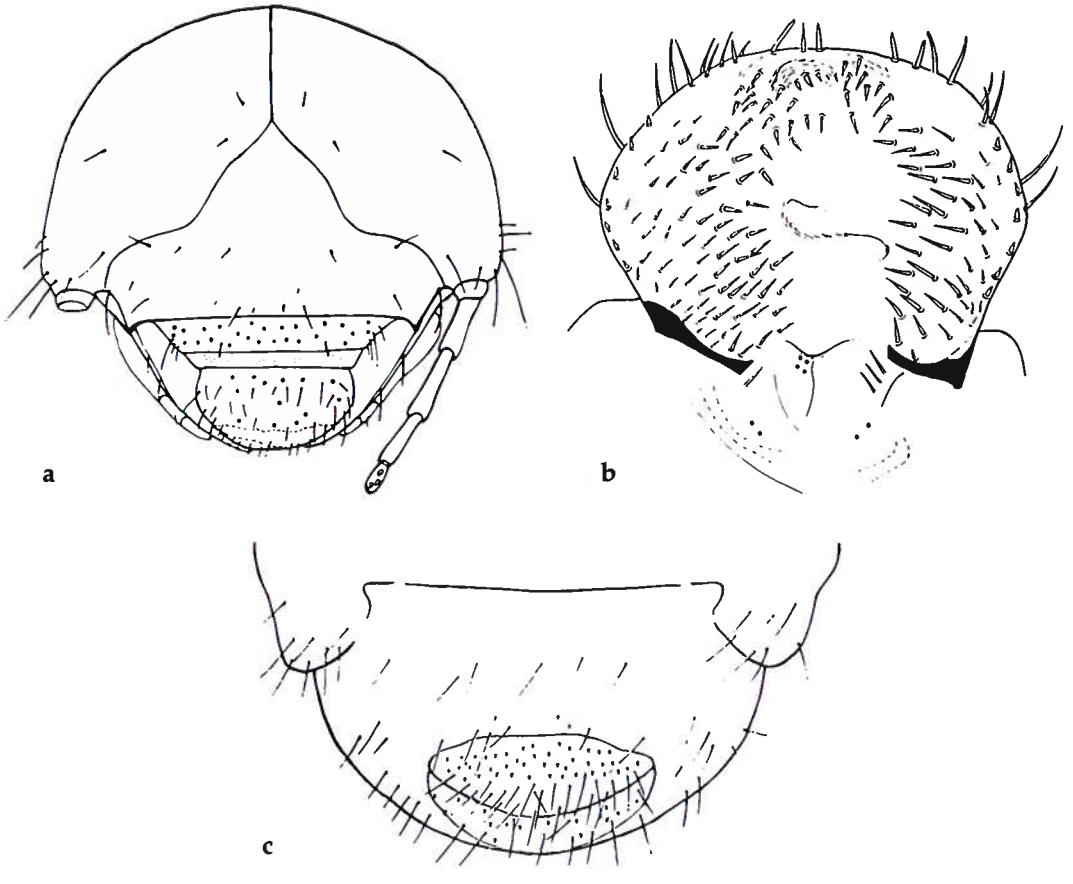
Description of pupa (Figs. 132a-b). Length 15.5 mm. Width 8.0 mm. Shape oval, stout, exarate. Color cream-white. Surface glabrous. *Head*: Bent ventrally; antennae, palps, and clypeus discernible. *Thorax*: Elytra, hind wings, and legs well developed. Elytra and hind wings closely appressed, curved ventrally around body; elytra extending to 4th abdominal segment; hind wing extending to 5th abdominal segment; legs without distinct tarsomeres. *Abdomen:* Segments 1-5 (ventral view) well defined, segment 6 with poorly defined sub-segment; segment 6 slightly longer than segments 1-5 combined. Segments 1-4 (dorsal view) with well sclerotized, piceous, rectangular spiracles; segments 5-8 with round, lobe-like poorly sclerotized spir-acles; spiracles 1-7 placed dorsolaterally, spiracle 8 placed laterally. Abdominal segment 9/10 coalesced, apex (except at middle) with dense, moderately long, brown setae.

Remarks. The pupa of *R. dorcyi* is the first pupa described in the genus *Rutela*. Collecting data indicate that pupae of other species of *Rutela* have been encountered in rotten logs in association with adults.

Third Instar Larva of *Rutela formosa* Burmeister
(Figs. 133a-c)

The larva of *R. formosa* was described by Ritcher (1966) based on two third instar larvae from Miami Beach, Florida and two third instar larvae from Cayamas, Cuba. The following description is after Ritcher (1966).

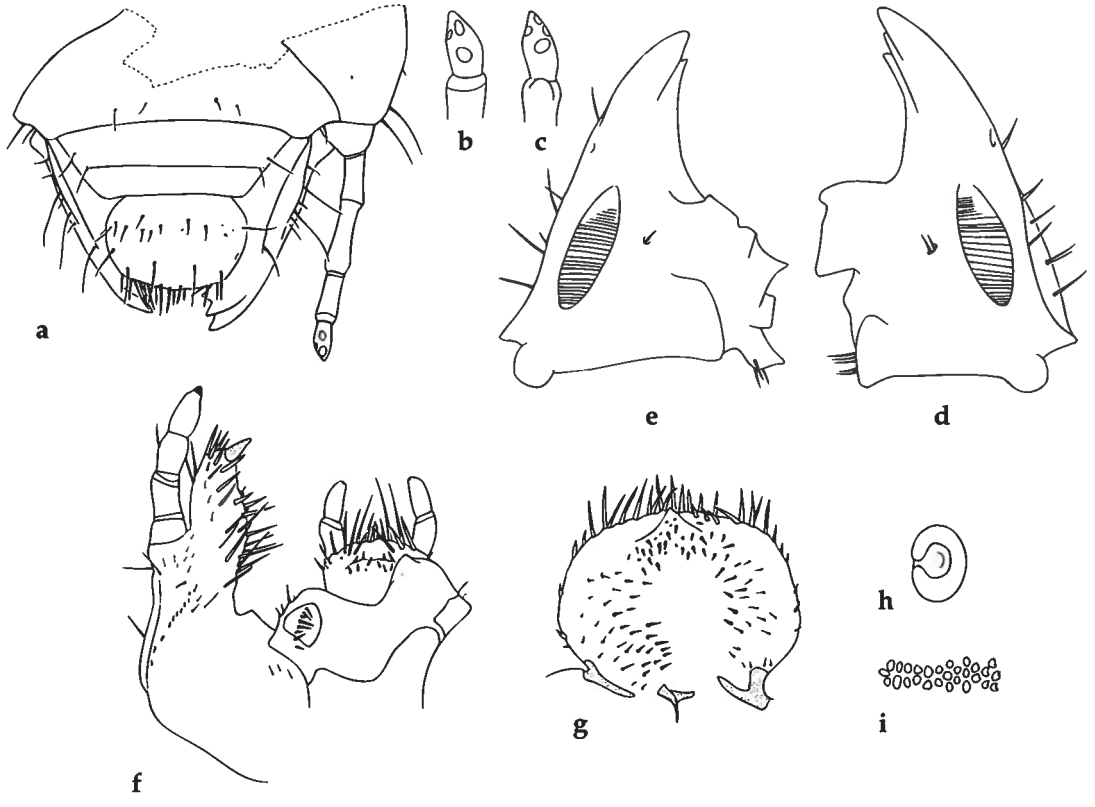
Description third instar larva. *Cranium* (Fig. 133a): Width of head capsule 3.8-4.7 mm. Surface smooth with fine reticulations, light yellow-brown. Frontoclypeal suture and clypeofrontal suture distinct. Epicranium with 2-3 dorsoepicranial setae on each side; frons with 1 long anterior frontal seta and 2-3 smaller setae; anterior frontal angle with 1 long seta; exterior frontal angle with 1-2 setae; posterior frontal region with 2-3 setae arranged in a transverse row. Ocellus absent. *Clypeus:* Form trapezoidal. Surface sparsely, setigerously punctate; lateral margins with 3-4 long setae on each side. *Labrum:* Form subovate, symmetrical, wider than long. Surface sparsely, setigerously punctate; setae, moderately long. *Antenna*: 4-segmented with well-defined scape; scape half length of antennal segment 1, segments 1-3 subequal in length, segment 4 two-thirds length of segment 3. Apical segment oval with 3 dorsal sensory spots. *Left Mandible*: Scissorial region with 2 scissorial teeth. Dorsal surface with longitudinal row of 7 dorsomolar setae. *Maxilla*: Lacinia with 1 vestigial uncus represented by a small, sclerotized region with



FIGS. 133a-c. *Rutela formosa*, third instar larva. 133a, frontal view of the cranium; 133b, epipharynx; 133c, venter of the last abdominal segment. Reprinted with permission from Oregon State University Press.

1 small seta. Stridulatory area with 8-10 conical teeth and anterior truncate process. *Epipharynx* (Fig. 133b): Form suboval, nearly symmetrical. Haptomerum with small, raised haptomeral process behind which are about 25 stout setae. Epizygum, proplegmatia, and plegmatia absent. Chaetoparia well developed, without sensillae among the chaetae. Haptolachus incomplete; nesium lacking; sensory cone poorly developed with 4 sensory pits. *Legs*: Claws poorly developed, terminal portion absent; claws of pro- and mesothoracic legs with 2 setae, metathoracic leg with 2-3 setae; 1 seta near apex. *Body vestiture:* Dorsum of segments 7-10 sparsely setigerous. Segment 7 not divided into annulets; apical region with sparse, short setae and a few long setae. Segments 8-9 with 2 widely separated, sparsely setigerous, transverse rows of long setae. Segment 10 nearly bare; dorsal impressed line absent. Venter of segment 10 (Fig. 133c) without palidia; teges absent or with 2-3 short, stout setae; anal lip curved; hamate setae absent. *Spiracles*: Thoracic spiracles 1.4-1.8 mm high, 0.7-1.2 mm wide. Segments 1-6 with spiracles similar in size, smaller than prothoracic spiracles and abdominal spiracles on segments 7-8. Respiratory plate of abdominal spiracles almost surrounding the bulla; holes irregular oval, not in definite rows; 17-18 holes across diameter of plate; distance between the lobes of the plate less than the dorsoventral diameter of the bulla.

Remarks. The third instar larvae of *R. formosa* and *R. dorcyi* are separated by the dorsoepicranial setae (two in *R. formosa* and five in *R.*



FIGS. 134a-i. *Microrutela viridiaurata*, third-instar larva. 134a, Frontal view of cranium (damaged); 134b-c, dorsal and ventral views, respectively, of apical antennal segments; 134d-e, ventral aspect of right and left mandibles, respectively; 134f, dorsal aspect of maxilla and labium; 134g, epipharynx; 134h abdominal spiracle; 134i, form of the holes in the respiratory plate.

dorcyi), lacinial unci (one vestigial uncus in *R. formosa*, lacking in *R. dorcyi*), and galeal unci (with one well-developed uncus and one vestigial uncus in *R. dorcyi*, lacking in *R. formosa*).

Larvae of *Microrutela*

Based on the larva of *M. viridiaurata*, larvae of *Microrutela* are most similar to those of *Rutela* (see discussion under "Larvae of *Rutela*"), but are separated based on the stridulatory area of the mandible with approximately 20 ridges (7 stridulatory ridges in *Rutela*); antenna with 4 ventral sensory spots (3 ventral sensory spots in *Rutela*) and with the apex nipple-shaped (rounded in *Rutela*); and left mandible with 3 scissorial teeth (2 scissorial teeth in *Rutela*).

The description of *M. viridiaurata* is based on one cast skin that is broken and distorted. Thus, some characters were not observable.

Third Instar Larva of *Microrutela viridiaurata* (Bates)
(Figs. 134a-i)

The larva of *Microrutela viridiaurata* (Bates) is described based on the cast skin of a third instar larva and associated adult. Terminology used for the larval description follows Ritcher (1966).

One third instar larva and one partial pupal exuvia of *M. viridiaurata* (INBio archived data 95.ER.69) were collected by Elias Rojas (INBC) from *Vitex cooperi* (Verbenaceae). The larva and pupa are housed in alcohol at INBC. The following data are associated with the specimen: "Cedrales Finca Montaña Grande (Limon), 2 km N de la Finca, A.C. Tortuguero, 10 m elev., Elias Rojas [Lambert projection 278,600 V, 366,500 H]." The larva was collected 28 August 1995; the prepupa formed on 22 September 1995; pupation occurred 2 October 1995; the adult eclosed 8 October 1995.

Description third instar larva. *Cranium* (Fig. 134a): Head capsule broken and distorted. Approximate cranial width 2.5-3.0 mm. Surface finely alutaceous, reddish-yellow, mandibles piceous. Frontal suture and clypeofrontal suture distinct, broken. Epicranium distorted, not observable. Frons with 2 long anterior frontal setae; anterior frontal angle with 1-2 long setae; exterior frontal angle without apparent setae; posterior frontal region broken, not observable. *Clypeus:* Form trapezoidal. Surface sparsely, setigerously punctate; setae moderately long, tawny; preclypeus and postclypeus with minute punctures; lateral margins with 2 tawny, long setae on each side. *Labrum:* Form subovate, symmetrical. Base and disc sparsely, setigerously punctate; punctures shallow; setae robust, moderately long. Sub-apical margin with 4 coarse, shallow, setigerous punctures, evenly spaced; setae moderately long, brown. Apex densely punctate; punctures moderately large, setigerous; setae thick, short. *Antenna* (Figs. 134b-c): 4-segmented with well-defined scape; scape half length of antennal segment 1, segments 1-3 subequal in length, segment 4 two-thirds length of segment 3. Apical segment oval with prominent apical nipple, with 3 dorsal sensory spots (Fig. 134b) and 4 ventral sensory spots (Fig. 134c). *Right Mandible* (Fig. 134d): Form falcate. Scissorial region with 2 scissorial teeth separated by a narrow scissorial notch. Lateral face with 6-8 long, brown setae. Dorsal surface without noticable dorsomolar setae. Venter (internal surface) with elongate-oval stridulatory area with ridges progressively shorter and less defined at apex and base, basal two-thirds with about 20 broad ridges, apical third with many short ridges; molar area with 3 poorly defined lobes, brustia with 3 moderately long setae; ventral process broad, well developed; basolateral angle with preartis. *Left mandible* (Fig. 134e): Form falcate. Scissorial region with 3 scissorial teeth separated by a narrow scissorial notches. Lateral face with 6-8 long, brown setae. Dorsal surface lacking noticable dorsomolar setae. Venter (internal surface) with elongate-

oval stridulatory area with ridges progressively shorter and less defined at apex and base; basal two-thirds with about 20 ridges, apical third with many short ridges; molar area with 2 lobes; basolateral angle with preartis. *Maxilla* (Fig. 134f): Cardo subrectangular. Stipes larger than wide. Lacinia with many stout setae and 1 vestigial uncus at subapex. Galea with many stout setae and 1 well-defined uncus. Palp 4-segmented, segment 1 half length of segment 2, segments 2-3 subequal, terminal segment with nipple-shaped apex. Stridulatory area with 10 curved spines and anterior truncate process. *Labium* (Fig. 134f): Surface with moderately long setae. Internal surface of glossa with moderately dense, moderately long setae at apex; disc with short, robust setae. Hypopharyngeal sclerome asymmetrical, concave; trunctate process produced, tuberculate; lateral lobe with 4 moderately long setae at margin and 8 stout setae on discal region. *Epipharynx* (Fig. 134g): Form suboval, symmetrical. Haptomerum with produced tubercle and about 25 stout setae. Zygum and epizygum absent. Acanthoparia with 6-7 stout, recurved spines. Plegmatia lacking. Gymnoparia present. Chaetoparia with 30-40 setae; setae longer at lateral margin, shorter and more robust on disc. Pedium well defined. Haptolachus incomplete; nesium and crepsis lacking; sensory cone not observed. Sclerotized plate present and produced posteriorly. Dexiotorma elongate. Laeotorma with broad, posteriorly produced pternotorma. *Legs*: Subequal in length. Trochanter, femur, and tibiotarsus with numerous, stout, moderately long setae. Left protibial claw heavily sclerotized, piceous, apex blunt due to wear; right protibial claw and remaining claws not heavily sclerotized, yellowish-brown, apex conical with 2 setae, 1 seta at subapex. *Body vestiture:* Thorax sparsely setose; abdominal segments 1-6 with moderately dense, robust setae; abdominal segments 7-10 sparsely setose. Thorax sparsely setose, setae moderately long. Abdominal segments 1-6 divided into annulets; prescutum with about 20 short, stout setae and 4 long setae near posterior margin; scutum with 80-100 short, stout setae (some longer laterally) and 8-10 long setae near posterior margin; scutellum with 80-100 short, stout setae and 6-8 long setae near posterior margin. Abdominal segments 7-9 distorted, apparently not divided into annulets, each with dense short, stout setae and sparse, long setae. Abdominal segment 10 distorted, not observable. *Spiracles* (Fig. 134h): Thoracic spiracle (.45 mm high, .30 mm wide); abdominal spiracles 1-7 similar in size (about .37 mm high, .25 mm wide). Respiratory plates C-shaped, surrounding weak, subconical bulla; holes irregular (outer margin) or circular-oval (inner margin), 11-20 holes across diameter of plate (Fig. 134i); distance between lobes of plate subequal to dorsoventral diameter of bulla.

Remarks. This is the only known and described larva in the genus *Microrutela*. The asymmetry of appendages (left protibia more sclerotized than all other tibiae) could be due to a developmental abnormality. Additional specimens are necessary to confirm this.

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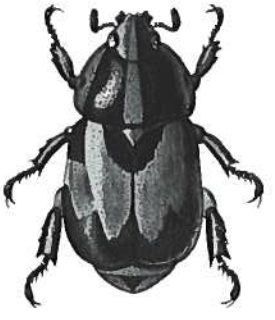

Appendix 1. HISTORY OF THE CLASSIFICATION OF THE SUBTRIBE RUTELINA AND RELATED GROUPS.

Burmeister (1844)

- Rutelidae
  - Parstasiidae
    - *Parastasia*
    - *Caelidia* (=*Parastasia*)
    - *Chalcentis* (=Antichirina)
  - Rutelidae Genuini
    - *Rutela*
    - *Cnemida*
  - Pelidnotidae
    - *Pelidnota*
    - *Strigidia*
      - subgenus of *Pelidnota*
    - *Chalcoplethis*
      - subgenus of *Pelidnota*
    - *Homonyx*
    - *Heterosternus* (=Heterosternina)
  - Chrysophoridae
    - *Chrysophora*
    - *Chrysina*
    - *Plusiotis*
- Cyclocephalidae
  - Chalepidae
    - *Peltonotus*

Lacordaire (1856)

- Rutélides
  - Rutélides vraies
    - *Rutela*
    - *Cnemida*
    - *Parastasia*
    - *Peperonota*
    - *Chalcentis* (=Antichirina)
  - Pélidnotides
    - *Pelidnota*
    - *Strigidia*
      - subgenus of *Pelidnota*
    - *Chalcoplethis*
      - subgenus of *Pelidnota*
    - *Plusiotis*
    - *Chrysophora*
    - *Chrysina*
    - *Homonyx*
    - *Catoclastus*
    - *Heterosternus* (=Heterosternina)
    - *Macropoides* (=Heterosternina)
    - *Lasiocala* (=Lasiocalina)
    - *Crathoplus* (=Antichirina)

H. Bates (1888)
(worked with New World taxa only)

- Rutelinae
  - Group Rutelina
    - *Rutela*
    - *Cnemida*
    - *Metapachylus*
    - *Rutelisca*
    - *Pelidnota*
  - Group Plusiotina
    - *Plusiotis*
    - *Chrysina*

Arrow (1917)
(worked only with Asian taxa)

- Rutelinae
  - Peltnotini
    - *Peltonotus*
  - Parastasiini
    - *Parastasia*
      - subgenus *Lutera*
      - subgenus *Cyphelytra*
      - subgenus *Rutelarcha*
    - *Peperonota*
    - *Dicaulocephalus*
    - *Didrepanephorus*
    - *Fruhstorferia*
- Desmonychinae
  - *Desmonyx*

Appendix 1. HISTORY OF THE CLASSIFICATION OF THE SUBTRIBE RUTELINA AND RELATED GROUPS (continued).

Ohaus (1918)
- Rutelinae
  - Rutelini
    - Rutelina
      - *Rutela*
      - *Cnemida*
      - *Metapachylus*
      - *Rutelisca*
      - *Lutera*
      - *Cyphelytra*
      - *Rutelarcha*
    - Parastasiina
      - *Parastasia*
      - *Peperonota*
      - *Dicaulocephalus*
      - *Ceroplophana*
    - Pelidnotina
      - *Pelidnota*
      - *Plusiotis*
      - *Chrysophora*
      - *Chrysina*
      - *Homonyx*
      - *Catoclastus*
      - *Peltonotus*
      - etc.
    - Fruhstorferiina
      - *Fruhstorferia*
    - Oryctomorphina
      - *Orcytomorphus*
    - Desmonychina
      - *Desmonyx*
    - Didrepanephorina
      - *Didrepanephorus*

Machatschke (1972)
- Rutelinae
  - Rutelini
    - Rutelina
      - *Rutela*
      - *Cnemida*
      - *Metapachylus*
      - *Rutelisca*
    - Parastasiina
      - *Parastasia*
      - *Lutera*
      - *Cyphelytra*
      - *Rutelarcha*
      - *Peperonota*
      - *Dicaulocephalus*
      - *Ceroplophana*

Machatschke (1972) (continued)
- Rutelinae
  - Rutelini
    - Rutelina
    - Pelidnotina
      - *Pelidnota*
      - *Plusiotis*
      - *Chrysophora*
      - *Chrysina*
      - *Homonyx*
      - *Catoclastus*
      - *Peltonotus*
      - etc.
    - Fruhstorferiina
      - *Fruhstorferia*
    - Oryctomorphina
      - *Orcytomorphus*
    - Didrepanephorina
      - *Didrepanephorus*
    - Desmonychina
      - *Desmonyx*

Kuijten (1988, 1992)
- Rutelinae
  - Rutelini
    - Rutelina
      - *Rutela*
      - *Cnemida*
      - *Metapachylus*
      - *Rutelisca*
      - *Lutera*
      - *Cyphelytra*
      - *Rutelarcha*
    - Parastasiina
      - *Parastasia*
      - *Peperonota*
      - *Dicaulocephalus*
      - *Ceroplophana*
    - Fruhstorferiina
      - *Fruhstorferia*
    - Didrepanephorina
      - *Didrepanephorus*

Appendix 2. LIST OF SPECIES USED IN THE PHYLOGENETIC ANALYSIS OF THE RUTELINA.

TAXONOMIC INGROUPS

Rutelini: Rutelina:
Rutela sensu Latreille ("*Rutela* A")
R. cryptica n. sp.
R. dimorpha Ohaus
R. dorcyi (Olivier)
R. formosa Burm.
R. glabrata (Fabr.)
R. heraldica Perty
R. histrio Salhberg
R. histrioparilis n. sp.
R. laeta (Weber)
R. lineola (L).
R. sanguinolenta Waterhouse
R. striata Olivier
R. tricolorea Ohaus
R. versicolor Latreille
R. vetula Ohaus
"*Rutela* B" (*Microrutela)*
M. batesi n. sp.
M. campa Ohaus
M. coerulea (Perty)
M. egana Ohaus
M. ucalayiensis n. sp.
M. vidua n. sp.
M. viridiaurata Bates
"*Rutela* C" (*Sphaerorutela)*
S. coeruleohumeralis (Ohaus)
S. lauta (Perty)
S. sumptusa (Ohaus)
S. viridicuprea (Ohaus)
"*Rutela* D" (*Plesiorutela) specularis*
H. Bates
Cnemida aterrima H. Bates
C. intermedia H. Bates
C. retusa (Fabr.)
Rutelisca durangoana Ohaus
R. flohri H. Bates
Metapachylus sulcatus H. Bates
Lutera luteola Westwood
L. nigromaculata Ohaus
Cyphelytra ochracea Waterhouse
Rutelarcha bakeri Ohaus
R. quadrimaculata Waterhouse

Rutelini: Parastasiina
Parastasia confluens Westwood
P. exophthalma Kuijten
P. basalis Candeze
P. marmorata Gestro
Peperonota harringtoni Westwood
Dicaulocephalus feae Gestro
D. fruhstorferi Felsche
Ceroplophana modiglianii Gestro

Rutelini: Pelidnotina
Pelidnota (Odontognathus) belti Sharp
P. xanthospila Germar
Pelidnota (Pelidnota) notata Blanchard
P. punctata (L.)
Plusiotis resplendens Bouchard
P. chrysopedila H. Bates
P. gloriosa Leconte
Chrysina macropus (Francillon)
Homonyx planicostata Blanchard
Peltonotus morio Burm.

Rutelini: Fruhstorferiina
Fruhstorferia sexmaculata Kraatz
F. flavipennis Nagai
F. mizunumai Nagai&Hirasawa*

Rutelini: Antichirina
Macraspis aterrima Waterhouse
M. hirtiventris (H. Bates)
M. cupripes (Kirsch)
Calomacraspis splendens (Burm.)
Telaugis aenescens (Burm.)

Rutelini: Heterosternina
Heterosternus oberthueri Ohaus
Macropoides crassipes (Horn)

Rutelini: Areodina
Cotalpa lanigera (L.)
Paracotalpa ursina (Horn)
Parabyrsopolis chihuahuae (H. Bates)

Rutelini: Lasiocalina
Lasiocala lucens Ohaus
Pseudochlorota peruana Ohaus

Rutelini: Acrobolbiina
Acrobolbia macrophylla Ohaus

Appendix 2. LIST OF SPECIES USED IN THE PHYLOGENETIC ANALYSIS OF THE RUTELINA (continued).

TAXONOMIC OUTGROUPS

Rutelinae: Anomalini
- *Anomala flavipennis* Burmeister
  - *A. lucicola* (Fabr.)
  - *A. undulata* Melsheimer
  - *A. binotata* Gyllenhal
- *Popillia japonica* Newman
- *Strigoderma arboricola* (Fabr.)
  - *S. sulcipennis* Burm.

Rutelinae: Spodochlamyini
- *Spodochlamys cupreola* H Bates
- *Anatista macrophylla* Ohaus

Rutelinae: Adoretini
- *Adoretus puberulus* Motschulsky
  - *A. sinicus* Burm.
  - *A. tenuimaculatus* Waterhouse

Dynastinae:
- *Cyclocephala amazona* (L.)
- *Dyscinetus dubius* (Olivier)
- *Xyloryctes jamaicensis* (Drury)
- *Strategus aloeus* (L.)
- *Oryctomorphus bimaculatus* Guerin

Melolonthinae:
- *Polyphylla decemlineata* (Say)
- *Phyllophaga crassisima* (Blanchard)
- *Diplotaxis haydeni* LeConte
- *Rhizotrogus solstitialis* (L.)

* Nagai and Hirasawa (1991) placed this species in *Didrepanephorus*. After comparison of specimens with *Didrepanephorus* and with *Fruhstorferia*, I transfer *Didrepanephorus mizunumai* Nagai and Hirasawa to the genus *Fruhstorferia*.

Specimens of *Rutela howdeni*, n. sp. were not available for the phylogenetic analysis.

Appendix 3. CHARACTER MATRIX FOR THE PHYLOGENETIC ANALYSIS OF THE TRIBE RUTELINA.

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
1	MELOLONTHINAE	0	0&1	0&1	0	0	0&1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
2	Anomalini	1	1	1	0	0	1	0	0	0	0	0&1	0	0	0	0	1	1	0	1	0
3	Spodochlamyini	1	0	0	0	0	1	0&1	0	0	0	0	1	0	1	1	1	1	0	1	0
4	Adoretini	1	0	1	0	0	0	0	0	0	0	0	0	0	1	2	1	1	0	1	1
5	*Rutela A cryptica n. sp.*	1	0	1	0	0	0	0	0	0	1	1	0	1	0	0	1	0	0	1	0
6	*Rutela A dimorpha*	1	0	1	0	0	0	0	0	0	1	1	0	1	0	0	1	0	0	1	0
7	*Rutela A dorcyi*	1	0	1	0	0	0	0	0	0	1	1	0	1	0	0	1	0	0	1	0
8	*Rutela A formosa*	1	0	1	0	0	0	0	0	0	1	1	0	1	0	0	1	0	0	1	0
9	*Rutela A glabrata*	1	0	1	0	0	0	0	0	0	1	1	0	1	0	0	1	0	0	1	0
10	*Rutela A heraldica*	1	0	1	0	0	0	0	0	0	1	1	0	1	0	0	1	0	0	1	0
11	*Rutela A histrio*	1	0	1	0	0	0	0	0	0	1	1	0	1	0	0	1	0	0	1	0
12	*Rutela A histriopartis n. sp.*	1	0	1	0	0	0	0	0	0	1	1	0	1	0	0	1	0	0	1	0
13	*Rutela A laeta*	1	0	1	0	0	0	0	0	0	1	1	0	1	0	0	1	0	0	1	0
14	*Rutela A lineola*	1	0	1	0	0	0	0	0	0	1	1	0	1	0	0	1	0	0	1	0
15	*Rutela A pygidialis*	1	0	1	0	0	0	0	0	0	1	1	0	1	0	0	1	0	0	1	0
16	*Rutela A s. sanguinolenta*	1	0	1	0	0	0	0	0	0	1	1	0	1	0	0	1	0	0	1	0
17	*Rutela A s. rufipennis*	1	0	1	0	0	0	0	0	0	1	1	0	1	0	0	1	0	0	1	0
18	*Rutela A st. striata*	1	0	1	0	0	0	0	0	0	1	1	0	1	0	0	1	0	0	1	0
19	*Rutela A st. antiqua*	1	0	1	0	0	0	0	0	0	1	1	0	1	0	0	1	0	0	1	0
20	*Rutela A tricolorea*	1	0	1	0	0	0	0	0	0	1	1	0	1	0	0	1	0	0	1	0
21	*Rutela A versicolor*	1	0	1	0	0	0	0	0	0	1	1	0	1	0	0	1	0	0	1	0
22	*Rutela A vetula*	1	0	1	0	0	0	0	0	0	1	1	0	1	0	0	1	0	0	1	0
23	*Rutela C coerulechumeralis*	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	1	0
24	*Rutela C lauta*	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	1	0
25	*Rutela C sumptuosa*	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	1	0
26	*Rutela C viridicuprea*	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	1	0
27	*Rutela B batesi*	1	0	1	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	1	0
28	*Rutela B campa*	1	0	1	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	1	0
29	*Rutela B coerulea*	1	0	1	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	1	0
30	*Rutela B egana*	1	0	1	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	1	0
31	*Rutela B ucalayiensis*	1	0	1	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	1	0
32	*Rutela B vidua*	1	0	1	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	1	0
33	*Rutela B viridiaurata*	1	0	1	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	1	0
34	*Rutela D specularis*	1	0	1	0	0	0	0	0	0	1	1	0	1	0	0	1	0	0	1	0
35	*Cnemida aterrima*	1	0	1	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	1	0
36	*Cnemida intermedia*	1	0	1	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	1	0
37	*Cnemida retusa*	1	0	1	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	1	0
38	*Rutelarcha bakeri*	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	1	0
39	*Rutelarcha quadrimaculata*	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	1	0
40	*Lutera luteola*	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	1	0
41	*Lutera nigromaculata*	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	1	0
42	*Cyphalytra ochracea*	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	1	0
43	*Metapachylus suicatus*	1	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	1	0	0	1
44	*Rutelisca flohri*	1	0	0	0	0	0	1	0	0	0	1	0	1	0	0	1	1	0	0	1
45	*Rutelisca durangoana*	1	0	0	0	0	0	1	0	0	0	1	0	1	0	0	1	1	0	0	1
46	*Fruhstorferia*	1	0	0	0	0	0	0	1	0	0	1	1	1	0	0	1	1	1	0	0
47	*Chrysina*	1	0	1	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	1	0
48	*Plusiotis*	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0
49	*Pelidnota (Odontognathus)*	1	0	1	0	0	0	0	0	0	1	1	0	0	0	0	1	0&1	0	1	0
50	*Pelidnota (Pelidnota)*	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
51	*Homonyx*	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
52	*Peltonotus*	1	0	1	0	1	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0
53	*Parastasia*	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1	0	0	1
54	*Peperonota*	1	0	0	0	1	0	0	1	0	0	1	1	0	0	0	1	0	1	0	0
55	*Dicaulocephalus*	1	0	0	0	1	0	0	1	1	0	1	1	0	0	0	1	1	1	0	0
56	*Ceraplophana*	1	0	0	0	1	0	0	?	0	0	1	1	0	0	0	1	1	1	0	0
57	*Cotalpa*	1	0	1	0	0	1	0	0	0	0	1	0	0	0	0	1	1	0	1	0
58	*Parabyrsopolis*	1	0	1	0	0	1	0	0	0	0	1	0	1	0	0	1	0	0	1	0
59	*Paracotalpa*	1	0	1	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	1	0
60	*Heterosternus*	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	1	0	1	0
61	*Macropoides*	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	1	0	1	0
62	*Macraspis*	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	1	0
63	*Calomacraspis*	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	1	0
64	*Telaugis*	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0
65	*Pseudochlorota*	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0
66	*Lasiocala*	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
67	*Acroboldia*	1	0	1	0	0	0	1	0	0	0	0	0	1	0	0	1	1	0	0	0
68	*Oryctomorphus*	1	0	0	1	0	0	0	0	1	0	0	0	1	0	0	1	1	0	0	1
69	*Cyclocephala*	1	0	1	0	0	1	0	0	0	0	1	0	1	0	0	1	1	0	1	0
70	*Dyscinetus*	1	0	1	0	0	1	0	0	0	0	1	0	1	0	0	1	1	0	1	0
71	*Strategus*	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0
72	*Xyloryctes*	1	0	0	1	0	0	0	1	1	0	1	0	1	0	0	1	1	0	0	0

Appendix 3. CHARACTER MATRIX FOR THE PHYLOGENETIC ANALYSIS OF THE TRIBE RUTELINA (continued).

		21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.	36.	37.	38.	39.	40.
1	MELOLONTHINAE	1	0	0	0	0	0	0	0	0	0	0	0&1	1	1	0&1&2	0	0	0	0	0
2	Anomalini	1	0	1	0	0	1	0	1	1	0	1	0	1	1	0	0	0	0&2	0	0
3	Spodochlamyini	1	0	1	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0
4	Adoretini	1	0	1	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
5	*Rutela A cryptica n. sp.*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	0	0	0	0	1
6	*Rutela A dimorpha*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	0	0	0	0	1
7	*Rutela A dorcyi*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	0	0	1	0	0
8	*Rutela A formosa*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	0	0	1	0	0
9	*Rutela A glabrata*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	0	0	1	0	0
10	*Rutela A heraldica*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	0	0	0	0	0
11	*Rutela A histrio*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	0	1	1	0	0
12	*Rutela A histroparilis n. sp.*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	0	1	1	0	0
13	*Rutela A laeta*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	0	1	1	0	0
14	*Rutela A lineola*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	0	1	1	0	0
15	*Rutela A pygidialis*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	0	0	0	0	1
16	*Rutela A s. sanguinolenta*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	0	0	0	0	1
17	*Rutela A s. rufipennis*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	0	0	0	0	1
18	*Rutela A st. striata*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	0	1	0	0	0
19	*Rutela A st. antiqua*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	0	1	0	0	0
20	*Rutela A tricolorea*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	0	1	1	0	0
21	*Rutela A versicolor*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	0	0	1	0	0
22	*Rutela A vetula*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	0	1	1	0	0
23	*Rutela C coeruleohumeralis*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	0	0	0	0	0
24	*Rutela C laeta*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	0	0	0	0	0
25	*Rutela C sumptuosa*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	0	0	0	0	0
26	*Rutela C viridicuprea*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	0	0	0	0	0
27	*Rutela B bateel*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	1	0	0	3	0
28	*Rutela B campa*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	1	0	0	3	0
29	*Rutela B coerulea*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	1	0	0	3	0
30	*Rutela B egana*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	1	0	0	3	0
31	*Rutela B ucalayiensis*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	1	0	0	3	0
32	*Rutela B vidua*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	1	0	0	3	0
33	*Rutela B viridiaurata*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	1	0	0	3	0
34	*Rutela D specularis*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	1	0	0	3	0
35	*Cnemida aterrima*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	0	0	2	1	0
36	*Cnemida intermedia*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	0	0	2	1	0
37	*Cnemida retusa*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	2	0	0	2	1	0
38	*Rutelarcha bakeri*	0	0	1	0	0	1	1	1	1	1	1	0	0	1	2	0	0	0	0	1
39	*Rutelarcha quadrimaculata*	0	0	1	0	0	1	1	1	1	1	1	0	0	1	2	0	0	0	0	0
40	*Lutera luteola*	0	0	1	0	0	1	1	1	1	1	1	2	0	1	1	0	0	0	0	0
41	*Lutera nigromaculata*	0	0	1	0	0	1	1	1	1	1	1	2	0	1	1	0	0	0	0	0
42	*Cyphelytra ochracea*	0	0	1	0	0	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0
43	*Metapachylus sulcatus*	0	0	1	1	0	1	1	1	1	1	1	2	0	0	1	0	0	0	0	0
44	*Rutelleca flohri*	0	0	1	1	0	1	1	1	1	1	1	2	0	0	1	0	0	0	0	1
45	*Rutelleca durangoana*	0	0	1	1	0	1	1	1	1	1	1	2	0	0	1	0	0	0	0	0
46	*Fruhstorferia*	0	0	1	0	0	1	1	1	1	0	1	0	1	1	1	0	0	0	0	0
47	*Chrysina*	1	1	1	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
48	*Plusiotis*	1	1	1	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
49	*Pelidnota (Odontognathus)*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	0	0	0	0	0	0
50	*Pelidnota (Pelidnota)*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	0	0	0	0	0	0
51	*Homonyx*	1	1	1	0	0	1	2	1	1	1	1	2	1	1	0	0	0	0	0	0
52	*Peltonotus*	0	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0
53	*Parastasia*	0	0	1	0&1	0	1	1	1	0	0	1	0	0	0	1&2	1	0	0	0	0
54	*Peperonota*	0	0	1	0	0	1	1	1	1	0	1	0	0	1	1	0	0	0	0	0
55	*Dicaulocephalus*	0	0	1	0	0	1	1	1	1	1	1	0	0	1	1	0	0	0	0	0
56	*Ceroplophana*	0	0	1	0	0	1	1	1	1	0	1	0	0	1	1	0	0	0	0	0
57	*Colalpa*	1	0	1	0	0	1	0	1	1	1	1	1	1	1	0	0	0	0	0	0
58	*Parabyrsopolis*	1	0	1	0	0	1	0	1	1	0	1	0	1	1	0	0	0	0	0	0
59	*Paracotalpa*	1	0	1	0	0	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0
60	*Heterosternus*	1	0	1	0	0	1	1	1	1	1	1	2	1	1	0	0	0	0	0	0
61	*Macropoides*	1	0	1	0	0	1	1	1	1	1	1	2	1	1	1	0	0	0	0	0
62	*Macraspis*	1	1	1	0	0	1	2	1	1	1	1	0	0	1	2	0	0	2	2	0
63	*Calomacraspis*	1	1	1	0	0	1	0	1	1	0	1	0	0	1	2	0	0	2	1	0
64	*Telaugis*	1	1	1	0	0	1	0	1	1	0	1	0	0	1	1	0	0	0	2	0
65	*Pseudochlorota*	1	0	1	0	0	1	2	1	1	1	1	0	0	1	0	0	0	0	0	0
66	*Lasiocala*	1	0	1	0	0	1	0	1	1	1	1	0	0	1	0	0	0	0	0	0
67	*Acroboilia*	1	0	1	0	0	1	1	1	0	0	1	0	0	0	2	0	0	0	0	0
68	*Oryctomorphus*	0	0	1	1	0	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0
69	*Cyclocephala*	1	0	1	0	0	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0
70	*Dyscinetus*	1	0	1	0	0	1	0	1	0	0	1	0	0	0	1	0	0	0	0	0
71	*Strategus*	0	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0
72	*Xyloryctes*	0	0	1	0	0	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0

Appendix 3. CHARACTER MATRIX FOR THE PHYLOGENETIC ANALYSIS OF THE TRIBE RUTELINA (continued).

		41.	42.	43.	44.	45.	46.	47.	48.	49.	50.	51.	52.	53.	54.	55.	56.	57.	58.	59.	60.
1	MELOLONTHINAE	0&1	0	0	0	0	0	0&1	0	0	0&1	0	0	0&2	1	0	0	0	0	0&1	0
2	Anomalini	0&1	0	0	0	0	0&1	1	0	0&1	0&1	0	0&1	0	1	0	0	1	1	1	0
3	Spodochlamyini	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
4	Adoretini	0&1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	0	0
5	*Rutela A cryptica n. sp.*	0	2	0	1	1	1	0	0	1	1	0	1	0	1	0	0	0	1	0	0
6	*Rutela A dimorpha*	0	2	0	1	1	1	0	0	1	1	0	1	0	1	0	0	0	1	0	0
7	*Rutela A dorcyi*	0	2	0	1	1	1	0	0	1	1	0	1	0	1	0	0	0	1	0	1
8	*Rutela A formosa*	1	2	0	1	1	1	0	0	1	1	0	0	0	1	0	0	0	1	0	1
9	*Rutela A glabrata*	0&1	2	0	1	1	1	0	0	1	1	0	1	0	1	0	0	0	1	0	0
10	*Rutela A heraldica*	0	2	0	1	1	1	0	0	1	1	0	1	0	1	0	0	0	1	0	1
11	*Rutela A histrio*	1	2	0	1	1	1	0	0	1	1	0	1	0	1	0	0	0	1	0	1
12	*Rutela A histriopartis n. sp.*	1	2	0	1	1	1	0	0	1	1	0	1	0	1	0	0	0	1	0	1
13	*Rutela A laeta*	1	2	0	1	1	1	0	0	1	1	0	1	0	1	0	0	0	1	0	1
14	*Rutela A linecla*	1	2	0	1	1	1	0	0	1	1	0	1	0	1	0	0	0	1	0	1
15	*Rutela A pygidialis*	0	2	0	1	1	1	0	0	1	1	0	1	0	1	0	0	0	1	0	0
16	*Rutela A s. sanguinolenta*	0	2	0	1	1	1	0	0	1	1	0	1	0	1	0	0	0	1	0	0
17	*Rutela A s. ruffpennis*	0	2	0	1	1	1	0	0	1	1	0	1	0	1	0	0	0	1	0	0
18	*Rutela A st. striata*	1	2	0	1	1	1	0	0	1	1	0	1	0	1	0	0	0	1	0	1
19	*Rutela A st. antiqua*	1	2	0	1	1	1	0	0	1	1	0	1	0	1	0	0	0	1	0	1
20	*Rutela A tricolorea*	1	2	0	1	1	1	0	0	1	1	0	1	0	1	0	0	0	1	0	1
21	*Rutela A versicolor*	1	2	0	1	1	1	0	0	1	1	0	1	0	1	0	0	0	1	0	1
22	*Rutela A vetula*	1	2	0	1	1	1	0	0	1	1	0	0	0	1	0	0	0	1	0	1
23	*Rutela C coeruleohumeralis*	0	1	0	0	1	0	0	0	1	0	1	1	0	1	0	0	0	1	0	0
24	*Rutela C laeta*	0	1	0	0	1	0	0	0	1	0	1	1	0	1	0	0	0	1	0	0
25	*Rutela C sumptuosa*	0	1	0	0	1	0	0	0	1	0	1	1	0	1	0	0	0	1	0	0
26	*Rutela C viridicuprea*	0	1	0	0	1	0	0	0	1	0	1	1	0	1	0	0	0	1	0	0
27	*Rutela B batesi*	1	3	0	1	1	1	0	1	1	1	0	1	0	1	0	0	0	1	0	0
28	*Rutela B campa*	1	3	0	1	1	1	0	1	1	1	0	1	0	1	0	0	0	1	0	0
29	*Rutela B coerulea*	1	3	0	1	1	1	0	1	1	1	0	1	0	1	0	0	0	1	0	0
30	*Rutela B egana*	1	3	0	1	1	1	0	1	1	1	0	1	0	1	0	0	0	1	0	0
31	*Rutela B ucayalensis*	1	3	0	1	1	1	0	1	1	1	0	1	0	1	0	0	0	1	0	0
32	*Rutela B vidua*	1	3	0	1	1	1	0	1	1	1	0	1	0	1	0	0	0	1	0	0
33	*Rutela B viridaurata*	1	3	0	1	1	1	0	1	1	1	0	1	0	1	0	0	0	1	0	0
34	*Rutela D specularis*	1	1	0	1	0	1	0	0	1	0	0	0	0	1	1	0	0	1	0	0
35	*Cnemida aterrima*	0	2	0	2	2	1	0	0	1	0	0	1	0	1	0	0	0	1	0	0
36	*Cnemida intermedia*	0	2	0	2	2	1	0	0	1	0	0	1	0	1	0	0	0	1	0	0
37	*Cnemida retusa*	0	2	0	2	2	1	0	0	1	0	0	1	0	1	0	0	0	1	0	0
38	*Rutelarcha bakeri*	1	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	1
39	*Rutelarcha quadrimaculata*	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1
40	*Lutera lutaola*	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
41	*Lutera nigromaculata*	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
42	*Cyphelytra ochracea*	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
43	*Metapachylus sulcatus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
44	*Rutellaca flohri*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
45	*Rutelleca durangoana*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
46	*Fruhstorferia*	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0
47	*Chrysina*	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
48	*Plusiotis*	0&1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
49	*Pelidnota (Odontognathus)*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
50	*Pelidnota (Pelidnota)*	0&1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
51	*Homonyx*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
52	*Peltonotus*	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0
53	*Parastasia*	0	1	0	0	0	0	0	0	0	0	0	0	1	1	2	0	0	1	0	0
54	*Peperonota*	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0
55	*Dicaulocephalus*	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0
56	*Ceroplophana*	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0
57	*Cotalpa*	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	1	0	0
58	*Parabyrsopolis*	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0
59	*Paracotalpa*	1	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	1	0	0
60	*Heterosternus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
61	*Macropoides*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
62	*Macraspis*	0&1	1	1	2	1	1	0	0	1	1	0	1	0	1	0	0	0	1	0	0
63	*Calomacraspis*	0	2	0	2	2	1	0	1	1	1	0	1	0	1	0	0	0	1	0	0
64	*Telaugis*	0	0	0	2	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
65	*Pseudochlorota*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0
66	*Lasiocala*	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
67	*Acrobolbia*	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0
68	*Oryctomorphus*	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
69	*Cyclocephala*	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0
70	*Dyscinetus*	1	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0
71	*Strategus*	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0
72	*Xyloryctes*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0

Appendix 3. CHARACTER MATRIX FOR THE PHYLOGENETIC ANALYSIS OF THE TRIBE RUTELINA (continued).

		61.	62.	63.	64.	65.	66.	67.	68.	69.	70.	71.	72.	73.	74.	75.	76.	77.	78.	79.	80.
1	MELOLONTHINAE	0&1	0&1	0	0	0	0	0	0	1	0&1	1	0&1	0	0	0	0	0	0	1	0&1
2	Anomalini	0&1	0&1	0	0	1	1	0	0	1	1	1	0	0	0	0	0	0	0	1	1
3	Spodochlamyini	0	0	0	0	1	0	0	0	1	0	2	0&1	0	0	0	0	0	0	0	1
4	Adoretini	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1
5	*Rutela A cryptica n. sp.*	0	1	1	0	1	1	1	0	1	0	0	1	0	1	1	1	3	1	1	1
6	*Rutela A dimorpha*	0	1	1	0	1	1	0	0	1	0	0	1	0	1	1	1	3	1	1	1
7	*Rutela A dorcyi*	1	1	0	0	1	1	0	0	1	0	0	1	0	1	1	1	3	1	1	1
8	*Rutela A formosa*	1	1	1	0	1	1	0	0	1	0	0	1	0	1	1	1	3	1	1	1
9	*Rutela A glabrata*	1	1	0	0	1	1	0	0	1	0	0	1	0	1	1	1	3	1	1	1
10	*Rutela A heraldica*	1	1	1	0	1	1	0	0	1	0	0	1	0	1	1	1	3	1	1	1
11	*Rutela A histrio*	1	1	1	0	1	1	0	0	1	0	0	1	0	1	1	1	3	1	1	1
12	*Rutela A histriopartilis n. sp.*	1	1	1	0	1	1	2	0	1	0	0	1	0	1	1	1	3	0	1	1
13	*Rutela A lasta*	1	1	1	0	1	1	0	0	1	0	0	1	0	1	1	1	3	0	1	1
14	*Rutela A lineola*	1	1	0	0	1	1	2	0	1	0	0	1	0	1	1	1	3	0	1	1
15	*Rutela A pygidialis*	0	1	1	0	1	1	0	0	1	0	0	1	0	1	1	1	3	1	1	1
16	*Rutela A s. sanguinolenta*	0	1	1	0	1	1	1	0	1	0	0	1	0	1	1	1	3	1	1	1
17	*Rutela A s. rufipennis*	0	1	1	0	1	1	0	0	1	0	0	1	0	1	1	1	3	1	1	1
18	*Rutela A st. striata*	1	1	1	0	1	1	0	0	1	0	0	1	0	1	1	1	3	1	1	1
19	*Rutela A st. antiqua*	1	1	1	0	1	1	0	0	1	0	0	1	0	1	1	1	3	1	1	1
20	*Rutela A tricolorea*	1	1	0	0	1	1	0	0	1	0	0	1	0	1	1	1	3	1	1	1
21	*Rutela A versicolor*	1	1	0	0	1	1	2	0	1	0	0	1	0	1	1	1	3	0	1	1
22	*Rutela A vetula*	1	1	0	0	1	1	2	0	1	0	0	1	0	1	1	1	3	0	1	1
23	*Rutela C coeruleohumeralis*	1	1	0	0	1	1	0	0	1	0	0	0	0	1	1	1	3	1	1	1
24	*Rutela C lauta*	1	1	0	0	1	1	0	0	1	0	0	0	0	1	1	1	3	1	1	1
25	*Rutela C sumptuosa*	1	1	0	0	1	1	0	0	1	0	0	0	0	1	1	1	3	1	1	1
26	*Rutela C viridicuprea*	1	1	0	0	1	1	0	0	1	0	0	0	0	1	1	1	3	1	1	1
27	*Rutela B batesi*	1	1	2	1	1	1	0	0	1	0	0	1	0	1	1	1	3	1	1	1
28	*Rutela B campa*	1	1	2	1	1	1	0	0	1	0	0	1	0	1	1	1	3	1	1	1
29	*Rutela B coerulea*	1	1	?	1	1	1	0	0	1	0	0	1	0	1	1	1	3	1	1	1
30	*Rutela B agana*	1	1	2	1	1	1	0	0	1	0	0	1	0	1	1	1	3	1	1	1
31	*Rutela B ucalayensis*	1	1	0	1	1	1	0	0	1	0	0	1	0	1	1	1	3	1	1	1
32	*Rutela B vidua*	1	1	0	1	1	1	0	0	1	0	0	1	0	1	1	1	3	1	1	1
33	*Rutela B viridiaurata*	1	1	2	1	1	1	0	0	1	0	0	1	0	1	1	1	3	1	1	1
34	*Rutela D specularis*	0	1	1	0	1	0	0	0	1	0	0	0	0	1	1	1	3	1	1	1
35	*Cnemida aterrima*	1	1	0	1	1	1	0	0	1	0	0	1	1	1	1	1	3	0	1	1
36	*Cnemida intermedia*	1	1	0	1	1	1	0	0	1	0	0	1	1	1	1	1	3	0	1	1
37	*Cnemida retusa*	1	1	0	1	1	1	0	0	1	0	0	1	1	1	1	1	3	0	1	1
38	*Rutelarcha bakeri*	0	0	0	0	1	1	0	0	0	0	0	1	0	0	1	0	2	0	1	1
39	*Rutelarcha quadrimaculata*	0	0	0	0	1	1	0	0	0	0	0	1	0	0	1	0	2	0	1	1
40	*Lutera luteola*	0	0	0	0	1	1	0	0	0	0	0	1	0	0	2	0	2	0	1	1
41	*Lutera nigromaculata*	0	0	0	0	1	1	0	0	0	0	0	1	0	0	2	0	2	0	1	1
42	*Cyphelytra ochracea*	0	0	0	0	1	1	0	0	0	0	0	1	0	0	2	0	2	0	1	1
43	*Metapachytus sulcatus*	1	0	0	0	1	0	0	0	0	0	0	1	0	0	2	0	1	0	0	0
44	*Rutelisca flohri*	0	0	0	0	1	0	0	0	0	0	0	1	0	0	2	0	1	0	0	0
45	*Rutelisca durangoana*	0	0	0	0	1	0	0	0	0	0	0	1	0	0	2	0	1	0	0	0
46	*Fruhstorferia*	0	0	0	0	1	0	0	0	0	0	0	1	1	1	1	0&1	1	0	1	0
47	*Chrysina*	0	0	0	0	1	1	0	0	1	0	0	0	0	0&1	1	0	1	0	1	1
48	*Plusiotis*	0	0	0&2	0	1	1	0	0	1	0	0	0	0	0&1	0	0&1	1	0	1	1
49	*Pelidnota (Odontognathus)*	0	0	0	0	1	1	0	0	1	0	0	0	0	1	0	1	3	1	1	1
50	*Pelidnota (Pelidnota)*	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0&1	3	0	1	1
51	*Homonyx*	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	1	0	1	1
52	*Peltonotus*	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0&2	0	0&2	0	0	0
53	*Parastasia*	0	0	0	0	1	1	0	0	0	0	0	1	0	0	2	0	2	0	1	1
54	*Peperonota*	0	0	0	0	1	0	0	0	0	0	0	1	0	1	1	1	1	0	1	0
55	*Dicaulocephalus*	0	0	0	0	1	0	0	0	0	0	0	1	0	1	1	1	1	0	1	0
56	*Ceroplophana*	0	0	0	0	1	0	0	0	0	0	0	1	0	1	1	1	1	0	1	0
57	*Cotalpa*	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1
58	*Parabyrsopolis*	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1
59	*Paracotalpa*	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1
60	*Heterosternus*	0	0	0	0	1	1	2	1	0	0	0	1	0	0	1	0	1	0	1	1
61	*Macropoides*	0	0	0	0	1	1	2	1	0	0	0	1	1	0	2	0	2	0	1	1
62	*Macraspis*	0&1	1	0	0	1	1	0	0	1	0	0	0	0	0	1	1	1	0	1	1
63	*Calomacraspis*	1	1	0	0	1	0	0	0	1	0	0	0	0	0	2	1	0	0	1	1
64	*Telsugia*	0	0	0	0	1	1	0	0	1	0	0	0	0	0	1	0	1	0	1	1
65	*Pseudochlorota*	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	1	0	1	0
66	*Lasiocala*	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1
67	*Acrobolbia*	0	0	0	0	0	0	0	0	1	0	0	1	1	1	2	0	2	0	0	0
68	*Oryctomorphus*	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0
69	*Cyclocephala*	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70	*Dyscinetus*	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
71	*Strategus*	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	2	0	0	0
72	*Xyloryctes*	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	2	0	0	0

Appendix 3. CHARACTER MATRIX FOR THE PHYLOGENETIC ANALYSIS OF THE TRIBE RUTELINA (continued).

		81.	82.	83.	84.	85.	86.	87.	88.	89.	90.	91.	92.	93.	94.	95.	96.	97.	98.	99.	100.
1	MELOLONTHINAE	0	0&3	0	0	0	0	0	0	0	0	0&1	2	0	2	2	0	0	0	0	0
2	Anomalini	0	3	1&2	1&2	1&2	1	1	0&1	1	1	0	1	1	1	0	1	1	0	2	0
3	Spodochlamyini	0	2	2	1&2	1	1	1	0&1	0&1	0&1	1	0&1	1&2	0&1	1	1	1	0	2	0
4	Adoretini	0	3	1	1	1	1	1	1	1	2	1	1	2	0	0	1	1	0	2	0
5	*Rutela A cryptica n. sp.*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
6	*Rutela A dimorpha*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
7	*Rutela A dorcyi*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
8	*Rutela A formosa*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
9	*Rutela A glabrata*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
10	*Rutela A heraldica*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
11	*Rutela A histrio*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
12	*Rutela A histrioparilis n. sp.*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
13	*Rutela A lasta*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
14	*Rutela A lineola*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
15	*Rutela A pygidialis*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
16	*Rutela A s. sanguinolenta*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
17	*Rutela A s. rufipennis*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
18	*Rutela A st. striata*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
19	*Rutela A st. antiqua*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
20	*Rutela A tricolorea*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
21	*Rutela A versicolor*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
22	*Rutela A vetula*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
23	*Rutela C coeruleohumeralis*	0	3	2	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
24	*Rutela C lauta*	0	3	2	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
25	*Rutela C sumptuosa*	0	3	2	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
26	*Rutela C viridicuprea*	0	3	2	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
27	*Rutela B batesi*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
28	*Rutela B campa*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
29	*Rutela B coerulea*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
30	*Rutela B egana*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
31	*Rutela B ucalayiensis*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
32	*Rutela B vidua*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
33	*Rutela B viridiaurata*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	1
34	*Rutela D specularis*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	0
35	*Cnemida aterrima*	2	1	1	1	1	1	1	0	1	1	1	1	1	0	0	1	1	1	2	1
36	*Cnemida intermedia*	2	1	1	1	1	1	1	0	1	1	1	1	1	0	0	1	1	1	2	1
37	*Cnemida retusa*	2	1	1	1	1	1	1	0	1	1	1	1	1	0	0	1	1	1	2	1
38	*Rutelarcha bakeri*	0	3	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	2	0
39	*Rutelarcha quadrimaculata*	0	3	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	2	0
40	*Lutera luteola*	0	3	1	0	0	1	1	0	1	1	1	1	1	1	2	1	1	0	2	0
41	*Lutera nigromaculata*	0	3	1	0	0	1	1	0	1	1	1	1	1	1	2	1	1	0	2	0
42	*Cyphelytra ochracea*	0	3	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	0	2	0
43	*Metapachylus sulcatus*	0	3	1	0	0	1	1	0	0	0	1	2	1	2	2	1	1	0	1	0
44	*Rutelisca flohri*	0	3	1	0	0	1	1	0	0	0	1	2	1	2	2	1	1	0	0	0
45	*Rutelisca durangoana*	0	3	1	0	0	1	1	0	0	0	1	2	1	2	2	1	1	0	0	0
46	*Fruhstorferia*	0	2	1	1	1	1	1	1	1	1	1	0	2	2	2	1	1	0	1	0
47	*Chrysina*	0	2	1	1	1	1	1	1	1	1	1	0	2	0	0	1	1	1	2	0
48	*Plusiotis*	0	2	1	1	1	1	1	1	1	1	1	0	2	0	0	1	1	1	2	0
49	*Pelidnota (Odontognathus)*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	0
50	*Pelidnota (Pelidnota)*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	0
51	*Homonyx*	1	1	1	1	1	1	1	0	0	0	1	0	2	0	0	1	1	1	2	0
52	*Peltonotus*	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	1	0	0	0	0
53	*Parastasia*	0	4	0	0	0	1	1	0	0	0	1	0	2	0&1	0&1	0	0&1	0	2	0
54	*Peperonota*	0	4	0	0	0	1	1	0	0	0	1	1	1	2	2	1	1	0	1	0
55	*Dicaulocephalus*	0	4	0	0	0	1	1	0	1	1	1	0	2	2	2	1	1	0	1	0
56	*Ceroplophana*	0	2	1	1	1	1	1	2	1	1	1	0	2	2	2	1	1	0	1	0
57	*Cotalpa*	0	3	2	2	1	1	1	0	0	1	1	1	1	1	1	1	1	0	2	0
58	*Parabyrsopolis*	0	3	2	2	1	1	1	0	1	1	1	1	1	1	1	1	1	0	2	0
59	*Paracotalpa*	0	3	2	2	1	1	1	1	1	1	1	0	2	0	0	1	1	1	2	0
60	*Heterosternus*	0	3	1	1	1	1	1	0	1	1	1	1	1	2	2	1	1	1	1	0
61	*Macropoides*	0	3	1	1	1	1	1	0	1	1	1	1	1	2	2	1	1	1	1	0
62	*Macraspis*	1	2&3	2	1	2	1	1	0	1	1	1	1	1	1	1	1	1	1	2	0
63	*Calomacraspis*	2	1	1	1	1	1	1	0	1	1	1	0	2	0	0	1	1	1	2	1
64	*Telaugis*	0	3	1	1	1	1	1	0	0	0	1	1	1	1	0	1	1	1	1	0
65	*Pseudochlorota*	0	3	1	1	1	1	1	0	0	0	1	2	1	2	2	1	1	1	0	0
66	*Lasiocala*	0	3	2	1	1	1	1	0	0	0	1	2	1	2	2	1	1	0	0	0
67	*Acroboilbia*	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	1	0	1	0	0
68	*Oryctomorphus*	0	0	0	0	0	1	1	1	0	0	0	2	1	0	0	1	0	0	0	0
69	*Cyclocephala*	0	0	0	0	0	1	0	1	0	0	0	0	2	0	0	1	0	1	0	0
70	*Dyscinetus*	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	1	0	0	0	0
71	*Strategus*	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
72	*Xyloryctes*	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0

Appendix 3. CHARACTER MATRIX FOR THE PHYLOGENETIC ANALYSIS OF THE TRIBE RUTELINA (continued).

		101.	102.	103.	104.	105.	106.	107.	108.	109.	110.	111.	112.	113.	114.	115.	116.	117.	118.	119.	120.
1	MELOLONTHINAE	0	0	0	0	1&2	0&1	1	0	0	0	0	0	0	0	2	0	0	0	0	0
2	Anomalini	2	0	0	0	2	1	1	0	0	0&1	0&1	0&1	0	0	1	0	0	0	0	0
3	Spodochlamyini	2	0	0	0	1	1	1	0	0	0	0	0	0	0	2	0	0	1	0	0
4	Adoretini	2	0	0	0	0	1	1	0	0	0	0	0	0	0	2	0	0	0	0	0
5	*Rutela A cryptica n. sp.*	2	1	2	3	0	1	1	0	1	2	1	2	1	1	1	0	0	1	1	1
6	*Rutela A dimorpha*	2	1	2	3	0	1	1	0	1	2	1	2	1	1	1	0	0	1	1	1
7	*Rutela A dorcyi*	2	1	2	3	0	1	1	0	0	2	1	2	0	1	1	0	0	1	1	1
8	*Rutela A formosa*	2	1	2	3	0	1	1	0	0	2	1	3	0	1	1	0	0	1	1	1
9	*Rutela A glabrata*	2	1	2	3	0	1	1	0	0	2	1	2	0	1	1	0	0	1	1	1
10	*Rutela A heraldica*	2	1	2	3	0	1	1	0	1	2	1	2	1	1	1	0	0	1	1	1
11	*Rutela A histrio*	2	1	2	3	0	1	1	0	1	2	1	2	1	1	1	0	0	1	0	1
12	*Rutela A histrioparilis n. sp.*	2	1	2	3	0	1	1	0	1	2	1	2	1	1	1	0	0	1	1	1
13	*Rutela A lasta*	2	1	2	3	0	1	1	0	1	2	1	3	1	1	1	0	0	1	1	1
14	*Rutela A lineola*	2	1	2	3	0	1	1	0	1	2	1	3	1	1	1	0	0	1	0	1
15	*Rutela A pygidialis*	2	1	2	3	0	1	1	0	1	2	1	2	1	1	1	0	0	1	1	1
16	*Rutela A s. sanguinolenta*	2	1	2	3	0	1	1	0	1	2	1	2	1	1	1	0	0	1	1	1
17	*Rutela A s. rufipennis*	2	1	2	3	0	1	1	0	1	2	1	2	1	1	1	0	0	1	1	1
18	*Rutela A st. striata*	2	1	2	3	0	1	1	0	1	2	1	3	0	1	1	0	0	1	1	1
19	*Rutela A st. antiqua*	2	1	2	3	0	1	1	0	1	2	1	3	0	1	1	0	0	1	1	1
20	*Rutela A tricolorea*	2	1	2	3	0	1	1	0	1	2	1	3	1	1	1	0	0	1	0	1
21	*Rutela A versicolor*	2	1	2	3	0	1	1	0	1	2	1	3	1	1	1	0	0	1	0	1
22	*Rutela A vetula*	2	1	2	3	0	1	1	0	1	2	1	3	1	1	1	0	0	1	0	1
23	*Rutela C coeruleohumeralis*	2	1	2	3	0	1	1	0	0	1	1	2	0	0	1	0	0	1	0	0
24	*Rutela C lauta*	2	1	2	3	0	1	1	0	0	1	1	2	0	0	1	0	0	1	0	0
25	*Rutela C sumptuosa*	2	1	2	3	0	1	1	0	0	1	1	2	0	0	1	0	0	1	0	0
26	*Rutela C viridicuprea*	2	1	2	3	0	1	1	0	0	1	1	2	0	0	1	0	0	1	0	0
27	*Rutela B batesi*	2	1	2	3	0	1	1	0	0	2	1	2	1	0	1	0	0	1	1	0
28	*Rutela B campa*	2	1	2	3	0	1	1	0	0	2	1	2	1	0	1	0	0	1	2	0
29	*Rutela B coerulea*	2	1	2	3	0	1	1	0	0	2	1	2	1	0	1	0	0	1	?	0
30	*Rutela B egana*	2	1	2	3	0	1	1	0	0	2	1	2	1	0	1	0	0	1	2	0
31	*Rutela B ucalayiensis*	2	1	2	3	0	1	1	0	0	2	1	2	1	0	1	0	0	1	1	0
32	*Rutela B vidua*	2	1	2	3	0	1	1	0	0	2	1	2	1	0	1	0	0	1	0	0
33	*Rutela B viridiaurata*	2	1	2	3	0	1	1	0	0	2	1	2	1	0	1	0	0	1	2	0
34	*Rutela D specularis*	2	0	2	3	0	1	1	0	1	2	1	2	0	0	1	0	0	1	0	0
35	*Cnemida aterrima*	2	1	2	3	0	1	1	0	1	1	1	2	0	0	1	0	0	1	0	1
36	*Cnemida intermedia*	2	1	2	3	0	1	1	0	1	1	1	2	0	0	1	0	0	1	0	1
37	*Cnemida retusa*	2	1	2	3	0	1	1	0	1	1	1	2	0	0	1	0	0	1	0	1
38	*Rutelarcha bakeri*	2	0	0	0	0	1	1	0	0	2	1	2	0	0	2	0	0	1	0	0
39	*Rutelarcha quadrimaculata*	2	0	0	0	0	1	1	0	0	2	1	2	1	0	2	0	0	1	0	0
40	*Lutera luteola*	2	0	0	0	0	1	1	0	0	1	1	1	0	0	2	0	0	1	0	0
41	*Lutera nigromaculata*	2	0	0	0	0	1	1	0	0	1	1	1	0	0	2	0	0	1	0	0
42	*Cyphelytra ochracea*	2	0	0	0	0	1	1	0	0	1	1	1	0	0	2	0	0	1	0	0
43	*Metapachylus sulcatus*	1	0	0	0	0	1	1	0	0	1	1	1	0	0	2	0	0	1	0	0
44	*Rutelisca flohri*	2	0	0	0	0	1	1	0	0	0	1	1	0	0	2	0	0	1	0	0
45	*Rutelisca durangoana*	2	0	0	0	0	1	1	0	0	0	1	1	0	0	2	0	0	1	0	0
46	*Fruhstorferia*	1	0	0	0	0&1	0&1	1	0	0	0	0	0	0	0	0	1	0	1	0	0
47	*Chrysina*	2	0	0	0	0	1	1	0	0	1	1	1	0	0	1	0	0	1	0	0
48	*Plusiotis*	2	0	0	0	0	1	1	0	0	1&2	1	1	0&1	0	1	0	0	1	0&2	0
49	*Pelidnota (Odontognathus)*	2	0	0	0	0	1	1	0	0	2	1	2	0	0	1	0	0	1	0&1	0
50	*Pelidnota (Pelidnota)*	2	0	0	0	0	1	1	0	0	1	1	1	0	0	1	0	0	1	0	0
51	*Homonyx*	2	0	0	0	0	1	1	0	0	0	1	1	0	0	1	0	0	1	0	0
52	*Peltonotus*	0	0	0	0&1	1	0	1	0	0	0	0	0	0	0	2	0	0	1	0	0
53	*Parastasia*	2	0	0	0	0	1	1	1	0&1	1	1	1&2	0	0	1	0	0	1	1	0
54	*Peperonota*	1	0	0	0	1	0	1	0	0	0	0	1	0	0	0	1	0	1	0	0
55	*Dicaulocephalus*	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	1	0	0
56	*Ceroplophana*	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	1	0	0
57	*Cotalpa*	2	0	0	0	0	1	1	0	0	1	1	1	0	0	2	0	0	1	0	0
58	*Parabyrsopolis*	2	0	0	0	0	1	1	0	0	0	1	1	0	0	2	0	0	1	0	0
59	*Paracotalpa*	2	0	0	0	0	0	1	0	0	1	1	1	0	0	2	0	0	1	0	0
60	*Heterosternus*	1	0	0	0	0	1	1	0	0	1	1	2	0	0	2	0	0	1	0	0
61	*Macropoldes*	1	0	0	0	0	1	1	0	0	1	1	2	0	0	2	0	0	1	0	0
62	*Macraspis*	2	0	0	0	1	1	1	0	0	2	1	3	0	0	1	0	1	1	0	1
63	*Calomacraspis*	2	1	2	3	1	1	1	0	1	2	1	3	1	0	1	0	0	1	0	1
64	*Telaugia*	1	0	0	0	0	1	1	0	0	1	1	2	0	0	1	0	0	1	0	0
65	*Pseudochlorota*	0	1	0	0	0	1	1	0	0	1	0	1	0	0	1	0	0	1	0	0
66	*Lasiocala*	0	1	0	0	0	1	0	0	0	1	0	1	0	0	2	0	0	1	0	0
67	*Acrobolbia*	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2	0	0	1	0	0
68	*Oryctomorphus*	0	0	0	0	1	1	0	0	0	0	0	0	0	0	2	0	0	1	0	0
69	*Cyclocephala*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0
70	*Dyscinetus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0
71	*Strategus*	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
72	*Xyloryctes*	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix 3. CHARACTER MATRIX FOR THE PHYLOGENETIC ANALYSIS OF THE TRIBE RUTELINA (continued).

		121.	122.	123.	124.	125.	126.	127.	128.
1	MELOLONTHINAE	0&1	0	0	0	0	0&1&2	0	0
2	Anomalini	0	0	0	0	0	1	0	0
3	Spodochlamyini	0	0	0	0	0	1	0	0
4	Adoretini	1	1	0	0	0	0	0	2
5	*Rutela A cryptica n. sp.*	0	1	1	1	0	0	0	0
6	*Rutela A dimorpha*	0	1	1	1	0	0	0	0
7	*Rutela A dorcyi*	0	1	1	1	0	0	0	0
8	*Rutela A formosa*	0	1	1	1	0	0	0	0
9	*Rutela A glabrata*	0	1	1	1	0	0	0	0
10	*Rutela A heraldica*	0	1	1	1	0	0	0	0
11	*Rutela A histrio*	0	1	1	1	0	0	0	0
12	*Rutela A histrioparilis n. sp.*	0	1	1	1	0	0	0	0
13	*Rutela A laeta*	0	1	1	1	0	0	0	0
14	*Rutela A linecia*	0	1	1	1	0	0	0	0
15	*Rutela A pygidialis*	0	1	1	1	0	0	0	0
16	*Rutela A s. sanguinolenta*	0	1	1	1	0	0	0	0
17	*Rutela A s. rufipennis*	0	1	1	1	0	0	0	0
18	*Rutela A st. striata*	0	1	1	1	0	0	0	0
19	*Rutela A st. antiqua*	0	1	1	1	0	0	0	0
20	*Rutela A tricolorea*	0	1	1	1	0	0	0	0
21	*Rutela A versicolor*	0	1	1	1	0	0	0	0
22	*Rutela A vetula*	0	1	1	1	0	0	0	0
23	*Rutela C coeruleohumeralis*	0	1	1	1	0	0	1	0
24	*Rutela C lauta*	0	1	1	1	0	0	1	0
25	*Rutela C sumptuosa*	0	1	1	1	0	0	1	0
26	*Rutela C viridicuprea*	0	1	1	1	0	0	1	0
27	*Rutela B batesi*	0	1	1	1	0	0	0	0
28	*Rutela B campa*	0	1	1	1	0	0	0	0
29	*Rutela B coerulea*	0	1	1	1	0	0	0	0
30	*Rutela B egana*	0	1	1	1	0	0	0	0
31	*Rutela B ucayalensis*	0	1	1	1	0	0	0	0
32	*Rutela B vidua*	0	1	1	1	0	0	0	0
33	*Rutela B viridiaurata*	0	1	1	1	0	0	0	0
34	*Rutela D specularis*	0	1	1	1	0	0	0	0
35	*Cnemida sterrima*	0	1	1	0	0	0	1	0
36	*Cnemida intermedia*	0	1	1	0	0	0	1	0
37	*Cnemida retusa*	0	1	1	0	0	0	1	0
38	*Rutelarcha bakeri*	0	0	0	0	1	1	0	0
39	*Rutelarcha quadrimaculata*	0	0	0	0	1	1	0	0
40	*Lutera luteola*	0	0	0	0	0	1	0	0
41	*Lutera nigromaculata*	0	0	0	0	0	1	0	0
42	*Cyphelytra ochracea*	0	0	0	0	1	1	0	0
43	*Metapachylus sulcatus*	0	0	0	0	0	1	0	0
44	*Rutelisca flohri*	0	1	0	0	0	1	0	0
45	*Rutelisca durangoana*	0	1	0	0	0	1	0	0
46	*Fruhstorferia*	0	0	0	0	0	0	0&1	1
47	*Chrysina*	0	1	1	1	0	0	0	0
48	*Plusiotis*	0	1	1	1	0	0	0&1	0
49	*Pelidnota (Odontognathus)*	0	1	1	1	0	0	0&1	0
50	*Pelidnota (Pelidnota)*	0	1	1	1	0	0	0	0
51	*Homonyx*	0	0	1	1	0	0	0	0
52	*Peltonotus*	0	0	0	0	0	1	1	0
53	*Parastasia*	0	0	0	0	0	0&1	0	2
54	*Paperonota*	0	0	0	0	0	0	1	1
55	*Dicaulocephalus*	0	0	0	0	0	0	1	1
56	*Ceraplophana*	0	0	0	0	0	0	1	1
57	*Cotalpa*	0	0	0	1	0	0	0	0
58	*Parabyrsopolis*	0	0	0	1	0	0	0	0
59	*Paracotalpa*	0	0	0	1	0	0	0	0
60	*Heterosternus*	0	0	0	1	0	0	0	0
61	*Macropoides*	0	0	0	1	0	0	0	0
62	*Macrasple*	0	1	0	1	0	0	0	0
63	*Calomacrasple*	0	1	0	1	0	0	0	0
64	*Telsugia*	0	1	0	1	0	0	0	0
65	*Pseudochlorota*	0	0	0	1	0	0	0	0
66	*Lasiocala*	0	0	0	1	0	0	0	0
67	*Acroboldia*	0	0	0	0	0	1	0	0
68	*Oryctomorphus*	0	0	0	0	0	0	0	0
69	*Cyclocephala*	0	0	0	0	0	0	0	0
70	*Dyscinetus*	0	0	0	0	0	0	0	0
71	*Strategus*	0	0	0	0	0	0	0	0
72	*Xyloryctes*	0	0	0	0	0	0	0	0

Appendix 4. STATUS OF THE SUBTRIBES IN TRIBE RUTELINI BASED ON THE PHYLOGENETIC ANALYSES.

TRIBE RUTELINI

SUBTRIBE RUTELINA—Not monophyletic. Subtribe eliminated.

SUBTRIBE PARASTASIINA—Not monophyletic. Subtribe eliminated.

SUBTRIBE PELIDNOTINA—Not monophyletic. Subtribe eliminated.

Genus *Peltonotus* Burmeister—transferred from Pelidnotina to Dynastinae.

SUBTRIBE FRUHSTORFERIINA—Not monophyletic. Subtribe eliminated.

SUBTRIBE ANTICHIRINA—Not monophyletic. Subtribe eliminated.

SUBTRIBE HETEROSTERNINA—Hypothesized monophyletic based on exemplar taxa. Subtribe maintained.

SUBTRIBE AREODINA—Data in conflict, but hypothesized monophyletic based on Jameson 1990. Subtribe maintained.

SUBTRIBE LASIOCALINA—Hypothesized monophyletic based on both genera in subtribe. Subtribe maintained.

SUBTRIBE ACROBOLBIINA—Subtribe eliminated and monotypic genus transferred to Dynastinae.

Genus *Acrobolbia* Ohaus—transferred from Acrobolbiina to Dynastinae.

SUBTRIBE DIDREPANEPHORINA—Exemplars not available for analysis. Subtribe maintained.

SUBTRIBE DESMONYCHINA—Exemplars not available for analysis. Subtribe maintained.

Appendix 5. CLASSIFICATION OF THE *RUTELA* GENERIC GROUPS PROPOSED IN THIS WORK.

TRIBE RUTELINI

NO SUBTRIBE (PREVIOUSLY SUBTRIBE RUTELINA)*

Rutela Latreille

Rutela caesarea Gistel, **new combination** (transferred to *Pelidnota* MacLeay)

R. cryptica Jameson, **new species**

R. dimorpha Ohaus

R. dorcyi (Olivier)

R. gloriosa Fabr., synonym

R. formosa Burm.

R. glabrata (Fabr.)

R. jamaicensis Thunberg, synonym

R. heraldica Perty

R. histrio Salhberg

R. histrio bimaculata Ohaus, **new synonymy**

R. histrio cayennensis Ohaus, **new synonymy**

R. histrio subandina Ohaus, **new synonymy**

R. histrioparilis Jameson, **new species**

R. howdeni Jameson, **new species**

R. laeta Weber

R. weberi Schönherr, synonym

R. lineola (L.)

R. surinama L., synonym

R. unungula Herbst, synonym

R. lineola ephippium (L.), **new synonymy**

R. lineola hesperus Drury, **new synonymy**

R. pygidialis Ohaus

R. runica Gistel, **new combination** (transferred to *Pelidnota* MacLeay)

R. sanguinolenta Waterhouse

R. sanguinolenta sanguinolenta Waterhouse, **new status**

R. sanguinolenta rufipennis Waterhouse, **new status** (previously *R. sanguinolenta* var. *rufipennis* Waterhouse)

R. striata (Olivier)

R. striata striata (Olivier), **new status**

R. guadulpensis Laporte, synonym

R. marginicollis Laporte, synonym

R. striata antiqua Ohaus, **new status** (previously *R. antiqua* Ohaus)

R. striata lineaticollis Dejean, synonym

R. striata martinicensis Chalumeau & Gruner, **new synonymy**

R. tricolorea Ohaus

R. tristis Gistel, **new combination** (transferred to *Pelidnota* MacLeay)

R. versicolor Latreille

R. tricolor Guérin, synonym

R. vetula Ohaus

Appendix 5. CLASSIFICATION OF THE *RUTELA* GENERIC GROUPS PROPOSED IN THIS WORK (continued).

Plesiorutela Jameson, **new genus**
P. specularis (H. Bates), **new combination** (previously *Rutela specularis* H. Bates)

Sphaerorutela Jameson, **new genus**
S. coeruleohumeralis (Ohaus), **new combination, new status** (previously *Rutela coeruela* var. *coeruleohumeralis* Ohaus)
Rutela coerulea var. *atrohumeralis* Ohaus, **new synonymy**
Rutela coerulea var. *rubripennis* Ohaus, **new synonymy**
S. lauta (Perty), **new combination, new status** (previously *Rutela coerulea* var. *lauta* Perty)
Rutela coerulea var. *sphaerica* Burm., **new synonymy**
Rutela coerulea var. *atrorufipes* Ohaus, **new synonymy**
Rutela coerulea var. *cupreooxydata* Ohaus, **new synonymy**
Rutela coerulea var. *coeruleorufipes* Ohaus, **new synonymy**
Rutela coerulea var. *coeruleovirens* Ohaus, **new synonymy**
S. sumptuosa (Ohaus), **new combination, new status** (previously *Rutela coerulea* var. *sumptuosa* Ohaus)
Rutela (Microrutela) martinsi Martínez & Martínez, **new synonymy**
S. viridicuprea (Ohaus), **new combination,** new status (previously *Rutela coerulea* var. *viridicuprea* Ohaus)
Rutela coerulea var. *atra* Ohaus, **new synonymy**
Rutela coerulea var. *cruenta* Ohaus, **new synonymy**
Rutela coerulea var. *ephippiata* Ohaus, **new synonymy**
Rutela coerulea var. *flavovittata* Ohaus, **new synonymy**
Rutela coerulea var. *phalerata* Ohaus, **new synonymy**
Rutela coerulea var. *flavovittata* Ohaus, **new synonymy**
Rutela coerulea var. *stapiata* Ohaus, **new synonymy**

Microrutela F. Bates, **new status** (previously a synonym of *Rutela* Latreille)
M. batesi Jameson, **new species**
M. campa (Ohaus), **new combination** (previously *Rutela campa* Ohaus)
M. coerulea (Perty), **new combination** (previously *Rutela coerulea* Perty)
M. egana (Ohaus), **new combination** (previously *Rutela egana* Ohaus)
M. ucalayiensis Jameson, **new species**
M. vidua Jameson, **new species**
M. viridiaurata (H. Bates), **new combination** (previously *Rutela viridiaurata* H. Bates)

Calomacraspis Burmeister
Treated in Jameson *et al.* (1994).

Macraspis MacLeay
Not treated here; lacking modern revision.

Cnemida Kirby
Treated in Jameson (1996).

*The subtribe Rutelina is not monophyletic and is not used here.

Appendix 6. PLANTS ASSOCIATED WITH *RUTELA, MICRORUTELA,* AND *PLESIORUTELA.*

PLANT TAXON	ASSOCIATED SPECIES
Annonaceae	
Metopium sp.	*Rutela formosa* (adults and larvae in decaying wood)
Anacardiaceae	
Anacardium occidentale L.	*Rutela lineola*
Mangifera indica (L.)	*Rutela striata striata* (adults and larvae in decaying wood)
Bigoniaceae	
Tabebuia pallida Miers	*Rutela striata striata* (larvae in decaying wood)
Burseraceae	
Bursera sp.	*Rutela formosa* (in decaying wood)
Chrysobalanaceae	
Chrysobalanus icaco L.	*Rutela striata striata*
Combretaceae	
Conocarpus erecta L.	*Rutela striata striata* (larvae and pupae in decaying wood)
Elaeocarpaceae	
Sloanea massoni Sw.	*Rutela striata striata*
Fabaceae (Leguminosae)	
Acacia cornigera (L.)	*Rutela cryptica*
Acacia nigra Clos.	*Rutela lineola*
Acacia sp.	*Rutela lineola*
Cassia sp.	*Rutela formosa* *Rutela striata striata*
Dichrostachys glomerata Chiov.	*Rutela formosa*
Inga cocleensis Pittier	*Rutela sanguinolenta sanguinolenta*
Inga dulcis Mart.	*Rutela striata striata*
Inga edulis Mart.	*Rutela dimorpha* *Rutela histrio*
Inga spp.	*Rutela lineola* (adults and larvae in decaying wood) *Rutela sanguinolenta sanguinolenta* *Rutela striata antiqua*
Mimosa sepiaria Benth.	*Rutela lineola*
Mimosa spp.	*Rutela histrio* *Rutela versicolor*
Schizolobium parahybum (Vell.) Blake.	*Rutela histrio*
Senna sp.	*Rutela lineola*
Lamiaceae (Labiatae)	
Hyptis brevipes Poit.	*Rutela lineola*

Appendix 6. PLANTS ASSOCIATED WITH *RUTELA, MICRORUTELA,* AND *PLESIORUTELA* (continued).

PLANT TAXON	ASSOCIATED SPECIES
Malvaceae	
Gossypium sp.	*Rutela formosa*
Hibiscus sp.	*Rutela lineola*
Hibiscus bifurcatus Blanco	*Rutela lineola*
Hibiscus tiliaceus L.	*Rutela lineola*
Hibiscus sinensis Mill.	*Rutela lineola*
Moraceae	
Ficus sp.	*Rutela formosa* (adults and larvae in decaying wood)
Myrtaceae	
Psidium guajava L.	*Rutela lineola*
Passifloraceae	
Passiflora sp.	*Rutela lineola*
Piperaceae	
Piper sp.	*Rutela lineola*
Rosaceae	
Rosa sp.	*Rutela lineola*
Rubiaceae	
Coffea arabica Benth.	*Rutela dorcyi*
Sarcocephalus esculentus Afzel	*Rutela lineola*
Rutaceae	
Citrus sp.	*Rutela formosa*
Simaroubaceae	
Simaruba amara Aubl.	*Rutela striata striata* (larvae in decaying wood)
Sterculiaceae	
Sterculia glauca Gentry	*Rutela sanguinolenta sanguinolenta* *Microrutela viridiaurata*
Guazuma ulmifolia Wall.	*Plesiorutela specularis*
Theobroma cacao L.	*Rutela lineola*
Tiliaceae	
Luehea sp.	*Rutela lineola*
Luehea divaricata Mart.	*Rutela lineola*
Ulmaceae	
Eryngium sp.	*Rutela lineola*
Urticaceae	
Artocarpus sp.	*Rutela striata striata* (larvae in decaying wood)
Verbenaceae	
Vitex cooperi Standl.	*Microrutela viridiaurata* (larvae in wood)
Zygophylleae	
Guaiacum sanctum L.	*Rutela formosa*

ABOUT THE AUTHOR

Dr. Mary Liz Jameson received her Ph.D. from the University of Kansas in 1997 and is now a Research Assistant Professor in the University of Nebraska State Museum. Jameson has had a long association with the University of Nebraska State Museum, having received her Masters' degree there and having worked in Public Programs. While a graduate student, she received several awards for excellence in teaching and research. Jameson is interested in patterns and processes of evolution, phylogenetic relationships, patterns of diversity, speciation, and sexual selection in scarab beetles. She is one of a handful of experts who study the metallic leaf chafers (subfamily Rutelinae), a group that includes over 4,000 species. Her research has dealt primarily with the systematics, phylogeny, and biogeography of New World ruteline scarabs. Jameson's research has taken her to Mexico, Guatemala, Honduras, Costa Rica, Panama, Brazil, Canada, Europe, and South Africa. In addition to her research on ruteline scarabs, she has also conducted faunistic and ecological research on dung beetles and carrion beetles of the Great Plains.