TAXONOMIC REVISION OF Zelomorpha ASHMEAD, 1900 AND Hemichoma ENDERLEIN, 1920 (BRACONIDAE: AGATHIDINAE) WITH A PHYLOGENETIC ANALYSIS OF COLOR PATTERNS

Carlos Eduardo Sarmiento-Monroy
University of Kentucky, cesarmientom@unal.edu.co

Right click to open a feedback form in a new tab to let us know how this document benefits you.

Recommended Citation
ABSTRACT OF DISSERTATION

Carlos Eduardo Sarmiento-Monroy

The Graduate School
University of Kentucky
2006
ABSTRACT OF DISSERTATION

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the College of Agriculture at the University of Kentucky

By
Carlos Eduardo Sarmiento-Monroy
Lexington, Kentucky

Director: Dr. Michael J. Sharkey, Professor of Entomology
Lexington, Kentucky
2006

Copyright © Carlos Eduardo Sarmiento-Monroy 2006
ABSTRACT OF DISSERTATION

TAXONOMIC REVISION OF *Zelomorpha* Ashmead, 1900 AND *Hemichoma* Enderlein, 1920 (HYMENOPTERA: BRACONIDAE: AGATHIDINAE) WITH A PHYLOGENETIC ANALYSIS OF COLOR PATTERNS

A revision and a phylogenetic analysis of the genera *Zelomorpha* Ashmead, 1900 and *Hemichoma* Enderlein, 1920 were conducted. Phylogenetic analyses used molecular and morphological data. A total of 39 sequences were obtained for COI (887 bases long) and 57 for 28S (1254 bases long). DNA sequences were aligned manually and also aligned with ClustalW (Thompson et al. 1997). Parsimony, Maximum Likelihood, and Bayesian approaches were applied to phylogenetic analyses with each gene region analyzed separately and in a combined analysis. The phylogenetic analysis supported the monophyletic status of the genera *Zelomorpha*, as defined by Sharkey et al. (2006), and *Hemichoma*; they upheld the hypothesis that the New World species formerly placed in *Biroia* belonged to *Zelomorpha*, and corroborated the synonymy of genus *Dichelosus* with *Zelomorpha* (Sarmiento and Sharkey, 2005). A total of 3,242 specimens of *Hemichoma* and *Zelomorpha* collected through the New World representing 113 species were examined. In addition to the 29 species of *Zelomorpha* described originally in diverse genera and now moved into the *Zelomorpha*, 74 new species are described. Seven new species are described for the genus *Hemichoma* for a total of 10 species. All species are fully redescribed. Fully illustrated keys to the species of *Zelomorpha* and *Hemichoma* are provided. The phylogenetic results based on maximum parsimony suggest that, despite the colorful nature of the sister group *Hemichoma*, species of *Zelomorpha* were nocturnal and became diurnal secondarily in one lineage. The change to diurnality is linked to a decrease in eye size, to an increase in body size, and to the emergence of colorful patterns. Palatability field tests using lizards as predators of *Zelomorpha concinna*, a common species with one of the more characteristic and bright color patterns, suggest that the coloration has a warning function and that this wasp is highly unpalatable. Evidence was found that the short ventrally curved ovipositor is an effective defensive structure.
DISCLAIMER: The text of this dissertation does not constitute the publication of new species as defined by the International Code of Zoological Nomenclature. The newly established species names in this work will be/have been recognized as valid upon their publication in a peer-reviewed journal.

KEY WORDS: Systematics and evolution, Braconidae, Color patterns origin, Mimicry, Taxonomy.

Carlos Eduardo Sarmiento-Monroy.

11 December 2006
TAXONOMIC REVISION OF *Zelomorpha* ASHMEAD, 1900 AND *Hemichoma* ENDERLEIN, 1920 (BRACONIDAE: AGATHIDINAE) WITH A PHYLOGENETIC ANALYSIS OF COLOR PATTERNS

By

Carlos Eduardo Sarmiento-Monroy

Dr. Michael J. Sharkey
Director of Dissertation

Dr. Kenneth Yeargan
Director of Graduate Studies

11 December, 2006
RULES FOR THE USE OF DISSERTATIONS

Unpublished dissertations submitted for the Doctor's degree and deposited in the University of Kentucky Library are as a rule open for inspection, but are to be used only with due regard to the rights of the authors. Bibliographical references may be noted, but quotations or summaries of parts may be published only with the permission of the author, and with the usual scholarly acknowledgments.

Extensive copying or publication of the dissertation in whole or in part also requires the consent of the Dean of the Graduate School of the University of Kentucky.

A library that borrows this dissertation for use by its patrons is expected to secure the signature of each user.
.DISSERTATION

Carlos Eduardo Sarmiento-Monroy

The Graduate School
University of Kentucky
2006
TAXONOMIC REVISION OF Zelomorpha ASHMEAD, 1900 AND
Hemichoma ENDERLEIN, 1920 (BRACONIDAE: AGATHIDINAE) WITH A PHYLOGENETIC ANALYSIS
OF COLOR PATTERNS

DISSERTATION

A dissertation submitted in partial fulfillment of the
requirements for the degree of Doctor of Philosophy in the
College of Agriculture
at the University of Kentucky
By
Carlos Eduardo Sarmiento-Monroy
Lexington, Kentucky

Director: Dr. Michael J. Sharkey, Professor of Entomology
Lexington, Kentucky

Copyright © Carlos Eduardo Sarmiento-Monroy 2006
This dissertation is dedicated to my loving wife Angela Rocio Amarillo-Suarez and my daughter, María Alejandra Sarmiento-Amarillo, my parents Maria Cecilia Monroy, Helena Monroy, and Eduardo Monroy (R.I.P.), my guide and friend Dr. Michael J. Sharkey and Dr. Bobby Pass (R.I.P.), without whose encouragement this work would not have been possible
ACKNOWLEDGMENTS

The dissertation benefited from the advice of several people. First, to Dr. Michael J. Sharkey for his continuous encouragement and excellent advice. He was patient and interested in obtaining the best I could give in everything I did under his supervision. He is a great advisor and friend.

Special thanks to my advisory committee members, Dr. David H. Wise, Dr. Christopher Schardl, Dr. Bruce Webb, and external examiner Dr. Randal Voss. Their advice was valuable throughout my graduate studies.

Thanks to Dr. Bobby Pass (R. I. P.) and all professors I had during my graduate courses from which I found different and interesting ways to look at insects as model organisms in ecology, animal-plant interactions, behavior, systematics, genetics, evolution, and physiology. Thanks also to Drs. D. Potter, K. Haynes, K. V. Yeargan, Subba Reddi Palli, and J. Obrycki. I thank the curators of all the museums that loaned specimens.

Several people provided advice and support for the field studies of color function: Dr. A. Bouskila (Ben Gurion Univ), Dr. N. Woodley (Smithsonian Institute), J. V. Rueda (Univ. Nacional de Colombia), M. Hernandez (R.I.P.) (Tayrona National Park), J. Avila. Dr. M. Speed, and Dr. L. Gilbert.

I am indebted to my lab mates Katja Seltmann, Andy Boring, Tom Pucci, Kevin Pitz, and Barbara Sharanowski. To Dr. Sharkey’s Lab. Martha Potts. To my friend Dr. Jordi Moya-Laraño for his encouragement and mentorship during his stay at UKY. To Angelika Fath-Goodin for her help with translations from German. To the many fellow graduate students from whom I obtained valuable help, specially Janet Lensing, Charlene Rucker, Amanda Stayley, Cora Allard, Jamee Hubbard, and Torrence Gill. To Dr. Sharkey’s undergraduate team Cheryl Lindsay, Jonathan Roden, and Vasudevan Mahalingam. I thank Bruce Webb’s lab team. I thank Bruce Webb’s lab team Matt, Turnbull, Kojihiro Tanaka, Walaikorn Rattanadechakul, Stephanie Dickey, and Jeremy Kroemer who provided important support in part of my thesis.

I am sincerely grateful to all administrators, professors and graduate students with whom I shared my time, especially to the Dr. Bruce Webb and Dr. Michael Goodin families. They made
this road easier and enjoyable. Thanks to the people at John Heraty’s lab (UC Riverside) who hosted me in 2002. To David Wesneat’s lab for support with color analyses

From Colombia, I am grateful to the Universidad Nacional de Colombia, the Instituto de Ciencias Naturales and to my friends Fernando Fernandez, Helmuth Aguirre, Andrea Rodriguez, and Juan Vargas who were very helpful during the final days of this project

The National Science Foundation of the United States of America (NSF-DEB 9972024, 0205982), the Graduate School of the University of Kentucky, the Humboldt Institute of Colombia and the Colombian National Parks System provided logistical and financial support to my research and to my participation at scientific meetings.

Finally, but not least, I like to express my sincere gratitude to all members of my family for their encouragement, help and time
# TABLE OF CONTENTS

**ACKNOWLEDGMENTS** ........................................................................................................................................... iii

**LIST OF TABLES** .................................................................................................................................................. vii

**LIST OF FIGURES** .................................................................................................................................................... viii

List of Files ........................................................................................................................................................................ ix

Chapter 1. Introduction and taxonomic history of the genera *Hemichoma* Enderlein, 1920 and *Zelomorpha* Ashmead, 1900

1. 1. Introduction ............................................................................................................................................................ 1
   General objective.................................................................................................................................................................. 1
   Specific objectives............................................................................................................................................................. 2
1. 2. The genus *Hemichoma* ......................................................................................................................................... 3
1. 3. The genus *Zelomorpha* ......................................................................................................................................... 3

Chapter 2. Phylogenetic analysis of *Zelomorpha* and *Hemichoma* and the origin of its color patterns

2. 1. Phylogenetic study with morphological data ................................................................................................................. 6
   2. 1. 1. Methodology ....................................................................................................................................................... 6
   2. 1. 2. Results ............................................................................................................................................................... 8
2. 2. Phylogenetic study with molecular data ......................................................................................................................... 12
   2. 2. 1. Methodology ....................................................................................................................................................... 12
   2. 2. 2. Results ............................................................................................................................................................... 15
2. 3. Evolution of the color patterns and biology .................................................................................................................... 30

Chapter 3. Revision of the species of *Hemichoma* Enderlein, 1920

3. 1. Diagnosis.................................................................................................................................................................... 33
3. 2. Description .................................................................................................................................................................... 33
3. 3. Key to the species of *Hemichoma* ............................................................................................................................... 34
3. 4. Descriptions of the species of *Hemichoma* .................................................................................................................. 35
   3. 4. 1. Characteristics of the descriptions .......................................................................................................................... 35
   3. 4. 2. Museums listed ..................................................................................................................................................... 36

Chapter 4. Revision of the species of *Zelomorpha* Ashmead, 1900

4. 1. Diagnosis.................................................................................................................................................................... 64
4. 2. Description .................................................................................................................................................................... 64
4. 3. Key to the species of *Zelomorpha* ............................................................................................................................... 64
4. 4. Descriptions of the species of *Zelomorpha* .................................................................................................................. 85
   4. 4. 1. Characteristics of the descriptions .......................................................................................................................... 85

Chapter 5. The function of the color pattern in *Zelomorpha concinna*: a study case

5. 1. Methods.................................................................................................................................................................... 366
5. 2. Results .................................................................................................................................................................... 368
5. 3. Discussion .................................................................................................................................................................... 370

Appendix 1. Pictures of the Species of *Zelomorpha* and *Hemichoma* .................................................................................. 376
Appendix 2. Characters Used in the Keys for Zelomorpha and Hemichoma .............436

Appendix 3. Matrices for phylogenetic analyses ..........................................................450

REFERENCES .............................................................................................................495

Vita ...............................................................................................................................508
LIST OF TABLES

Table 1. Primers used for PCR amplifications ................................................................. 13
Table 2. Substitution model parameters estimated with PHYml under ML from partitioned and combined data sets ........................................................................... 18
Table 3. Palatability of colored prey relative to non-colored fly species ....................... 372
LIST OF FIGURES

Figure 1. Strict consensus trees from parsimony analyses of morphological data.............. 11
Figure 2. Strict consensus tree from parsimony analysis of 28S D2-D3 gene fragments......... 19
Figure 3. Strict consensus tree from parsimony analysis of COI fragments..................... 20
Figure 4. Strict consensus tree from parsimony analysis of combined molecular data using 28SD2-D3 y COI gene fragments................................................................. 21
Figure 5. Strict consensus tree from parsimony analysis of 28S D2-D3, COI and morphology. 22
Figure 6. Strict consensus tree from parsimony analysis of 28S D2-D3, COI, and morphology. 23
Figure 7. Maximum Likelihood tree from combined (28S and COI) extended matrix......... 24
Figure 8. Maximum Likelihood tree from the combined condensed matrix (28S and COI)..... 25
Figure 9. Maximum Likelihood tree from COI matrix. 42 taxa, 895bp alignment length...... 26
Figure 10. Bayesian tree from combined molecular extended data.................................. 27
Figure 11. Bayesian tree from 28S data................................................................. 28
Figure 12. Bayesian tree from COI data.............................................................. 29
Figure 13. Condensed version of phylogeny based on the parsimony analysis of combined data (COI, 28S and morphology) tracking the major color patterns......................... 32
Figure 14. Some of the insects captured in the area of study ....................................... 371
Figure 15. Relationship between palatability and abundance ranks ............................. 373
List of Files

- SarmientoPhD.pdf : 7.7MB
Chapter 1. Introduction and taxonomic history of the genera *Hemichoma* Enderlein, 1920 and *Zelomorpha* Ashmead, 1900

1. 1. Introduction

Despite the impressive advances in biotechnology and genetics, basic aspects of the living world study like its description remain notoriously incomplete. Estimates of the biological richness range from five to 30 million species and depending on which estimation is used, we have described between the five and 30 percent (Winston 1999). After a dangerous period when taxonomy was considered just a bookkeeping task, the biodiversity crisis and the birth of phylogenetics has helped restore taxonomy’s central position in the biological sciences. The ability of systematics to test evolutionary hypotheses made it a necessity for many evolutionary studies (Brooks & McLennan 1991).

The genus *Zelomorpha* is in the species-rich family of parasitoid wasps Braconidae, subfamily Agathidinae, tribe Disophrini. Ashmead described the genus in 1900 with the type species *Z. arizonensis* from Arizona. It has never been systematically revised; its limits are confused, and species descriptions are dispersed in the literature. These difficulties are especially evident in the neotropics where there are 34 species described but Sharkey (1997) predicted the actual number to be around 100 species and therefore the richest genus of the tribe.

Based on morphological evidence, Chou & Sharkey (1989) proposed that *Zelomorpha* should be synonymized with *Coccygidium* Szépligeti because, although *Coccygidium* s.s. has a clear synapomorphy in their long foretibial spurs, species of *Zelomorpha* only have the plesiomorphic condition of foretibial spurs of normal length. Van Achterberg & Maetô (1990) did not agree with this approach. Sharkey et al. (2006) have published a detailed morphological and molecular analysis of the relationships among agathidine genera and presented evidence to conclude that both *Zelomorpha* and *Coccygidium* are monophyletic and should be treated as separate genera.

The species of *Zelomorpha* are koinobiont endoparasitoids of late instar free-living larvae and had been reared from noctuid and arctiid moths; some of them hunt at sunset or are truly nocturnal (Sharkey, 1997), others are diurnal. A characteristic of many species is that they exhibit conspicuous and different varied aposematic color patterns that are shared by a diverse array of other Neotropical insects, e.g., as: Reduviidae, Diptera, Lepidoptera (mainly moths), Coleoptera, Symphyta,
Ichneumonidae (i.e., *Acrotaphus* spp), braconids such as those of the genera *Alabagrus*, *Capitonius*, and *Digonogastra* (Leathers & Sharkey 2003), and social vespids such as those of the genus *Parachartergus*. The number of species involved in these coloration assemblages may be more than 2000. A common color pattern is two black and yellow transverse stripes on the front wings and a black and yellow body.

Extensive reviews on mimicry (Pasteur 1982, Malcolm 1990) have shown that the traditional goal of labeling every specific case as Batesian or Mullerian mimicry is probably more an obstacle to our understanding than an appropriate tool. Moreover, mimicry is now envisioned as the product of dynamic interactions among four main variables: 1) relative abundance of the species that share the coloration pattern, 2) relative palatability, 3) the learning skills of local predators, and 4) alternative food availability for the predators (Burd 1994, Edmunds 2000, Holmgren & Enquist 1999, MacDougall & Dawkins 1998, Mallet & Joron 1999, O’Donnell & Joyce 1999, Ritland 1994, Speed 1993, Speed 1993b, Speed & Turner 1999). A part of this dissertation investigates these variables in one case study in northern Colombia.

Mimicry may also be important as an isolating mechanism and thereby influence speciation rates. There are species of *Zelomorpha* and *Hemichoma* with several color patterns, and these could be under disruptive selective pressure, with different populations mimicking different models (Charlesworth 1994, Joron & Mallet 1998, Mallet et al. 1998, Jiggins et al. 2001). The main purposes of this thesis are to conduct a cladistic revision of the species of *Zelomorpha* and *Hemichoma* and to study the function and evolution of their color patterns.

**General objective**
To revise the genera *Zelomorpha* and *Hemichoma* (Braconidae: Agathidinae) and study the evolution of color patterns

**Specific objectives**
- To revise the species of *Zelomorpha* and *Hemichoma*.
- To propose phylogenetic relationships among the species of *Zelomorpha* and *Hemichoma*
- To describe the evolution of color patterns in the species of the genus *Zelomorpha* and *Hemichoma*
- To describe the biological function of the color patterns for at least some species of *Zelomorpha*
1. 2. The genus *Hemicoma*

Enderlein (1920), describes the genus *Hemicoma* with *H. fenestratum* as type species. The genus is originally composed by two neotropical species *H. fenestratum* and *H. pulchrum*. To Enderlein this genus is close to *Gyrochus*, sharing the absence of the parapsidal sutures. The traits that Enderlein indicated to differentiate this genus from others were: Parapsidal sutures completely missing, lateral carina of frons only developed around each antennal base but completely missing in the posterior part, ovipositor approx. 1/3 of the length of the abdomen. The long ovipositor is not a homologous character with that present in the Cremnoptini. It belongs to the large ventrally recurved ovipositor of the Disophrini. Since the original description of the genus no species have been added and the status of the genus has not been debated (Shenefelt, 1970, Yu et al. 2005) Sharkey (1992) included the genus as part of the Disophrini (as “Hemiecoma”) but the genus was not included in the generic key to the neotropical Agathidinae Sharkey, 1997) or in the generic list of the Neotropical region (Fernandez & Sharkey 2006). The Sharkey’s et al. (2006) phylogenetic revision of the Agathidinae mentions that the genus is likely a junior synonym of *Zelomorpha* but as will be shown in chapter 2, this is not the case.

The examination of the type of *Hemicoma* reveals that *H. fenestratum* is actually a junior synonym of *Biroia bicolor* Szépligeti, 1902. Sharkey et al (2006) found that all the new world species of *Biroia* belong to *Zelomorpha* suggesting so that the genus *Hemicoma* should be a synonym of *Zelomorpha*; however, the present study founds that all the species of *Hemicoma* are part of a monophyletic clade separated from *Zelomorpha* (see chapter on phylogeny of the group). As a consequence the genus is supported with *Biroia bicolor* Szépligeti, 1902 as the type species.

This genus can be distinguished by the pointed gena at the median height; an extremely large posteroventral area of genae is also present although it is not an exclusive character for the genus. Also, the lateral carinae around the antennae are reduced or absent.

1. 3. The genus *Zelomorpha*

The genus *Zelomorpha* was described by Ashmead in 1900. He included two tribes, Agathidini and Microdini, “as a matter of convenience”, and in the key for Microdini, Ashmead recognized fourteen genera plus *Zelomorpha*. The only species included in *Zelomorpha* was *Z. arizonensis* and no further information was provided about diagnostic characters, type specimens or distribution. The characters in
his key are not sufficient to identify the genus. These are: “very large eyes, genal space obsolete, areolet not petiolated, HW (Hind Wing) without closed discoidal cell, second joint of maxillary palp, dilated, ovipositor short or only slightly exerted, labium not very long, cubital and discoidal cells confluent”. Ashmead suggested that Zelomorpha is related to the monotypic genera Chromomicrodus and Epimicrodus which he described in the same paper. He distinguished Zelomorpha from these by its large eyes and reduced malar space. Bradley (1916) synonymized Epimicrodus with Crassomicrodus and Baltazar (1961) synonymized Chromomicrodus with Euagathis.

Muesebeck (1927) synonymized Neophylax Ashmead 1900, Caenophylax Schulz, 1911, and Zelomorphidea Viereck, 1912, with Zelomorpha, and Muesebeck & Walkley (1951) synonymized Lisitheria Cameron, 1904, Spilomicrodus Cameron, 1904, and Xanthomicrodus Cameron, 1904 with Zelomorpha. About twelve species were included in the genus at this time. Only three species, i.e., the type species, Z. melanota Viereck, 1912, and Z. sudanensis Gahan, 1928, were originally described as Zelomorpha; the remaining species were described as members of the following genera: Agathis, Chromomicrodus, Crassomicrodus, Disophrys, Lisitheria, Microdus, Neophylax, Spilomicrodus, and Xanthomicrodus.

The first revisionary works on Zelomorpha are those of Gupta & Bhat (1972) and Bhat & Gupta (1977). In 1972, these authors described three new species for a total of seven for the Indo-australian region and stated that Zelomorpha is close to Euagathis but the presence of the frontal carinae in the former distinguishes the two genera. Bhat & Gupta (1977) described nine more species from Asia and suggested that the genus is closely related to Disophrys. They stated that these can be differentiated by the relative lengths of the submedian and median cells. The submedian cell is 0.5X as long as the median cell in Disophrys while it is 0.33X as long as the median cell in Zelomorpha. They also proposed the sulana species group for those Zelomorpha species that lack the lateral carinae of frons and that have relatively short foretibial spur. In 1979 Bhat published a table comparing morphological traits of Zelomorpha and Disophrys. Though some continuous characters were used, the shape and length of the fore tibial spur was included. This trait would prove to be important in future discussions about the status of Zelomorpha.

In following years, debate focused on the concepts and limits of Zelomorpha and Coccygidium Saussure 1892. Tobias (1971) and Chou & Sharkey (1989), considered Zelomorpha to be a synonym of Coccygidium, whereas, Achterberg and Maetô (1990) thought that the genera should remain separated because “the difference in shape of the fore spur significantly enough [sic]”. Given the brief original description of the genus, Achterberg and Maetô (1990) provided a redescription of Zelomorpha using the
types which are deposited at the United States National Museum, and only listed Zelomorphidea as junior synonym. Even though the difference between the foretibial spurs of these genera is self evident, the recognition of Coccygidium, based solely on this one character, leaves Zelomorpha unsupported by derived character states since it possesses the plesiomorphic condition of a short foretibial spur. In his 1992 cladistic and tribal classification Sharkey reiterated his position that Zelomorpha should be retained as junior synonym of Coccygidium while Achterberg and other authors maintained these as separate concepts (Kurhade & Nikam 1994, Sharkey 1997, Sarmiento et al. 2004, Sarmiento & Sharkey 2005). For the remainder of this introduction I will refer to the Chou and Sharkey concept of Coccygidium and Coccygidium s. l.

Sarmiento & Sharkey (2005) synonymized the genus Dichelosus with Coccygidium s.l. based on the lack of consistent characters to differentiate them. The genus Dichelosus Szépligeti is a neotropical taxon composed of seven species (Shenefelt 1970). Dichelosus was defined as having a smooth mesoscutum and a smooth propodeum, but a continuous grade in degree of sculpture is evident among species, from highly rugose to completely smooth. Including the species previously described in Dichelosus, the genus Coccygidium s.l. comprise 44 species worldwide in 2005.

Sharkey et al. (2006), based on a phylogenetic analysis with molecular and morphological data, provided a new arrangement for the genera related to Zelomorpha. They recognized Zelomorpha as being comprised of those species of Coccygidium s.l. restricted to the Neotropical region. All of these species have the frons bordered by carina and short fore tibial spur. Though these are plesiomorphic characters, the molecular evidence demonstrated the monophyly of this restricted concept of Zelomorpha. The old world species of Coccygidium s. l. were separated into Coccygidium and Hypsostypos. Coccygidium comprising those species with the frons bordered by carina and a short fore-tibial spur, and Hypsostypos includes species with the frons lacking lateral carina, the ventral surface of hind femur rugose, and foretibial spur not elongate.

Copyright © Carlos Eduardo Sarmiento-Monroy 2006
Chapter 2. Phylogenetic analysis of *Zelomorpha* and *Hemichoma* and the origin of its color patterns

A phylogenetic analysis for the species of *Zelomorpha* sensu Sharkey et al. (2006) plus the species of highly related groups such as *Hemichoma* (indicated in the Appendix of figures as “H”) and the neotropical *Biroia* was conducted. Special attention was given to the species that were transferred from the genus *Dichelosus*, synonymized with *Coccygidium* by Sarmiento & Sharkey (2005) on morphological grounds. The purpose of the chapter is to test the monophyly of the genus and to provide a frame to study the evolution of the color patterns. The analysis was conducted using morphological and molecular data. Two gene fragments, 28SD2-D3 and COI were used. Separated analyses were conducted with each data set and then, a total evidence approach was carried out with a reduced set of species.

2. 1. Phylogenetic study with morphological data

2. 1. 1. Methodology

*Taxa and character selection.* A main data matrix was constructed with 67 characters and the 113 species of the genera *Hemichoma* plus *Zelomorpha*, 113; additionally, *Cremnops comstocki* Morrison, 1917, *Cremnops desertor* L. 1758, *Hypsostypos concolor* (Sharkey, 1996) and *Coccygidium lutea* (Brullé, 1846) were used as out groups and its selection was based on the study of Sharkey et al. (2006). In the analyses of the molecular data other outgroups were choosen based upon Sharkey’s et al. (2006) study.

The concepts of *Zelomorpha* and *Coccygidium* used here follow Sharkey’s et al. proposal (2006). A total of 19 characters were coded as multistate while 48 were coded as double state. Characters were always treated as non additive. Morphological terminology follows Sharkey (1992), Sharkey & Wharton (1997) and Sarmiento et al. (2004).

Characters were included when the following conditions were accomplished: the definition of their states was reliable and self evident, exhibit none or extremely low intraespecific variation, and display interespecific variation. Polymorphic characters were treated as unknown. Character selection also followed previous works on the subfamily (Sarmiento et al. 2005, Sharkey 1992, Sharkey et al. 2006).
Character selection and character definition is one of the more complex issues in systematics and explicit justification of the characters selected for a phylogenetic analysis is often neglected in literature especially in morphological analyses (Kirchoff et al. 2004). According to Kirchoff et al (2004) complex data can provide better characters and thus, it is possible that heuristic definitions of complex structures rather than the particularization of their components could provide stronger characters for phylogenetic purposes. In the case of *Zelomorpha* and related genera, the sculpturation of the propodeum has been characters traditionally considered that define genera or species (see chapter one).

The sculpturation of the propodeum is composed of several ridges and carenae that define the areolae and its variation sometimes generates difficulties to set a limit between one state and the other. The sculpturation of the face is also complex and variable and the informative value of that characteristic has not been explored. In order to study the value of these characters these were codified as follows: first, characters were described as presence/absence as a whole, and second every type of sculpturation, ridge or areola and its location on the face or propodeum was described as a separated character; this approach generated six characters for the face and eleven characters of the propodeum. The first matrix will be called “heuristic matrix”, the second will be called “specific matrix” Two data matrices were derived from these coding types including in each one a type of codification for these structures leaving constant the other characters.

*Phylogenetic analysis* --- Parsimony analyses were performed using Winclada 1.00.04 (Nixon, 1999) since preliminary tests with PAUP* 4.0b10 (Swoford, 1999) provided longer trees and required 2x-3x more time of analysis. In order to avoid getting trapped in local suboptima of the tree landscape.

Characters were equally weighted. Ratchet search was implemented with 5,000 iterations, holding one tree per iteration, and sampling about 10% of the characters each time. The standard of 5,000 iterations was defined through several tests where the number of iterations was progressively increased (200, 500, 1,000, 2,000, 5,000, 10,000 times) recording from each one: number of trees, length, CI, RI, and number of collapsed branches using the strict consensus option. Although minimal tree length was reached very soon (200-500 iterations), around 5,000 iterations the number of minimum length trees and the number of collapsed branches stabilized.

Branch support was studied by looking at bootstrap values using the default options of Winclada: 100 replicates with 10 replications per search, holding maximum 100 trees per replicate were considered too. Regardless of the problems that have been detected with bootstrap, the properties and reliability of this method has been studied and validated in several papers (Felsenstein 2004, Areekul & Quicke 2006,
Sharkey et al. 2006). Even for the lack of independence among sites, due to the secondary and tertiary structure of the products of the sequences, bootstrap seems to be a reliable approach. Galtier (2004) studied this specific problem in simulated data and he identified that in the worst case scenario, bootstrap scores overestimates “real” support by just 10%. In the other hand, the average of the retention index score of the traits that were holding each branch was used as an indication of support and as an indicative of the quality of the characters that support that branch.

2.1.2. Results

The analysis of the heuristic matrix resulted in 678 fundamental trees of 525 steps. The strict consensus collapsed 79 branches as it is expected given the number of characters and the number of taxa (Figure 1A). The analysis of the particularized matrix resulted in 1,199 fundamental trees of 670 steps. The strict consensus collapsed 69 branches (Figure 1B). Trees are mostly unresolved although their structure is basically the same; Zelomorpha plus Coccygidium for example show up as a monophyletic clade although the latter appear within Zelomorpha. In both matrices the monophyletic nature of these species is supported by 15 and five characters respectively; in both cases, however, these characters did not provide high retention scores.

The species of Hemichoma appear as a monophyletic clade within Zelomorpha supported by 11 characters in the heuristic tree and seven characters in the particularized tree. In both trees the clade with only the Hemichoma species is supported by the character “presence of an acute posterior peak of the gena” which has a retention index of 100. The average retention index for the other characters that support the Hemichoma clade are 0.53 for the particularized matrix and 0.43 for the heuristic matrix. In other words, only one character strongly supports the clade and molecular information is necessary to define the status of the genus.

Only some of the species that were originally described as Dichelosus came out as a clade. In both trees about half of the species appeared spread out through the tree out of the Dichelosus clade. No character with retention index close to 1.00 supported any of the two clades. The strongest character that supports the Dichelosus clade is the “absence of transverse carenae in the suture between mesepisternum and metepimeron” with a retention index of 0.87. Other characters show an average retention index of 0.65 for the particularized matrix and 0.36 for the heuristic matrix; once more, there is poor support for this clade and none for the genus Dichelosus as it was stated on purely morphological grounds by Sarmiento & Sharkey (2005)
The species originally described as *Biroia* exhibit different behaviors in the two analyses; while in the heuristic case species are distributed along the entire tree with minimum clade formation, the particularized matrix included most of the species except four into a single clade. This clade includes 16 species such as *Z. tarsalis* and *Z. tropicola* and it is supported by nine characters; however, the average retention value of these characters is 0.52 and the highest retention score is given to the absence of the posteriomedian areola of metanotum with 0.80; this character state is also present in the clade that includes most of the *Dichelosus* and a set of 12 species in which *Z. fernandezi* and *Z. angelica* are found. Therefore, not much support is given to this group.

In addition to the described clades, the heuristic tree shows a smooth gradation of clades with increasing number of species: four clades with two species, two clades with three species, two with four species, and two with five species. In no case these clades were supported by characters with strong retention indexes which suggest their poor quality as diagnostics of the species groups involved. The particularized matrix shows a similar situation.

The bootstrap values shown in all the branches of the two trees would meet what traditionally is considered high, 0.87 the lowest, and indicator of relative reliability of the clades. The average bootstrap value for the trees is 0.94 for the heuristic tree and 0.90 for the particularized tree. However, as it was described above, the quality of the characters that support each branch is not congruent with the values given by the bootstrap tests.

The effect on the tree of treating the propodeal and face sculpturations as a series of separate characters each or as a whole appears at the bootstrap values, the retention scores, and the number of equally parsimonious trees. In the heuristic matrix higher tree retention indexes, higher average bootstrap values, and lower number of trees (0.65, 0.94, and 678 respectively) were observed than in the particularized matrix (0.62, 0.90, 1199 respectively). This may suggest that the use of these characteristics as a whole improves the quality of the trees obtained; however, it should be considered that the particularized matrix is necessarily longer and thus, the possibility to have lower scores increases. This is consequence of increasing the number of traits subject to change because a more generalized definition of a character can hide little changes occurred into the propodeal sculpturation. Considering the above described results, the heuristic matrix was used for the analyses where DNA and morphological information was combined.
The morphological analysis agrees with the previous considerations about the lack of strength of the traditional characters to support the monophyly of the genus *Dichelosus* and the neotropical species of *Biroia* (Sarmiento & Sharkey 2005, Sharkey et al. 2006). The presence or absence of carenations in the propodeum, the presence or absence of notauli and the presence or absence of lateral carinae of the antenna, traditionally used to define these genera, do not appear to be good indicators of phylogenetic relatedness. In the other hand, the trees in general are not strong enough to either refute or support the validity of these genera and their relationship with the *Zelomorpha*, and *Coccygidium* clade.
Figure 1. Strict consensus trees from parsimony analyses of morphological data. (A) Heuristic matrix where face and propodeum sculpturation treated as a single character each (678 trees, length = 525, CI = 0.13, RI = 65, 79 branches collapsed, 52 characters, 117 taxa). (B) Specific matrix where face and propodeum sculpturation treated as sets of separated characters each (1,199 trees, length 670, CI = 0.13, RI = 62, 79 branches collapsed, 65 characters, 117 taxa). Numbers above branches are bootstrap values.
2. 2. Phylogenetic study with molecular data

2. 2. 1. Methodology

DNA extraction, amplification, and sequencing

Sequence fragments of the nuclear gene for 28S rDNA and the mitochondrial gene COI were amplified. These genes have been successfully used in phylogenetic studies of Braconidae (Dowton et al. 1998, Gimeno et al. 1998, Mardulyn & Whitfield 1999, Sanchis et al. 2000, Smith & Kambhapati 1999). Most of genomic DNA extractions were conducted using DNeasy tissue kits (Qiagen) but a few were carried out with a phenol-chloroform extraction protocol (Jim Whitfield pers. comm). DNA was extracted from the wasp hind leg, but depending on the wasp body size, the mid leg was included too. Frozen legs in liquid nitrogen were macerated in individual 1.5mL centrifuge tubes with Drosophila pestles.

For Phenol-chloroform extraction frozen legs were grind vigorously in 1-200 ul Solution I and then an equal amount of Solution II with 10ul 10mg/ml Proteinase K was add. The mixture was incubated for 45 min at 65°C. Buffered phenol was add to double volume, vortexed briefly and spun for 5 min. The top aqueous layer was carefully extracted and the lower portion discarded. Buffered phenol addition and centrifugation was repeated once. Chloroform:isoamyl alcohol 24:1 was add to double volume, mixed well and spun for 5 min. The top phase was extracted and the lower phase was discarded. Chloroform:isoamyl alcohol addition and centrifugation was repeated once. A 1/10 volume 2M NaCl and 2 volumes cold 95% EtOH were added vortexed and placed at –20°C overnight. Then, the sample was spun in microcentrifuge at top speed for 15 min and the alcohol/aqueous phase was carefully poured off from pellet. 50ul 70% EtOH was add, mixed well and spun down for 5 min. Alcohol was removed from tube using a micropipettor, taking care not to dislodge or suck up pellet. The pellet was place on Speed-Vac until pellet is dry. The pellet was resuspend (up&down pipped) in distilled pure H2O accordingly. Solution I consisted of 25 ul 2M Tris pH 7.2 (HCl). 60 ul 5M NaCl. 0.5 ml 50% sucrose. 250 ul 0.2M EDTA. 4.165 ml d H2O. Solution II consisted of 750 ul 2M Tris pH 7.2. 330 ul 20% SDS. 0.5 ml 50% sucrose. 2.5 ml 0.2M EDTA, 920 ul d H2O.

PCR reactions were conducted for all cases using Invitrogen components following manufacturer instructions: 5.0 uL of buffer, 1.5uL of MgCl2, 1.0uL of dNTPs mixture, 50 pmol of each primer, 1.0 uL of genomic DNA 0.25uL of 5U/uL of Taq Polymerase; the mixture was brought to a final volume of 50ul with distilled sterilized water. Primers used are listed on Table 1. PCR reactions for gene 28S-D2, 28S-D3, and gene COI, were run. The temperature cycles were as follows: Thirty cycles of denaturation at 95°C for 60 s, annealing at 40-52°C, depending on the gene primer, for 60 s, extension at 72°C for 90 s.
An initial preparation at 95°C for 3 min and a final extension of 5 min were carried out. PCR products were purified using the QIAquick PCR purification kit (QIAGen).

Most of the PCR products were sent to Macrogen (http://www.macrogen.com) for sequencing other products were sequenced in Dr. Bruce Webb’s ABI sequencer facility at the UKY department of entomology. To increase data quality, forward and reverse sequences were obtained from each amplification and then checked using the programs Seqpup 9.0 (Gilbert, 1999) and Bioedit 5.0.6 (Hall 2001). These programs were also used for sequence edition and alignment (Mardulyn & Whitfield 1999, Whitfield & Cameron 1998). PCR products were tested for homology by way of looking at the size of the product in a high melt gel electrophoresis and by checking sequences using the BLAST option of the NCBI database (http://www.ncbi.nlm.nih.gov/BLAST/). 28S and COI gene amplifications generated matrices 895bp and 1253bp long respectively.

Table 1. Primers used for PCR amplifications.

<table>
<thead>
<tr>
<th>Gene</th>
<th>Primer Name</th>
<th>Sequence</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>28S</td>
<td>D3R</td>
<td>TCG GAA GGA ACC AGC TAC TA</td>
<td>J. Heraty’s lab (UCR)</td>
</tr>
<tr>
<td>28S</td>
<td>D3Rx</td>
<td>CCC ACA GCG CCA GTT CTG CTT ACC</td>
<td>D. Murray (Sharkey lab)</td>
</tr>
<tr>
<td>28S</td>
<td>D3F</td>
<td>GAC CCG TCT TGA AAC ACG GA</td>
<td>J. Heraty’s lab (UCR)</td>
</tr>
<tr>
<td>28S</td>
<td>D2 CF</td>
<td>CGT GTT GCT TGA TAG TGC AGC</td>
<td>J. Heraty’s lab (UCR)</td>
</tr>
<tr>
<td>28S</td>
<td>D2 CR2</td>
<td>TCA AGA CGG GTC CTG AAA GT</td>
<td>J. Heraty’s lab (UCR)</td>
</tr>
<tr>
<td>COI</td>
<td>Jerry</td>
<td>CAA CAT TTA TTT TGA TTT TTT GG</td>
<td>Mardulyn &amp; Whitfield</td>
</tr>
<tr>
<td>COI</td>
<td>Pat2</td>
<td>TCC ATT ACA TAT AAT CTG CCA TAT TAG</td>
<td>D. Murray (Sharkey lab)</td>
</tr>
<tr>
<td>COI</td>
<td>New Jerry</td>
<td>TAT ATT TTA ATT YTW CCW GGA TTT GG</td>
<td>D. Murray (Sharkey lab)</td>
</tr>
<tr>
<td>COI</td>
<td>Pat</td>
<td>TCC AAT GCA CTA ATC TGC CAT ATT A</td>
<td>Mardulyn &amp; Whitfield</td>
</tr>
</tbody>
</table>

Characterization and alignment of sequences

To check for nucleotid bias, the homogeneity test of base composition was performed using PAUP** 4.0b10 (Swofford, 1999). To check for incongruence between gene sequences, the incongruence length difference test (ILD) (Farris et al., 1994) was performed with the default options of Winclada. MP searches of molecular data were conducted in a similar way to that described in the morphological section and using Winclada.

Due to the strong effect that the alignment can have on the phylogenetic analysis, two alignment approaches were followed: in the first one, sequences were aligned manually with the directive of setting the position of the bases to reduce the number of changes to a minimum. This is an intuitive process that has been widely applied (Renner & Zhang 2004, Phillips et al. 2006) but its major difficulty is the possibility to replicate results obtained by other researchers. Thus, a second approach was to do automated alignment using Clustal W (Thompson et al. 1997). Static programming was used under gap
opening of 10 and gap extension of 0.2. No sequences were removed given the findings of Wenzel & Siddall (1997) that highly variable places have small effect on the phylogeny.

**Phylogenetic analyses**

There are three (or two depending on the point of view) major approaches of phylogenetic tree search and the debate of their strengths and weaknesses is far from being settled; some authors argue that parsimony does not take in account the well documented properties of DNA evolution while others put into question the use of statistical approaches such as Maximum Likelihood and Bayesian analysis, to study historical processes (Sober 2004, Haber 2005). Perhaps one way to solve this discussion is to apply these methods to specific cases and to compare their performance because the decision about the reliability of a phylogenetic hypothesis is finally in the mind of the scientist, not in the bare data. We always take decisions; from the characters we include, to the method to provide weight to the characters (i. e. evolution models), to the consensus algorithm we follow. In this line of thought a reasonable approach, observed in a significant number of papers (Wiens et al. 2005, Dunn et al. 2006 for example), is to use and compare the three methods and to see which one will provide a more convincing hypothesis to kept for future testing. Hence, in this study Maximum Parsimony, Maximum Likelihood and Bayesian analyses were used and their resulting trees compared.

Outgroup selection – Out group selection for the molecular and combined data dependen upon the availability of homologous sequences, thus, these may varies between analyses. In any case an array of related species was included in order to test for the monophyly of Zelomorpha and Hemichoma. The outgroups choosen are as follows: For 28S gene data a species of the Agathidinae genus Earinus was used to root the tree although species of Cremnops, Agathis, and Coccygidium were included. For COI gene a Braconinae species was used to root the tree; species of Cremnops and Coccygidium were also included. For the combined molecular and morphological condensed data, a specimen of the genus Cremnops was used to root the tree; for the extended matrix a species of Braconinae was used to root the tree and species of the Agathidinae genera Cremnops, Bassus, Earinus, and Coccygidium were included.

**Parsimony analyses** - searches were conducted in a similar way to that described in the morphological section and using Winclada. Gaps were treated as missing data. All characters were weighted equally. Searches were repeated for matrices aligned by eye and aligned following Clustal W alignment protocols (Thompson et al. 1997). In order to check for the influence of missing data, two combined matrices were analyzed; in the first matrix, the condensed matrix, only taxa in which sequences of both genes were
Maximum Likelihood - The program Modeltest 3.7 (Posada & Crandall 1998) was used to determine the substitution model that better fits the alignment. It follows a comparison of nested substitution DNA models in a hierarchical framework. The statistic calculated is $\delta = 2 \log \Lambda$ where $\Lambda$ is the likelihood ratio of the null model divided by the alternative model. The null model is the simplest substitution model with equal substitution probabilities and equal base frequencies, i.e. the Jukes-Cantor model (Posada & Crandall 1998). ML searches using the model chosen in Modeltest where run using PHYML v2.4.4, a program developed by Guindon & Gascuel (2003) which uses a more efficient searching tree algorithm than PAUP (available at http://atgc.lirmm.fr/phyml/). The results of preliminary tests with the data concur with the authors of PHYML who claim that it reaches an answer several times faster than PAUP. The program advantage is in the searching algorithm that adjusts tree topology and branch lengths simultaneously (Guindon & Gascuel 2003). Non parametric bootstrap supports were requested.

Bayesian analysis – Bayesian analysis was performed in a preliminary basis using MrBayes 3.1.2 (Ronquist et al. 2005) for the combined extended matrix. This approach was not fully explored and the reasons to this are explained in the ML results section. The same GTR+Γ+I model obtained from Modeltest was used with 500,000 generations sampling trees every 100 generations and burning 1,000 trees.

2.2.2. Results

Parsimony analyses. The strict consensus tree of parsimony analysis from the 28SD2-D3 gene fragments indicated several interesting results (Figure 2): *Zelomorpha* came up as a monophyletic clade with the clade most of *Coccygidium-Hemicoma* as sister group. All but one species of *Coccygidium* form a clade with *Hemicoma*. *Hemicoma* is strongly supported as a monophyletic clade. *Z. melanota* show up basal to a strongly supported but mostly unresolved clade that includes all the species of *Zelomorpha*. In four cases the specimens of what morphologically belong to a single species show up in separated places of the tree, these are: *Z. fernandezi*, *Z. dengoii*, *Z. concinna* and *Z. arizonensis*.

The strict consensus tree of parsimony analysis from the COI gene fragments (Figure 3) coincides with some of the relationships proposed by the 28S D2-D3: *Coccygidium* and *Zelomorpha* came up as part of a monophyletic clade with Branoinae and *Cremnops* basal to them. In this tree there is not a clade
composed by the species of *Coccygidium* plus *Hemichoma* but these show up as part of a polytomy that includes *Zelomorpha*. *Hemichoma* is again strongly supported as a monophyletic clade. No significant structure is found beyond this point but it is important to mention that more of the specimens of the morphologically defined species appear as monophyletic clades than in the 28S gene tree. The only exceptions are the specimens of *Z. fernandezi* and *H. bicolor*.

Base frequencies were A-T biased as it has been found in many other insect taxa (Chung-Ping, et al. 2004). No bias of base composition was found for the COI fragment ($\chi^2 = 65.04$, df = 114, $P = 0.999$) or the 28SD2-D3 ($\chi^2 = 60.31$, df = 168, $P = 1.00$) and the ILD test indicated no heterogeneity between the 28SD2-D3 and COI gene fragments (sum of gene tree length = 1,884, $P = 0.1667$), which suggest that these data can be combined for a simultaneous analysis. No significant differences were found between the trees provided by manual alignment and these by use of Clustalw.

The strict consensus tree from the two genes coincides with previous results in showing *Zelomorpha* species as monophyletic and in indicating that the species described as *Hemichoma* are a monophyletic clade basal to the *Zelomorpha* clade (Figure 4). A new group is the basal position of the clade *Z. arizonensis*-*Z. lenisterna*-*Z. oxybela*; However, the bootstrap values of the nodes that link these clades with the remaining *Zelomorpha* are particularly low. A specimen of *Z. concinna* appeared far apart from the others.

The parsimony analysis combining morphological and molecular data from the condensed matrix provided two fundamental trees; the strict consensus only collapses a branch within the clade composed by the *Z. concinna* specimens (Figure 5); However, the branch support is very low for several of the intermediate clades. The analysis using the extended matrix (68 taxa and 2,193 characters) generated 144 fundamental trees (Figure 6). The strict consensus tree reveals several similar clades to these already provided in previous analyses: the clade *Coccygidium* and *Hemichoma* appear as sister group of *Zelomorpha*. In general the bootstrap values are higher than these already provided to the other trees.

An interesting difference from the combined condensed matrix was the monophyly of most of the specimens assigned to a morphological species. In previous results there were several specimens of the same morphological species that appeared in several parts of the three. The result with the extended matrix suggests that in most cases, previous anomalous locations of specimens were due to lack of data. On the other hand, all the specimens of *Z. concinna*, which were described as different species by several authors (i. e., *Microdus championi*, *M. fascipennis*, *Microdus pulchripennis*, *Zelomorphidea fascipennis*,...
Disophrys flavifemur, Disophrys conjungens), appeared as monophyletic. In several species, multiple exemplars came out in different parts of the tree, i.e., Hemichoma atrata, Hemichoma bicolor, Z. fernandezi, and the specimens that belong to the morphologically related Z. lenisterna, Z. oxybela, and Z. arizonensis.

**Maximum likelihood analyses.** Modeltest selected the model GTR+I+G as the best fit for all the data sets. Hence, PHYML was run using the following parameters: nucleotid substitution model GTR, base frequency estimated by ML, proportion of invariable sites estimated, and six substitution categories. However, it is important to notice that the difference between the Akaike Information Criterion values of the best model selected (GTR+I+G) and the next model (TIM+I+G) is very high (23.88) which suggests that the ranking of model selection is not very strong (Posada & Buckley 2004). A similar phenomena occurs with the following models.

Even though the general topology of the ML tree obtained from genes COI and 28S resembles that found with parsimony analyses of DNA plus morphology, there are unusual results (Figure 7). First, several members of well established outgroups such as Earinus, and Cremnops show up within the ingroup at derived positions, second, specimens of the same species are spread through the tree, and finally, bootstrap values for a large set of intermediate branches were extremely low (i.e. 2, 0). Trees where these anomalies are more prominent were obtained with the condensed matrix (Figure 8) and with the COI data only (Figure 9). An explanation to this outcome is the amount of sites with missing data. The condensed matrix for example, have some species with very short sequences and up to a 40% of the “sequence” is composed of missing data. As it is expected, these species that have the higher percentage of unknown data are those that show up in very unusual parts of the tree. As it was explained before, these relationships are not present in any previous publication on the Agathidinae.

**Bayesian analysis.** The bayesian analyses from the combined extended data provided a tree with lower resolution than that found with both the parsimony and the Maximum Likelihood analyses (Figure 10). The tree concurs with the parsimony analyses in tree aspects: Cremnops, Earinus, and Bassus are a basal grade, most of Coccygidium specimens and Hemichoma are monophyletic and are sister group to all the Zelomorpha, and Zelomorpha is a monophyletic clade. However, a large unresolved clade that includes the larger part of the Zelomorpha species is present. Also several morphologically defined species have specimens spread through the tree, these are: H. bicolor, H. atrata, Z. concinna, and the clade that includes Z. lenisterna, Z. arizonensis, Z. pseudobaios and Z. oxybela. The Bayesian tree obtained with 28S data (Figure 11) coincides with what has been described previously for the extended matrix, but with
a new most-of-*Coccygidium-Cremnops* relationship. The Bayesian tree obtained with COI data does not depart from the major conclusions described for the extended matrix (Figure 12). These results may be consistent with the idea that the amount of missing data is strongly influencing the topology of the trees.

The parsimony tree obtained from the extended combined matrix (Figure 6) is the preferred hypothesis for the taxonomic conclusions and for the description of the evolution of color patterns in the genus because two reasons: 1. That tree provides a phylogeny consistent with other analyses where other sources of information have been studied (Sharkey et al. 2006, Sharkey 1992), 2. That tree follows the concept of species defined on morphological grounds. However, the low levels of bootstrap support and the mixed results of the ML and Bayesian approaches suggest that a stronger phylogenetic hypothesis is necessary and more genes should be sampled.

An important phenomenon observed in that hypotheses an in several other analyses was that specimens of what morphologically appear to be a single species show up in separated places of the trees, i.e., *Z. fernandezi, Z. dengoii, Z. concinna* and *Z. arizonensis*. This strongly suggests that there may be many criptic species in *Zelomorpha* and that dense sampling will have to be conducted, and rearing data will have to be gathered to further refine species concepts in the genus. On the other hand Considering the results common to all the different analyses it can be proposed that the genus *Zelomorpha* is a monophyletic taxon with the genera *Hemichoma* and *Coccygidium* as the sister clade. These results concur with the taxonomic proposition of Sharkey et al. (2006). The results also support the synonymy of *Dichelosus* with *Zelomorpha* and the transference of *Biroia* species as derived members within the *Zelomorpha* as proposed in other papers (Sarmiento & Sharkey 2005, Sharkey et al. 2006).

Table 2. Substitution model parameters estimated with PHYml under ML from partitioned and combined data sets. All with GTR+Γ+I. * G-T is not included since it is fixed.

<table>
<thead>
<tr>
<th>Dataset</th>
<th>-lnL</th>
<th>Base frequencies</th>
<th>Substitution rates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A</td>
<td>C</td>
</tr>
<tr>
<td>Combined 28S-COI extended</td>
<td>11546.00044</td>
<td>0.32814</td>
<td>0.19306</td>
</tr>
<tr>
<td>Combined 28S-COI condensed</td>
<td>7371.013377</td>
<td>0.3049</td>
<td>0.1842</td>
</tr>
<tr>
<td>28S</td>
<td>5014.53367</td>
<td>0.31354</td>
<td>0.24077</td>
</tr>
<tr>
<td>COI</td>
<td>6702.285570</td>
<td>0.36138</td>
<td>0.10801</td>
</tr>
</tbody>
</table>
Figure 2. Strict consensus tree from parsimony analysis of 28S D2-D3 gene fragments (31 branches collapsed). Tree search using Ratchet with 5,000 repetitions. Numbers above branches are Bootstrap values. *Earinus* sp was used to root the tree.
Figure 3. Strict consensus tree from parsimony analysis of COI fragments (4 branches collapsed). Tree search using Ratchet with 5,000 repetitions. Numbers above each branch are Bootstrap values. Braconinae sp was used to root the tree.
Figure 4. Strict consensus tree from parsimony analysis of combined molecular data using 28SD2-D3 y COI gene fragments. (8 branches collapsed). Ratchet search with 5,000 repetitions. 8 fundamental trees. length 951, CI = 0.48, RI = 0.45. Numbers above branches are bootstrap values. 1,982 characters, 25 taxa. Only species with data from the two genes were included (condensed matrix). Earinus sp was used to root the tree.
Figure 5. Strict consensus tree from parsimony analysis of 28S D2-D3, COI and morphology (1 branch collapsed) using the condensed matrix. Tree search using Ratchet with 5,000 repetitions. Numbers above branches are Bootstrap values. Length = 1069, CI = 0.48, RI = 0.47. Characters were equally weighted. *Cremnops* sp was used to root the tree.
Figure 6. Strict consensus tree from parsimony analysis of 28S D2-D3, COI, and morphology (20 branches collapsed) using the extended matrix. Tree search using Ratchet with 5,000 repetitions. Numbers above branches are Bootstrap values. Length = 2,542, CI = 0.57, RI = 0.63. All characters were equally weighted. *Braconinae* sp was used to root the tree.
Figure 7. Maximum Likelihood tree from combined (28S and COI) extended matrix. 68 taxa, 2141 characters. See substitution model parameters and tree likelihood in table 2. Braconinae sp 61 was used to root the tree.
Figure 8. Maximum Likelihood tree from the combined condensed matrix (28S and COI). 25 taxa, 1982 characters. Branch length is proportional to sequence distances. See substitution model parameters and tree likelihood in table 2. Cremnops sp was used to root the tree.
Figure 9. Maximum Likelihood tree from COI matrix. 42 taxa, 895bp alignment length. See substitution model parameters and tree likelihood in table 2. Bootstrap values are shown at the nodes. Braconinae sp was used to root the tree.
Figure 10. Bayesian tree from combined molecular extended data. 500,000 generations, samplefreq = 100, burning = 1,000 trees. 4 chains, one cold. Posterior probability values are indicated at the nodes. Braconinae sp1 was used to root the tree.
Figure 11. Bayesian tree from 28S data. 500,000 generations, samplefreq = 100, burning = 1,000 trees. 3 heated chains, one cold. Posterior probabilities are indicated by the nodes. *Earinus* sp was used to root the tree.
Figure 12. Bayesian tree from COI data. 500,000 generations, samplefreq = 100, burning = 1,000 trees. 3 heated chains, one cold. Posterior probabilities are indicated by the nodes. Braconinae sp 1 was used to root the tree.
2.3. Evolution of the color patterns and biology

Considering that the parsimony combined extended matrix was chosen as the preferred phylogenetic hypothesis (Figure 6) several conclusions about the evolution of the color patterns and the basic biology in the genus Zelomorpha can be drawn. No close similarity in the color patterns was observed within the different clades, in fact, certain color patterns appeared several times through the phylogeny of the group, that is the case of the hyaline wings with two transverse infumate bands, which were present in several branches of the tree such as in *Z. concinna*, *Z. adynata*, *Z. interstitium*, and even in *H. pannucea* and *H. boringi* (Figure 13).

*Z. melanostoma* is sister group of all the other members of the genus Zelomorpha and exhibits a bright coloration with combinations of black and light yellow in the body, and the wings are hyaline with two transverse infumate bands. The next sister group to all the other species is the group composed by *Z. arizonensis*, *Z. oxybela*, and *Z. lenisterna*; all these are entirely pale colored species with entirely hyaline wings. The sister group to that complex is a large number of species with a wide array of color patterns. It is important to point out that the Bayesian tree with the COI data which a highly resolved tree (Figure 12) proposes that the pale colored species of the *Z. arizonensis* complex, appear apical in the tree suggesting a derived condition. However, that tree also presents several difficulties described in the previous section.

As it has been found in several groups of insects, large eyes can be related to nocturnal habits while small eyes can be related to diurnal habits. In the Zelomorpha, small eyes were defined as these that do not reach the tentorial pits and that in lateral view are smaller ventrally than dorsally. Eye size is often linked to body coloration, while species with small eyes are brightly colored, species with large eyes are pale colored. Most of the species indicated in the phylogenetic tree (Figure 13) that have large eyes are located at the basal part of the tree. Exceptions to this trend are: *Z. melanostoma* which is the sister species to all the Zelomorpha, have small eyes, and is brightly colored; *Z. pseudobaios* which is a derived species and have large eyes and exhibits bright coloration.

On the other hand, field data from this work and label data of specimen collections indicate that strict nocturnal habits can unquestionably be assigned only to *Z. arizonensis*, *Z. lenisterna* and *Z. oxybela* while in other species diurnal and nocturnal habits have been recorded. Considering the phylogenetic results, the strict nocturnal habits have appeared early and only once in the genus.
Caveats to the current description on the history of the color patterns and circadian habits of the group come from two sources: first the tree presented here includes only 22 species of the genus while 81 remain to be included; second, the branch support of the selected parsimony tree is not very strong and other analyses such as the Bayesian tree of COI data, suggest that being nocturnal is a derived condition while the diurnal species are basal. In support of the latter description is the location of the sister group of *Zelomorpha, Hemichoma*, which is composed of brightly colored species with small eyes. In any case, the nocturnal habits seem to appeared only once in the genus *Zelomorpha*. 
Figure 13. Condensed version of phylogeny based on the parsimony analysis of combined data (COI, 28S and morphology) tracking the major color patterns. Only one specimen of each species was retained if all the specimens were in the same clade. Arrows indicate the body color of most of the species. Figures are not at the same scale. Dashed lines indicated double location of morphologically identical specimens. Figures are not at the same scale. Species names with orange font are species with large eyes.

Copyright © Carlos Eduardo Sarmiento-Monroy 2006
Chapter 3. Revision of the species of *Hemichoma* Enderlein, 1920


3. 1. Diagnosis

*Hemichoma* can be distinguished from the other Disophrini genera by the following set of characters: lateral carina of frons strongly reduced or absent; posterioventral area of gena strongly developed; anteriomedial area of gena developed as a propounced posterior peak; apical antennal antennomere acute; notauli present; propodeal ridges present; ovipositor short and ventrally curved; carina of hind trochantellus present; serrate ridge of setae in hind basitarsomeres; tarsal caws cleft.

3. 2. Description

**Head:** Eyes not reaching the ventral border of tentorial pits; lateral carina of frons strongly reduced; interantennal carina strongly developed; posterioventral area of gena strongly developed; anteriomedial area of gena developed as a propounced posterior peak; penultimate labial palpomere about half length of apical palpomere; apical antennal antennomere acute. **Mesosoma and metasoma:** Mesoscutum with notauli; epicnemial carina either complete or incomplete; posterior margin of mesopleuron with 7-8 transverse carinae evenly distributed; juxtacoxal flange wide; scutellar disk rounded; propodeal ridges present although some specimens can have a few reduced ridges; anteriomedial area of first metasomal tergum smooth; ovipositor short and ventrally curved. **Legs:** carina of hind trochantellus weak; serrate ridge of setae in hind basitarsomeres; tarsal caws cleft.

The phylogenetic analyses support the genus *Hemichoma*. It is composed by ten species. These are fully described (seven species) and redescribed (three species).
3.3. Key to the species of *Hemichoma*

The key to the species of this genus and the key to *Zelomorpha* species were developed using the software DELTA 1.04 (CSIRO, 2000) using the following parameters: 110 characters in data, 47 characters in key, 103 species, number of confirmatory characters 4, Rbase = 1.80, Abase = 2.00, Reuse = 1.01, Varywt = 0.80. Character reliabilities (please see character list below): 16,6.0 17–18,10.0 30,10.0 34,7.0 40,2.0 43–44,2.0 45,7.0 47,7.0 57,8.0 59,4.0 63,9.0 65,6.0 71,8.0 74,8.0 80,6.0 81,3.0 94,10.0 106–110,10.0. The number of confirmatory characters defines the number of characters required to sort a taxon out. The program selects the characters for the key construction according to three criteria: reliability, evenness, and number of taxa that are variable for the character. A higher reliability value gives more weight to the specified character than to the others, *i.e.*: 16, 6.0 means “give a weight of 6.0 to character 16”. Character reliability ranges from 1 to 10. An Rbase value close to 2.0 gives more importance to the reliability than to the evenness of distribution of the taxa by the character, and to the number of taxa that are variable for the character. The evenness determines how balanced is the number of taxa that are split by the character; the program gives more importance to these characters that distribute the taxa equally (Dalwitz et al., 1993). Character reliability was selected according to the easiness to sort species out regardless of the details to characterize the species; thus, colour characters that are self evident were ranked higher. Character order within each couplet follows the reliability of the character.

1. HW entirely hyaline .................................................................................................. 2
   HW entirely infumate ......................................................................................... *Hemichoma bicolor* (Szépligeti, 1902)
   HW hyaline with distal area infumate ................................................................. 5
   HW hyaline with infumate dorsoproximal area .................................................... 7

2(1). Length of T1 median tergite more than two times its posterior width; head entirely black or brown; anteropleural areola present, with multiple fovea. .. *Hemichoma confusa* n. sp.
   Length of T1 median tergite less than 1.5 times its posterior width; head black with yellow or dark-yellow palpi and labrum; anteropleural areola present, with some weak rugae... 3

3(2). FW hyaline with two transverse infumate bands ................................................. 4
   FW entirely infumate or infumate with transverse hyaline band or semicircular spot........
   ........................................................................................................ *Hemichoma atrata* (Enderlein, 1920)

4(3). Distance between antennal insertions distinctly shorter than their diameters; posterior border of mesoscutal sulcus carinate, gently sloped ............... *Hemichoma pseudoatrata* n. sp.
Distance between antennal insertions subequal to their diameters; posterior border of mesoscutal sulcus high, carinate, with a strong slope .................................................................................................................................
........................................................................................................... Hemichoma intermedia (Szépligeti, 1908)
Distance between antennal insertions distinctly longer than their diameters; posterior border of mesoscutal sulcus non carinate, gently sloped .................. Hemichoma seltmanni n. sp.

5(1). FW hyaline with two transverse infumate bands .............................................................................. 6
FW entirely infumate or infumate with transverse hyaline band or semicircular spot........
................................................................................................................................. Hemichoma atrata (Enderlein, 1920)

6(5). Notaulus absent; anteromedial areola pentagonal, with lateral ridges strong, shorter than anterior ridges; posteromedian areola incomplete; anteropleural areola present, with some weak rugae Hemichoma magna n. sp.
Notaulus indicated by weak depressions; anteromedial areola campanulate; posteromedian areola complete, defined by distinct lateral carina; anteropleural areola present, with several strong rugae ................................................................................................................................. Hemichoma pannucea n. sp.

7(1). Length of T1 median tergite more than two times its posterior width; notaulus indicated by weak depressions; posteromedian areola complete, defined by distinct lateral carina; face medial transverse striations present......................... Hemichoma occipitalis n. sp.
Length of T1 median tergite less than 1.5 times its posterior width; notaulus absent; posteromedian areola fused with posterolateral areola; face medial transverse striations absent ................................................................................................................................. Hemichoma boringi n. sp.

3. 4. Descriptions of the species of Hemichoma

3. 4. 1. Characteristics of the descriptions
The examined material is ordered by country from north to south. If a specimen has multiple labels the data of each are separated by a “/” sign. In some cases where label data are thought to be erroneous, the correct information is placed within square brackets “[ ]”. The text at the end of the label information corresponds to the acromyn of the museum where the specimen is deposited. Acromyns of museums where specimens are deposited follows the list provided by Evenhuis & Samuelson (2004) (http://hbs.bishopmuseum.org/codens/codens-r-us.html) Please see museum list below.
Morphological terminology follows Sharkey (1992), Sharkey & Wharton (1997), and Sarmiento et al. (2004). The shape of the anteriomedial areola of propodeum is described according to the terminology defined for plant leafs in the botany manual of Harris & Harris (1994). Species names and nomenclatorial changes follow regulations of the International Code of Zoological Nomenclature (ICZN 2000). To name new species grammar details follows Brown (1956). Species descriptions and redescriptions are based on the holotype; however, the variation observed in other specimens is detailed in italics immediately after the description of each character. An additional variation section is included which describes characters in which variation is extensive. Figures indicated under each species name refer to Appendix 1.

3.4.2. Museums listed

The acronyms listed in this review are taken from Evenhuis & Samuelson (2004) http://hbs.bishopmuseum.org/codens/codens-r-us.html which is an extended version of Arnett et al (1993):

AMNH USA, New York, New York, American Museum of Natural History.
AEIC USA, Florida, Gainesville, American Entomological Institute
BMNH United Kingdom, London, The Natural History Museum [formerly British Museum (Natural History)].
CASC USA, California, San Francisco, California Academy of Sciences.
CNCI Canada, Ontario, Ottawa, Canadian National Collection of Insects.
EAPZ Honduras, Tegucigalpa, Escuela Agricola Panamericana
EMEC USA, California, Berkeley, University of California, Essig Museum of Entomology
FMNH USA, Illinois, Chicago, Field Museum of Natural History (also used by Finnish Museum of Natural History)
FSCA USA, Florida, Gainesville, Division of Plant Industry, Florida State Collection of Arthropods.
HBS USA, Hawaii, Honolulu, Bishop Museum, Hawaii Biological Survey
HNHM Hungary, Budapest, Hungarian Natural History Museum
IMLA Argentina, Tucuman, Universidad Nacional de Tucuman, Fundacion e Instituto Miguel Lillo
IAVH Instituto Alexander von Humboldt, Villa de Leyva, Colombia
INBC Costa Rica, Santo Domingo de Heredia, Instituto Nacional de Biodiversidad (INBio)
LACM USA, California, Los Angeles, Los Angeles County Museum of Natural History
Hemichoma bicolor (Szépligeti, 1902) new combination
(Figs. 3C, 18EF, 33C, 48B)


Hemichoma fenestratum Enderlein, 1920 Arch. Naturgesh. 84 A (11): 184, ♀, fig. “Peru, Department Chanchamayo, Rio toro” (Stettin, ♀) new synonymy

Redescription

Measurements. Mesosoma length 4.4 mm. FW length 12.2 mm.

Head. Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striaations present, with regular fovea dense medially and sparse laterally, with punctures sparsely distributed laterally. Penultimate labial palpmere about half length of apical palpmere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye not bordered by groove. Lateral carina of frons composed of rugae and fovea, separated posteriorly from interantennal carina, non striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly shorter than their diameters. Number of flagellomeres 45–48. Depression laterad lateral ocellus absent. Gena at mid-
height, posteriad eye with an acute peak. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena as a strong posteroventral subquadrate projection. Posteroventral area of gena concave, depression dorsal flange absent, with rugae restricted to area immediately distad eye.

**Mesosoma.** Epicnemial carina complete and evenly curved, or interrupted at midlength, with groove wide and flat, or with groove narrow, no flat area is visible. Crenulation of epicnemial carina composed of 3–6 large ridges restricted to mid length, or composed of irregular and unevenly distributed ridges or composed of 5–6 small ridges restricted to ventral half. Mesopleuron punctate but lacking punctures medially. Sternaulus with a notorious depression and strong transverse striations forming an irregular dorsal margin, or with a notorious depression and up to three weak ridges or with a notorious depression and a clear set of striations evenly distributed. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of different sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, wide, with a complete carina mediad flange apex, or smooth or with two complete carinae. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum completely crenated. Notaulus absent. Median longitudinal mesoscutal groove absent. Scutellar sulcus deep and subquadrate, with two carinae, or with 1. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk as a smooth carina. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola close to apex. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola with transverse ridges, pentagonal but with sinuated lateral ridges. Anterolateral areola with an incomplete ridge extending half distance from midlength of anteromedial keel to anterodorsal corner, or rugous anterolaterally and with some irregular ridges converging anterolaterally. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola incomplete, posteromedial areola or complete, defined by distinct lateral carina, subquadrate, without transverse ridge, with median longitudinal ridge separated from the transverse keel, posteromedial areola or without median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel, or reduced and absent medially.
Legs and wing venation. Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia shorter than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia with three spines, or with two spines. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa present, at least weakly, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

Color pattern. Mostly orange except as follows: head, antennae, most of pronotum, metaepimeron, propodeum, last six metasomal segments black or metasoma entirely black. Fore leg brown except three basitarsomereres orange. Midleg and hindleg brown or mid legs yellow with coxa, trochanter, trochantellus, femur and telotarsomere brown; hind leg brown. Forewing infumate except for hyaline transverse band that starts at anteriad 2nd submarginal extending a bit further stigma apex. Hind wing entirely infumate.

Variation
This species is variable in several characteristics as follows: The area of metaepimeron close to the coxa may have either weak or strong longitudinal carinae. Males are significantly smaller than females. Some specimens have only one longitudinal carina in the mesoscutal sulcus. The sternaulus of some specimens from Brazil is longer and have stronger transverse carenation, this is particularly notorious in the Lectotype which has a strong carenation with several ridges defining an irregular dorsal carina. The epicnemial carina may be absent medially or it may be complete and with strong carenations uniformly distributed.

The coloration of the species is variable: the size of the transverse hyaline band of the FW ranges from absent to be a wide band. The mesosoma may be black with some areas orange or it may be orange with some light brown infuscations. The metasoma may vary from totally black to orange up to the anterior part of the T3.

Diagnosis and similar species
This species can be distinguished by the following characteristics: longitudinal striations laterad face; suture between metaepisternum and metaepimeron with carinae of different heights; anteriomedial areola with irregular lateral carinae

Geographic distribution and elevation range: Guayana, Colombia, Peru, Brazil (Pará), Bolivia. 0-1100m.
Material examined


_Hemichoma magna_ n. sp.

(Figs. 9A, 24AB, 39A, 54A)

**Measurements.** Mesosoma length 4.02 mm. FW length 11.2 mm.
**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, lateral longitudinal striations present, with regular fovea evenly distributed leaving flat areas between them. Penultimate labial palpomere about half length of apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye not bordered by groove. Lateral carina of frons composed of rugae and fovea, separated posteriorly from interantennal carina, non striate laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters. Depression laterad lateral ocellus absent. Gena at mid-height, posteriad eye with an acute peak. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena as a strong posteroventral subquadrate projection. Posteroventral area of gena concave, depression dorsad flange absent, with rugae restricted to area immediately distad eye.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 3–6 large ridges restricted to mid length. Mesopleuron punctate but lacking punctures medially. Sternaulus with a notorious depression and a clear set of striations evenly distributed. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, wide, with two complete carinae. Anterior area of subpronope not modified. Posterolateral margin of pronotum carenated ventrally. Notaulus absent. Median longitudinal mesoscutal groove absent. Scutellar sulcus deep and subquadrate, with two carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, pentagonal, with lateral ridges strong, shorter than anterior ridges. Anterolateral areola with a strong ridge heading half distance from midlength of anteromedial keel to anterodorsal corner. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola incomplete, very thin, without transverse ridge, without median longitudinal ridge. Posterolateral areola absent, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia shorter than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of
hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulus. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly brown except as follows: head, propleurum, mesoscutum, and pronotum black. Ventral area of mesosternum, metaepimeron, metaepisternum, metanotum, propodeum, four basal metasomal segments, and ventral part of hind leg femora orange. Palpi, foreleg tarsus, and four basitarsomeres of midleg yellow. Forewing hyaline with infumated areas as follows: costal border, transverse band between parastigma and stigma, transverse apical band extending between radial cell apex and wing apex. Hind wing hyaline with apical half hyaline.

**Etymology:** The specific epithet of this species refers to its large size

**Diagnosis and similar species**
This species shares with both *H. boringi* and *H. occipitalis* the complete epicnemial carina. *H. magna* shares with *H. atrata* and *H. pseudoatrata* the 3-6 ridges in the epicnemial carina, and with *H. carinata* the two complete ridges of the juxtacoxal flange; the propodeal sculpturation of this species is similar to that of *H. pseudoatrata* and *H. boringi*.

This species can be distinguished by the following characteristics: face strongly sculpturated with longitudinal striations and evenly distributed fovea; anteriad area of subpronope without a flange or disc.

**Geographic distribution and elevation range:** Brazil (Amapá). 45m.

**Material examined**
HOLOTYPE: ♀, Porto Platon, Terr. Amapá, BRASIL, 1 X-1957, J. Lame Leg. / Colleçao J. Lane / MZSP

*Hemichoma boringi* n. sp.
(Figs. 3E, 18IJ, 33E, 48E)

**Measurements.** Mesosoma length 3.97 mm. FW length 10.4 mm.

**Head.** Medial ridge or convexity of face absent, *or present*. Face with a narrow dorsomedial groove, convex medially with sides *flat, mediad* longitudinal striations present, *or mediad longitudinal striations*
absent, with regular fovea present medially only, with punctures sparsely distributed laterally. Penultimate labial palpomere about half length of apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye not bordered by groove. Lateral carina of frons composed of rugae and fovea, separated posteriorly from interantennal carina, non striate laterally. Frontal depression entirely smooth. Distance between antannal insertions subequal to their diameters. Number of flagellomeres 43. Depression laterad lateral ocellus absent. Gena at mid-height, posteriad eye with an acute peak. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena as a strong posteroventral subquadrate projection. Posteroventral area of gena concave, depression dorsad flange absent, with rugae restricted to area immediately distad eye.


Legs and wing venation. Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of
hind tibia or with three spines. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly orange except as follows: head, antenna, propleuron, anterior half of pronotum, metaepisternum, laterad propodeum, apical six metasomal segments, black. Some specimens have the last five segments black. Foreleg yellow except: coxa, trochanter, trochantellus, and last tarsomere brown. Midleg yellow except coxa, trochanter, trochantellus, and last two tarsomeres dark yellow some specimens have the posterior half of the coxa yellow. Hind leg brown except: posteroventral area of coxa and basal half of femur yellow. Forewing hyaline except as follows: costal border, transverse band between parastigma and anterior apex of stigma; transverse apical band extending between posterior stigma apex and wing apex. Hind wing hyaline. Some specimens are mostly black except as follows: palpi, tegula, posterior half of scutellum, metanotum, propodeum, first four metasomal segments, front and middle legs, hind femur and part of tibia yellow.

**Etymology:** The specific epithet of this species honors Andy Boring, colleague at the University of Kentucky, Department of Entomology.

**Variation**
Some specimens have six apical metasomal segments black instead of the typical five segments. The coxa of the midleg may be entirely black or black with posteriad half yellow.

**Diagnosis and similar species**
This species can be distinguished from related species by the combination of the following characteristics: epicnemial carina complete; incomplete carina in the juxtacoxal flange, scuto-scutellar articulation indicated by a border, propodeum almost smooth, with a few open areolae; transverse carina present only medially. This species shares with H. carinata the thin groove in the vertex; H. boringi shares with H. occipitalis the complete and evenly curved epicnemial carina.

**Geographic distribution and elevation range:** Peru, Brazil (Mato Grosso). 120m.

**Material examined**
- PARATYPES: 1 ♀, Avispas [Avispa], Peru, IX 1962 / collection of R. D. Shenefelt / AEIC

44
- 1 ♀, COLOMBIA, Amazonas, Amacayacu Natl. Park, Matamata Station, Tierra Firme, Total sweep, 8-12.mar.2000, Sharkey / HIC

Other specimens
- 1 ♀, BRAZIL, Mato Grosso, Sinop., X.1976, M. Alvarenga Mal. Trap. / CNCI

**Hemichoma pannucea** n. sp.
(Figs. 11C, 26EF, 41C, 56C)

**Measurements.** Mesosoma length 3.38 mm. FW length 9.4 mm.

**Head.** Medial ridge or convexity of face absent. Face without a dorsomedial groove, convex medially with sides flat, lacking striations, or *mediad longitudinal striations present*, with regular fovea present medially only, with punctures sparsely distributed laterally. Penultimate labial palpomere about half length of apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye not bordered by groove. Lateral carina of frons composed of rugae and fovea, separated posteriorly from interantennal carina, non striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly shorter than their diameters. Number of flagellomeres 43. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye with an acute peak. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area, or weak, *indicated by narrow groove*. Posteroventral margin of gena as a strong posteroventral subquadrate projection. Posteroventral area of gena concave, depression dorsad flange absent, with rugae restricted to area immediately distad eye.

**Mesosoma.** Epicnemial carina complete and with distinct angle ventrolaterally, with groove wide and flat. Crenulations of epicnemial carina with some crenulae fused with these of sternaulus. Crenulation of epicnemial carina composed of 4–9 large evenly distributed ridges. Mesopleuron with small punctures evenly distributed. Sternaulus with a notorious depression and strong striations forming a dorsal border and some fused with these of epicnemial carina. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, wide, rugous, or *with two complete carinae*. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum
carenated ventrally. Notaulus indicated by weak depressions. Median longitudinal mesoscutal groove indicated by a wide, flat, sculptured depression. Scutellar sulcus deep and subquadrate, with three carinae. Scuto-scuteellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk as a smooth carina, scutellum or deep, with crenulae extending anteriorly but not reaching midway to scutellar sulcus. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with strong rugosities distorting most primary ridges that form areolae. Anteromediaal areola with transverse ridges, campanulate. Anterolateral areola rugous anterolaterally and with some irregular ridges converging anterolaterally. Anteropleural areola present, with several strong rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromediaal areola complete, defined by distinct lateral carina, subquadrate, without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel reduced or absent medially.

Legs and wing venation. Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia with three spines. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa present, at least weakly, or 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 with a anteromedian bulge defined by a ridge. Length of T1 median tergite less than 1.5 times its posterior width.

Color pattern. Mostly black, except as follows: palpi, tegula, metaepimeron, metaepisternum, metanotum, propodeum, and first three metasomal segments orange. Foreleg yellow or yellow with brown coxa. Midleg entirely yellow or yellow with brown coxa, trochanter, and apical band of femur. Hind leg mostly brown except as follows: ventral side of coxa, proximal band of femur extending ventrally, and ventral mediad spot of tibia yellow or brown with coxa apex, trochanter, trochantellus and base of femur yellow. Forewing hyaline except as follows: costal border, transverse band between parastigma and anterior apex of stigma; transverse apical band extending between posterior stigma apex and wing apex. Hind wing hyaline with distal half infumate.

Etymology: The specific epithet of this species refers to the extremely wrinkled surface of the propodeum.
Variation
The longitudinal depression posteriad vertex may have a thin groove. The scutellum may be devoid of any punctures and its transverse groove may have short longitudinal ridges. In addition to the rugous surface the juxtacoxal area may have two complete carinae. The vein 3RSa of the FW may be present or absent. There is variation in the color pattern of the front and hind legs.

Diagnosis and similar species
This species shares with H. atrata the angulated epicnemial carina. H. pannucea and H. occipitalis share the notaulus indicated by weak depressions.

This species is very distinctive and can be recognized from related species by several characteristics as follows: medial ridge and dorsomedian groove of the face absent; epicnemial carina with strong crenulae that fuses with these of the sternaulus at mid height; sternaulus with a strong set of crenulae that reach the epicnemial carina; rugous juxtacoxal area; smooth scutellum; the propodeum and metaepimeron surface is strongly rugous, distorting in several places the regular ridges; three spines in the hind tibia apex; strong medial ridge in T1 anterior part.

Geographic distribution and elevation range: Venezuela, Peru. 150-250m.

Material examined
HOLOTYPE: ♀, Venezuela, T. F., Amazonas, 150m / Alto Rio Mavaca, 02°02’10”N 65°06’50”O 14-II-6-III-89 / cols. J. De Marmels, A. Chacon / MIZA
PARATYPES:

Other specimens

Hemichoma confusa n. sp.
(Figs. 4G, 19MN, 34G, 49G)
Measurements. Mesosoma length 4.09 mm. FW length 10.78 mm.

Head. Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, with regular fovea present medially only, with punctures sparsely distributed laterally. Penultimate labial palpmere about half length of apical palpmere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posteriororbit of eye not bordered by groove. Lateral carina of frons composed of rugae and fovea, separated posteriorly from interantennal carina, non striate laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters. Number of flagellomeres 46. Depression laterad lateral ocellus absent. Gena at mid-height, posteriad eye with an acute peak. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli absent. Posteroventral margin of gena as a strong posteroventral subquadrate projection. Posteroventral area of gena concave, depression dorsad flange absent, with rugae restricted to area immediately distad eye.

Mesosoma. Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 5–6 small ridges evenly distributed. Mesopleuron punctate but lacking punctures medially. Sternalus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina, metaepisternum or without carina. Juxtacoxal flange present, regularly concave, wide, or wide, smooth, or with one incomplete carina. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum crenated ventrally. Notaulus absent. Median longitudinal mesoscutal groove absent. Scutellar sulcus deep and subquadrate, with two carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus high, carinate, with a strong slope. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk as a smooth carina. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, acuminate. Anterolateral areola with a strong ridge heading half distance from midlength of anteromedial keel to anterodorsal corner. Anteropleural areola present, with multiple fovea. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteroepisternal areola complete, defined by distinct lateral carina, subquadrate, without transverse
ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrace, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia shorter than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia or with three spines. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly black except as follows: palpi, tegula, and first three metasomal segments orange. Foreleg yellow but telotarsus brown. Midleg yellow but trochanter and telotarsus brown. Hind leg mostly brown except as follows: black coxa with ventral area and apex yellow; trochantellus, basad third of femur, proximal area of tibia yellow. Forewing hyaline except as follows: costal border, transverse band between parastigma and anterior apex of stigma; transverse apical band extending between posterior stigma apex and wing apex. Hind wing hyaline.

**Etymology.** The specific epithet of this species refers to the lack of a unique character to identify this species.

**Diagnosis and similar species**
This species shares with *H. seltmanni* the posterior area of ocelli devoid of depressions. *H. confusa* shares with *H. magna* the strong diagonal ridge in the anterolateral areola.

This species can be distinguished from others by the following combination of characters: vertex without longitudinal posterior depression; epicnemial carina complete, evenly curved, with several small transverse ridges; acuminate anteromedial areola

**Geographic distribution and elevation range:** Ecuador. 450m

**Material examined**
HOLOTYPE: ♀, ECUADOR: Provincia de Napo, 20km E. Of Puerto Napo, Selva Aliñahui, 450m, December 1992 / 1°0’ S, 77°25’ W E.S. Ross collector California Academy of Sciences Collection / CASC
**Hemichoma occipitalis** n. sp.
(Figs. 10F, 25KL, 40F, 55F)

**Measurements.** Mesosoma length 4.36 mm. FW length 12 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, medial transverse striations present, with regular fovea present medially only, with punctures sparsely distributed laterally. Penultimate labial palpomere about half length of apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye not bordered by groove. Lateral carina of frons composed of rugae and fovea, separated posteriorly from interantennal carina, non striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 44. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye with an acute peak. Area of vertex posteriad lateral ocellus. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena as a strong posteroventral subquadrate projection. Posteroventral area of gena concave, depression dorsad flange absent, with rugae restricted to area immediately distad eye.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of several irregular and unevenly distributed ridges. Mesopleuron punctate but lacking punctures medially. Sternaulus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, wide, smooth. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum completely crenated. Notaulus indicated by weak depressions. Median longitudinal mesoscutal groove absent. Scutellar sulcus deep and subquadrate, with two carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk as a smooth carina.
Median areola of metanotum with a complete median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, acute triangle. Anterolateral areola rugous anterolaterally and with some irregular ridges converging anterolaterally. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola complete, defined by distinct lateral carina, subquadrate, without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrate, narrower than anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly black except as follows: palpi, dorsal apex of pronotum, mesoscutum, tegula, T1–2 and part of 3, S1–3 orange. Foreleg yellow except last tarsomere. Midleg yellow except dorsal spot on coxa, trochanter, and last four tarsomeres brown. Hind leg black except: ventral side of coxa, trochantellus, anterior half of femur, and most of tibia yellow. Forewing hyaline except infumate costal border, transverse band between parastigma and anterior apex of stigma; transverse apical band extending between posterior stigma apex and wing apex. Hind wing infumate with apical third hyaline.

**Etymology:** The name refers to the presence of the longitudinal depression at the occipital margen.

**Diagnosis and similar species**
This species can be distinguished from related species by the complete medial carina in the median areola of the metanotum. The pleural area of propodeum has long yellow hairs.

This species is closely related to *Hemichoma seltmanni* but it differs from *H. seltmanni* in several traits as follows: short and barely carenated sternaulus; less curved occipital margin, and epicnemial carina is complete and carenate. This species shares with *H. seltmanni* the narrow posteromedian areola. The posterior flange of the scutellum has a smooth carina without transverse carinae; this trait is present in *H. seltmanni* too.
**Geographic distribution and elevation range:** Bolivia.

**Material examined**

**HOLOTYPE:** ♀, BOLIVIA, Dept. Santa Cruz, Saavedra, Agr. Exp. Station / C. C. Porter, X-1973 coll / FSCA.

*Hemichoma seltmanni* n. sp.

(Figs. 14C, 29EF, 44B, 59B)

**Measurements.** Mesosoma length 3.43 mm. FW length 9.36 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, medial transverse striations present, with regular fovea present medially only, with punctures sparsely distributed laterally. Penultimate labial palpomere about half length of apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye not bordered by groove. Lateral carina of frons composed of rugae and fovea, separated posteriorly from interantennal carina, non striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 42. Depression laterad lateral ocellus absent. Gena at mid-height, posteriad eye with an acute peak. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli absent. Posteroventral margin of gena as a strong posteroventral subquadrate projection. Posteroventral area of gena concave, depression dorsad flange absent, with rugae restricted to area immediately distad eye.

**Mesosoma.** Epicnemial carina interrupted at middenlength, with groove narrow, no flat area is visible. Crenulation of epicnemial carina absent. Mesopleuron punctate but lacking punctures medially. Sternaulus with a notorious depression and a clear set of striations evenly distributed. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of different sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with three subparallel carinae. Juxtacoxal flange present, regularly concave, wide, smooth. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum crenated ventrally. Notaulus absent. Median longitudinal mesoscutal groove
indicated by a wide, flat, sculptured depression. Scutellar sulcus deep and subquadrate, with two carinae. Scutum-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk as a smooth carina. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, pentagonal, with lateral ridges strong, shorter than anterior ridges. Anterolateral areola rugous anterolaterally and with some irregular ridges converging anterolaterally. Anteropleural areola present, with some weak rugae. Pleural carina weak and incomplete. Transverse ridges of pleural carina absent. Posteromedian areola complete, defined by distinct lateral carina, subquadrate, without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrate, narrower than anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

Legs and wing venation. Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia shorter than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa present, at least weakly, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

Color pattern. Mostly yellow except as follows: head, antenna, propleuron, most of pronotum, posterodorsal part of mesopleura, metaepisternum, propodeum, last five metasomal segments black. Foreleg mostly yellow except: coxa black; trochanter, trochantellus, and a median ventral spot of femur brown. Midleg yellow except: coxa, trochanter, trochantellus, and last three tarsomeres brown. Hind leg brown except: coxa black dorsally ventrally yellow; basal third of femur yellow; tarsomere black. Forewing hyaline except as follows: costal border, transverse band between parastigma and anterior apex of stigma; transverse apical band extending between posterior wing apex and stigma apex. Hind wing hyaline.

Etymology: The name of this species honors my colleague Katja Seltmann graduate student at the University of Kentucky.

Diagnosis and similar species
In addition to the differences in color pattern, this species can be distinguished from related species, especially from H. bicolor, by the absence of the median depression at the occipital area, by the absence
of transverse carinae in the epicnemial carina, by the strongly carenated sternaulus, and by the three
carinae in the dorsal apex of metaepisternum.

**Geographic distribution and elevation range:** Ecuador. 250m

**Material examined**

HOLOTYPE: ♀, Coca, Napo R. Napo, ECUADOR, 22-30.IV.65, 250m, L. Pena / 11 det. M.J. Sharkey
19 / CNCI

*Hemichoma intermedia* (Szépligeti, 1908) **new combination**

(Figs. 7G, 22MN, 37G, 52G)

(Budapest, ♀, 682).

**Redescription**

**Measurements.** Mesosoma length 3.1 mm. FW length 9.26 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, *or lacking striations, or mediad longitudinal striations present*, transverse striations between interantennal carinae present, *or transverse striations between interantennal carinae absent*, with regular fovea present medially only, with punctures sparsely distributed laterally. Penultimate labial palpomere about half length of apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye not bordered by groove. Lateral carina of frons composed of rugae and fovea, separated posteriorly from interantennal carina, non striate laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters. Number of flagellomeres 40, 41. Depression laterad lateral ocellus absent. Gena at mid-height, posteriad eye with an acute peak. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena as a strong posteroventral subquadrate projection. Posteroventral area of gena concave, depression dorsad flange absent, with rugae restricted to area immediately distad eye.

**Mesosoma.** Epicnemial carina interrupted at midlength, with groove narrow, no flat area is visible. Crenulation of epicnemial carina composed of 5–6 small ridges evenly distributed, *or absent.*
Mesopleuron punctate but lacking punctures medially. Sternaulus with a notorious depression and a clear set of striations evenly distributed. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimerone complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, wide, with two complete carinae, or with one incomplete carina. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum carenated ventrally. Notaulus absent. Median longitudinal mesoscutal groove indicated by a wide, flat, sculptured depression. Scutellar sulcus deep and subquadrate, with two carinae, or with 3. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus high, carinate, with a strong slope. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk as a smooth carina. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, pentagonal, with lateral ridges strong, shorter than anterior ridges. Anterolateral areola absent, or with two incomplete ridges heading diagonally half distance from midlength of anteromedial keel, and with an incomplete lateral keel. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola incomplete, posteromedial areola or complete, defined by distinct lateral carina, very thin, posteromedial areola or subquadrate, without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, or open anteriolaterally, subquadrate, narrower than anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia shorter than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa present, at least weakly, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black except as follows: palpi, posterior half of pronotum, tegula, mesoscutum, dorsal part of mesosternum, part of scutellum, first two metasomal segments or first three metasomal segments and anterior half of the fourth dark orange. Foreleg mostly yellow except: coxa black; trochanter, and trochantellus, some with a median ventral spot of femur, and last tarsomere brown. Midleg yellow except: coxa, trochanter, trochantellus, and last two tarsomeres brown. Hind leg brown.
except: ventral area of coxa yellow. Forewing hyaline except as follows: costal border, transverse band between parastigma and anterior apex of stigma; transverse apical band extending between posterior wing apex and stigma apex. Hind wing hyaline. Some specimens have most of mesosternum, scutellum, and base of hind femur, dark orange.

The specimen indicated as holotype fits the description and data provided by Szépligeti; however, the label also has the text “Des Papp J. 1967”. Other species described by Szépligeti have a lectotype designated by Jenő Papp with the same type of label “Des Papp J. 1967”; thus, I assume that Papp mistakently designated the specimen of the Szépligeti type series as a Holotype and it should be a lectotype instead.

**Variation**
Some females have an incomplete r-m vein of the forewing leaving the second submarginal cell open. This seems to be an anomaly. The epicnemial carina can appear complete by a very weak depression or it can appear incomplete; in some cases the carina is crenulate

**Diagnosis and similar species**
This species can be differentiated from similar species by the following combination of characteristics: epicnemial carina very weak or entirely interrupted at midlength, juxtacoxal flange with one or two complete carinae, posterior border of the scutellar sulcus is very high and clearly carenated.

This species is very close to *H. seltmanni*; these share the epicnemial carina medially interrupted, without crenulations; the sternaulus have a clear set of evenly distributed striations. *H. carinata* shares with *H. atrata* the hind trochantellus smooth, without longitudinal carina or flat area.

**Geographic distribution and elevation range**: Venezuela, Peru. 705m

**Material examined**


Measurements. Mesosoma length 3.53 mm. FW length 10.05 mm.

Head. Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, with regular fovea present medially only, with punctures sparsely distributed laterally. Penultimate labial palpomere about half length of apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye not bordered by groove. Lateral carina of frons composed of rugae and fovea, separated posteriorly from interantennal carina, non striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly shorter than their diameters. Number of flagellomeres 45, 44. Depression laterad lateral ocellus absent. Gena at mid-height, posteriad eye with an acute peak. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena as a strong posteroventral subquadrate projection. Posteroventral area of gena concave, depression dorsad flange absent, with rugae restricted to area immediately distad eye.

Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, pentagonal, with lateral ridges strong, shorter than anterior ridges. Anterolateral areola rugous anterolaterally and with some irregular ridges converging anterolaterally. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola complete, defined by weak lateral carina, subquadrate, without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrate, narrower than anterolateral areola, posteropleural areola closed. Transverse keel strong, dividing propodeum into two distinct planes.

**Legs and wing venation.** Basal tooth of foretarsal claw acute. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia shorter than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia or with three spines. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw acute. Forewing 3M curved, 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing absent. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black except as follows: palpi, tegula, scutellum and metanotum with yellow infuscations, first two or three metasomal segments yellow or dark orange. Fore and midleg yellow or midleg with black coxa. Hind leg mostly brown except: ventrad area of coxa, trochanter, trochantellus, and most of basad femur yellow. Some specimens have an extensive ventral yellow spot in the tibia. Forewing hyaline except as follows: costal border, trasnverse band between parastigma and anterior apex of stigma; transverse apical band extending between posterior stigma apex and wing apex. Hind wing hyaline.

**Etymology:** The specific epithet refers to the close similarity between this species and *H. atrata*

**Variation**
Specimens from Peru have weak ridges in the epicnemial carinae but other characters indicate that these specimens belong to *H. pseudoatrata*. Some specimens may have a narrow median metanotal areola; the anteromedial areola of the propodeum can be triangular or pentagonal.

**Diagnosis and similar species**
This species can be distinguished from similar species by the following characteristics: acute basal tooth of the tarsal claws, vein CUb of the hind wing absent. The following combination of characters is also
useful to distinguish this species: epicnemial carina with strong mediad crenulae; juxtacoxal flange very wide and strongly concave with a ventral complete carina; anteromedial areola of propodeum pentagonal. This species shares with *H. boringi* and *H. bicolor* mediad striations of the face;

**Geographic distribution and elevation range:** Venezuela, Peru. 350-457m

**Material examined**


PARATYPES: 1 ?, Trincheras [Las Trincheras], Venezuela-Carabobo, 350m, 16-X-1947 / F. Fernandez Y. Col. / MIZA.


**Hemichoma atrata** (Enderlein, 1920) **new Combination**

(Figs. 2F, 17KL, 32F, 47F)


**Redescription**

**Measurements.** Mesosoma length 3.72 mm. FW length 8.67 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance, *or absent.* Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, *or mediad longitudinal striations absent,* medial transverse striations present, *or medial transverse striations absent,* with regular fovea present medially only, with punctures sparsely distributed laterally. Penultimate labial palpomere about half length of apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye not bordered by groove. Lateral carina of frons composed of rugae and fovea, separated posteriorly from interantennal carina, non striate laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters, *or distinctly longer than their diameters.* Number of flagellomeres 40–43. Depression laterad lateral ocellus absent. Gena at mid-height, posteriad eye with an acute peak. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli weak, barely indicated as a
shallow area. Posteroventral margin of gena as a strong posteroventral subquadrate projection. Posteroventral area of gena concave, depression dorsad flange absent, with rugae restricted to area immediately distad eye, or smooth.

**Mesosoma.** Epicnemial carina complete and with distinct angle ventrolaterally, or complete and evenly curved, with groove wide and flat, or with groove narrow, no flat area is visible. Crenulation of epicnemial carina composed of 3–6 large ridges restricted to mid length, or composed of 4–9 large ridges evenly distributed. Mesopleuron punctate but lacking punctures medially. Sternaulus with a notorious depression and up to three weak ridges, or with a notorious depression and a clear set of striations evenly distributed. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, wide, with a complete carina and irregular additional carinae, or with a complete carina mediad flange apex or with a complete carina located ventrally. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum crenated ventrally, or completely crenated. Notaulus absent. Median longitudinal mesoscutal groove indicated by a wide, flat, sculptured depression. Scutellar sulcus deep and subquadrate, with two carinae, or with 1 or 3. Scuto-scuteellar articulation absent, or indicated by a tenuous line. Posterior border of mesoscutal sulcus carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk as a smooth carina. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with irregular striations. Anteromedial areola without transverse ridges, deltoid. Anterolateral areola divided by several ridges converging anterolaterally. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola complete, defined by distinct lateral carina, narrow posteriorly but with lateral ridges separated, without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia shorter than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia or with three spines. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of
hind wing nebulosus. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black except as follows: palpi yellow. T1–3 red-brown. Foreleg tarsomeres 1–3 yellow. Forewing infumate except for a hyaline transverse band that starts at anteriad 2nd submarginal extending a bit further stigma apex. Hind wing infumate.

**Variation**

This species shows ample morphological variation. The medial ridge or convexity of the face can be present or absent. The species has two types of sculpturations in the propodeum; the first type has both a definite deltoid anterior median areola and other common carinae; the other type of sculpturation has very irregular ridges all over the propodeum. The sculpturations of the juxtacoxal area may vary in strength. The base of the mesopleural furrow may be either strongly crenated or smooth but in both cases it is deep. The body coloration varies from mostly black to almost completely orange. The wing coloration also varies from the common pattern hyaline with two transverse infumated bands, to completely infumated.

**Diagnosis and similar species**

Although this species was originally described as *Bioria*, it clearly fits into the *Hemichoma* concept. *H. atrata* can be distinguished from the other species by the combination of the following characteristics: epicnemial carina with strong crenulation; external surface of the posterior ocelli without a depression; anteromedial areola of propodeum irregular or deltoid.

*H. atrata* is similar to *H. pseudoatrata* but these can be distinguished by the acute basal tooth of the tarsal claws in the latter.

**Geographic distribution and elevation range:** Mexico, Costa Rica, Trinidad, Colombia, Venezuela, Peru. 90-1200m.

**Material examined**

- 1 ♀ Maracas V, Trinidad BWI oct. 14 1953, Collector F. J. Simmonds / Homotype *Biroia atrata* Enderlein Compared by Sharkey / 1 M. J. Sharkey 19 / CNCI.

**MEXICO:** 1♀, St. Lucrecia, Tehuantepec, Mexico / april / W M Mann collector / USNM.

**COSTA RICA:** 1 ♂, S. Rosa Park, Guan. C. Rica, 22 jul 78, D. H. Janzen, Dry Hill / AEIC. 1 ♀, COSTA RICA,
Prov. Limón, Central, Res. Biológica Hitoy Cerere, Send. Bobócara 340m, 6-18 ABR 1999 F. Umaña
Biology

Daniel Janzen’s project on the Lepidoptera of the Area of Conservation of Guanacaste have recorded several hosts for this species: *Halisisota donahuei* (Arctiidae, Arctiinae) feeding on *Bernardia nicaraguensis* (Euphorbiaceae), *Halisisota orientalis* (Arctiidae, Arctiinae) feeding on *Trema micrantha* (Ulmaceae), *Halysidota underwoodi* feeding on *Trema micrantha* (Ulmaceae), *Opharus consimilis* (Arctiidae, Arctiinae) feeding on *Urera elata* (Urticaceae), *Pachydota saduca* (Arctiidae) feeding on *Licaria* sp. (Lauraceae), *Pachydota saduca* (Arctiidae) feeding on *Ocotea paulii* (Lauraceae). In all cases one wasp emerged from the cocoon or from the prepupa instar of the moth. The wasp cocoons are either white or black and are spun inside of the dirty gray arcticid cocoon. The species has been found in dry environments of (Costa Rica)

*Hemichoma pulchrum* (Szépligeti, 1904)


The type of this species was not examined and no specimen examined fits the original description.

Copyright © Carlos Eduardo Sarmiento-Monroy 2006
Chapter 4. Revision of the species of Zelomorpha Ashmead, 1900


4. 1. Diagnosis

Zelomorpha can be distinguished from the other Disophrini genera by the following set of characters: lateral carina of frons as a continuous ridge; apical antennal antennomere acute; anteromedial area of gena without prominent peaks, uniformly developed; foretibial spurs short; ovipositor short and ventrally curved; carina of hind trochantellus present; serrate ridge of setae in hind basitarsomeres; tarsal caws cleft.

4. 2. Description

Head: Eyes either reaching or not the ventral border of tentorial pits; lateral carina of frons and interantennal carina strongly developed; posterioventral area of gena either reduced or strongly developed; apical antennal antennomere acute. Mesosoma and metasoma: Mesoscutum with or without notauli; epicnemial carina complete; sternaulus present and carenate or entirely absent; posterior margin of mesopleuron with or without transverse carinae; juxtacoxal flange variable; scutellar disk either rounded or three-sided; propodeal ridges present or entirely absent; ovipositor short and ventrally curved. Legs: carina of hind trochantellus present; serrate ridge of setae in hind basitarsomeres; tarsal caws cleft.

In addition to the 29 species described by previous authors 74 new species were described. All species are fully redescribed. Both species descriptions and key to the species of Zelomorpha were developed following the same protocols described above for the genus Hemichoma, in chapter 4, thus, details are referred there.

4. 3. Key to the species of Zelomorpha

1. FW entirely hyaline .................................................................................................................. 2
   FW hyaline with infumate transverse medial band ...... Zelomorpha anchicayensis n. sp.
   FW hyaline with infumate apical band.......................................................... 7
   FW hyaline with infumate stigmatic area and costal border ................................. 9
   FW hyaline with two transverse infumate bands.............................................. 12
   FW hyaline with three transverse infumate bands............................................. 62
FW hyaline, black pterostigma, yellow stigma, and infuscate apical band posteriad stigma apex

........................................................................................................... Zelomorpha boliviensis n. sp.

FW infumate with transverse hyaline band or semicircular spot................................. 63
FW infumate with hyaline apex................................................................................... 69
FW infumate with stigmal area hyaline....................................................................... 70
FW entirely infumate.................................................................................................... 78
FW infumate with two transverse hyaline bands.........................................................
........................................................................................................... Zelomorpha dubiosus (Szépligeti, 1908)

2(1). Gena in lateral view uniform width along its length (eyes appear large) (Fig. 18B); dorsal apex of metepisternum with two subparallel carinae; forewing 3RSa present, at least weakly 3
Gena in lateral view wider ventrally than dorsally (eyes appear small) (Fig. 18D); dorsal apex of metepisternum with one carina; forewing 3RSa absent ............................................. 6

3(2). Anteromedial areola triangular (Fig. 47E), or pentagonal but with sinuated lateral ridges
........................................................................................................... Zelomorpha arizonensis Ashmead, 1900
Anteromedial areola lanceolate or pentagonal, with lateral ridges strong, longer than anterior ridges .......................................................................................... Zelomorpha lenisterna n. sp.
Anteromedial areola pentagonal, very thin, anterior ridges shorter than lateral ridges (Fig. 46A)
........................................................................................................... Zelomorpha acuta n. sp.
Anteromedial areola acute triangle................................................................................ 4
Anteromedial areola campanulate .............................................................................. 5

4(3). Suture between metepisternum and metepimeron with transverse carinae restricted to suture width (Fig. 32E); face with regular fovea present medially only; lateral carina of frons fused posteriorly with interantennal carina forming a circular ridge; frontal depression entirely smooth; posteroventral area of gena with rugae restricted to area immediately basad eye
........................................................................................................... Zelomorpha arizonensis Ashmead, 1900
Suture between metepisternum and metepimeron with transverse carinae extending posteriorly at least half width of suture; face with irregular fovea evenly distributed; lateral carina of frons separated posteriorly from interantennal carina; frontal depression rugous; posteroventral area of gena with irregular rugae evenly distributed.............. Zelomorpha oxybela n. sp.

5(3). Face with regular fovea dense medially and sparse laterally; lateral carina of frons separated posteriorly from interantennal carina; posteroventral area of gena with parallel rugae reaching

65
Zelomorpha lenisterna n. sp.

Face with regular fovea present medially only; lateral carina of frons fused posteriorly with interantennal carina forming a circular ridge; posteroventral area of gena with rugae restricted to area immediately basad eye; face mediad longitudinal striations absent; face medial transverse striations absent

Zelomorpha arizonensis Ashmead, 1900

Ventral border of eyes reaching ventral border of tentorial pits; scutellar disk three-sided, without lateral carinae; transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus; posteromedian areola incomplete; face mediad longitudinal striations present

Zelomorpha colossa n. sp.

Ventral border of eyes not reaching ventral border of tentorial pits; scutellar disk rounded; transverse groove of scutellar disk deep, with crenulae extending anteriorly reaching midway to scutellar sulcus; posteromedian areola complete, defined by distinct lateral carina; face mediad longitudinal striations absent

Zelomorpha dengoii n. sp.

Carina of hind trochantellus weakly indicated (the trochantellus has a flat area); head black with yellow or dark-yellow palpi and labrum; depression laterad lateral ocellus present; posteroventral area of gena depression dorsad flange absent; posteroventral area of gena smooth

Zelomorpha scitula n. sp.

Carina of hind trochantellus present and well developed; head black dorsally, transitioning to yellow; depression laterad lateral ocellus absent; posteroventral area of gena depression dorsad flange present; posteroventral area of gena with a few subparallel rugae dorsad genal flange

Zelomorpha rugosa n. sp.

Length of T1 median tergite more than two times its posterior width; scutellar disk three-sided, without lateral carinae; notaulus indicated by weak depressions; propodeum with several strong areolae; posteroventral margin of gena evenly rounded and flanged

Zelomorpha similis (Szépligeti, 1908)

Gena in lateral view uniform width along its length (eyes appear large); penultimate labial palpmere less than 25% shorter than apical palpmere
Zelomorpha angelica n. sp.
Gena in lateral view wider ventrally than dorsally (eyes appear small); penultimate labial palpomere subequal in length to apical palpomere.

10(9). Carina of hind trochantellus weakly indicated (the trochantellus has a flat area); posteromedian areola fused with posterolateral areola; lateral carina of frons separated posteriorly from interantennal carina; frontal depression entirely smooth; posteroventral area of gena depression dorsad flange absent.

10(10). Carina of hind trochantellus present and well developed; posteromedian areola complete, defined by weak lateral carina; lateral carina of frons fused posteriorly with interantennal carina forming a circular ridge; frontal depression with a few circular rugae; posteroventral area of gena depression dorsad flange present.

Zelomorpha janzeni n. sp.

11(10). Length of T1 median tergite more than two times its posterior width; HW hyaline with two transverse infumate bands; scutellar disk rounded; notaulus strong; posteroventral margin of gena strongly flanged.

11(11). Length of T1 median tergite less than 1.5 times its posterior width; HW hyaline with distal area infumate; scutellar disk three-sided, without lateral carinae; notaulus absent; posteroventral margin of gena evenly rounded and flanged.

Zelomorpha metahirsuta n. sp.

Zelomorpha vesmaeli (Spinola, 1840)

12(1). HW entirely hyaline.

12(2). HW entirely infumate.

12(3). HW infumate with a semicircular medial hyaline area.

12(4). HW hyaline with two transverse infumate bands.

12(5). HW hyaline with distal area infumate.

12(6). HW hyaline with median infumate band.

13(12). Head entirely yellow-orange.

13(13). Head black dorsally, transitioning to yellow.

13(14). Head black with yellow or dark-yellow palpi and labrum.

13(15). Head black with yellow mouthparts part of clypeus and gena.

Zelomorpha annulifovea (Enderlein, 1920)

Zelomorpha akidna n. sp.

Zelomorpha coxatus (Holmgren, 1868)
14(13). Gena in lateral view uniform width along its length (eyes appear large); length of T1 median tergite more than two times its posterior width; ventral border of eyes reaching ventral border of tentorial pits; notaulus strong; posteroventral margin of gena evenly rounded and flanged  ................................................................. Zelomorpha peronatus (Cameron, 1887)

Gena in lateral view wider ventrally than dorsally (eyes appear small); length of T1 median tergite less than 1.5 times its posterior width; ventral border of eyes not reaching ventral border of tentorial pits; notaulus indicated by weak depressions; posteroventral margin of gena strongly flanged  ................................................................. Zelomorpha eurytera n. sp.

15(13). Carina of hind trochantellus weakly indicated (the trochantellus has a flat area); T1 with a anteromedian round bulge clearly separated from lateral tergite border .......... 16

Carina of hind trochantellus present and well developed; T1 smooth anteriorly .......... 18

16(15). Notaulus absent; suture between metepisternum and metepimeron incomplete, without transverse carinae (Fig. 44D); eyes emarginate; posteroventral area of gena convex ..........................  

................................................................. Zelomorpha trailii (Cameron, 1905)

Notaulus indicated by weak depressions; suture between metepisternum and metepimeron complete and deep, with transverse carinae restricted to suture width (Fig. 44G); eyes non emarginate; posteroventral area of gena concave ....................................................... 17

17(16). Penultimate labial palpomere subequal in length to apical palpomere; transverse groove of scutellar disk indicated by a wide depression with some faint crenulae; posteromedian areola fused with posterolateral areola; face with regular fovea present medially only; face with punctures sparsely distributed laterally ............................. Zelomorpha melina n. sp.

Penultimate labial palpomere less than 25% shorter than apical palpomere; transverse groove of scutellar disk weak and with irregular crenulae; posteromedian areola absent; face with regular fovea evenly distributed leaving flat areas between them; face with punctures evenly distributed except a wide area between tentorial pits ... Zelomorpha variegatus (Szépligeti, 1908)

18(15). Ventral border of eyes reaching ventral border of tentorial pits (Figs. 20A, 20C); posteroventral area of gena with irregular rugae evenly distributed; forewing 3RSa present, at least weakly; distance between antennal insertions distinctly longer than their diameters; longitudinal apical crest of median metanotal areola strongly developed, separated from lateral ridges ......  

................................................................. Zelomorpha katatonus n. sp.
Ventral border of eyes not reaching ventral border of tentorial pits (Figs. 20K, 20O);
posteroventral area of gena smooth; forewing 3RSa absent; distance between antennal
insertions subequal to their diameters; longitudinal apical crest of median metanotal areola
fused apically with lateral ridges................................................................. 19

19(18). Mesosoma entirely yellow or orange; scutellar disk rounded; notaulus indicated by weak
depressions; suture between metepisternum and metepimeron complete and deep;
posteromedian areola incomplete .......................................................... Zelomorpha euryterga n. sp.
Mesosoma with areas black or brown and yellow or orange; scutellar disk three-sided, without
lateral carinae; notaulus absent; suture between metepisternum and metepimeron incomplete;
posteromedian areola fused with posterolateral areola................................................. Zelomorpha areolaris (Szépligeti, 1908)

20(12). Carina of hind trochantellus weakly indicated (the trochantellus has a flat area); posteroventral
area of gena smooth; face lacking striations; face mediad longitudinal striations absent; face
with regular fovea evenly distributed leaving flat areas between them...................... 21
Carina of hind trochantellus present and well developed; posteroventral area of gena with
irregular rugae evenly distributed; face with striations; face mediad longitudinal striations
present; face with regular fovea present medially only .... Zelomorpha crowdusi n. sp.

21(20). Length of T1 median tergite more than two times its posterior width; propodeum with several
strong areolae; posteroventral margin of gena evenly rounded and flanged; suture between
metepisternum and metepimeron complete and deep; suture between metepisternum and
metepimeron with transverse carinae restricted to suture width..............................
........................................................................................................ Zelomorpha amoena (Brullé, 1846)
Length of T1 median tergite less than 1.5 times its posterior width; propodeum without areolae,
smooth; posteroventral margin of gena strongly flanged; suture between metepisternum and
metepimeron incomplete; suture between metepisternum and metepimeron without transverse
carinae .................................................................................................................. 22

22(21). Scutellar disk rounded; eyes emarginate; distance between antennal insertions subequal to their
diameters; posteroventral area of gena depression dorsad flange absent; posterior border of
mesoscutal sulcus non carinate, gently sloped .................................................. Zelomorpha similis (Szépligeti, 1908)
Scutellar disk three-sided, without lateral carinae; eyes non emarginate; distance between antennal insertions distinctly shorter than their diameters; posteroventral area of gena depression dorsad flange present; posterior border of mesoscutal sulcus high, carinate, with a strong slope

......................................................................................... Zelomorpha hospitator (Fabricius, 1793)

23(12). Head entirely yellow-orange............................ Zelomorpha melanota (Viereck, 1912)
Head yellow with dark testaceous vertex ................................................................. 24
Head black dorsally, transitioning to yellow ......................................................... 26
Head black with yellow or dark-yellow palpi and labrum....................................... 27
Head black with yellow mouthparts part of clypeus and gena ............................ 44

24(23). Ventral border of eyes reaching ventral border of tentorial pits; eyes not converging ventrally; posteromedian areola without transverse ridge ......................................................... 25
Ventral border of eyes not reaching ventral border of tentorial pits; eyes converging ventrally; posteromedian areola with a straight transverse ridge................................................................. Zelomorpha mexicana n. sp.

25(24). Anteromedial areola pentagonal, with lateral ridges strong, shorter than anterior ridges; penultimate labial palpomere about half length of apical palpomere; transverse groove of scutellar disk deep, wide, with a median crenula; distance between antennal insertions distinctly longer than their diameters; posteroventral area of gena concave................................. Zelomorpha rugocapitis n. sp.
Anteromedial areola pentagonal, with lateral ridges strong, longer than anterior ridges; penultimate labial palpomere less than 25% shorter than apical palpomere; transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus; distance between antennal insertions subequal to their diameters; posteroventral area of gena convex ................................................................. Zelomorpha concinna (Brullé, 1846)

26(23). Anteromedial areola triangular ...................... Zelomorpha cucullifera (Enderlein, 1920)
Anteromedial areola campanulate or pentagonal, with lateral ridges strong, longer than anterior ridges ................................................................. Zelomorpha nigriceps (Cameron, 1911)

27(23). Carina of hind trochantellus weakly indicated (the trochantellus has a flat area) ........ 28
Carina of hind trochantellus present and well developed......................................... 35

28(27). Length of T1 median tergite more than two times its posterior width.................... 29
Length of T1 median tergite less than 1.5 times its posterior width................................. 30

29(28). Mesosoma entirely yellow or orange; anteromedial areola acuminate; suture between metepisternum and metepimeron complete and deep; eyes non emarginate; distance between antennal insertions subeual to their diameters.............. Zelomorpha fuscurhetha n. sp.
Mesosoma with areas black or brown and yellow or orange; anteromedial areola cuspitate; suture between metepisternum and metepimeron complete and shallow; eyes emarginate; distance between antennal insertions distinctly longer than their diameters................................. Zelomorpha adynata n. sp.

30(28). Mesosoma entirely yellow or orange; forewing RS2a longer than r-m.............................
..............................................................................................................Zelomorpha peruensis (Szépligeti, 1902)
Mesosoma with areas black or brown and yellow or orange; forewing RS2a shorter than r-m 31

31(30). Scutellar disk rounded; posteroventral margin of gena strongly flanged; T1 with a anteromedian round bulge clearly separated from lateral tergite border................................. 32
Scutellar disk three-sided, without lateral carinae; posteroventral margin of gena evenly rounded and flanged; T1 smooth anteriorly................................. Zelomorpha octava n. sp.

32(31). Propodeum without areolae, smooth .............................................................................. 33
Propodeum with a few isolated ridges......................... Zelomorpha interstitium n. sp.
Propodeum with a few open areolae................................................................. 34
Propodeum with several strong areolae......................... Zelomorpha cracens n. sp.

33(32). Notaulus absent; suture between metepisternum and metepimeron incomplete, without transverse carinae; transverse groove of scutellar disk absent; face with punctures sparsely distributed laterally ................................................................. Zelomorpha querubina n. sp.
Notaulus indicated by weak depressions; suture between metepisternum and metepimeron complete and deep, with transverse carinae restricted to suture width; transverse groove of scutellar disk weak and with irregular crenulae; face with punctures evenly distributed except a wide area between tentorial pits .............................................................................. Zelomorpha variegatus (Szépligeti, 1908)
34(32). Transverse groove of scutellar disk indicated by a wide depression with some faint crenulae; posteropleural areola open anteriorly .................................................. *Zelomorpha melina* n. sp.

Transverse groove of scutellar disk weak and with irregular crenulae; posteropleural areola absent .......................................................... *Zelomorpha variegatus* (Szépligeti, 1908)

Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus; posteropleural areola closed ........................................... *Zelomorpha transversa* n. sp.

35(27). Ventral border of eyes reaching ventral border of tentorial pits........................................ 36

Ventral border of eyes not reaching ventral border of tentorial pits........................................ 40

36(35). Mesosoma entirely yellow or orange.............................................................................. 37

Mesosoma with areas black or brown and yellow or orange................................................. 39

37(36). Anteromedial areola pentagonal, with lateral ridges strong, shorter than anterior ridges; face with punctures densely distributed medially ........................................... *Zelomorpha miza* n. sp.

Anteromedial areola pentagonal, with lateral ridges strong, longer than anterior ridges; face with punctures evenly distributed............................... *Zelomorpha concinna* (Brullé, 1846)

Anteromedial areola ensiform; face with punctures evenly distributed except a wide area between tentorial pits................................................................. 38

38(37). Lateral carina of frons separated posteriorly from interantennal carina; depression laterad lateral ocellus present; posteroventral area of gena depression dorsad flange present; mesopleuron with small punctures evenly distributed; suture between metepisternum and metepimeron without acute angles at anterior or posterior borders........................................... *Zelomorpha petila* n. sp.

Lateral carina of frons fused posteriorly with interantennal carina forming a circular ridge; depression laterad lateral ocellus absent; posteroventral area of gena depression dorsad flange absent; mesopleuron punctate but lacking punctures medially; suture between metepisternum and metepimeron with acute angle at anterior border . *Zelomorpha pseudobaios* n. sp.

39(36). Length of T1 median tergite more than two times its posterior width; anteromedial areola pentagonal, very thin, anterior ridges shorter than lateral ridges; posteroventral margin of gena strongly flanged; penultimate labial palpmere subequal in length to apical palpmere; posteromedian areola complete, defined by distinct lateral carina..........................................

................................................................. .......................... *Zelomorpha lineata* n. sp.
Length of T1 median tergite less than 1.5 times its posterior width; anteromedial areola campanulate; posteroventral margin of gena evenly rounded and flanged; penultimate labial palpomere less than 25% shorter than apical palpomere; posteromedian areola incomplete .............................. Zelomorpha eurugosa n. sp.

40(35). Gena in lateral view uniform width along its length (eyes appear large); posterolateral margin of pronotum with a strong set of irregular fovea at mid height .................................
............................ Zelomorpha puncturata n. sp.
Gena in lateral view wider ventrally than dorsally (eyes appear small); posterolateral margin of pronotum smooth................................................................. 41

41(40). Length of T1 median tergite more than two times its posterior width; mesosoma entirely yellow or orange; lateral carina of frons fused posteriorly with interantennal carina forming a circular ridge; mesopleuron with small punctures evenly distributed; suture between metepisternum and metepimeron with both anterior and posterior borders with acute angle ........................
.............................. Zelomorpha rarolopha n. sp.
Length of T1 median tergite less than 1.5 times its posterior width; mesosoma with areas black or brown and yellow or orange; lateral carina of frons separated posteriorly from interantennal carina; mesopleuron punctate but lacking punctures medially; suture between metepisternum and metepimeron without acute angles at anterior or posterior borders......................... 42

42(41). Propodeum without areolae, smooth; suture between metepisternum and metepimeron incomplete; forewing RS2a longer than r-m ........................................... Zelomorpha fernandezi n. sp.
Propodeum with a few open areolae; suture between metepisternum and metepimeron complete and shallow; forewing RS2a subequal to r-m................... Zelomorpha schunkei n. sp.
Propodeum with several strong areolae; suture between metepisternum and metepimeron complete and deep; forewing RS2a shorter than r-m ............................................. 43

43(42). Anteromedial areola triangular or pentagonal, with lateral ridges strong, shorter than anterior ridges ...................................................................... Zelomorpha platamon n. sp.
Anteromedial areola pentagonal, with lateral ridges strong, longer than anterior ridges ....
................................................................. Zelomorpha nigrobalteata (Cameron, 1911)
44(23). Length of T1 median tergite more than two times its posterior width; notaules strong; anteromedial areola acuminate; posteroventral margin of gena evenly rounded and flanged; penultimate labial palpomere about half length of apical palpomere.............................
................................................................................................. Zelomorpha coxalicus (Cameron 1887)
Length of T1 median tergite less than 1.5 times its posterior width; notaules indicated by weak depressions; anteromedial areola triangular; posteroventral margin of gena strongly flanged; penultimate labial palpomere subequal in length to apical palpomere..........................
................................................................................................. Zelomorpha nigricoxa (Enderlein, 1920)

45(12). Carina of hind trochantellus weakly indicated (the trochantellus has a flat area) ....... 46
Carina of hind trochantellus present and well developed ................................................. 58

46(45). Ventral border of eyes reaching ventral border of tentorial pits; gena in lateral view uniform width along its length (eyes appear large)............................ Zelomorpha mariae n. sp.
Ventral border of eyes not reaching ventral border of tentorial pits; gena in lateral view wider ventrally than dorsally (eyes appear small)......................................................... 47

47(46). Mesosoma entirely yellow or orange................................................................. 48
Mesosoma entirely brown or black................................................................................. 50
Mesosoma with areas black or brown and yellow or orange......................................... 51

48(47). Scutellar disk rounded; notaules indicated by weak depressions; face with regular fovea present medially only; depression laterad lateral ocellus absent; posteroventral area of gena convex
.............................................................................................................. Zelomorpha martahernandezae n. sp.
Scutellar disk three-sided, without lateral carinae; notaules absent; face with regular fovea evenly distributed leaving flat areas between them; depression laterad lateral ocellus present;
posteroventral area of gena concave................................................................................. 49

49(48). Posteroventral margin of gena evenly rounded and flanged; suture between metepisternum and metepimeron complete and deep, with transverse carinae restricted to suture width; penultimate labial palpomere subequal in length to apical palpomere; posteromedian areola fused with posterolateral areola......................................................... Zelomorpha vesmaeli (Spinola, 1840)
Posteroventral margin of gena strongly flanged; suture between metepisternum and metepimeron incomplete, without transverse carinae; penultimate labial palpomere less than 25% shorter than apical palpomere; posteromedian areola absent ..........................................................
50(47). Scutellar disk rounded; posteroventral margin of gena strongly flanged; suture between metepisternum and metepimeron incomplete, without transverse carinae; penultimate labial palpomere less than 25% shorter than apical palpomere.............................. Zelomorpha similis (Szépligeti, 1908)

Scutellar disk three-sided, without lateral carinae; posteroventral margin of gena evenly rounded and flanged; suture between metepisternum and metepimeron complete and deep, with transverse carinae restricted to suture width; penultimate labial palpomere subequal in length to apical palpomere.............................. Zelomorpha vesmaeli (Spinola, 1840)

51(47). Scutellar disk rounded .................................................................................................... 52

Scutellar disk three-sided, without lateral carinae ..................................................................... 54

Scutellar disk three-sided, without lateral carina, and wider than long.................................

.................................................................Zelomorpha sharkeyi n. sp.

52(51). Propodeum without areolae, smooth; lateral carina of frons composed of a strong continuous ridge

53

Propodeum with a few isolated ridges; lateral carina of frons barely indicated by a continuous ridge.............................................................. Zelomorpha compta n. sp.

Propodeum with a few open areolae; lateral carina of frons composed of rugae and fovea

.................................................................Zelomorpha melina n. sp.

53(52). Notaulus absent; suture between metepisternum and metepimeron incomplete, without transverse carinae; face with regular fovea evenly distributed leaving flat areas between them; face with punctures evenly distributed except a wide area between tentorial pits.................................

.................................................................Zelomorpha similis (Szépligeti, 1908)

Notaulus indicated by weak depressions; suture between metepisternum and metepimeron complete and deep, with transverse carinae restricted to suture width; face with regular fovea present medially only; face with punctures sparsely distributed laterally.........................

.................................................................Zelomorpha martahernandezae n. sp.

54(51). Length of T1 median tergite more than two times its posterior width..............................

................................................................. Zelomorpha amoena (Brullé, 1846)

Length of T1 median tergite less than 1.5 times its posterior width................................. 55
55(54). Propodeum without areolae, smooth .............. *Zelomorpha hospitator* (Fabricius, 1793)

Propodeum with a few open areolae................................. *Zelomorpha sharkeyi* n. sp.

Propodeum with several strong areolae ......................................................... 56

56(55). Penultimate labial palpomere subequal in length to apical palpomere; lateral carina of frons separated posteriorly from interantennal carina; mesopleuron punctate but lacking punctures medially; suture between metepisternum and metepimeron without acute angles at anterior or posterior borders; sides of median areola of metanotum almost vertical to scutellum border

Penultimate labial palpomere about half length of apical palpomere; lateral carina of frons fused posteriorly with interantennal carina forming a circular ridge; mesopleuron with small punctures evenly distributed; suture between metepisternum and metepimeron with acute angle at posterior border; sides of median areola of metanotum strongly diagonal to scutellum border, as a triangle with a wide base ................................. *Zelomorpha akrolophos* n. sp.

57(56). Distance between antennal insertions subequal to their diameters; posteroventral area of gena depression dorsad flange present; dorsal apex of metepisternum with one carina; face with punctures evenly distributed except a wide area between tentorial pits; forewing RS2a shorter than r-m ................................................................. *Zelomorpha panopa* n. sp.

Distance between antennal insertions distinctly longer than their diameters; posteroventral area of gena depression dorsad flange absent; dorsal apex of metepisternum without carina; face with punctures more sparsely distributed around the clypeus; forewing RS2a longer than r-m ................................................................. *Zelomorpha tropicola* (Szépligeti, 1908)

57(56). Distance between antennal insertions subequal to their diameters; posteroventral area of gena depression dorsad flange present; dorsal apex of metepisternum with one carina; face with punctures evenly distributed except a wide area between tentorial pits; forewing RS2a shorter than r-m ................................................................. *Zelomorpha panopa* n. sp.

Distance between antennal insertions distinctly longer than their diameters; posteroventral area of gena depression dorsad flange absent; dorsal apex of metepisternum without carina; face with punctures more sparsely distributed around the clypeus; forewing RS2a longer than r-m ................................................................. *Zelomorpha tropicola* (Szépligeti, 1908)

58(45). Mesosoma entirely yellow or orange............................................................. 59

Mesosoma entirely brown or black...................................... *Zelomorpha crowdusi* n. sp.

Mesosoma with areas black or brown and yellow or orange............................... 60

59(58). Ventral border of eyes reaching ventral border of tentorial pits; gena in lateral view uniform width along its length (eyes appear large); length of T1 median tergite more than two times its posterior width; notaulus strong; propodeum with several strong areolae ......................

................................................................. *Zelomorpha panopa* n. sp.

Ventral border of eyes not reaching ventral border of tentorial pits; gena in lateral view wider ventrally than dorsally (eyes appear small); length of T1 median tergite less than 1.5 times its

76
posterior width; notaulus indicated by weak depressions; propodeum with a few open areolae

................................................................. *Zelomorpha deulufeuti* n. sp.

60(58). Scutellar disk rounded; posteroventral margin of gena with a strong posteroventral projection composed by a subquadrature concave area; transverse groove of scutellar disk deep, without crenulae; posteromedian areola absent; posteroventral area of gena with rugae restricted to area immediately basad eye................................................................. *Zelomorpha jordii* n. sp.

Scutellar disk three-sided, without lateral carinae; posteroventral margin of gena evenly rounded and flanged; transverse groove of scutellar disk absent; posteromedian areola fused with posterolateral areola; posteroventral area of gena with irregular rugae evenly distributed ................................................................. *Zelomorpha salvadorensis* n. sp.

Scutellar disk three-sided, without lateral carina, and wider than long; posteroventral margin of gena strongly flanged; transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus; posteromedian areola complete, defined by distinct lateral carina; posteroventral area of gena smooth ............. *Zelomorpha hallwachsae* n. sp.

61(12). Head entirely yellow-orange; mesosoma entirely yellow or orange; anteromedial areola acuminate; posteroventral margin of gena evenly rounded and flanged; transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus ........

......................................................... *Zelomorpha elegans* (Brullé, 1846)

Head black with yellow or dark-yellow palpi and labrum; mesosoma with areas black or brown and yellow or orange; anteromedial areola campanulate; posteroventral margin of gena strongly flanged; transverse groove of scutellar disk deep, without crenulae ........................................

............................................................ *Zelomorpha melanostoma* (Cameron, 1887)

62(1). HW hyaline with two transverse infumate bands; length of T1 median tergite more than two times its posterior width; notaulus strong; propodeum with several strong areolae; penultimate labial palpomere subequal in length to apical palpomere........................................... *Zelomorpha baios* n. sp.

HW hyaline with three transverse bands; length of T1 median tergite less than 1.5 times its posterior width; notaulus indicated by weak depressions; propodeum with a few isolated ridges; penultimate labial palpomere less than 25% shorter than apical palpomere .................

................................................................. *Zelomorpha tingomarianensis* n. sp.

63(1). HW entirely hyaline.......................................................... *Zelomorpha emissaria* n. sp.
HW infumate with a semicircular medial hyaline area........... *Zelomorpha akinda* n. sp.
HW hyaline with distal area infumate ................................. *Zelomorpha ocellata* n. sp.
HW hyaline with median infumate band............... *Zelomorpha elegans* (Brullé, 1846)
HW entirely infumate ........................................................................ 64
HW hyaline with two transverse infumate bands ................................................. 68

64(63). Mesosoma entirely yellow or orange................................................................. 65
   Mesosoma entirely brown or black........................... *Zelomorpha araguaensis* n. sp.
   Mesosoma with areas black or brown and yellow or orange.............................. 67

65(64). Ventral border of eyes reaching ventral border of tentorial pits; gena in lateral view uniform width along its length (eyes appear large); length of T1 median tergite less than 1.5 times its posterior width; face with both regular and irregular fovea no leaving flat areas between them; lateral carina of frons fused posteriorly with interantennal carina forming a circular ridge ....
........................................................................... *Zelomorpha anator* (Fabricius, 1804)
   Ventral border of eyes not reaching ventral border of tentorial pits; gena in lateral view wider ventrally than dorsally (eyes appear small); length of T1 median tergite more than two times its posterior width; face with regular fovea evenly distributed leaving flat areas between them; lateral carina of frons separated posteriorly from interantennal carina ................. 66

66(65). Carina of hind trochantellus weakly indicated (the trochantellus has a flat area); head black with yellow or dark-yellow palpi and labrum; scutellar disk three-sided, without lateral carina, and wider than long; notaulus absent; anteromedial areola pentagonal, with lateral ridges strong, longer than anterior ridges............................. *Zelomorpha obscura* n. sp.
   Carina of hind trochantellus present and well developed; head entirely yellow-orange; scutellar disk rounded; notaulus strong; anteromedial areola pentagonal, with lateral ridges strong, as long as anterior ridges ............................................. *Zelomorpha ocellata* n. sp.

67(64). Carina of hind trochantellus weakly indicated (the trochantellus has a flat area); scutellar disk rounded; anteromedial areola pentagonal, with lateral ridges strong, shorter than anterior ridges; penultimate labial palpomere less than 25% shorter than apical palpomere; transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus ........
......................................................................................... *Zelomorpha ariasae* n. sp.
   Carina of hind trochantellus present and well developed; scutellar disk three-sided, without lateral carinae; anteromedial areola pentagonal, with double carina in several parts; penultimate labial
palpomere subequal in length to apical palpomere; transverse groove of scutellar disk absent

........................................................................................................... 
Zelomorpha pentagonalis n. sp.

68(63). Length of T1 median tergite more than two times its posterior width; head black with yellow or
dark-yellow palpi and labrum; mesosoma with areas black or brown and yellow or orange;
notaulus indicated by weak depressions; suture between metepisternum and metepimeron with
transverse carinae extending posteriorly at least half width of suture Zelomorpha kolapta n. sp.
Length of T1 median tergite less than 1.5 times its posterior width; head entirely yellow-orange;
mesosoma entirely yellow or orange; notaulus strong; suture between metepisternum and
metepimeron with transverse carinae restricted to suture width.................................
........................................................................................................... 
Zelomorpha cuyaguana n. sp.

69(1). Length of T1 median tergite more than two times its posterior width; head entirely yellow-orange;
mesosoma entirely yellow or orange; scutellar disk rounded; notaulus strong ............
........................................................................................................... 
Zelomorpha dengoii n. sp.
Length of T1 median tergite less than 1.5 times its posterior width; head black with yellow or
dark-yellow palpi and labrum; mesosoma entirely brown or black; scutellar disk three-sided,
without lateral carinae; notaulus absent.............................. Zelomorpha pitzi n. sp.

70(1). Head entirely yellow-orange.............................................. 
Zelomorpha bicarinata n. sp.
Head entirely black or brown ................................................................. 71
Head black with yellow or dark-yellow palpi and labrum.............................. 73

71(70). Carina of hind trochantellus weakly indicated (the trochantellus has a flat area); eyes non
emarginate; eyes not converging ventrally; lateral carina of frons separated posteriorly from
interantennal carina; frontal depression entirely smooth................................. 72
Carina of hind trochantellus present and well developed; eyes emarginate; eyes converging
ventrally; lateral carina of frons fused posteriorly with interantennal carina forming a circular
ridge; frontal depression with a few circular rugae ............ Zelomorpha prudens n. sp.

72(71). Mesosoma entirely brown or black; scutellar disk rounded; notaulus indicated by weak
depressions; propodeum with several strong areolae; suture between metepisternum and
metepimeron complete and deep .......... Zelomorpha xanthostigma (Szépligeti, 1902)
Mesosoma with areas black or brown and yellow or orange; scutellar disk three-sided, without
lateral carinae; notaulus absent; propodeum without areolae, smooth; suture between
metepisternum and metepimeron incomplete..........................................................
73(70). Length of T1 median tergite more than two times its posterior width; sides of median areola of metanotum strongly diagonal to scutellum border, as a triangle with a wide base .... 74
Length of T1 median tergite less than 1.5 times its posterior width; sides of median areola of metanotum almost vertical to scutellum border.......................................................... 75

74(73). Scutellar disk three-sided, without lateral carinae; anteromedial areola acuminate (Fig. 46C, 51H); posteroventral margin of gena evenly rounded and flanged; penultimate labial palpmere subequal in length to apical palpmere; transverse groove of scutellar disk weak, indicated by an irregular protuberance........................................... Zelomorpha amoena (Brullé, 1846)
Scutellar disk three-sided, without lateral carina, and wider than long; anteromedial areola acuminate, barely indicated by weak lateral carina; posteroventral margin of gena strongly flanged; penultimate labial palpmere about half length of apical palpmere; transverse groove of scutellar disk indicated by a row of parallel crenulations ...........................................
.............................................................................................. Zelomorpha pallida n. sp.

75(73). Carina of hind trochantellus weakly indicated (the trochantellus has a flat area); scutellar disk three-sided, without lateral carinae; eyes not converging ventrally; lateral carina of frons separated posteriorly from interantennal carina; frontal depression entirely smooth. 76
Carina of hind trochantellus present and well developed; scutellar disk rounded; eyes converging ventrally; lateral carina of frons fused posteriorly with interantennal carina forming a circular ridge; frontal depression with a few circular rugae ......... Zelomorpha crowdusi n. sp.

76(75). Mesosoma entirely brown or black or entirely yellow or orange ................................................
.................................................................................................................. Zelomorpha vesmaeli (Spinola, 1840)
Mesosoma with areas black-brown and yellow-orange.................................................. 77

77(76). Face with regular fovea evenly distributed leaving flat areas between them; face with punctures evenly distributed except a wide area between tentorial pits; distance between anteninal insertions distinctly shorter than their diameters; posterior border of mesoscutal sulcus high, carinate, with a strong slope; posterior orbit of eye not bordered by groove ..............
.................................................................................................................. Zelomorpha hospitator (Fabricius, 1793)
Face with regular fovea present medially only; face with punctures sparsely distributed laterally; distance between anteninal insertions distinctly longer than their diameters; posterior border of
mesoscutal sulcus non carinate, gently sloped; posterior orbit of eye partially bordered by groove................................................................................................. *Zelomorpha stigmata* n. sp.

78(1). Mesosoma entirely yellow or orange................................................................. 79
    Mesosoma entirely brown or black............................................................................. 83
    Mesosoma with areas black or brown and yellow or orange................................. 87

79(78). Gena in lateral view uniform width along its length (eyes appear large); head black with yellow or dark-yellow palpi and labrum; posterior border of mesoscutal sulcus non carinate, gently sloped; forewing 3M straight...................................................................................... 80
    Gena in lateral view wider ventrally than dorsally (eyes appear small); head entirely yellow-orange; posterior border of mesoscutal sulcus non carinate, with strong slope; forewing 3M curved ......................................................................................................................... 82

80(79). Ventral border of eyes reaching ventral border of tentorial pits; carina of hind trochantellus present and well developed; length of T1 median tergite more than two times its posterior width (Fig. 47A, 47G); anteromedial areola pentagonal, with lateral ridges strong, shorter than anterior ridges; posteroventral margin of gena evenly rounded and flanged .............. 81
    Ventral border of eyes not reaching ventral border of tentorial pits; carina of hind trochantellus weakly indicated (the trochantellus has a flat area); length of T1 median tergite less than 1.5 times its posterior width (Fig. 46H, 47F); anteromedial areola campanulate; posteroventral margin of gena strongly flanged.................................................. *Zelomorpha inca* n. sp.

81(80). Scutellar disk rounded; penultimate labial palpomere less than 25% shorter than apical palpomere; transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus; posteromedian areola complete, defined by distinct lateral carina; face with regular fovea dense medially and sparse laterally .................................................................................................................. *Zelomorpha cherylae* n. sp.

Scutellar disk three-sided with angle outlined by strong carinae; penultimate labial palpomere longer than apical palpomere; transverse groove of scutellar disk weak and with irregular crenulae; posteromedian areola incomplete; face with regular fovea densely distributed no leaving flat areas between them........................................... *Zelomorpha hondurensis* n. sp.

82(79). Anteromedial areola acuminate ................................................................. *Zelomorpha dengoii* n. sp.
Anteromedial areola pentagonal but with sinuated lateral ridges or pentagonal, with lateral ridges strong, longer than anterior ridges (Figs. 49A, 49F) ..............................

..............................................................................................................................................  *Zelomorpha bejaranoi* n. sp.
Anteromedial areola pentagonal, with lateral ridges strong, as long as anterior ridges (Fig. 46C)
....................................................................................................................................................  *Zelomorpha ocellata* n. sp.
Anteromedial areola campanulate ...........................................  *Zelomorpha bicarinata* n. sp.

83(78). Head entirely black or brown .......................................................... 84
Head black with yellow or dark-yellow palpi and labrum ......................... 85

84(83). Gena in lateral view uniform width along its length (eyes appear large); scutellar disk three-sided, without lateral carina, and wider than long; notaulus absent; posteroventral margin of gena strongly flanged; penultimate labial palpomere subequal in length to apical palpomere
....................................................................................................................................................  *Zelomorpha campester* n. sp.
Gena in lateral view wider ventrally than dorsally (eyes appear small); scutellar disk rounded; notaulus indicated by weak depressions; posteroventral margin of gena evenly rounded and flanged; penultimate labial palpomere less than 25% shorter than apical palpomere.....
..........................................................................................................................  *Zelomorpha gregarium* (Sarmiento & Sharkey, 2004)

85(83). Gena in lateral view uniform width along its length (eyes appear large); carina of hind trochantellus present and well developed; face mediad longitudinal striations present; face with both regular and irregular fovea; face with striations ......................................................
....................................................................................................................................................  *Zelomorpha araguaensis* n. sp.
Gena in lateral view wider ventrally than dorsally (eyes appear small); carina of hind trochantellus weakly indicated (the trochantellus has a flat area); face mediad longitudinal striations absent; face with regular fovea evenly distributed leaving flat areas between them; face lacking striations ................................................................................................................................. 86

86(85). Scutellar disk rounded; propodeum without areolae, smooth; posteroventral margin of gena strongly flanged; suture between metepisternum and metepimeron incomplete, without transverse carinae ...........................  *Zelomorpha similis* (Szépligeti, 1908)
Scutellar disk three-sided, without lateral carinae; propodeum with several strong areolae; posteroventral margin of gena evenly rounded and flanged; suture between metepisternum and metepimeron complete and deep, with transverse carinae restricted to suture width (Fig. 32E) ........................................................................................................................................................................  *Zelomorpha chiapanensis* n. sp.

82
87(78). Carina of hind trochantellus weakly indicated (the trochantellus has a flat area) .......... 88
   Carina of hind trochantellus present and well developed ................................................. 96

88(78). Head entirely black or brown ......................................................................................... 89
   Head black with yellow or dark-yellow palpi and labrum.............................................. 90

89(88). Propodeum without areolae, smooth; posteroventral margin of gena strongly flanged; suture
   between metepisternum and metepimeron incomplete, without transverse carinae; penultimate
   labial palpomere less than 25% shorter than apical palpomere ........................................
   ................................................................................................................................. Zelomorpha hospitator (Fabricius, 1793)
   Propodeum with several strong areolae; posteroventral margin of gena evenly rounded and
   flanged; suture between metepisternum and metepimeron complete and deep, with transverse
   carinae restricted to suture width; penultimate labial palpomere subequal in length to apical
   palpomere ....................................................................................................................... Zelomorpha tarsalis (Szépligeti, 1902)

90(88). Length of T1 median tergite more than two times its posterior width.........................
   ................................................................................................................................. Zelomorpha amoena (Brullé, 1846)
   Length of T1 median tergite less than 1.5 times its posterior width .................................... 91

91(90). Scutellar disk rounded .................................................................................................... 92
   Scutellar disk three-sided, without lateral carinae ............................................................ 94

92(91). Notaulus absent; propodeum without areolae, smooth; posteroventral margin of gena strongly
   flanged; suture between metepisternum and metepimeron incomplete, without transverse
   carinae ............................................................................................................................. Zelomorpha similis (Szépligeti, 1908)
   Notaulus indicated by weak depressions; propodeum with several strong areolae; posteroventral
   margin of gena evenly rounded and flanged; suture between metepisternum and metepimeron
   complete and deep, with transverse carinae restricted to suture width.......................... 93

93(92). Anteromedial areola pentagonal, with lateral ridges strong, shorter than anterior ridges; face with
   regular fovea evenly distributed leaving flat areas between them; face with punctures evenly
   distributed; posterior orbit of eye partially bordered by groove; lateral carina of frons composed
   of a strong continuous ridge ...................................................................................... Zelomorpha pseudorugosa n. sp.
Anteromedial areola ensiform; face with regular fovea present medially only; face with punctures sparsely distributed laterally; posterior orbit of eye not bordered by groove; lateral carina of frons composed of rugae and fovea........................................... *Zelomorpha webbi* n. sp.

94(91). Propodeum without areolae, smooth; posteroventral margin of gena strongly flanged; suture between metepisternum and metepimeron incomplete, without transverse carinae; penultimate labial palpomere less than 25% shorter than apical palpomere.............................. 95

Propodeum with several strong areolae; posteroventral margin of gena evenly rounded and flanged; suture between metepisternum and metepimeron complete and deep, with transverse carinae restricted to suture width; penultimate labial palpomere subequal in length to apical palpomere ............................................................ *Zelomorpha cellapatula* n. sp.

95(94). Eyes non emarginate; posterior orbit of eye not bordered by groove; distance between antennal insertions distinctly shorter than their diameters; posteroventral area of gena smooth; posterior border of mesoscutal sulcus high, carinate, with a strong slope........................................

...................................................................................................................... *Zelomorpha hospitator* (Fabricius, 1793)

Eyes emarginate; posterior orbit of eye completely bordered by groove; distance between antennal insertions distinctly longer than their diameters; posteroventral area of gena with irregular rugae evenly distributed; posterior border of mesoscutal sulcus non carinate, gently sloped

...................................................................................................................... *Zelomorpha passi* n. sp.

96(87). Ventral border of eyes reaching ventral border of tentorial pits; gena in lateral view uniform width along its length (eyes appear large); length of T1 median tergite more than two times its posterior width; head black with yellow or dark-yellow palpi and labrum; eyes emarginate

97

Ventral border of eyes not reaching ventral border of tentorial pits; gena in lateral view wider ventrally than dorsally (eyes appear small); length of T1 median tergite less than 1.5 times its posterior width; head entirely black or brown; eyes non emarginate......................... 99

97(96). Scutellar disk rounded; penultimate labial palpomere less than 25% shorter than apical palpomere; transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus; face with punctures evenly distributed except a wide area between tentorial pits; T1 smooth anteriorly.................................................................................................................. 98

Scutellar disk three-sided, without lateral carinae; penultimate labial palpomere subequal in length to apical palpomere; transverse groove of scutellar disk weak and with irregular crenulae; face
with punctures sparsely distributed laterally; T1 with a anteromedian round bulge clearly separated from lateral tergite border .............................................. *Zelomorpha illi* n. sp.

98(97). Notaulus strong; anteromedial areola pentagonal, with lateral ridges strong, as long as anterior ridges; posteromedian areola complete, defined by distinct lateral carina; face mediad longitudinal striations absent; lateral carina of frons separated posteriorly from interantennal carina .............................................. *Zelomorpha lencai* n. sp.

Notaulus indicated by weak depressions; anteromedial areola pentagonal but with sinuated lateral ridges; posteromedian areola complete, defined by weak lateral carina; face mediad longitudinal striations present; lateral carina of frons fused posteriorly with interantennal carina forming a circular ridge .............................................. *Zelomorpha pennator* (Fabricius, 1804)

99(96). Anteromedial areola acuminate; penultimate labial palpomere less than 25% shorter than apical palpomere; face mediad longitudinal striations absent; posteroventral area of gena depression dorsad flange absent; posteroventral area of gena smooth .............................................. 

................................................................. *Zelomorpha erugocephala* n. sp.

Anteromedial areola campanulate; penultimate labial palpomere subequal in length to apical palpomere; face mediad longitudinal striations present; posteroventral area of gena depression dorsad flange present; posteroventral area of gena with parallel rugae reaching distal margin of flange ................................................................. *Zelomorpha rufimana* (Brullé, 1846)

4. 4. Descriptions of the species of *Zelomorpha*

4. 4. 1. Characteristics of the descriptions

The characteristics of the descriptions for the species of the *Zelomorpha* are the sema used for the species of *Hemichoma*, see section 3. 4. 1. for details.

*Zelomorpha kolapta* n. sp.

(Figs. 8D, 23GH, 38D, 53D)

**Measurements.** Mesosoma length 3.53 mm. FW length 10.5 mm.

**Head.** Medial ridge or convexity of face present and with a dorsal circular protuberance. Face without a dorsomedical groove, convex medially with sides flat, lacking striations, with regular fovea dense
medially and sparse laterally. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, fused posteriorly with interantennal carina forming a circular ridge, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 44. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena strongly flanged. Posteroventral area of gena concave, depression dorsad flange absent, with a few subparallel rugae dorsad genal flange.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulations of epicnemial carina separated from sternaulus, or with some crenulae fused with these of sternaulus. Crenulation of epicnemial carina composed of 4–9 large evenly distributed ridges. Mesopleuron punctate but lacking punctures medially. Sternal carina with a notorious depression and strong striations forming a dorsal border and some fused with these of epicnemial carina, *or with a notorious depression and strong transverse striations forming an irregular dorsal margin*. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae extending posteriad at least half width of suture, with strong carinae of different sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with two carina meeting as an inverted Y. Juxtacoxal flange present, regularly concave, slender, straight, with acute apex, with a complete carina located dorsally, *or with two complete carinae*. Anterior area of subpronope disk-shaped. Posterolateral margin of pronotum smooth. Notaulus indicated by weak depressions. Median longitudinal mesoscutal groove indicated by a wide, flat, sculptured depression. Scutellar sulcus deep and subquadrat, with one carina, *or with 3*. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, mostly smooth, with some longitudinal striations. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum with an incomplete median longitudinal carina, *or with a complete median longitudinal carina*. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola strongly developed, separated from lateral ridges. Transverse crest of median metanotal areola close to apex. Propodeum with several strong areolae, surface with microsculptures only. Anteromedial areola with a strong anterior transverse ridge, *or with a strong posterior transverse ridge*, pentagonal, with lateral ridges strong, longer than anterior ridges, *or*
triangular. Anterolateral areola with an incomplete ridge extending half distance from midlength of anteromedial keel to anterodorsal corner, or with a strong ridge heading half distance from midlength of anteromedial keel to anterodorsal corner. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola complete, defined by distinct lateral carina, subquadrate, without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa present, at least weakly, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly black-brown except as follows: apex of pedicel or scape brown with yellow infuscations, pronotum, mesosternum, tegula, anterior half of scutellum or posterior half, metanotum, and propodeum orange. Some specimens are mostly brown with metanotum, propodeum, metepisternum, metepimeron, and first three metasomal segments orange. Palpi, foreleg yellow or brown with femur apex, tibia and tarsi yellow. Mid leg yellow except coxa, trochanter, trochantellus, anterior two thirds of femur, and median part of tibia dark brown. Hind leg brown with a wide subapical orange band on femur or with femur almost entirely brown. Metasoma black with anterior half of T1 or T1-T3 orange dark. Forewing infumate with an incomplete hyaline transverse band basad M vein and a second complete transverse band by the stigma. Hind wing infumate with two hyaline bands that match these of the forewing.

**Etymology:** The specific epithet of this species is a Greek word and refers to the strong sculpturation of the sternaulus

**Variation**
In some specimens the carination of the sternaulus is restricted to the depression while in others the ridges can reach the epinomial carina. In some specimens the transverse ridges of the suture between metaepisternum and metaepimeron extend posteriorly beyond the suture. The juxtacoxal flange can have one or two carinae. The posterior border of mesoscutal sulcus could be crenate. The median longitudinal ridge of the median metanotal areola can be either incomplete or complete. The anteriomedian areola of propodeum can be either pentagonal or triangular. The transverse ridge of the anteriomedial areola can be
either anterior or posterior. The transverse ridge of the anteriolateral areola can be either complete or incomplete. The males of this species have a strong posterior carina in the mesoscutal sulcus. A specimen from Trinidad differs in the body coloration with most of mesosoma brown and the metasoma more extensively orange.

**Diagnosis and similar species**

This species can be distinguished by the following combination of characters: lateral carina of frons fused with internatennal carina; scutellar disk without striations; transverse ridge of scutellar disk deep and with several longitudinal crenulae; sternaulus with a strong set of crenulae.

**Geographic distribution and elevation range:** Trinidad and Tobago, Peru, Bolivia, Brazil. 0-490m

**Material examined**

HOLOTYPE: ♀, Bolivia, Depto. Cochabamba, Chapare-Cesarzama 1-1975, Col. Martínez / AEIC
PARATYPES: - 1 ♂, BOLIVIA: Beni Prov., VII, 10-27, 1960. B. Malkin leg. / Chacob Indian village, on Río Benicito 66° -12°20’ [it may be Chacobos? 11° 41’ 60S Long, 65° 58’ 60] / FMNH. 1 ♀, PERU: Madre de Dios, Río Tambopata Reserve, 30 air km SW of Puerto Maldonado 290m, November 1-26, 1982, Edward S. Ross./ CASC

Other specimens

**PERU:** 1 ♂, Juanjui, San Martin, Peru, Dec. 3 1946, alt. 1600 ft. / J. C. Pallister, coll. Donor Frank Johnson / AMNH. **BRAZIL:** 1 ♂, Pará, Brazil, Baker / Coccyclidium sp Det. M. Sharkey / USNM Bot. garden, Port-of-Spain, Trinidad, oct. 13 1918, A. 7 59, Harold Morrison / Coccyclidium sp Det. M. Sharkey / USNM

**Zelomorpha ariasae** n. sp.

(Figs. 2D, 17GH, 32D, 47D)

**Measurements.** Mesosoma length 2.5 mm. FW length 6.66 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedical groove, convex medially with sides flat, lacking striations, with irregular fovea evenly distributed. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of about 10 robust transverse ridges, absent in dorsal third. Mesopleuron with strong uniformly distributed punctures. Sternaulus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, with acute angle at posterior border, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with two subparallel carinae. Juxtacoxal flange present, regularly concave, wide, with a complete carina mediad flange apex. Anterior area of subpronope not modified. Posterolateral margin of pronotum smooth. Notaulus absent. Median longitudinal mesoscutal groove indicated by a wide, flat, sculptured depression. Scutellar sulcus deep and slender, with two carinae. Scuto-scuteellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum with a complete median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with irregular striations. Anteromedial areola without transverse ridges, pentagonal, with lateral ridges strong, shorter than anterior ridges. Anterolateral areola with a strong ridge heading half distance from midlength of anteromedial keel to anterodorsal corner. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina absent. Posteromedian areola fused with posterolateral areola, without transverse ridge, with median longitudinal ridge separated from the transverse keel. Posteropleural areola closed. Transverse keel strong, dividing propodeum into two distinct planes.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of
hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black except as follows: palpi, four basitarsomeres of fore and mid legs yellow. Abdomen dark orange. Fore wings infumate with a clear posterior band. Hind wings infumate.

**Etymology:** The specific epithet of this species honors Tania and Diana Arias, fellow Colombian entomologists.

**Diagnosis and similar species**
This species is similar to *Z. araguaensis* and shares with it characteristics such as the robust crenulation of the epinenemial carina, the sculpturation of the vertex posterad ocelli, the vein 3M of the FW straight, and the 3RSa vein of FW absent. This species can be distinguished by the following characteristics: strong punctures in the mesosternum, and posteromedial areola of propodeum fused with lateromedial areola. *Z. ariasae* it is very close to *Z. pitzi*, although these differ in the carenation of the propodeum; *Z. ariasae* is also smaller than *Z. pitzi*.

**Geographic distribution and elevation range:** Venezuela. 238m

**Material examined**

HOLOTYPE: ♀, Tucuco, Zulia, Venez, IV.23.81, H. K. Townes/ AEIC

**Zelomorpha webbi** n. sp.
(Figs. 15G, 30MN, 45G, 60E)

**Measurements.** Mesosoma length 1.85 mm. FW length 4.24 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance, *or absent*. Face without a dorsomedial groove, *or with a narrow dorsomedial groove*, convex medially with sides flat, lacking striations, with regular fovea present medially only, with punctures sparsely distributed laterally. Penultimate labial palpmere less than 25% shorter than apical palpmere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye not bordered by groove. Lateral carina of frons composed of rugae and fovea, separated posteriorly from interantennal

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of about 10 robust transverse ridges, strongest at mid-length, absent in ventral third, or composed of irregular and unevenly distributed ridges or composed of 5–6 small ridges evenly distributed. Mesopleuron with small punctures evenly distributed. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, or with acute angle at posterior border, with transverse carinae restricted to suture width, with strong carinae of subequal sizes, or transversed with strong carinae of different sizes. Convex flange on posterodorsal border of mesopleuron absent. Dorsal apex of metepisternum with one carina, metaepisternum or without carina. Juxtacoxal flange present, regularly concave, wide, or slender, straight, with acute apex, with a complete carina mediad flange apex. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus indicated by weak depressions. Median longitudinal mesoscutal groove indicated by a wide, flat, sculptured depression. Scutellar sulcus deep and subquadrate, with one carina, or with either 2, 3 or 4. Scuto-scutellar articulation absent, or indicated by a tenuous line. Posterior border of mesoscutal sulcus carinate, gently sloped. Scutellar disk rounded, rugous or sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus, scutellum or deep, without crenulae. Median areola of metanotum without median longitudinal carina, or with an incomplete median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola separated from lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with irregular striations. Anteromedial areola without transverse ridges, or with transverse ridges, ensiform. Anterolateral areola present and without ridges, or with a strong ridge heading half distance from midlength of anteromedial keel to anterodorsal corner or with two incomplete ridges heading diagonally half distance from midlength of anteromedial keel, and with an incomplete lateral keel. Anteropleural areola present and smooth. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola incomplete, like an inverted triangle, without transverse ridge, with median longitudinal ridge fused with transverse posteriomediad carenae, ending far from transverse keel.
Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel, or diagonal at the lateral areolae but weak and transverse at the medial areola.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsosomere. Longest spur of midleg tibial longer than 1/2 basitarsosomere, hind leg tibia longer than 1/2 basitarsosomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia or with three spines. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa absent, or 3RSa present, at least weakly, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 with anterolateral protuberances on spiracles. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly brown except as follows: head, propleurum, fore, mid, and hind leg femora, mid and hind leg coxa, black. Dorsad scrobal groove of mesosternum, metapleura, propodeum, and fore and mid leg four basitarsosomeres yellow. Metasomal segments 1–4 light brown. Wings infumated. Some specimens can be black with fore, mid tarsi, propodeum, and metasoma light brown. Also these can be black with fore, and mid tarsi light brown. Metapleuron, propodeum, and segments 1–2 and part of 3 orange.

**Etymology:** The specific name of this species honors Dr. Bruce Webb at the University of Kentucky

**Variation**
In some specimens the lateral carina is almost absent; the dorsal surface of the scutellar disk may have a deep longitudinal medial depression; the sculpturation of the propodeum is characteristic: anteriormedian areola triangular, acute, posteriormedian areola with fused apex, like an inverted pentagon. There is variation in the length of the median longitudinal ridge of the posteriomedian areola of propodeum.

**Diagnosis and similar species**
This species is closely related to Z. gregarium but differs from it in the shape of the anteromedian areola which is very slender in Z. webbi (ensiform); also it differs in the shape of the epicnemial carina; Z. webbi has an evenly curved epicnemial carina while this is angulated in Z. gregarium; median longitudinal ridge of the posteriomedial areola of propodeum long.

**Geographic distribution and elevation range:** Costa Rica, Ecuador, Brazil (Amapá). 450-1228m

**Biology and hosts**
Z. webbi was reared from prepupa of *Euglyphis marina* Lasiocampidae. This larva was feeding on *Nectandra hihua* (Lauraceae) collected cocoons 04/12/1999 eclose: 04/21/1999 beige large elongate flattened cocoons stuck lightly to the cocoon silk. This is the second species with gregarious larvae after *C. gregarium* (Sarmiento & Sharkey, 2004)

**Material examined**

HOLOTYPE: ♀, Costa Rica, Alajuela, Area de Conservacion Guanacaste, Sector San Cristobal, Sendero Vivero, 730 meters, Lambert coordinates: North 316490 East 384531, Apr /12/1999, Osvaldo Espinoza / Ex prepupa *Euglyphis marina* Lasiocampidae feeding on *Nectandra hihua* (Lauraceae) / collected cocoons 04/12/1999 eclose: 04/21/1999 beige large elongate flattened cocoons stuck lightly to the cocoon silk, saved all in gelatin capsule in the cocoon / 99SRNP4860


Other specimens


[http://janzen.sas.upenn.edu](http://janzen.sas.upenn.edu) Area de Conservacion Guanacaste, COSTA RICA 04-SRNP-3528.


**ECUADOR**: 1 ♂, Ecuador, Provincia de Napo, 20 km E. of Puerto Napo, Selva Alifahui, 450m, December 1992 / 1°0’ S 77°25’ W, E.S. Ross Collector, California Academy of Sciences Collection / CASC.
**Zelomorpha gregarium** (Sarmiento & Sharkey, 2004) **new combination**
(Figs. 7A, 22AB, 37A, 52A)


**Redescription**

**Measurements.** Mesosoma length 2.7 mm. FW length 6.94 mm.

**Head:** Medial ridge or convexity of face present and without a dorsal circular protuberance or absent.
Face without a dorsomedial groove, convex medially with sides flat, lacking striations, with regular fovea present medially only, with punctures sparsely distributed laterally. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye not bordered by groove. Lateral carina of frons composed of rugae and fovea, separated posteriorly from interantennal carina, non striate laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters. Number of flagellomeres 35, 36–37. Depression lateral lateral ocellus absent. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli absent. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange absent, with rugae restricted to area immediately basad eye, or smooth.

**Mesosoma.** Epicnemial carina complete and with distinct angle ventrolaterally, with groove wide and flat. Crenulation of epicnemial carina composed of about 10 robust transverse ridges, strongest at mid-length, absent in ventral third. Mesopleuron with small punctures evenly distributed. Sternaulus barely depressed and smooth, with one posteroventral crenulation or with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or with posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron absent. Dorsal apex of metepisternum with two subparallel carinae. Juxtacoxal flange present, regularly concave, wide, with a complete carina mediad flange apex. Anterior area of subpronope not modified. Posterolateral margin of pronotum smooth. Notaulus indicated by weak depressions. Median longitudinal mesoscutal groove indicated by a wide, flat, sculptured depression. Scutellar sulcus deep and subquadrate, with three carinae or with one. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus carinate, gently sloped. Scutellar disk rounded, rugous. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than
sulcus. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola separated from lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with irregular striations. Anteromedial areola with transverse ridges, triangular. Anterolateral areola divided by several ridges converging anterolaterally. Anteropleural areola present and smooth. Pleural carina weak and incomplete. Transverse ridges of pleural carina absent. Posteromedian areola incomplete, like an inverted triangle, with a straight transverse ridge, with median longitudinal ridge fused with transverse posteriomedial carenae, ending far from transverse keel. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel strong, dividing propodeum into two distinct planes.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia shorter than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia with three spines. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa absent, RS2a longer than r-m, RS2b absent. CUb of hind wing absent. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black except as follows: four fore and midleg basitarsomeres yellowish with brown infuscations. Wings infumate. Metasoma orange with ovipositor sheats black.

**Variation**
This species exhibit variation in the following characters: Medial ridge or convexity of face present or absent; 35-37 antennal flagellomeres; scutellar sulcus deep, subquadrate, with 1 or 3 longitudinal carinae.

**Diagnosis and similar species**
This species is closely related to *Z. webbi* but differs from it in the shape of the anterior median areola which is very slender in *Z. webbi* and it also differs in the shape of the epicnemial carina; *Z. webbi* has an evenly curved epicnemial carina while this is clearly angulated in *Z. gregarium*

**Geographic distribution and elevation range:** Mexico, El Salvador, Costa Rica. 900-1150m

**Biology and hosts**
This is the first gregarious species of the subfamily Agathidinae. All the previous records refers to the members of this species as solitary koinobiont endoparasitoids of either concealed or free-living larvae (Sharkey, 1997)

Adults of *Z. gregarium* came out of a Lasiocampid larva found in penultimate instar. The larva is an unidentified species of Lasiocampidae (Janzen’s code: Janzen14 Lasiocampidae). It is black with a segmented yellow line on the sides; the prolegs are red; it is covered of tufts of white hairs; the black head has five frontal orange dots. The larva was feeding on *Beilschmiedia costaricensis* (Lauraceae). 19 elongate large white/gray puparia or cocoons were tightly packed, but not silked together, completely filling the cocoon of the larvae; 15 parasitoids were females and 4 were males. All the parasitoids emerged at once. It also has been collected by blacklighting.

**Material examined**

PARATYPES: 4 ♂♂, 14 ♀♀, same data as holotype and from same brood; 1 ♀, MEX: Veracruz, Fortín de las Flores, XII-22-63 / Blacklight L. R. O’Brien collector, Insect Collection Los Angeles County Museum of Natural History. Paratypes deposited at INBIO, Instituto de Ciencias Naturales of the Universidad Nacional de Colombia, American Entomological Institute, University of Kentucky Insect Collection, and Los Angeles County Museum of Natural History.
- 1 ♀, MEX: Veracruz, Fortín de las Flores, XII-22-63 / Blacklight L. R. O’Brien Collector / HIC

Other specimens
- 1 ♀, Santa Tecla, Salvador, 41 373, verawellborn / Coccygidium Det. M. sharkey / USNM

*Zelomorpha araguaensis* n. sp.  
(Figs. 2B, 17CD, 32B, 47B)
Measurements. Mesosoma length 3.09 mm. FW length 7.55 mm.

Head. Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, with both regular and irregular fovea. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes non emarginate, not converging ventrally. Posterior orbit of eye not bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 34–39. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area, or absent. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena concave, depression dorsad flange absent, with irregular rugae evenly distributed, or with rugae restricted to area immediately basad eye.

Mesosoma. Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of about 10 robust transverse ridges, absent in dorsal third. Mesopleuron with irregular foveae below level of sternaulus, causing sternaulus to appear rugous. Sernaulus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, with acute angle at posterior border, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with two subparallel carinae. Juxtacoxal flange present, regularly concave, slender, curved posteriorly, with round apex, with a complete carina and irregular additional carinae, or with a complete carina mediad flange apex. Anterior area of subpronope not modified. Posterolateral margin of pronotum smooth. Notaulus absent. Median longitudinal mesoscutal groove absent. Scutellar sulcus deep and subquadrate, with three carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk three-sided, without lateral carinae, or three-sided with angle outlined by strong carinae, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus, scutellum or deep, with crenulae extending anteriorly reaching midway to scutellar sulcus. Median areola of metanotum with a complete median longitudinal carina, or with an incomplete median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with
several strong areolae, surface with irregular striations. Anteromedial areola without transverse ridges, campanulate. Anterolateral areola with two incomplete ridges heading diagonally half distance from midlength of anteromedial keel. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina absent. Posteromedian areola complete, defined by weak lateral carina, like an inverted pentagon with wide apex, without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel strong, dividing propodeum into two distinct planes.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia shorter than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa absent, RS2a subequal to r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black except as follows: palpi, clypeus, metaepisternum, metaepimeron, propodeum, T1 of metasoma dark orange. Fore and midleg brown except four basitarsomeres orange. Hind leg brown. Fore wings infumate although more clear at apex, *some specimens may have a clear posterior band*. Hind wings infumate. *The mesosoma of some specimens can be entirely black-brown, or orange with black both pronotum and part of mesopleuron.*

**Etymology:** This species was named after the type locality, Aragua, Venezuela

**Variation**

There is variation in the coloration pattern of this species, some specimens are entirely black-brown while other exhibit orange metapleuron and propodeum; some specimens may present a hilaine transverse band in the forewing. The number of antennal flagellomeres ranges from 34 to 3. Specimens from Venezuela have complete or almost complete lateral carinae dividing the scutellum in three sides and with long ridges that cover about a half of the length between the scutellar flange and the anterior border of the scutellum. A female from Chiapas, Mexico, presents strong transverse sculpturations anterior to the sternaulus

**Diagnosis and similar species**

The sculpturation of the face of *Z. araguaensis* is very strong. The foveae of the lower part of the mesopleura are strong and give to the surface of that sclerite an irregular appearance. This species can be distinguished from the others with rugous face by the following combination of characters: campanulate
anteromediad areola of propodeum, juxtacoxal area with two or a complete and an incomplete carina, and
median areola of metanotum with a median longitudinal carina. The shape of the mesoscutum in Z.
araguaensis is similar to that of H. atrata; however these differ in the shape of the genae and the occipital
margin,

**Geographic distribution and elevation range:** Mexico, Costa Rica, Panama, Venezuela. 79-450m

**Material examined**
PARATYPES: - 1 ♂, COSTA RICA / HIC
-1 ♀, Escuintla, Chiapas, Crawford / USNM

Other specimens
COSTA RICA: 1 ♀, Playa del Coco, Guanacaste, COSTA RICA, VII-24 1962, FS Truxal coll. / LACM
/HIC. 1 ♂, COSTA RICA / HIC. PANAMA: 1 ♀, PANAMA, C. Z., Barro Colorado Is., 9°10’N
AMNH. 1 ♀, Old Panama, Rep. de Pan., X-20-37 / USNM 2021943 / USNM. VENEZUELA: 1 ♂,
Venezuela, Minas Aroa, Yar., Venezuela, mts. / 12-X-82 F.G. / MJMO. 1 ♂, VENEZ. Amazonas, Yutajé,
200m, 2-iii-1995/ J.L.García (Barrido) Exp. Terramar/ MIZA.

**Zelomorpha pennator** (Fabricius, 1804) **new combination**
(Figs. 11F, 26KL, 41F, )

**Ophion pennator** Fabricius, 1804, Systema Piezatorum : 135 ♀

Acad. St. Petesburg 9: 314 (Zoological Museum, University of Copenhagen, Copenhagen, ZMUC)

**Coccygidium pennator** (Fabricius, 1804), Sarmiento & Sharkey, 2005: 66.

**Redescription**

**Measurements.** Mesosoma length 1.81 mm. FW length 4.84 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with
a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present,
transverse striations between interantennal carinae present, dense net of mediad transverse and longitudinal striae absent, fine set of mediad parallel transverse striations absent, with both regular and irregular fovea no leaving flat areas between them. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, fused posteriorly with interantennal carina forming a circular ridge, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with several evenly distributed foveae. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena concave, depression dorsad flange present, with semiparallel dorsal rugae and irregular ventral rugae.

Mesosoma. Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 5–6 small ridges restricted to ventral half. Mesopleuron with strong uniformly distributed punctures. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 10–12 small uniform carinae. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, slender, straight, with round apex, with a complete carina and irregular additional carinae. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus indicated by weak depressions. Median longitudinal mesoscutal groove absent. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with irregular striations. Anteromediaal areola without transverse ridges, pentagonal but with sinuated lateral ridges. Anterolateral areola with two incomplete ridges heading diagonally half distance from midlength of anteromedial keel. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola complete, defined by weak lateral carina, subquadrate, without transverse ridge, with median longitudinal ridge separated from the transverse keel.
Posterolateral areola closed, triangular, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa present, at least weakly, RS2a subequal to r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly dark-orange except as follows: head, scape, anterior half of pronotum, and apical six metasomal segments black. Antenna brown. Palpi yellow. Front leg brown except coxa and four basitarsomeres which are yellow. Midleg brown with tarsomeres yellow. Hind leg brown with yellow infuscations at coxa apex, trochantellus, and an apical band of femur. Wings entirely infumate.

**Diagnosis and similar species**
Shenefelt (1970) listed this species as “unplaced Agathidinae”; however, it is clearly a member of the tribe Disoprini, genus *Zelomorpha* [as *Coccygidium* in Sarmiento & Sharkey, 2005]

*Z. pennator* can be distinguished from other species by the following combination of characters: face strongly sculptured, with no flat areas; posteroventral area of gena rugous; juxtacoxal flange with a complete medial carina and several irregular rugae; transverse groove of scutellar disk deep with crenulae extending anteriorly but not reaching midway to scutellar sulcus; anteromedial areola of metanotum pentagonal but with sinuated lateral ridges; longitudinal carina of hind leg trochantellus strongly developed. This species shares with *Z. rugosa* and *Z. pseudorugosa* the strong sculpturation of the face.

**Geographic distribution and elevation range:** “America meridionali”

**Material examined**
HOLOTYPE: 1 ♀, Type, *O. pennator*, am: meridionalis / ZMUC

*Zelomorpha pseudorugosa* n. sp.
(Figs. 12H, 27OP, 42H, 57G)

**Measurements.** Mesosoma length 3.28 mm. FW length 8.04 mm.
**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, flat medially and laterally, dense net of mediad transverse and longitudinal striae present, with punctures evenly distributed. Penultimate labial palpmere less than 25% shorter than apical palpmere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, fused posteriorly with interantennal carina forming a circular ridge, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea. Median longitudinal depression posteriad ocelli wide and deep. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange present, smooth.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 5–6 small ridges restricted to ventral half. Mesopleuron with small punctures evenly distributed. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 10–12 small uniform carinae. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, slender, straight, with round apex, with two incomplete carinae. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus indicated by weak depressions. Median longitudinal mesoscutal groove absent. Scutellar sulcus deep and subquadrate, with three carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, without crenulae. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with irregular striations. Anteromedial areola without transverse ridges, or with transverse ridges, pentagonal, with lateral ridges strong, shorter than anterior ridges. Anterolateral areola with two incomplete ridges heading diagonally half distance from midlength of anteromedial keel. Anteropleural areola present and smooth. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola complete, defined by distinct lateral carina, posteromedial areola or complete, defined by weak lateral carina, narrow posteriorly but with lateral ridges separated, without transverse ridge, without median longitudinal ridge. Posterolateral
areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia shorter than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia with two spines or with three spines. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa present, at least weakly, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black except as follows: palpi, apex of pronotum, tegula, scutellum, mesepisternum, and first three sternites of metasoma yellow. Foreleg and midleg brown except first four tarsomeres orange. Hind leg brown except trochanter and trochantellus. Wings entirely infumate.

**Etymology:** The specific epithet of this species refers to its similarities with *C. rugosus* which has a strong sculpturation of its face.

**Variation**
The paratype from Rurembaraque have stronger lateral carinae of the posteriormedial areola.

**Diagnosis and similar species**
This species resembles *Z. rugosa* especially in the sculpturation of the face, but differs from *Z. rugosa* in the carination of the juxtacoxal flange and in the shape of the anterior border of the metaepisternum. The juxtacoxal area has a series of subparallel carinae that can extend beyond the posterior border, sometimes it is composed of irregular carinae

**Geographic distribution and elevation range:** Bolivia. 416m

**Material examined**
PARATYPE: ♂, Rurrenabaque, Rio Beni, Boliv., Nov, WMMan / Mulford Bio Expl. 1921-22 / USNM

*Zelomorpha rugosa* n. sp.
**Measurements.** Mesosoma length 3.23 mm. FW length 8.18 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, transverse striations between interantennal carinae absent, with both regular and irregular fovea no leaving flat areas between them. Penultimate labial palptomere less than 25% shorter than apical palptomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with irregular striations laterad ocelli. Median longitudinal depression posteriad ocelli absent. Posteromarginal margin of gena evenly rounded and flanged. Posteromarginal area of gena convex, depression dorsad flange absent, smooth.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove narrow, no flat area is visible. Crenulation of epicnemial carina absent. Mesopleuron with small punctures evenly distributed. Sternaulus barely depressed and smooth, with one posteromarginal crenulation. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, with acute angle at anterior border, with transverse carinae restricted to suture width, with strong carinae of different sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with two subparallel carinae. Juxtacoxal flange present, regularly concave, slender, straight, with round apex, with a complete carina mediad flange apex. Anterior area of subpronope wide and flanged. Posteromarginal margin of pronotum smooth. Notaulus indicated by weak depressions. Median longitudinal mesoscutal groove indicated by a wide, flat, sculptured depression. Scutellum sulcus deep and subquadrate, with one carina. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk three-sided, without lateral carinae, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with irregular striations. Anteromediaal areola with transverse ridges, pentagonal, with lateral ridges strong, shorter than anterior ridges. Anterolateral areola
with a strong ridge heading half distance from midlength of anteromedial keel to anterodorsal corner. Anteropleural areola present and smooth. Pleural carina distinct and complete. Transverse ridges of pleural carina absent. Posteromedian areola incomplete, like an inverted triangle, with an angulated transverse ridge, with median longitudinal ridge fused with transverse posteriomedial carenae, ending far from transverse keel. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia shorter than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa present, at least weakly, RS2a shorter than r-m, RS2b present. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly dark-orange except as follows: head, antennae, prosternum, anterior half of pronotum, posterior part of scutellum, metapimeron, lateral part of propodeum, and last four abdominal segments black-brown. Foreleg and midleg brown except four basitarsomeres yellow. Hind leg brown. Forewing hyaline with a faintly infumate spot midway between stigma apex and wing apex. Hind wing hyaline.

**Etymology:** the name of this species refers to the strong rugae of its face

**Diagnosis and similar species**
The species can be distinguished by the transverse groove of the scutellum which is deep and has several crenulae extending anteriorly. The apical tip of the metanotal central areola has a particularly large longitudinal carina. This species shares with *Z. pseudorugosa* the strong sculpturation of the face; however, *Z. rugosa* has a different carination of the juxtacoxal flange and the transverse groove of the scutellum is smaller in the former.

**Geographic distribution and elevation range:** Brazil (Mato Grosso). 180m

**Material examined**

*Zelomorpha hondurensis* n. sp.
Measurements. Mesosoma length 2.92 mm. FW length 6.52 mm.

Head. Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, dense net of mediad transverse and longitudinal striae present, with regular fovea densely distributed no leaving flat areas between them. Penultimate labial palpomere longer than apical palpomere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, fused posteriorly with interantennal carina forming a circular ridge, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly shorter than their diameters. Number of flagellomeres 36. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with irregular fovea and striations over entire surface. Median longitudinal depression posteriad ocelli wide and deep. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena concave, depression dorsad flange absent, with parallel rugae reaching distal margin of flange.

Mesosoma. Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 3–6 large ridges restricted to mid length. Mesopleuron with small punctures evenly distributed. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum without carina. Juxtacoxal flange present, regularly concave, wide, with a complete carina mediad flange apex. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove absent. Scutellar sulcus deep and subquadrate, with three carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk three-sided with angle outlined by strong carinae, rugous. Transverse groove of scutellar disk weak and with irregular crenulae. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with irregular striations. Anteromedial areola with a strong posterior transverse ridge, pentagonal, with lateral ridges strong, shorter than anterior ridges. Anterolateral areola with two incomplete ridges one heading diagonally half
distance from midlength of anteromedial keel, the other parallel to the transverse keel. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina absent. Posteromedian areola incomplete, like an inverted triangle, without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia shorter than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa present, at least weakly, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly orange except as follows: head, antennae, and metasoma black. Foreleg yellow with last tarsomere brown, midleg brown except proximal apex of coxa, distal apex of femur, both extremes of tibia, and four basitarsomeres yellow. Hind leg brown. Wings entirely infumate.

**Etymology:** The specific epithet of this species the country were the holotype was found

**Diagnosis and similar species**
The last labial palpomere of this species is shorter than the penultimate palpomere; this characteristic is unique within all the members of the genus. The strong sculpturation of the face of this species is similar to that in *Z. rugosa*.

**Geographic distribution and elevation range:** Honduras

**Material examined**
HOLOTYPE: ♀, HONDURAS, Gracias a Dios, Krausirpi, 15°03’N, 84°52’W, 22 may 1994, recol. R. Cordero. / ZAIC

**Zelomorpha eurugosa** n. sp.
(Fig. 6E, 21IJ, 36E, 51E)

**Measurements.** Mesosoma length 3.04 mm. FW length 8.18 mm.
**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, transverse striations between interantennal carinae absent, with both regular and irregular fovea no leaving flat areas between them. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, fused posteriorly with interantennal carina forming a circular ridge, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 40, 37. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange absent, with rugae restricted to area immediately basad eye.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 3–6 large ridges restricted to mid length. Mesopleuron with punctures more concentrated anterodorsally. Sternalus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of different sizes, or transversed with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, slender, straight, with round apex, with a complete carina and irregular additional carinae. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove absent. Scutellar sulcus deep and subquadrate, with one carina, or with 3. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, with strong slope. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum with an incomplete median longitudinal carina, or without median longitudinal carina. Posterior border of median areola of metanotum with an acute transverse crest and a longitudinal crest. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola close to apex. Propodeum with several strong areolae, surface with irregular striations. Anteromedial areola without transverse ridges, campanulate. Anterolateral areola with an incomplete ridge extending half distance from midlength of anteromedial keel to anterodorsal corner. Anteropleural areola present,
with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola incomplete, narrow posteriorly but with lateral ridges separated, without transverse ridge, without median longitudinal ridge. Posterolateral areola open medially, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa absent, **or 3RSa absent**, RS2a subequal to r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black except as follows: mandibles, palpi, posterior border of pronotum, tegula, posterior half of scutellum, metanotum, propodeum, first four metasomal segments yellow or amber. *Some specimens have mesoscutum and posterior apex of pronotum yellow.* Front and middle leg yellow. Hind leg brown with black coxa, trochanter, trochantellus, and femur yellow; basal band of tibia yellow. *Some specimens have the hind leg brown except for trochanter and trochantellus which are amber.* Forewing hyaline except as follows: transverse medial band located between parastigma and anterior half of stigma. Transverse apical band extending medially between stigma apex and wing apex. Hind wing hyaline with transverse bands that match these of the front wing.

**Etymology:** The specific epithet of this species refers to the strong sculpturation of the face.

**Geographic distribution and elevation range:** Surinam, Brazil (Rondonia), Bolivia. 1100-1470m

**Material examined**

**HOLOTYPE:** ♀, BRAZIL: RO, Fazenda Rancho Grande, 62km s. Ariquemes, 25.XI.1991, S. L. Heydon, Hg-vapor light / UCDC

**PARATYPES:** 1 ♀, Museum Leiden Surinam, Paramaribo, Plantation Ma. Retraite, 20-22-I-1964, D.C.Geijskes, swamp forest / NNMN
- 1 ♂, Sta. Barbara, Corioco, Bolivia, I.4.76, 1100m, Luis Peña / AEIC

**Diagnosis and similar species**

This species can be distinguished by the following combination of characters: face covered with regular and irregular fovea no leaving flat areas in between; penultimate palpomere as long as the last one; lateral
carina of frons separated from interantennal carina; posteroventral area of gena with subparallel rugae reaching the marginal border; strong notauli; epicnemial carina with six strong ridges at mid length; mesopleuron with punctures concentrated anteriomedially; posterior border on mesosternum with 8-10 strong, evenly distributed ridges; juxtacoxal area with a complete carina and posterior strong rugae; campanulate anteriomedial areola.

Variation

The transverse carinae of the epicnemial can be very strong and deformated the epicnemial border. The scutellar sulcus could have either one or three carinae. There is variation in the extension of black coloration in the mesosoma

\textit{Zelomorpha nigrobalteata} (Cameron, 1911) \textbf{new combination} (Figs. 10D, 25GH, 40D, 55D)


\textit{Microdus nigrobalteatus}: Turner 1918 Bull. Ent. Res. 9: 82


\textit{Disophrys variegata} Enderlein 1920 (not Szépligeti 1908) Arch. Naturgesch. 84 A (11): 189, ♂ ♀, preoccupied by Szépligeti 1908. \textbf{New synonymy}


\textbf{Redescription}

\textbf{Measurements}. Mesosoma length 3.72 mm. FW length 10.1 mm.

\textbf{Head}. Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, lacking striations, with regular fovea dense medially and sparse laterally. Penultimate labial palpomere less than 25% shorter than apical palpomere.

Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, or barely indicated by a continuous ridge, separated posteriorly from interantennal carina, with acute base, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters. Number of flagellomeres 43, 43–45. Depression laterad lateral ocellus present. Gena at mid-
height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea, posteriad ocelli or smooth. Median longitudinal depression posteriad ocelli wide and deep, or weak, indicated by narrow groove. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange absent, with rugae restricted to area immediately basad eye, or with a few subparallel rugae dorsad genal flange.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulations of epicnemial carina separated from sternaulus, or with some crenulae fused with these of sternaulus. Crenulation of epicnemial carina composed of about 10 robust transverse ridges, absent in dorsal third, or composed of 4–9 large ridges evenly distributed. Mesopleuron punctate but lacking punctures medially. Sternaulus with a notorious depression and strong striations forming a dorsal border and some fused with these of epicnemial carina, or with a notorious depression and strong transverse striations forming an irregular dorsal margin. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes or with weak carinae of similar sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina, metaepisternum or with two subparallel carinae.

Juxtacoxal flange present, regularly concave, wide, with a complete carina located dorsally, or with a complete carina mediad flange apex or with two incomplete carinae or with two carinae, one complete, one incomplete. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit, or indicated by weak depressions. Median longitudinal mesoscutal groove indicated by a wide, flat, sculptured depression. Scutellar sulcus deep and subquadrate, with three carinae, or with 1. Scuto-scutellar articulation absent, or indicated by a tenuous line. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated or mostly smooth, with some longitudinal striations. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus, scutellum or deep, without crenulae. Median areola of metanotum with a complete median longitudinal carina, or without median longitudinal carina or with an incomplete median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola separated from lateral ridges, or fused apically with lateral ridges. Transverse crest of median metanotal areola absent, or close to apex. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola with a strong anterior transverse ridge, or with transverse ridges, pentagonal, with lateral ridges strong, longer than anterior ridges. Anterolateral areola with a strong ridge heading half distance from midlength of anteromedial keel to anterodorsal corner. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola complete,
defined by distinct lateral carina, narrow posteriorly but with lateral ridges separated, posteromedial areola or subquadrate, without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

Legs and wing venation. Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising from a lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M straight or 3M curved, 3RSa absent or 3RSa present, at least weakly, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly, or with anterolateral protuberances on spiracles. Length of T1 median tergite less than 1.5 times its posterior width.

Color pattern. Mostly yellow except as follows: head, antennae, prosternum, anterior half of pronotum, mesosternum, metaepimeron, scutellum, metanotum, and last three metasomal segments black. Foreleg yellow. Midleg yellow except as follows: most of coxa black, basad brown spot of femur. Hind leg black with yellow spots as follows: coxa ventrally; basad trochantellus; most of femur and basad apex of tibia. Forewing hyaline except as follows: costal border, transverse medial band located between parastigma and base of stigma extending posteriorly; transverse apical band extending posteriorly from apex of stigma to wing apex. Hind wing hyaline with infumate bands that match distribution of these in forewing.

Variation
The following morphologic variation was observed: while the male holotype of Z. variegatenda has one longitudinal carena in the scutellar sulcus, some females have three carinae. The anterior margin of the scutellar sulcus can be either present or absent. The longitudinal carena of the median metanotal areola can be complete, incomplete or absent. The posterior border of the median metanotal areola can be transverse or not. the carenations of the sternauli extended toward the epicnemial carina either reach or not the epicnemial carina. The carenations of the suture between metaepisternum and metaepimeron can either restrict to the suture borders or extend posteriorly beyond it. The sculpturation of the yuextacoxal area variates in strength and extension. The lateral carina can be fused or separated from the interantennal carina

Diagnosis and similar species
This species can be distinguished by the following combination of characters: sternaulus with strong crenulae; these may fusionate (see variation) with the transverse ridges of epicnemium, propodeum with
several areolae, mesoscutum with notaulli weakly indicated, scuto-scuteellar articulation indicated by a clear border.

Z. nigrobalteata shares with Z. illi, and Z.chiapanensis the complete carina of the juxtaoxal flange. The carenation of the sternaulus fused with these of the epicnemium is a characteristic shared with Z. panamea. The longitudinal carinae in the mesoscutal sulcus are concentrated medially.

**Geographic distribution and elevation range:** Trinidad and Tobago, British Guiana, Venezuela, Colombia, Peru, Brazil (Amazonas), Bolivia. 0-1100m

**Material examined**

HOLOTYPE: ♀, Type / B.M. Type Hym. 3.c.948 / Disophrys “nigrobalteatus”, Cam. Type, Br. Guyana / P. Cameron Coll. 1914-110 / 463 / BMNH

HOLOTYPE: ♂, Demerara, II III 04, R. Haensch / Type / Disophrys “variegatula” type Enderl. ♂, Dr. Enderlein det. 1919 / MIZ (MZPW) (Museum and Institute of Zoology, Polish Academy of Sciences)

ALOTYPE: ♀, Demerara, II III 04, R. Haensch / Type / Disophrys variegata type Enderl. ♀, Dr. Enderlein det. 1919 / MIZ (MZPW) (Museum and Institute of Zoology, Polish Academy of Sciences)


1 ♀, no label, syntype of Bracon similator Fabricius coll. Kiel., [missidentification] ZMUC

**Zelomorpha pitzi** n. sp.

(Fig. 12C, 27EF, 42C 57B)
**Measurements.** Mesosoma length 3.42 mm. FW length 7.17 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face without a dorsomedial groove, convex medially with sides flat, lacking striations, with regular fovea present medially only, with punctures sparsely distributed laterally. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly shorter than their diameters. Number of flagellomeres 36. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli smooth, posterad ocelli *or with a few mediad fovea*. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena concave, depression dorsad flange absent, with rugae restricted to area immediately basad eye.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 3–6 large ridges restricted to mid length. Mesopleuron with small punctures evenly distributed. Sternaulus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with two subparallel carinae. Juxtacoxal flange present, regularly concave, wide, with a complete carina located ventrally. Anterior area of subpronope not modified. Posterolateral margin of pronotum smooth. Notaulus absent. Median longitudinal mesoscutal groove absent. Scutellar sulcus deep and subquadrate, with three carinae. Scutal-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk three-sided, without lateral carinae, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum with a complete median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, pentagonal, with lateral ridges strong, shorter than anterior ridges. Anterolateral areola rugous anterolaterally and with some irregular ridges converging anterolaterally. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina absent. Posteromedian areola fused with
posterolateral areola, without transverse ridge, with median longitudinal ridge separated from the transverse keel. Posteropleural areola closed. Transverse keel reaching posteropleural keel, double at median and lateral areola area.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa absent, RS2a subequal to r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black except as follows: palpi, clypeus, first three sternites of metasoma yellow or dark orange, first three tergites with orange spots. Fore and midlegs brown except first four tarsomeres orange. Hind legs brown. Fore wings infumate except by a wide hyaline band posteriad to 2nd. submarginal cell. Hind wings infumate.

**Etymology:** The specific epitetus of this species honors Kevin Pitz colleague of the graduate school at the University of Kentucky

**Diagnosis and similar species**

*Z. pitzi* can be distinguished by the following characteristics: 3-6 large ridges at mid height of epicnemial carina, two carinae in the dorsal apex of metaepisternum; transverse ridges in the pleural carina of the propodeum. The color pattern is also unique in the genus.

This species shares with *Z. illi* the following characteristics: *Distribution and elevation range* of fovea in the face (dense medially and sparse laterally), the mesopleura with punctures uniformly distributed. This species shares with *Z. pentagonalis* the longitudinal mediad ridge in the posteromediad areola of the propodeum and the fused posteromediad and posterolateral areolae of propodeum. *Z. pitzi* is also similar to *Z. ariasae* but these differ in the propodeal carina.

**Geographic distribution and elevation range:** Panama, Brazil (Mato Grosso). 79-800m

**Material examined**

**HOLOTYPE:** ♀, Canal zone, Pan, Barro Colorado I, IX 13 78, R B & R L Kimsey UCDC

**PARATYPES:** ♀, PANAMA: Colon Pr., ‘Achiote Road’, 4km NW Escobal, 9°10’ N 80°00’N, 12-VIII-1978, H. A. Hespenheide / HIC

115
♀, Chapada dos Guimarães, Mato Grosso, Brazil, 800m, july 1983, M. Alvarenga / AEIC

**Zelomorpha anator** (Fabricius, 1804) **new combination**
(Figs. 1F, 16KL, 31F, 46F)

*Bracn anator* Fabricius, 1804 Systema Piezatorum. 110, ♀, ZMUC.

*Bracn anator* Fabricius, 1804 Shenefelt 15: 1465

*Coccygidium anator* (Fabricius, 1804), Sarmiento & Sharkey, 2005: 65.

**Redescription**

**Measurements.** Mesosoma length 1.08 mm. FW length 2.18 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedical groove, convex medially with sides flat, lacking striations, with both regular and irregular fovea no leaving flat areas between them. Penultimate labial palpmere less than 25% shorter than apical palpmere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes non emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, fused posteriorly with interantennal carina forming a circular ridge, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 42. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with several evenly distributed foveae, posteroad ocelli or smooth. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange absent, smooth.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of about 10 robust transverse ridges, strongest at mid-length, present in ventral third, or composed of 4–9 large ridges evenly distributed. Mesopleuron with small punctures evenly distributed. Setaulus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with two subparallel carinae. Juxtacoxal flange present, regularly concave, rounded, or wide, with two incomplete carinae, or with two complete
carinae or with two incomplete carinae and irregular rugae. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus indicated by weak depressions. Median longitudinal mesoscutal groove indicated by a single wide smooth depression. Scutellar sulcus deep and subquadrate, with three carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded. Transverse groove of scutellar disk deep, without crenulae. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum with an acute transverse crest and a longitudinal crest. Longitudinal apical crest of median metanotal areola long and horizontal, strongly projected, or separated from lateral ridges. Transverse crest of median metanotal areola close to apex. Propodeum with several strong areolae, surface with irregular striations. Anteromedial areola without transverse ridges, deltoid, or pentagonal, with lateral ridges strong, shorter than anterior ridges. Anterolateral areola with a strong ridge heading half distance from midlength of anteromedial keel to anterodorsal corner. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedial areola fused with posterolateral areola, posteromedial areola or incomplete, posteromedial areola or narrow posteriorly, without transverse ridge, without median longitudinal ridge. Posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

Legs and wing venation. Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising from a lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 with anterolateral protuberances on spiracles. Length of T1 median tergite less than 1.5 times its posterior width.

Color pattern. Mostly orange except as follows: head, antennae, prosternum, anterior half of pronotum, apical five metasomal segments black. Foreleg and mid leg black with four basitarsomeres yellow. Hind leg black. Fore wings and hind wings entirely infumate.

Variation
The type series exhibit two distinctive shapes of the juxtacoxal carinae, the lectotype has a rounded smooth juxtacoxal carina, the paralectotypes have a pointed juxtacoxal carinae with two complete carinae.

Diagnosis and similar species
This species is close to the species with rugous face species but Z. anator can be distinguished by the following characteristics: length of T1 less than 1.5 its width, spiracles set on strong lateral carina, and
longitudinal carina of hind leg trochanter entirely absent. In some specimens the anteriomedial areola of metanotum is wide and has a deltoid shape.

**Geographic distribution and elevation range:** “America meridionali” Guyana, Peru. 0-500m

**Material examined**

LECTOTYPE: ♀, Type / Essequibo, Smidt, mus, Dom. Lund. *Bracon anator* Fabr. / ZMUC

PARALECTOTYPE: ♀, Type / *anator* / ZMUC

PARALECTOTYPE: ♂, Type / ZMUC


*Zelomorpha prudens* n. sp.

(Figs. 12E, 27IJ, 42E, 57D)

**Measurements.** Mesosoma length 3.82 mm. FW length 10.3 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, lacking striations, with punctures densely distributed medially. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes emarginate, converging ventrally. Posterior orbit of eye not bordered by groove. Lateral carina of frons composed of a strong continuous ridge, fused posteriorly with interantennal carina forming a circular ridge, striate laterally. Frontal depression with a few circular rugae. Distance between antennal insertions subequal to their diameters. Number of flagellomeres 43. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena strongly flanged. Posteroventral area of gena concave, depression dorsad flange absent, smooth.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina absent. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a longer than r-m, RS2b absent. CUb of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly light brown with tibiae and tarsus lighter and darker metasoma. Forewing infuscate with hyaline triangular area covering stigma and most of 2nd submarginal cell. Hind wings infuscate. Some specimens may have darker infuscations all over the body.

**Etymology:** The species name refers to the locality of one of the paratypes, Prudentópolis, Brazil

**Variation**
Even though the color pattern of this species can be cataloged as brown, there is variation, from completely brown to dark-brown or brown with dark brown or almost black areas.

**Diagnosis and similar species**
This species has several unique characteristics: the epicmenial carina is clearly curved; the frontal depression has several circular rugosities; the median facial groove of the males is surrounded by a lateroventral protuberance; the surface of the lower gena is smooth, and the lateral carina of frons is complete.

The closest species to *Z. prudens* is *Z. crowdusi* but it does have rugous lower gena, and a different color pattern. This species shares with *Z. crowdusi* the following characteristics: the shape of the lateral carina of frons, the shape of the posterior border of the median metanotal areola, and the prominent bulk TI. This species shares the subquadrate shape of the juxtacoxal flange with several species such as *Z. querubina* and *Z. stigmata*. The color pattern of *Z. prudens* is similar to that of *Z. xanthostigma*.

**Geographic distribution and elevation range:** Brazil (Santa Catarina, Paraná, Rio Grande do Sul). 0-664m.

**Material examined**

**HOLOTYPE:** ♀, Brasilien, Nova Teutonia, 27°11′ B, 52°23′ L, 16-“12”-1960, 300-500 / CNCI

**PARATYPES:** ♂, Brasilien, Nova Teutonia, 27°11′ “B”, 52°23′ 1-II-1961, 300-500 / CNCI

♂, Nova Teutonia, Santa Catarina, I.5.53, Braz, Fritz Plaumann / AEIC

Other specimens


*Zelomorpha campester* n. sp.

(Figs. 3G, 18MN, 33G, 48G)

**Measurements.** Mesosoma length 4.02 mm. FW length 11.47 mm.
**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, with punctures evenly distributed. Penultimate labial palpmere subequal in length to apical palpmere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes non emarginate, not converging ventrally. Posterior orbit of eye not bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, with acute base, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly shorter than their diameters. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli absent. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange absent, smooth.


**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia shorter than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of
hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Entirely black, wings entirely infumate.

**Etymology:** the name of this species refers to the smooth depression of the mesoscutal sulcus.

**Diagnosis and similar species**
This species can be distinguished from the others by the following combination of characteristics: the marginal carina, proximad to the eye turns towards forward forming a “C”; the face has an acute ridge on top of the conical protuberance; the posterior border of the eye has a clear depression; the juxtacoxal carina is clearly convex. *Z. campester* and *Z. prudens* share a smooth posteroventral area of genae. This species is similar to *Z. chiapanensis* but the former has a carina in the dorsal apex of metepisternum absent in the latter.

**Geographic distribution and elevation range:** Brazil (Goiás). 912m

**Material examined**

*Zelomorpha chiapanensis* n. sp.
(Figs. 4C, 19EF, 34C, 49C)

**Measurements.** Mesosoma length 4.21 mm. FW length 10.98 mm.

**Head.** Medial ridge or convexity of face absent. Face with a narrow dorsomedial groove, flat medially and laterally, lacking striations, with regular fovea evenly distributed leaving flat areas between them. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, with acute base, non striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly shorter than their diameters. Number of flagellomeres 44. Depression laterad
lateral ocellus absent. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange absent, with rugae restricted to area immediately basad eye.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of a strong ridge at height of scrobal groove. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of different sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with two carina meeting as an inverted Y. Juxtacoxal flange present, regularly concave, slender, straight, with round apex, with a complete carina mediad flange apex. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus absent. Median longitudinal mesoscutal groove absent. Scutellar sulcus deep and slender, with five carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk three-sided, without lateral carinae, sparsely foveolated. Transverse groove of scutellar disk absent. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum broad, round, without acute longitudinal ridge, and with a pointed tip. Longitudinal apical crest of median metanotal areola absent. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola with transverse ridges, acuminate. Anterolateral areola present and without ridges. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina absent. Posteromedian areola fused with posterolateral areola, without transverse ridge, without median longitudinal ridge. Posteropleural areola closed. Transverse keel strong, dividing propodeum into two distinct planes.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a shorter than r-m, RS2b present. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black except as follows: part of clipeus and palpi yellow. Foreleg and midleg coxae black with brown trochanter, trochantellus, femur and tibia. First four tarsomeres yellow. Hind leg brown. Wings entirely infumate.
Etymology: The name of this species refers to the type locality.

Diagnosis and similar species
Within the species related to *Z. flavipennis*, this species can be distinguished by the presence of two dorsoventral carinae that joints at the dorsal part of the metaepisternon, the metaepimeron is strongly punctured; the RS2B vein of the FW is present. This species has a median longitudinal depression at the scutellum

*Z. chiapanensis* shares with *Z. xanthostigma* the presence of strong transverse carinae of different sizes in the suture that separates metaepisternum from metaepimeron. This species shares with *Z. rufimana* the large and evenly distributed fovea on the face; however, *Z. chiapanensis* differs from it in the following characters: The apical tip of the metanotum is convex and pointed and the central areola of the metanotum does not have a longitudinal carina; the apical tip of the metanotum of *Z. rufimana* is concave and the central areola of that sclerite is devoid of a longitudinal carina

Geographic distribution and elevation range: Mexico. 544m

Material examined
HOLOTYPE: ♀. Escuintla, Chiapas, Crawford/ USNM 2021943/ USNM

*Zelomorpha illi* n. sp.
(Figs. 7E, 22IJ, 37E, 52E)

Measurements. Mesosoma length 3.33 mm. FW length 9.41 mm.

Head. Medial ridge or convexity of face present and without a dorsal circular protuberance. Face without a dorsomedial groove, or with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, with regular fovea present medially only, with punctures sparsely distributed laterally. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal
insertions distinctly longer than their diameters. Number of flagellomeres 41, 42. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena concave, depression dorsad flange absent, with irregular rugae evenly distributed.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 5–6 small ridges evenly distributed, or absent. Mesopleuron with small punctures evenly distributed. Sternalus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, wide, with a complete carina mediad flange apex, or with a complete carinae and irregular additional carinae. Anterior area of subpronope not modified. Posterolateral margin of pronotum smooth. Notaulus indicated by weak depressions. Median longitudinal mesoscutal groove indicated by a wide, flat, sculptured depression. Scutellar sulcus deep and subquadrate, with one carina. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk three-sided, without lateral carinae, sparsely foveolated. Transverse groove of scutellar disk weak and with irregular crenulae. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, pentagonal, with lateral ridges strong, shorter than anterior ridges. Anterolateral areola with two incomplete ridges heading diagonally half distance from midlength of anteromedial keel. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina absent. Posteromedian areola complete, defined by distinct lateral carina, narrow posteriorly but with lateral ridges separated, without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a
subequal to r-m, RS2b absent. CUb of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly black except as follows: posterior half of pronotum, mesosternum, tegula mesoscutum, scutellum, metanotum, median areola of propodeum orange. *Some specimens have only part of the metaepimeron black with all the other posterior segments orange.* Palpi, tarsomeres of foreleg and midleg yellow. Hind leg brown. Metasoma black with segments 1–2 orange dark. Fore wings and hind wings entirely infumate.

**Etymology:** The specific epithet of this species is a name by aposition and refers to them

**Variation**
The epicnemial carina can be either crenulate or smooth. The black coloration in the posterior part of the mesosoma can be reduced to cover partially the metapimeron. The juxtacoxal area can be strongly rugous or almost smooth.

**Diagnosis and similar species**
This species can be distinguished by the following characteristics: eyes notoriously emarginated, posteroventral area of gena entirely rugous, only one carina in the scutellar sulcus, the surface of the anterolateral areola is rugous and has two incomplete transverse ridges. The posteromedial areola not fused with the posterolateral areola. This species shares with *Z. xanthostigma* and *Z. prudens* the weak depressions indicating the notaulli.

**Geographic distribution and elevation range:** Colombia, Ecuador, Brasil (Pará, Rondonia). 134-800m

**Material examined**
HOLOTYPE: ♀, ECUADOR, Provincia de Morona Santiago, 20km S of Gualaquiza, Bomboiza, 800m, 19 December 1992, E. S. Ross collector, Calif. Acad. Sci. Collection /CASC
♂, COLOMBIA, Amazonas, PNN Amacayacu, San Martín, 3°23´ S, 70°06´W, 150m, Red, 15.x.2001, D. Chota M. 2266 / IAVH

**Biology and hosts**
Some specimens have been collected at night with halogen vapor lamps
*Zelomorpha tropicola* (Szépligeti, 1908) **new combination**
(Figs. 15D, 30GH, 45D, 60B)

(Budapest, ♀, 680)

**Redescription**

**Measurements.** Mesosoma length 3.62 mm. FW length 10.73 mm.

**Head.** Medial ridge or convexity of face absent. Face with a narrow dorsomedial groove, *or without it*, convex medially with sides flat, lacking striations, with punctures more sparsely distributed around the clypeus. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, with acute base, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 43.

Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli foveolate-striate laterally, posterad ocelli *or with a few mediad fovea*. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange absent, with parallel rugae reaching distal margin of flange, *or with rugae restricted to area immediately basad eye*.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina absent. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 4–6 strong carinae restricted to dorsal half and a few weak carina in ventral half. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum without carina. Juxtacoxal flange present, regularly concave, wide, with a complete carina located dorsally, *or smooth or with a complete carina located ventrally*. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus absent. Median longitudinal mesoscutal groove absent. Scutellar sulcus
deep and subquadrate, with four carinae, or with 3. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk three-sided, without lateral carinae, sparsely foveolated. Transverse groove of scutellar disk indicated by a few mediad crenulations, scutellum or absent. Median areola of metanotum with an incomplete median longitudinal carina, or without median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures, or with microsculpturae. Anteromedial areola without transverse ridges, or with transverse ridges, acuminate. Anterolateral areola present and without ridges. Anteropleural areola present and smooth. Pleural carina distinct and complete. Transverse ridges of pleural carina absent. Posteromedian areola fused with posterolateral areola, without transverse ridge, without median longitudinal ridge. Posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa present, at least weakly, RS2a longer than r-m, RS2b present, or RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black except as follows: labrum, flagellum, palpi, tegula, part of propleura, propodeum and first four metasomal segments yellow. Foreleg yellow or yellow with mediodorsal black spot in femur. Midleg entirely yellow or yellow except as follows: basal coxa, apical trochantellus, most of femur. Hindleg brown except as follows: ventroapical part of coxa, trochanter, trochantellus, base and apex of femur yellow. Forewing hyaline with infumate areas in transverse medial band between pterostigma and anterior half of stigma; transverse apical band extending medially midway of distance between stigma apex and wing apex. Hind wing hyaline with posterior half infumate.

**Diagnosis and similar species**

*Z. tropicola* can be distinguished by the following combination of characters: posteroventral area of gena rugous, only the dorsal half of the posterior border of the mesopleuron with strong crenation, smooth posterior border of the mesoscutal sulcus, and transverse groove of the scutellum absent or indicated by a few median crenulations.

This species is very similar to *Z. tarsalis*. They differ in color pattern but this characteristic is variable in several related species; the two consistent differences between them is the sculpture of the
posteroventral area of gena and the carenation of the posterior border of the mesoscutum; the former is rugous in *Z. tropicola* while it is smooth in *Z. tarsalis*. The later is carenate only in the dorsal half in *Z. tropicola* while it is entirely carenate in *Z. tarsalis*. It may be possible that these are a single species but only the examination of more specimens will clarify this.

This species shares with *Z. vesmaeli* the carenation in the dorsal half of posterior border of the mesopleuron but it is devoid of the median longitudinal mesoscutal groove.

**Geographic distribution and elevation range**: Surinam, Colombia, Brazil (Mato Grosso, Rondonia). 150-460m

**Material examined**


**Zelomorpha tarsalis** (Szépligeti, 1902) **new combination**

(Figs. 14G, 29MN, 44G, )

*Biroia tarsalis* Szépligeti 1902 Természet. Füz. 25:73, ♀, “Peru: Yquitos” (Budapest, ♀, 674)
Redescription

Measurements. Mesosoma length 3.6 mm. FW length 10.7 mm.

Head. Medial ridge or convexity of face absent. Face with a narrow dorsomedial groove, convex medially with sides flat, lacking striations, with regular fovea dense medially and sparse laterally. Penultimate labial palptomere subequal in length to apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye not bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, with acute base, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange absent, smooth.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa absent, RS2a shorter than r-m, RS2b present. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black except as follows: metaepimeron, metaepisternum, and propodeum orange. Metasoma dark orange basally transitioning to black. Foreleg black with yellow four basal tarsomeres. Midleg black with yellow three basal tarsomeres. Wings entirely infumate.

**Diagnosis and similar species**

This species can be distinguished by the following combination of characters: posteroventral area of gena smooth, complete carenation of the posterior border of the mesopleuron, smooth posterior border of the mesoscutal sulcus, and transverse groove of the scutellum absent.

This species is very close to *Z. tropicola*. They differ in color pattern but this characteristic is variable in several species; the two consistent differences between them is the surface sculpture of the posteroventral area of gena and the carenation of the posterior border of the mesoscutum; the former is rugous in *Z. tropicola* while it is smooth in *Z. tarsalis*. The latter is carenate only in the dorsal half in *Z. tropicola* while it is entirely carenate in *Z. tarsalis*. These may be a single species but only the examination of more specimens will clarify their status.

**Geographic distribution and elevation range:** Peru. 106m

**Material examined**

LECTOTYPE: ♀ Yquitos, Peru / tarsalis det. Szépligeti / Lectotypus *Biroia tarsalis* Szépligeti 1902 sp. n. ♀ % des Papp, J. 1967 / Hym. Typ No. 674. Museum Budapest / *Dichelosus tarsalis* (Sz.) det. Papp J. 2003 HNHM (Zoological Department, Hungarian Natural History Museum)

*Zelomorpha pentagonalis* n. sp.

(Figs. 11G, 26MN, 41G, 56F)

**Measurements.** Mesosoma length 4.21 mm. FW length 11.08 mm.
**Head.** Medial ridge or convexity of face absent. Face without a dorsomedical groove, convex medially with sides flat, lacking striations, with punctures evenly distributed. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, with acute base, non striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 44. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posterovertral margin of gena evenly rounded and flanged. Posterovertral area of gena convex, depression dorsad flange absent, with irregular rugae evenly distributed.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 5–6 small ridges evenly distributed. Mesopleuron punctate but lacking punctures medially. Sternalcarus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum without carina. Juxtacoxal flange present, regularly concave, wide, with two complete carinae. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum carinated ventrally. Notaulus absent. Median longitudinal mesoscutal groove absent. Scutellar sulcus deep and subquadrate, with four carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk three-sided, without lateral carinae, sparsely foveolated. Transverse groove of scutellar disk absent. Median areola of metanotum with a complete median longitudinal carina. Posterior border of median areola of metanotum broad, round, without acute longitudinal ridge, and with a pointed tip. Longitudinal apical crest of median metanotal areola absent. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with irregular striations. Anteromedial areola without transverse ridges, pentagonal, with double carina in several parts. Anterolateral areola present and without ridges. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina absent. Posteromedian areola fused with posterolateral areola, without transverse ridge, with median longitudinal ridge separated from the transverse keel. Posteropleural areola closed. Transverse keel strong, dividing propodeum into two distinct planes.
**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Forewing 3M straight, 3RSa absent, RS2a shorter than r-m, RS2b present. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black except as follows: palpi, tegula, and first two metasomal segments yellow. Foreleg yellow except browinsh tibia and telotarsomere. Midleg black except ventral part of trochanter, trochantellus, basad femur and proximal four tarsomeres yellow. Hind leg black with brown tip of coxa, trochanter, and trochantellus. Fore wings infumate with a hyaline transverse band that starts at 2nd cubital cell and ends half length of marginal cell. Hind wings infumate.

**Etymology:** The name of this species refers to the shape of the propodeal anterior median areola

**Diagnosis and similar species**

This species can be distinguished by the following characteristics: anteriomedian areola of propodeum unique, pentagonal, with double ridges; thin groove in the longitudinal depression posteriad ocelli; rugous and depressed posteroventral area of genae; carenate posteroventral area of pronotum.

This species shares with *Z. chiapanensis* the smooth lateral carina of frons, striations in the external side of the lateral carina are present in most of the species of the genus. The posterior border of the scutellum is strongly truncated. The propodeum presents two clear surfaces divided by the posterior transversal carinae.

**Geographic distribution and elevation range:** Venezuela. 300m

**Material examined**

HOLOTYPE: ♂ Venezuela, Táchira, Quebrada La Uracá, San Félix, 300m, 17-22-vi-1998, J. DeMarmels- A. Chacón / MIZA

*Zelomorpha salvadorensis* n. sp.

(Figs. 13G, 28MN, 43G, 58F)
Measurements. Mesosoma length 4.16 mm. FW length 11.17 mm.

Head. Medial ridge or convexity of face absent. Face without a dorsomedial groove, flat medially and laterally, lacking striations, with regular fovea evenly distributed leaving flat areas between them. Penultimate labial palpmere about half length of apical palpmere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, with acute base, non striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly shorter than their diameters. Number of flagellomeres 42. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange absent, with irregular rugae evenly distributed.

Legs and wing venation. Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

Color pattern. Mostly orange except as follows: head, antennae, prosternum, most of pronotum, apex of metaepimeron, apical five metasomal segments black. Foreleg yellow except black coxa, trochanter, trochantellus and femur. Midleg brown except first four tarsomeres yellow. Hind leg brown except as follows: coxa and femur black; trochanter, trochantellus brown with yellow infuscations. Forewing hyaline except as follows: costal border, transverse medial band located between parastigma and anterior half of stigma, transverse apical band extending medially between stigma apex and wing apex. Hind wing hyaline with apical half infumate.

Etymology: The specific epithet of this species refers to country of the type locality.

Diagnosis and similar species
This species can be distinguished by the following characteristics: penultimate labial palp 50% shorter than the last one; angulated epicnemial carina; strong groove that surrounds the posterior border of the eyes; dorsal apex of metaepisternum with two carinae; acute posterior border of the median metanotal areola defined by convergent lateral borders. The juxtacoxal carina is long slender and subquadrate.

This species shares with Z. pentagonalis and Z. chiapanensis the smooth sides of the lateral carina of frons. Z. salvadorensis shares with Z. pentagonalis the thing groove in the vertex of the head, and it shares the two complete carinae in the juxtacoxal flange. Z. salvadorensis shares with Z. chiapanensis the shape of the scutellar sulcus, it is deep and slender

Geographic distribution and elevation range: El Salvador. 500-900m

Material examined
PARATYPES: 2 ♀♂, Santa Tecla, El Sal., 900m, 6-Viii-1972, No. F [293, 294], Leg. S. & L. Steinhauser / FSCA
Other Specimens

**EL SALVADOR**: 1 ♀, Santa Tecla, El Sal., 900m, 6-Viii-1972, No. F 292, Leg. S. & L. Steinhauser / FSCA

---

**Zelomorpha amoena** (Brullé, 1846) *new combination*

(Figs. 1E, 16IJ, 31E, 46E. As *B. surinamensis* 14F, 29KL, 44F, 59E)


*Agathis amsena* (!): Szépligeti 1904 Genera Insect. 22: 127 [misspelling]


*Biroia imitatrix* Enderlein 1920. Zur kenntnis au außereuropäischer braconiden Archive für naturgeschichte 84A (11) 196 ♀. “Surinam” (Stettin,♀). *New synonymy*

---

**Redescription**

**Measurements.** Mesosoma length 4.2 mm. FW length 12 mm.

**Head.** Medial ridge or convexity of face absent. Face with a narrow dorsomedial groove, convex medially with sides flat, lacking striations, or with regular fovea evenly distributed leaving flat areas between them, with punctures evenly distributed. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters. Number of flagellomeres 47. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea, posteriad ocelli or foveolated over entire surface or with irregular striations laterad ocelli. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove, or absent. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange absent, smooth.
**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina absent, or composed of 5–6 small ridges evenly distributed. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 4–6 strong carinae restricted to dorsal half and a few weak carina in ventral half, or with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina, metaepisternum or without carina. Juxtacoxal flange present, regularly concave, slender, curved posteriorly, with round apex, or wide, with two complete carinae, or smooth or with a complete carina located ventrally. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus absent. Median longitudinal mesoscutal groove absent. Scutellar sulcus shallow and slender transversally, or deep and subquadrate, with three carinae, or with 6. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk three-sided, without lateral carinae, sparsely foveolated. Transverse groove of scutellar disk weak, indicated by an irregular protuberance. Median areola of metanotum without median longitudinal carina, or with an incomplete median longitudinal carina. Sides of median areola of metanotum strongly diagonal to scutellum border, as a triangle with a wide base. Posterior border of median areola of metanotum acute, formed by convergent lateral borders, or acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with irregular striations, or with both regular striations and punctures. Anteromedial areola without transverse ridges, or with transverse ridges, acuminate. Anterolateral areola present and without ridges. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina absent. Posteromedian areola fused with posterolateral areola, without transverse ridge, without median longitudinal ridge. Posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa present, at least weakly, RS2a subequal to r-m, RS2b absent, or RS2b present. CUb of hind wing nebulous.

**Color pattern.** [Missing metasoma in holotype] mostly orange except as follows: head, antennae, anterior half of pronotum, prosternum, foreleg coxa, and most of midleg coxa black. Front leg yellow
except as follows: trochantellus, femur and telotarsomere brown. Midleg yellow except as follows: coxa mostly brown, femur brown, hind leg yellow except as follows: most of coxa, median part of femur, tibia and tarsus brown. In some specimens the metasoma is black with first three segments and anterior half of the IV orange. Forewing hyaline except as follows: costal border, transverse medial band between pterostigma and anterior half of stigma extending posteriorly up to intersection of 2cu-a and 2–1A. Transverse apical band extending medially midway of distance between stigma apex and wing apex. Hind wing hyaline with posteroapical area infumate. Some specimens have most of mesopleuron, most of metaepisternum, and metaepimeron black. Front and middle legs yellow.

**Variation**

A male of Peru have the juxtacoxal flange very wide and round, and one carina. Also, there are differences in the color pattern; however, this specimen follows the characters used to define this species. The number of carina in the scutellar sulcus can range from 3 to 6. There are some minor variations in the amount of yellow infuscations in the legs.

**Diagnosis and similar species**

This species can be distinguished by the following combination of characters: median areola of metanotum with a wide base, triangular; RS vein of the front wing well developed; anteriomedial areola of propodeum acuminate; posteriomedial areola of metanotum fused with the posteriolateral areola. The T1 is almost as wide as long in all the specimens observed, unfortunately the metasoma is missing in the holotype.

This species is very similar to Z. vesmaeli the major differences are the shape of the median metanotal areola and the long RS vein. It is possible that future research found that Z. vesmaeli and Z. amoena are one species. In the other hand Biroia surinamensis (Szépligeti, 1908), B. sarothriceps Enderlein 1920, and Biroia imitatrix Enderlein 1920 differs only in color patterns. If the coloration patterns are not considered, the limits between Z. surinamensis and Z. vesmaeli are difficult to set.

**Geographic distribution and elevation range**: El Salvador, Costa Rica, Guyanne, Venezuela, Surinam, Ecuador, Peru, Bolivia, Brazil (Amazonas, Pará). 0-1123m

**Material examined**


HNHM (Zoological Department, Hungarian Natural History Museum)


*Zelomorpha vesmaeli* (Spinola, 1840) new combination

(Figs. 15F, 30KL, 45F, 60D)


Redescription

Measurements. Mesosoma length 4.1 mm. FW length 12 mm.

Head. Medial ridge or convexity of face present and without a dorsal circular protuberance, or absent. Face with a narrow dorsomedial groove, or without it, convex medially with sides flat, lacking striations, or mediad longitudinal striations present, with punctures evenly distributed. Setal punctures of face not on regular depressions. Penultimate labial palpmere subequal in length to apical palpmere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters. Number of flagellomeres 43, 42–45. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea, posteriad ocelli or with irregular striations laterad ocelli. Median longitudinal depression posteriad ocelli absent, or weak, barely indicated as a shallow area or weak, indicated by narrow groove. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena concave, depression dorsad flange absent, with rugae restricted to area immediately basad eye, or smooth.

Mesosoma. Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina absent, or composed of 3–6 large ridges at mid length or composed of 5–6 small ridges evenly distributed. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 4–6 strong carinae restricted to dorsal half and a few weak carina in ventral half, or with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, or with acute angle at anterior border, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of
mesopleuron present. Dorsal apex of metepisternum without carina, metaepisternum or with one carina or with two subparallel carinae. Juxtacoxal flange present, regularly concave, wide, smooth, or with a complete carina mediad flange apex or with a complete carinae and irregular additional carinae. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus absent. Median longitudinal mesoscutal groove absent, or indicated by a single wide smooth depression. Scutellar sulcus shallow and slender transversally, or deep and slender, with three carinae, or with 4. Scutello-scuteal articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped, or carinate, gently sloped. Scutellar disk three-sided, without lateral carinae, sparsely foveolated. Transverse groove of scutellar disk weak, indicated by an irregular protuberance, scutellum or absent or indicated by a row of parallel crenulations or weak and with irregular carinae. Median areola of metanotum without median longitudinal carina. Sides of median areola of metanotum almost vertical to scutellum border. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, or with a few open areolae, surface with microsculptures only, or with both regular striations and punctures. Anteromedial areola without transverse ridges or with transverse ridges or barely indicated by lateral ridges, acuminate, or pentagonal, with lateral ridges strong, shorter than anterior ridges or pentagonal, barely indicated by incomplete lateral ridges. Anterolateral areola present and without ridges. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina absent. Posteromedial areola fused with posterolateral areola, without transverse ridge, without median longitudinal ridge. Posteropleural areola closed or open anteriorly. Transverse keel regular, reaching posteropleural keel, or strong, dividing propodeum into two distinct planes.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight or 3M curved, 3RSa present, at least weakly, or 3RSa absent, RS2a subequal to r-m or RS2a longer than r-m, RS2b present. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly orange except as follows: head, antennae, anterior half of pronotum, prosternum, most of foreleg coxa, most of fore and midleg femur, anterodorsal part of mid and hind coxae, basal third of hind femur, and posterior fourth metasomal segments black; other segments of metasoma with black or brown infuscations; hind tibia and tarsomeres brown. Forewing hyaline except as follows: costal border, transverse medial band between pterostigma and anterior half of stigma extending
posteriorly to the intersection of 2cu-a and 2–1A. Transverse apical band extending medially midway of distance between stigma apex and wing apex. Hind wing entirely hyaline. Some specimens have either an entirely black mesosoma or brown spots in mesoscutum, mesopleura and T1 tergite of the metasoma. A second color pattern found in specimens of this species is as follows: mostly light brown with lighter tibiae and tarsi, and darker metasoma. Forewing infuscate with hyaline triangular area covering stigma and most of 2nd submarginal cell. Hind wings infuscate. A third color pattern found is as follows: head, anteriad half of pronotum, mesosternum, and metapleurum black, other parts of mesosoma orange; metasomal segments 1–3 orange.

Variation

Some specimens have either a completely black mesosoma or dark-black spots in both mesopleuron and metaepisternon. In 1851 Spinola describes two varieties of the species collected from Pará (Brazil). These species differs from the type in the color pattern; one “variety” presents scutellum propodeum and the sides of the mesothorax below the wings and “mesospectus”, black. The other “variety” has black metathorax. Specimens from Pucallpa, Peru, follow the description of the first variety but their propodeum is orange and the black areas are infuscated with yellow.

The anteromedial propodeal areola either acuminate or pentagonal, sometimes with weak lateral ridges;

Color variation is ample in this species. Z.vesmaeli and Z.sharkeyi share color patterns in the different locations where these occur. Also, some specimens of Z.vesmaeli follow the color pattern of both Z.variegatus and Z.prudens. The specimens from Costa Rica have a lighter yellow coloration. A specimen from Ecuador has the hind legs entirely black while the front and midleg are black with yellow tarsi. A specimen from Brazil has an extensive black coloration in its wings and metapleurum. The carenation of the propodeum is variable; the anteromedial areola can be either campanulate or pentagonal, its ridges range from acute to blunt being more frequent the first condition. Some specimens may have strong transverse carina.

Diagnosis and similar species

Z. vesmaeli can be distinguished by the following combination of characters: lateral ridges of the median areola of metanotum almost vertical to scutellum anterior border; medial longitudinal carina of the metapleural central areola absent, the first character seems to be the most reliable indicator of the species boundaries between this species and Z. amoena.
No morphologic character was found to distinguish *Agathis wesmaeli* Spinola 1840 and *Biroia taeniolata* Enderlein 1920, consequently these species were synonymized.

*Z. vesmaeli* is very close to *Z. amoena* and can be distinguished from the latter by the median areola of metanotum with both sides almost vertical to anterior scutellar border. *Z. vesmaeli* shares with *Z. tropicola* the carenation in the dorsad part the posterior margin of the mesopleuron. *Z. vesmaeli* shares with *Z. xanthostigma* the carenated posterior border of the mesoscutal depression. *Z. tropicola* and *Z. prudens* have the anteriomedial areola delimited by weak ridges. The median longitudinal carina of the metanotal central areola is the only solid character to differentiate *Z. vesmaeli* from *Z. sharkeyi*.

**Geographic distribution and elevation range:** El Salvador, Costa Rica, Colombia, Venezuela, Surinam, French Guiana, Peru, Brazil (Amazonas, Mato Grosso, Pará, Rondonia, Santa Catarina). 0-1800m

**Material examined**


Biology and hosts
This species has been captured with light traps

**Zelomorpha akrolopha** n. sp.
(Figs. 1D, 16GH, 31D, 46C)

**Measurements.** Mesosoma length 4.1 mm. FW length 12 mm.

**Head.** Medial ridge or convexity of face absent. Face with a wide dorsomedial groove, convex medially with sides flat, lacking striations, with regular fovea evenly distributed leaving flat areas between them. Penultimate labial palpomere about half length of apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, fused posteriorly with interantennal carina forming a circular ridge, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters. Number of flagellomeres 43. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with irregular fovea and striations over entire surface. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange present, with a few subparallel rugae dorsad genal flange.

**Mesosoma.** Epicnemial carina complete and with distinct angle ventrolaterally, with groove wide and flat. Crenulation of epicnemial carina composed of 4–5 large ridges restricted to dorsad half. Mesopleuron with small punctures evenly distributed. Sternaulus with a notorious depression and up to three weak

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa present, at least weakly, RS2a subequal to r-m, RS2b present. CUb of hind wing nebulous. T1 with anterolateral protuberances on spiracles. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black except as follows: palpi, labrum, scape, posterior half of pronotum, tegula, mesoscutum, sides of metanotum, median and lateral areola of propodeum, and sides of first three metasomal segments orange. Foreleg and midleg yellow. Hind leg black except as follows: coxa apex, trochanter, trochantellus, basad apex of femur and basad apex of tibia yellow. Forewing hyaline except as follows: costal border, transverse medial band located between parastigma and base of stigma extending posteriorly; transverse apical band extending posteriorly from apex of stigma to wing apex. Hind wing hyaline with posterior half infumate. The propodeum and the first three metasomal segments can be entirely yellow.
Etymology: The specific epithet of this species is a Greek word and it refers to the multiple ridges present in the juxtacoxal carina and to the locality where the holotype was collected.

Variation
The specimen from Venezuela has a different color pattern and the gena is more sculpturated but all the other characters indicate that this and the holotype belong to the same species.

Diagnosis and similar species
This species can be distinguished by the following combination of characteristics: penultimate labial palpomere about half length of apical palpomere; gena with subparallel ridges dorsad flange and a strongly rugous ventrally; marginal carina fused with the interantennal carina; juxtacoxal flange with three carinae; scutal groove more curved than usual.

Geographic distribution and elevation range: Colombia, Venezuela. 100-280m

Material examined
PARATYPE: ♂, VENEZUELA, Aragua, Cuyagua, 19.i.1999, JL. García, R. Montilla, Barrido / MIZA

Zelomorpha areolaris (Szépligeti, 1908) new combination
(Figs. 2C, 17EF, 32C, 47C)


Measurements. Mesosoma length 4.1 mm. FW length 12 mm.

Head. Medial ridge or convexity of face absent. Face with a narrow dorsomediaal groove, convex medically with sides flat, lacking striations, with regular fovea dense laterally and sparse medically. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small).
Eyes non emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters. Number of flagellomeres 44. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange absent, smooth.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epinomial carina composed of 1–3 strong ridges near angle. Mesopleuron punctate but lacking punctures medially. Sternaulus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 4–6 strong carinae restricted to dorsal half and a few weak carina in ventral half. Suture between metepisternum and metepimeron incomplete, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of different sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum without carina. Juxtacoxal flange present, regularly concave, rectangular, with a complete carina located dorsally. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus absent. Median longitudinal mesoscutal groove indicated by two strong depressions. Scutellar sulcus deep and subquadrate, with five carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus carinate, gently sloped. Scutellar disk three-sided, without lateral carinae, sparsely foveolated. Transverse groove of scutellar disk absent. Median areola of metanotum with a complete median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, acuminatae, barely indicated by weak lateral carina. Anterolateral areola present and without ridges. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina absent. Posteromedian areola fused with posterolateral areola, without transverse ridge, without median longitudinal ridge. Posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a longer than r-m, RS2b present. CUb of hind wing nebulos. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.
**Color pattern.** Mostly orange except as follows: head, antennae, prosternum, and apical five metasomal segments black. Anterior half of pronotum brown. Foreleg and midleg yellow except black infuscations of coxa, and most of femur. Hind leg orange except as follows: dorsal half of coxa and tarsomeres brown-black. Forewing hyaline except as follows: costal border, transverse medial band located between parastigma and anterior half of stigma. Transverse apical band extending medially between stigma apex and wing apex. Hind wing entirely hyaline.

**Diagnosis and similar species**
This species can be distinguished by the following combination of characters: face with wider and more fovea laterally; posteroventral area of gena smooth; epicnemial carina with 1-3 strong ridges mid length; suture between metepisternum and metepimeron with transverse carina of different sizes; rectangular juxtacoxal flange; five carinae in the scutellar sulcus; posterior border of mesoscutal sulcus carinate; median areola of metanotum with a median longitudinal carina; anteriomedial areola of propodeum acuminate but with very weak lateral ridges

This species shares with *Z. tarsalis* and with *Z. chiapanensis* the unequal carena in the suture between metepisternum and metepimeron. *Z. areolaris* shares with *Z. prudens* and *Z. obscura* the rectangular shape of the juxtacoxal flange

**Geographic distribution and elevation range:** Surinam

**Material examined**

*Zelomorpha hallwachsae* n. sp.
(Figs. 7B, 22CD, 37B, 52B)

**Measurements.** Mesosoma length 3.97 mm. FW length 10.34 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedical groove, convex medially with sides flat, mediad longitudinal striations present, medial transverse striations present, with punctures densely distributed medially. Penultimate labial

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of several irregular and unevenly distributed ridges. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, clearly convex posteriorly, wide, with a complete carina mediad flange apex. Anterior area of subpronope wide and flanged. Posteroventral margin of pronotum smooth. Notaulus absent. Median longitudinal mesoscutal groove absent. Scutellar sulcus shallow and subquadrate, with one carina. Scutoscutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk three-sided, without carina, and wider than long, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotold areola fused apically with lateral ridges. Transverse crest of median metanotol areola absent. Propodeum with several strong areolae, surface with microsculptures only. Anteromedial areola without transverse ridges, pentagonal, with lateral ridges strong, shorter than anterior ridges. Anterolateral areola divided by several ridges converging anterolaterally. Anteropleural areola present and smooth. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola complete, defined by distinct lateral carina, narrow posteriorly but with lateral ridges separated, without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2
basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia with three
spines. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate.
Forewing 3M straight, 3RSa absent, RS2a longer than r-m, RS2b absent. CUb of hind wing nebulos. T1
smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black-brown except as follows: clypeus, palpi, tegula, metaepisternum,
metaepimeron, scutellum, metanotum, propodeum and first three metasomal segments orange. Fore and
midlegs yellow except coxa, medial area of femur and telotarsomere brown. Hindleg brown except as
follows: trochanter, trochantellus, ventrobasal part of femur and diverse spots in tibia yellow. Forewing
hyaline except as follows: transverse medial band located between the pterostigma and the anterior half of
stigma extending posteriorly; transverse apical band extending medially midway of distance between
stigma apex and wing apex. Hind wing hyaline with distal half infumate.

**Etymology:** The specific epithet of this species honors Winnie Hallwachs heavily involved person in
developing conservation areas in Costa Rica.

**Diagnosis and similar species**
This species can be distinguished by the following combination of characteristics: face with longitudinal
and transverse striations; penultimate labial palpi 50% shorter than the last one; epicnemial carina with
irregular unevenly distributed ridges; the mesoscutum strongly truncated anteriorly; scutellar sulcus
shallow and subquadrate; first metasomal tergum convex posteriorly; anteromedial areola pentagonal and
short.

This species shares with *Z. salvadorensis* having the penultimate labial palpi 50% shorter than the last
one. *Z. hallwachsae* shares with *Z. prudens* and *Z. campester* the smooth posteroventral area of gena. *Z.
hallwachsae* shares with *Z. campester* and *Z. illi* the longitudinal carina in the dorsal part of the
metaepisternum; the deep and crenulate transverse groove of the scutellum is a character that this species
shares with *Z. campester* and *Z. xanthostigma*. *Z. hallwachsae* is similar to *Z. campester* but in addition to
their different color pattern, that species can be differenciated by the length of the penultimate labial
palpi, and by the shape of the posteromedial propodeal areola.

**Geographic distribution and elevation range:** Costa Rica, Suriname. 200m

**Material examined**

- 1 ♀, Museum Leiden, W. suriname exp., Nickerie River, Blanche Marie-Falls, Meteocamp, 9-16 II 1971, D. C. Geijskes / in malaise traps / NNMN

Other specimens

Zelomorpha obscura n. sp.
(Figs. 10E, 25IJ, 40E, 55E)

Measurements. Mesosoma length 4.51 mm. FW length 11.71 mm.

Head. Medial ridge or convexity of face absent. Face with a narrow dorsomedial groove, convex medially with sides flat, lacking striations, with punctures evenly distributed. Penultimate labial palpmere about half length of apical palpmere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, non striate laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters. Depression laterad lateral ocellus absent. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli foveolated over entire surface. Median longitudinal depression posteriad ocelli absent. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange absent, smooth.

Mesosoma. Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina absent. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 4–6 strong carinae restricted to dorsal half and a few weak carina in ventral half. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders,
with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum without carina. Juxtacoxal flange present, regularly concave, rectangular, with a complete carina located ventrally. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus absent. Median longitudinal mesoscutal groove absent. Scutellar sulcus shallow and subquadrate, with three carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk three-sided, without carina, and wider than long, mostly smooth, with some longitudinal striations. Transverse groove of scutellar disk absent. Median areola of metanotum with an incomplete median longitudinal carina. Sides of median areola of metanotum strongly diagonal to scutellum border, as a triangle with a wide base. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola with transverse ridges, pentagonal, with lateral ridges strong, longer than anterior ridges. Anterolateral areola present and without ridges. Anteropleural areola present, with multiple fovea. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola fused with posterolateral areola, without transverse ridge, posteriomedial areola or with a straight transverse ridge, with median longitudinal ridge separated from the transverse keel. Posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa present, at least weakly, RS2a subequal to r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly orange except as follows: head, antennae, pro sternum, most of pronotum, last five abdominal segments black. Foreleg black except tibia, tarsus, and apex of coxa, trochanter, trochantellus, and femur which are yellow. Midleg yellow except coxa and femur; coxa with apical yellow infuscations which are black. Hind leg brown except coxa apex, trochanter, trochantellus, proximal, and distal apex of femur which are black. Forewing infumate with a tranverse hyaline band around second submarginal cell. Hind wing infumate.

**Etymology:** The specific epithet of this species refers to the extensive infumated coloration of the wings in several of the specimens.
**Diagnosis and similar species**

*Z. obscura* can be distinguished by the following combination of characters: face without striations, posterioventral area of gena strongly convex, posterior area of vertex richly foveolate, epicnemial carina without crenulations, scutellum three-sided but wider than longer, juxtacoxal flange almost quadrate, T1 length twice longer than wider.

This species shares with *Z. hallwachsi* and *Z. salvadorensis* the penultimate labial palpi being 50% shorter than the last one. *Z. obscura* shares with both *Z. vesmaeli* and *Z. tropicola* the dorsal carenation of the posterior border of the mesosternum. This species shares with *Z. hallwachsi* the shallow and subquadrate scutellar sulcus.

**Geographic distribution and elevation range**: British Guiana. 0m

**Material examined**

HOLOTYPE: 1 ♂, Kartabo, Bartica District, BRITISH GUIANA, 12.vi.1924 / AMNH

---

*Zelomorpha pallida* n. sp.

(Figs. 11B, 26CD, 41b, 56B)

**Measurements**. Mesosoma length 3.92 mm. FW length 12.2 mm.

**Head**. Medial ridge or convexity of face absent. Face with a narrow dorsomedial groove, flat medially and laterally, lacking striations, with regular fovea dense medially and sparse laterally. Penultimate labial palpomere about half length of apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, non striate laterally. Frontal depression entirely smooth. Distance between antenial insertions subequal to their diameters. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange absent, smooth.

**Mesosoma**. Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina absent. Mesopleuron with small punctures evenly distributed. Sternaulus with a
notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 4–6 strong carinae restricted to dorsal half and a few weak carina in ventral half. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, slender, curved posteriorly, with round apex, with a complete carina located ventrally. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus absent. Median longitudinal mesoscutal groove absent. Scutellar sulcus shallow and subquadrate, with three carinae. Scuto-scute articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk three-sided, without carina, and wider than long, mostly smooth, with some longitudinal striations. Transverse groove of scutellar disk indicated by a row of parallel crenulations. Median areola of metanotum without median longitudinal carina. Sides of median areola of metanotum strongly diagonal to scutellum border, as a triangle with a wide base. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola separated from lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, acuminate, barely indicated by weak lateral carina. Anterolateral areola present and without ridges. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina absent. Posteromedian areola fused with posterolateral areola, without transverse ridge, without median longitudinal ridge. Posteropleural areola absent. Transverse keel proximad at mediad areola, distad at lateral areola.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsosomere. Longest spur of midleg tibial longer than 1/2 basitarsosomere, hind leg tibia longer than 1/2 basitarsosomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa present, at least weakly, RS2a subequal to r-m, RS2b present. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly orange except head and metasoma brownish black. Palpi and mandibles yellow, front and mid leg tarsus yellow. Telotarsomeres brown. *Some specimens are entirely dark brown except front leg, tegula, and first two sternal segments which are yellow.*

**Etymology:** The specific epithet of this species comes from the Latin word pallidus which means pale

**Variation**
The specimen from Brazil is darker on head and metasoma than the specimen from Argentina. Specimens from Paraguay are almost entirely brown with the wings strongly infumated.

**Diagnosis and similar species**
This species is very close to *Z. oscura* and shares most of the characters with that species; however *Z. pallida* can be distinguished from it by the following combination of characters: juxtacoxal carina pointed posteriorly, vertex with few fovea.

**Geographic distribution and elevation range:** Brazil, Argentina, Paraguay. 75-500m

**Material examined**
PARATYPES: ♀, Argentina, Misiones, San Javier, 12.XI.1971, C. Porter / Zelomorpha / IMLA
- ♀, BernardinoS, Paraguay XI 20 / K Fiebrig collector / 20 nov “friegrid” vald Hym / USNM

Other specimens
PARAGUAY: 1 ♀, Q 9.8, 1901, Sapucay, Paraguay / Biroidea / USNM

*Zelomorpha xanthostigma* (Szépligeti, 1902) **new combination**
(Figs. 15H, 30OP, 45H, 60F)


**Redescription**

**Measurements.** Mesosoma length 3.92 mm. FW length 11.27 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance, *or absent.* Face with a narrow dorsomedial groove, convex medially with sides flat, lacking striations, *or mediad longitudinal striations present,* with punctures densely distributed medially, *or with punctures evenly distributed.* Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye not bordered by
groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, with acute base, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 44. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea, posteriad ocelli or smooth. Median longitudinal depression posteriad ocelli absent. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange absent, smooth.

Mesosoma. Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of about 10 robust transverse ridges, strongest at mid-length, absent in ventral third. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes, or transversed with strong carinae of different sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina, metaepisternum or with three subparallel carinae. Juxtacoxal flange present, regularly concave, wide, smooth, or with a complete carina mediad flange apex. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus indicated by weak depressions. Median longitudinal mesoscutal groove indicated by a wide, flat, sculptured depression. Scutellar sulcus deep and subquadrate, with one carina, or with 3. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum with a complete median longitudinal carina, or with an incomplete median longitudinal carina. Posterior border of median areola of metanotum with an acute transverse crest and a longitudinal crest. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola close to apex. Propodeum with several strong areolae, surface smooth. Anteromedial areola without transverse ridges, acuminate. Anterolateral areola present and without ridges. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina absent. Posteromedian areola complete, defined by weak lateral carina, posteromedial areola or fused with posterolateral areola, narrow posteriorly but with lateral ridges separated, with an angulated transverse ridge, without median longitudinal ridge, posteromedial areola or with median longitudinal ridge. Posterolateral areola closed, or open anteriolaterally, subquadrate, narrower than anterolateral areola, posteropleural areola closed. Transverse keel diagonal at the lateral areolae, weak and transverse at the medial areola.
Legs and wing venation. Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia shorter than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia or with three spines. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Combined length of hind tarsomeres shorter than tibia. Forewing 3M curved, 3RSa absent, RS2a longer than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

Color pattern. Mostly dark brown except as follows: head and anterior half of pronotum black. Fore wings infumated with yellow area around tip of C+Sc+R, parastigma, and anterior half of stigma. Hind wings entirely infumate. The propodeum of some specimens is dark brown or black.

Variation
The species is variable in several characteristics: longitudinal striations of the face can be present or absent. The notauli may be absent or indicated by a weak depression. The carination of the propodeum is irregular in some specimens. The females seem to be bigger than the males.

Diagnosis and similar species
This species can be distinguished by the following characteristics: posteroventral area of genae without rugae but with a small depression, epicnemial carina with several strong ridges. The carenation of the propodeum is unique, specifically the posteromedian areola fused with the posteriolateral areola and with a V-shape transverse ridge. The marginal carina is small and, unlike most of the species of the genus, runs distant from the posterior ocelli.

This species shares with *H. atrata* the shorter hind leg tarsomeres than the tibia, but other characteristics clearly separate these species such as: the weak marginal carina of *H. atrata*, the strong posteroventral projection of the gena in *H. atrata*. *Z. xanthostigma* shares with *Z. chiapanensis* the suture between metaepisternum and metaepimeron tranversed with carinae of different sizes.

Geographic distribution and elevation range: Brazil (Espirito Santo, Santa Catarina). 300-642m

Material examined
LECTOTYPE: ♀, Espirito-Santo, Brasil, ex coll. Fruhstorfer / *xanthostigma* det. Szépligeti / Lectotypus ♀
% Biroia *xanthostigma* Szépligeti, 1902 – sp. n. des. Papp J. 1967 / Hym. Typ. No. 673 Museum Budapest. HNHM (Zoological Department, Hungarian Natural History Museum)
**Zelomorpha sharkeyi** n. sp.

(Figs. 14B, 29CD, 44C, 59A)

**Measurements.** Mesosoma length 4.21 mm. FW length 10.49 mm.

**Head.** Medial ridge or convexity of face absent. Face with a narrow dorsomedial groove, convex medially with sides flat, lacking striations, with regular fovea evenly distributed leaving flat areas between them. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, with acute base, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters. Number of flagellomeres 44. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with irregular striations laterad ocelli, posteriad ocelli or with a few mediad fovea. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange present, smooth.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of several irregular and unevenly distributed ridges. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, wide, smooth, or with a complete carina mediad flange apex. Anterior area of subpronope not modified. Posterolateral margin of pronotum smooth. Notaulus absent. Median
longitudinal mesoscutal groove absent. Scutellar sulcus deep and subquadrate, with three carinae, *or with 2 or 5*. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk three-sided, without lateral carinae, *or three-sided, without carina, and wider than long*, sparsely foveolated. Transverse groove of scutellar disk indicated by a row of parallel crenulations, scutellum *or absent*. Median areola of metanotum with a complete median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, *or with a few open areolae*, surface with both striations and punctures. Anteromedial areola without transverse ridges, acuminated, *or pentagonal, barely indicated by incomplete lateral ridges*. Anterolateral areola present and without ridges. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola fused with posterolateral areola, without transverse ridge, without median longitudinal ridge. Posteropleural areola closed. Transverse keel strong, dividing propodeum into two distinct planes.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa present, at least weakly, RS2a shorter than r-m, RS2b present. CUb of hind wing nebulose. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly orange except as follows: head, antennae, prosternum, anterior half of pronotum, mesopleurum, metaepisternum, metaepimeron, scutellum, last five abdominal segments black. Foreleg yellow. Midleg yellow except basal brown spots in coxa. Hind leg brown except as follows: coxa apex, trochanter, trochantellus, and base of femur yellow. Forewing hyaline except as follows: costal border, transverse medial band located between parastigma and anterior half of stigma; transverse apical band extending medially between stigma apex and wing apex. Hind wing hyaline with apical half infumated. *Some specimens have black mesosoma with orange tegula, metanotum, metaepisternum, metaepimeron, and propodeum*. Wings hyaline with a medial and a distal infumate band. *Some specimens are mostly yellow except as follows: head, antenna, prosternum, anterior part of pronotum, and last four metasomal segments*. *Some specimens are mostly black except as follows: clypeus, mandibles, palpi, posterior apex of pronotum, tegula, mesoscutum, T1–3 of metasoma, yellow*. Foreleg and midleg yellow with last tarsomere brown. Hind leg black except: apex of coxa, and most of femur. Forewing hyaline except as follows: transverse medial band located between parastigma and anterior half of stigma extending posteriorly; transverse apical band extending medially midway of distance between stigma
apex and wing apex. Hind wing hyaline with infumated bands that match distribution of these in forewing.

**Etymology**: The specific epithet of this species honors my advisor Dr. Michael Sharkey

**Variation**
A male from Pucallpa, Peru has a triangular anteromedial areola of propodeum. Specimens from Costa Rica have their scutellum wider than those from South America. The species exhibit three color patterns: some specimens from Pucallpa, Peru and from Guyane Francaise have most of the mesosoma black with orange propodeum and metaepimeron. The specimens from Costa Rica have the mesosoma almost entirely yellow. Specimens from Brazil follow the color pattern of *Z. variegatus*.

**Diagnosis and similar species**
This species can be distinguished by the following combination of characters: medial areola of metanotum with a median longitudinal carina; propodeum with acuminate anteromedial areola; posteromedial and posterolateral areola fused. Some specimens of *Z. sharkeyi* share with *Z. rufimana* the transverse groove of scutellum being indicated by a row of parallel crenulations.

**Geographic distribution and elevation range**: Costa Rica, Venezuela, French Guiana, Brazil (Rondonia), Peru. 0-100m.

**Material examined**
HOLOTYPE: ♀, Estación Sirena, P. N. Corcovado, Prov. Punta, COSTA RICA, 1-100m, abr 1994, G. Fonseca, L. S. 270500, 508300 # 2853 / COSTA RICA, INBIO CRI001798196 / INBC
PARATYPES: 1 ♀, Estación Sirena, Puntarenas, COSTA RICA, 1-100m, mar 1996, G. Fonseca, L. S. 270500, 508300 # 2853 / COSTA RICA, INBIO CRI000441312 / INBC

Other specimens
**COSTA RICA**: 1 ♀, COSTA RICA, Prov. Puntarenas, Est. Agujas, Sendero Ajo, 300m, 21 mar 1997, A. Azofeifa, L_S_276750_526550 # 46255 / COSTA RICA, INBIO CRI002562817 / INBC
1 ♀, Amubri, Prov. Limón, Costa Rica, 70m, 3-28 jul 1995, G. Gallardo, L S 385000 578100 # 5334 / COSTA RICA, INBIO CRI0002235862 / INBC
1 ♀, Amubri, A. C. Amistad, Prov. Limón, Costa Rica, 70m, 2-31 May 1994, G. Gallardo, L S 385000_578100 # 2928 / COSTA RICA, INBIO CRI002871974 / INBC
2 ♀♀,

**Zelomorpha rufimana** (Brullé, 1846) **new combination**

(Figs. 13D, 28GH, 43D, 58C)


**Redescription**
Given the poor condition of the *Z. rufimana* holotype, the present redescription includes data from the type of *Z. ruficollis* to fill out missing structures.

**Measurements.** Mesosoma length 4.02 mm. FW length 11.9 mm.

**Head.** Medial ridge or convexity of face absent. Face with a narrow dorsomedial groove, convex medially with sides flat, lacking striations, *or mediad longitudinal striations present*, with regular fovea evenly distributed leaving flat areas between them. Penultimate labial palpmere subequal in length to apical palpmere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, with acute base, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 44, 44–45. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with irregular striations laterad ocelli. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange present, with parallel rugae reaching distal margin of flange, *or with rugae restricted to area immediately basad eye*.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina absent. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 4–6 strong carinae restricted to dorsal half and a few weak carina in ventral half. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, *or with acute angle at posterior border*, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, wide, *or rectangular*, with two carinae, one complete, one incomplete, *or smooth or with a complete carina mediad flange apex*. Anterior area of subpronoipe wide and flanged. Posterolateral margin of pronotum smooth. Notaulus absent. Median longitudinal mesoscutal groove absent. Scutellar sulcus deep and slender, with three carinae, *or with 4*. Scuto-scutelllar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk three-sided, without lateral carinae, sparsely foveolated. Transverse groove of scutellar disk absent, scutellum *or indicated by a row of parallel crenulations*. Median areola of metanotum with a complete median longitudinal carina, *or without median longitudinal carina*. Posterior border of median areola of metanotum with an acute transverse crest and a longitudinal crest.
Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola close to apex. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola with a strong posterior transverse ridge, or with transverse ridges, campanulate. Anterolateral areola present and without ridges. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina absent. Posteromedian areola fused with posterolateral areola, without transverse ridge, without median longitudinal ridge, posteromedial areola or with median longitudinal ridge. Posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa present, at least weakly, RS2a subequal to r-m, RS2b present. CUb of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black except as follows: posterior half of pronotum, mesosternum, metaepisternum, tegula, mesoscutum, and scutellum orange. *In some specimens metaepisternum and scutellum are black.* Metanotum and part of propodeum light brown or black. Foreleg brown except first four tarsomeres yellow. *In some specimens the midleg four basitarsomeres are yellow.* Hind leg brown. Wings entirely infumate.

**Geographic distribution and elevation range:** British Guiana, Colombia, Venezuela, Peru, Bolivia, Brazil (Pará, Mato grosso, Goiás). 0-500m

**Material examined**
HOLOTYPE: ♀, *Biroia flavipennis* MIZ (MZPW) (Museum and Institute of Zoology, Polish Academy of Sciences)
HOLOTYPE: ♀, Type, B. M. Type HYM. 3.c.939. / Biroia ruficollis Cam. Type Br. Guiana / P. Cameron Coll. 1914-110 / 449 The Natural History Museum, London (BMNH)
BRITISH GUIANA: 1 ♀, Blairmont, B. Guiana/ H. E. Box 1923-1924/ 147/ USNM 2021943/ USNM.
VENEZUELA: 1 ♂, VENEZUELA, Barinas, Río Caparo, Res. Station, 32km E. El Canton, 3-5 II 1978, seasonal forest H. B. Jeppner / USNM. COLOMBIA: 1 ♀, COLOMBIA, Valle, 15 km NO Cali Río

**Variation**

This species presents great variation in its color pattern although is very uniform in its morphology. It is possible that several species are included in here but at the moment there is not enough information to sort them out. The striations of the face can be present or absent; specimens from Madre de Dios, Peru, have the lower part of the gena strongly rugosus; the posterior transverse carina of the propodeum may be absent in some males; the anterior median areola may have one or several transverse carinae. A specimen from Rurrenbanaque (Bolivia) has a quadrate juxtacoxal carina.

**Diagnosis and similar species**

164
A close examination of the holotypes of *Agatis rufimana*, *Biroia ruficollis* and *Biroia flavipennis* let me no doubt that these are the same species; thus, I synonymize them.

This species can be distinguished by the combination of the following characters: anteriomedial areola of the propodeum campanulate, scutellar sulcus with four carinae, row of crenulations in the scutellum, posteromedian and posterolateral areola fused. This species shares with *Z. chiapanensis* and *Z. vesmaeli* the face evenly covered by large punctures.

**Zelomorpha erugocephala** n. sp.

(Fig. 6D, 21GH, 36D, 51D)

**Measurements.** Mesosoma length 3.82 mm. FW length 11.52 mm.

**Head.** Medial ridge or convexity of face absent. Face with a wide dorsomedial groove, flat medially and laterally, lacking striations, with punctures evenly distributed except a wide area between tentorial pits. Penultimate labial palptomere less than 25% shorter than apical palptomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, with acute base, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 43. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with irregular fovea and striations over entire surface. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange absent, smooth.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina absent. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, with both anterior and posterior borders with acute angle, with transverse carinae restricted to suture width, with strong carinae of different sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with two subparallel carinae. Juxtacoxal flange present, regularly concave, slender, curved posteriorly, with round apex, with an incomplete carina. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus absent. Median
longitudinal mesoscutal groove absent. Scutellar sulcus deep and slender, with five carinae. Scuto-
scutellar articulation absent. Posterior border of mesoscutal sulcus carinate, gently sloped. Scutellar disk
three-sided, without lateral carinae, sparsely foveolated. Transverse groove of scutellar disk indicated by aow of parallel crenulations. Median areola of metanotum with a complete median longitudinal carina.
Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical
crest of median metanotal areola long and horizontal, strongly projected. Transverse crest of median
metanotal areola absent. Propodeum with several strong areolae, surface with both striations and
punctures. Anteromedial areola with transverse ridges, acuminate. Anterolateral areola with two
incomplete ridges heading diagonally half distance from midlength of anteromedial keel, and with an
incomplete lateral keel. Anteropleural areola present, with some weak rugae. Pleural carina distinct and
complete. Transverse ridges of pleural carina present. Posteromedian areola fused with posterolateral
areola, without transverse ridge, without median longitudinal ridge. Posteropleural areola closed.
Transverse keel regular, reaching posteropleural keel.

Legs and wing venation. Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2
basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2
basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising from a
lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa present, at least weakly, RS2a
subequal to r-m, RS2b present. CUb of hind wing nebulous. T1 with anterolateral protuberances on
spiracles. Length of T1 median tergite less than 1.5 times its posterior width.

Color pattern. Mostly black except as follows: posterior apex of pronotum, mesosternum, tegula,
mesoscutum, and scutellum orange. Metanotum light brown. Foreleg brown except first four tarsomeres
yellow. Median and hind leg brown. Fore and hind wings entirely infumate.

Etymology: The specific epithet of this species refers to the large smooth area between the tentorial pits.

Diagnosis and similar species
This species can be distinguished from the others by the following combination characters: Face
dorsomedial groove wide; face with an ample smooth area in between the tentorial pits; penultimate labial
palpomere 25% shorter than apical palpomere; median metanotal areola with a long and strong apical
median ridge; suture between metepisternum and metepimeron with anterior and posterior borders
carinate and with transverse carina of different sizes; posterior border of mesoscutal sulcus carinate;
longitudinal crest of the median central metanotal areola strong and horizontal; spiracles of T1 on
protuberances. This species resembles Z. rufimana in color pattern but the characters described above
readily distinguish from it.
Geographic distribution and elevation range: Bolivia. 1800m

Material examined
HOLOTYPE: ♀, Coroico, 1800m, BOLIVIA, 3-8.XII.1955, L. E. Pena. / Homotype Biroia flavipennis Enderlein compared by Sharkey/ CNCI

**Zelomorpha cellapatula** n. sp.
(Figs. 3H, 18OP, 33H, 48H)

**Measurements.** Mesosoma length 3.72 mm. FW length 10.68 mm.

**Head.** Medial ridge or convexity of face absent. Face with a narrow dorsomedial groove, convex medially with sides flat, lacking striations, with regular fovea evenly distributed leaving flat areas between them. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye not bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, with acute base, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with irregular fovea and striations over entire surface. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange absent, smooth.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina absent. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 4–6 strong carinae restricted to dorsal half and a few weak carina in ventral half. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum without carina. Juxtacoxal flange present, regularly concave, rounded, with two complete carinae. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus absent. Median longitudinal mesoscutal groove absent. Scutellar sulcus shallow and slender transversally, with three carinae. Scuto-scutellar
articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk three-sided, without lateral carinae, sparsely foveolated. Transverse groove of scutellar disk indicated by a row of parallel crenulations. Median areola of metanotum without median longitudinal carina. Sides of median areola of metanotum strongly diagonal to scutellum border, as a triangle with a wide base. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola with transverse ridges, acuminate. Anterolateral areola with two incomplete ridges heading diagonally half distance from midlength of anteromedial keel. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola fused with posterolateral areola, with a straight transverse ridge, with median longitudinal ridge separated from the transverse keel. Posteropleural areola closed. Transverse keel diagonal at the lateral areolae, weak and transverse at the medial areola.

Legs and wing venation. Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Forewing 3M straight, 3RSa present, at least weakly, RS2a subequal to r-m, RS2b present. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

Color pattern. Mostly orange except as follows: apical three palpomeres yellow; head, prosternum, pronotum, most of mesoscutum, apical five metasomal segments black. Legs black except: basal apex of hind coxa orange; four basitarsomerres of fore and mid legs yellow. Wings entirely infumate.

Etymology: The specific epithet of this species refers to the notoriously wide anterior side of the median metanotal areola.

Diagnosis and similar species
This species can be distinguished by the following combination of characters: wide median metanotal areola; the shape of both the anteromedia1 and posteriomedial areola is also distinctive of this species.

Geographic distribution and elevation range: Brazil (Pará). 25m

Material examined
**Zelomorpha bejaranoi** n. sp.
(Figs. 3A, 18AB, 33A, 48A)

**Measurements.** Mesosoma length 3.39 mm. FW length 7.9 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face without a dorsomedial groove, convex medially with sides flat, mediad longitudinal striations absent or mediad longitudinal striations present, lateral longitudinal striations present, mediad transverse striations absent, or **mediad transverse striations present**, short lateral transverse striations present, or **short lateral transverse striations absent**, transverse striations between interantennal carinae present, or **transverse striations between interantennal carinae absent**, with regular fovea dense mediadally and sparse laterally.

Penultimate labial palpomere subequal in length to apical palpomere, or less than 25% shorter than apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina or fused posteriorly with interantennal carina forming a circular ridge, striate laterally. Frontal depression entirely smooth, or with a few circular rugae. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 40, 43.

Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with irregular fovea and striations over entire surface, posteriad ocelli or smooth. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange absent, smooth, or with rugae restricted to area immediately basad eye.

**Mesosoma.** Epicnemial carina complete and evenly curved, or complete and with distinct angle ventrolaterally, with groove wide and flat. Crenulation of epicnemial carina composed of about 10 robust transverse ridges, strongest at mid-length, present in ventral third, or composed of 3–6 large ridges at mid length. Mesopleuron with small punctures evenly distributed. Sternalis with a notorious depression and a clear set of striations evenly distributed, or with a notorious depression and strong transverse striations forming an irregular dorsal margin. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed, or with 4–6 carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of different sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with a longitudinal and a transverse carinae disposed as a T. Juxtacoxal flange present, regularly concave, slender, curved posteriorly, with round apex, or
wide, with two incomplete carinae and irregular rugae, or with a complete carinae and irregular additional carinae. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum with a strong set of irregular fovea at mid height, or completely carenated. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove indicated by a single wide smooth depression. Scutellar sulcus deep and subquadrate, with three carinae. Scuto-scutellar articulation indicated by a tenuous line. Posterior border of mesoscutal sulcus non carinate, with strong slope. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum with a complete median longitudinal carina, or without median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge, or with an acute transverse crest and a longitudinal crest. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola close to apex, or absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, or with transverse ridges or with a strong posterior transverse ridge or with longitudinal ridges, pentagonal, with lateral ridges strong, longer than anterior ridges, or pentagonal but with sinuated lateral borders. Anterolateral areola divided by several ridges converging anterolaterally, or with an incomplete ridge heading half distance from midlength of anteromedial keel to anterodorsal corner or with two incomplete ridges heading diagonally half distance from midlength of anteromedial keel or rugous anterolaterally and with some irregular ridges converging anterolaterally. Anteropleural areola present, with several strong rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina absent. Posteromedian areola fused with posterolateral areola or incomplete or complete, defined by weak lateral carina, posteromedial areola or complete, defined by weak lateral carina, wide posteriorly, posteromedial areola or semicircular by fusion of lateral ridges or narrow posteriorly, without transverse ridge, with median longitudinal ridge separated from the transverse keel, posteromedial areola or without median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

Legs and wing venation. Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa present, at least weakly, or 3RSa absent, RS2a subequal to r-m, RS2b absent, or RS2b present. CUb of hind wing nebulous. T1 with anterolateral protuberances on spiracles. Length of T1 median tergite more than two times its posterior width.
**Color pattern.** Mostly orange except as follows: antenna, front and midleg telotarsomeres, apical half of hind leg tibia and tarsomeres brown; basal third of front and hind wings hyaline, apical part infumate. *Some specimens have both metasoma and wings almost entirely brown.*

**Etymology:** The specific epithet of this species honors my father-in-law Jose A. Bejarano who provided valious help with the Latin grammar for many species names.

**Variation**
In some specimens the transverse ridges of the suture between metepisternum and metepimeron extend beyond the posterior border; the lateral ridges of the posteriomedian areola can be fusionated forming a circular ridge, or can be incomplete. The penultimate labial palpomere could be either of similar size to the apical one or 25% shorter than it. The lateral carina of frons can be either continuous or separated from the interantennal carina.

**Diagnosis and similar species**
This species can be distinguished from the others by the following combination of characters: posterior margin of pronotum entirely carenate and with strong fovea, sometimes these are dense in the dorsal part; lateral carina of frons separated from interantennal carina; T1 1.5 times longer than wider.

The color pattern of this species is very distinctive; it is orange body with entirely infumated wings, black antenna, and posterior half of hind tibia and tarsi.

**Geographic distribution and elevation range:** Mexico, Honduras, El Salvador, Costa Rica. 63-1483m.

**Material examined**
HOLOTYPE: 1 ♀, MEXICO, Compostela, Nayarit, VII-27-1954 / M. Cazier & W. Gortsch Bradts Collectors AMNH

Other specimens
Zelomorpha cherylae n. sp.

(Figs. 4B, 19CD, 34B, 49B)

Measurements. Mesosoma length 3.72 mm. FW length 9.36 mm.

Head. Medial ridge or convexity of face present and without a dorsal circular protuberance. Face without a dorsomedial groove, or with a narrow dorsomedial groove, convex medially with sides flat, medid longitudinal striations present, or medid longitudinal striations absent, lateral longitudinal striations absent, medial transverse striations absent, short lateral transverse striations present, or short lateral transverse striations absent, transverse striations between interantennal carinae absent, with
regular fovea dense medially and sparse laterally. Penultimate labial palpmore less than 25% shorter than apical palpmere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth, or with a few circular rugae. Distance between antenal insertions distinctly longer than their diameters. Number of flagellomeres 43, 42. Depression laterad lateral ocellus present. Gena at midheight, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea, posteriad ocelli or with several evenly distributed foveae. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area, or weak, indicated by narrow groove. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange absent, with rugae restricted to area immediately basad eye.

Mesosoma. Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 4–9 large evenly distributed ridges. Mesopleuron with small punctures evenly distributed. Sternalus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metapleron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina, metaepisternum or with two subparallel carinae. Juxtacoxal flange present, regularly concave, slender, straight, with round apex, or slender, curved posteriorly, with round apex, with a complete carina located ventrally, or with a complete carina mediad flange apex. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove indicated by a single wide smooth depression. Scutellar sulcus deep and subquadrate, with three carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum with an incomplete median longitudinal carina, or without median longitudinal carina. Posterior border of median areola of metanotum with an acute transverse crest and a longitudinal crest. Longitudinal apical crest of median metanotal areola separated from lateral ridges, or long and horizontal, strongly projected. Transverse crest of median metanotal areola close to apex. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, or with transverse ridges, pentagonal, with lateral ridges strong, shorter than anterior ridges. Anterolateral areola with an incomplete ridge extending half distance from midlength of anteromedial keel to anterodorsal corner, or with two ridge extending half distance from midlength of anteromedial keel to anterodorsal corner, or with two
incomplete ridges heading diagonally half distance from midlength of anteromedial keel, and with an incomplete lateral keel. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola complete, defined by distinct lateral carina, subquadrate, posteromedia areola or narrow posteriorly, without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

Legs and wing venation. Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa absent, RS2a subequal to r-m, RS2b absent. CUb of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite more than two times its posterior width.

Color pattern. Mostly orange except as follows: antenna, head, anterior half of pronotum black; front and mid legs black except four basitarsomeres and base of coxa; hind leg black except coxa and femur which are orange posterior half of coxa and anterior half of femur black; basal third of front and hind wings hyaline, apical part infumate.

Etymology: The specific epithet of this species honors Cheryl Lindsay fellow student who provided extensive help during this revision.

Variation
Some specimens have the ventral transverse carina of the suture between metepisternum and metepimeron extended posteriorly; posterior border of mesoscutal sulcus crenated in some specimens; specimens from Costa Rica have weak rugosities in the posterior part of juxtacoxal flange but never as those present in Z. bejaranoi

Diagnosis and similar species
This species can be distinguished by the following combination of characters: epicmenial carina with evenly distributed carinations; juxtacoxal flange almost smooth, with mediad carina; median metanotal areola with a transverse posterior ridge; T1 more than two times its wide and with a median bulge instead of lateral ridges on spiracles. This species is very close to Z. bejaranoi

Geographic distribution and elevation range: Costa Rica, Venezuela. 300-1460m
Material examined

HOLOTYPE: ♀, Venezuela, Aragua, Rancho Grande, 1100m, 9-VI-76 / J. Martinez, J. M. Gonzalez / MIZA

1 ♀, Venezuela, Lara, Yacambu National Park, 13 km SE Sanare, 4800 feet, 4-7 III 1978, black light cloud forest, J. B. Heppner / USNM

Other specimens


Zelomorpha inca n. sp.
(Figs. 7F, 22KL, 37F, 52F)

Measurements. Mesosoma length 3.51 mm. FW length 9.56 mm.

Head. Medial ridge or convexity of face present and with a dorsal circular protuberance. Face without a dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, with regular fovea dense medially and sparse laterally. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes non emarginate, not converging ventrally.
Posterior orbit of eye not bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters. Number of flagellomeres 40.
Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of
vertex posteriad ocelli with a few medial fovea. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange present, with a few rugae and a puff of hairs ventrally.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of more than eight small, evenly distributed ridges or crenulations. Mesopleuron with small punctures evenly distributed. Sternaulus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, wide, with two carinae, one complete, one incomplete. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove absent. Scutellar sulcus deep and subquadrate, with three carinae. Scuto-scutellar articulation indicated by a tenuous line. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, without crenulae. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotonal areola long and horizontal, strongly projected. Transverse crest of median metanotonal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, campanulate. Anterolateral areola with two incomplete ridges heading diagonally half distance from midlength of anteromedial keel. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina absent. Posteromedian areola complete, defined by distinct lateral carina, narrow posteriorly but with lateral ridges separated, without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel diagonal at the lateral areolae, weak and transverse at the medial areola.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSA present, at least weakly, RS2a shorter than r-m, RS2b absent. CUB of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.
**Color pattern.** Mostly orange except as follows: head, antennae, anterior half of pronotum, apical five metasomal segments black. Front and mid legs black with four basitarsomeres orange, hind leg black with apex of coxa orange. Wings entirely infumate.

**Etymology:** The specific epithet of this species honors the Inca culture developed in Peru, where the holotype comes from.

**Diagnosis and similar species**
This species can be distinguished by the following combination of characters: Posteroventral area of gena with an anteroventral dense set of hairs; posterior orbit of eye not bordered; wide T1.

This species appears as an intermediate between *Z. cherylae* and the species originally described as members of the genus *Dichelosus*.

**Geographic distribution and elevation range:** Peru

**Material examined**
HOLOTYPE: 1 ♀, PERU: Loreto; Atalaya, 17.iii.1954, J. M. Schunke, B. M. 1961-64/ BMNH.

---

**Zelomorpha annulifovea** (Enderlein, 1920) **new combination**
(Figs. 2A, 17AB, 32A, 47A)

*Disophrys annulifovea* Enderlein, 1920 Arch. Naturgesch. 84 A (11): 192, ♀, MIZ (MZPW) (Museum and Institute of Zoology, Polish Academy of Sciences)

**Redescription**

**Measurements.** Mesosoma length 2 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face without a dorsomedical groove, convex mediadly with sides flat, mediad longitudinal striations present, lateral longitudinal striations absent, medial transverse striations absent, short lateral transverse striations present, lateral and dorsolateral striations radiating from the tentorial pits present, transverse striations between interantennal carinae absent, dense net of mediad transverse and longitudinal striae absent, fine set of mediad parallel transverse striations absent, with punctures evenly distributed. Penultimate labial
palpomere less than 25% shorter than apical palpomere. Ventral border of eyes reaching ventral border of
tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes emarginate,
not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons
composed of a strong continuous ridge, fused posteriorly with interantennal carina forming a circular
ridge, with acute base, striate laterally. Frontal depression entirely smooth. Distance between antennal
insertions distinctly longer than their diameters. Number of flagellomeres 37. Depression laterad lateral
ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a
few medial fovea. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow
area. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex,
depression dorsad flange absent, with semiparallel dorsal rugae and irregular ventral rugae.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of
epicnemial carina composed of more than eight small, evenly distributed ridges or crenulations.
Mesopleuron with small punctures evenly distributed. Sternaulus barely depressed and smooth, with one
posteroventral crenulation. Posterior margin of mesopleuron with 10–12 small uniform carinae. Suture
between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior
borders, with transverse carinae restricted to suture width, with strong carinae of different sizes. Convex
flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina.
Juxtacoxal flange present, regularly concave, slender, curved posteriorly, with round apex, with a
complete carina and irregular additional carinae. Anterior area of subpronope wide and flanged.
Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal
mesoscutal groove indicated by a single wide smooth depression. Scutellar sulcus deep and subquadrate,
with one carina. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate,
gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep,
without crenulae. Median areola of metanotum without median longitudinal carina. Posterior border of
median areola of metanotum with an acute transverse crest and a longitudinal crest. Longitudinal apical
crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal
areola close to apex. Propodeum with several strong areolae, surface with irregular striations.
Anteromedial areola without transverse ridges, pentagonal but with sinuated lateral ridges. Anterolateral
areola with an incomplete ridge extending half distance from midlength of anteromedial keel to
anterodorsal corner. Anteropleural areola present, with some weak rugae. Pleural carina distinct and
complete. Transverse ridges of pleural carina present. Posteromedian areola complete, defined by distinct
lateral carina, narrow posteriorly but with lateral ridges separated, without transverse ridge, without
median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral
areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.
**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur longer than 1/2
basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2
basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising from a
lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa absent, RS2a subequal to r-m,
RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite more than
two times its posterior width.

**Color pattern.** Mostly yellow except as follows: antenna, metasoma, midleg telotarsomere, hind leg
apical quarter of tibia and tarsi brown. Forewing hyaline except as follows: transverse band anteriad
stigma as wide as the 1st subdiscl cell; transverse apical band extending between posterior stigma apex
and wing apex. Hind wing hyaline.

**Variation**
There is variation in the shape of the propodeal areola; some specimens have the posteriomedial areola
wider than the anteriomedial areola while others have the inverse condition. The abdomen can be entirely
yellow or light brown. Males have slender heads than females, they can have a median longitudinal carina
along the propodeum. In several specimens the justacoxal area has about three vertical carinae attached to
the superior transversal carina. Costa Rica specimens are larger than Suriname specimens. The
venezuelan specimens shows smooth mesopleural carina.

**Diagnosis and similar species**
Z. annulifovea can be distinguished by the following combination of characters: frontal depression with
some circular rugae; labial palpomeres of similar size; epicnemial carina composed of irregular and
unevenly distributed small ridges. Apical margin of medial metanotal areola with both a longitudinal and
a transverse ridge. Anteromedial areola pentagonal with the lateral ridges about the same length of the
anterior ridges.

Z. annulifovea can be distinguished from Z. concinna by the shape of the anteromedial areola, which is a
pentagon with long lateral ridges in Z. concinna, the transverse ridges of the epicnemial carina present in
Z. concinna also distinguish this species from Z. annulifovea.

**Geographic distribution and elevation range:** Mexico, Costa Rica, Honduras, Panamá, Colombia,
Venezuela, Guyana, Ecuador, Peru, Brazil, Bolivia. 0-2200m.

**Material examined**
HOLOTYPE: ♀, Mexico, Chiapas, 20-7-07, L. Conradt S. / Type / Disophrys annulifovea type Enderl. ♀, Dr. Enderlein det. 1919 MIZ (MZPW) (Museum and Institute of Zoology, Polish Academy of Sciences).

Biology

The species has been captured in several types of environments such as: seacoast *Avicenia* forests, sand savannas, meadow shrub areas from Surinam, and in grassy weedy sites from Costa Rica. *Z. annulifovea* has been reared from *Anticarsia* moths frequently found in soybean crops. The more frequent host reported is *Anticarsia gemmatilis* in soybean. Other wasps have been captured from *Anticarsia* larvae feeding on *Glycine* and *Cannavalia*. Possible nocturnal activity has been reported through UV trapping.

**Zelomorpha elegans** (Brullé, 1846) New combination

(Figs. 6B, 21CD, 36B, 51B)


*Disophrys scita* Enderlein, 1920 Arch. Naturgesch. 84 A (11): 191, ♀, MIZ (MZPW) (Museum and Institute of Zoology, Polish Academy of Sciences) Shenefelt 1970 cites the holotype as a male; however, this is actually a female. New synonymy


Redescription

**Measurements.** Mesosoma length 3.14 mm. FW length 8.18 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, or without it, flat medially and laterally, lacking striations, with regular fovea densely distributed no leaving flat areas between them, or with regular fovea evenly distributed leaving flat areas between them. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 32–
Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea, posteriad ocelli or smooth or foveolated over entire surface. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area, or absent. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange absent, or depression present, with rugae restricted to area immediately basad eye, or smooth or with parallel rugae reaching distal margin of flange or with semiparallel dorsal rugae and irregular ventral rugae (sp 34).

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove narrow, no flat area is visible. Crenulation of epicnemial carina composed of about 10 robust transverse ridges, strongest at mid-length, absent in ventral third, or composed of 4 large ridges, two at height of scrobal groove and two in lower part or composed of 3–6 large ridges at mid length or composed of 1–3 stronger ridges near angle. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 10–12 small uniform carinae. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of different sizes, or transversed with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, slender, curved posteriorly, with round apex, or wide, with a complete carina mediad flange apex, or smooth or with one incomplete carina or with two complete carinae or with two carinae, one very high (sp 80). Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove indicated by a single wide smooth depression. Scutellar sulcus deep and subquadrate, with three carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum with an incomplete median longitudinal carina, or without median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with irregular striations. Anteromedial areola with transverse ridges, or without transverse ridges, acuminate. Anterolateral areola present and without ridges. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola fused with posterolateral areola, without transverse ridge, with median longitudinal ridge separated from the transverse keel. Posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.
Legs and wing venation. Basal tooth of foretarsal claw truncate. Foreleg tibial spur longer than 1/2 basitarsomere. Elongate tail of foreleg tibial spur absent. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia or with three spines. Apex of hind tibia arising directly from apical margin, or with widely separated spines. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa absent, or 3RSa present, at least weakly, RS2a subequal to r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

Color pattern. Mostly yellow except as follows: antenna some specimens have the scape and apical 4–8 antennal segments yellow, apical band in hind leg femur and hind leg tarsus brown some specimens have a dark-orange head. Apical two tarsomeres of front and mid leg are either yellow or brown. Some specimens have hind trochanter and trochantellus brown. Metasoma orange-dark or brown. Front wing infumate with a hyaline circular medial spot. Hind wing with an hyaline semicircular spot that match that of front wing.

Variation
This widely distributed species exhibit variation in several characteristics but in no case that variation was consistent enough to indicate that more than one species were present. The dorsomedial groove of the face can be present or absent; face either almost smooth or with fovea densely distributed not leaving flat spaces; marginal carina fused or separated from interantennal carina; area posteriad ocelli can be either smooth or entirely foveolated; rugosities of the posteroventral area of gena can be restricted to the dorsal border or can cover the entire surface of the gena; the carenation of the epicnemial carina can extend from four through 10 ridges but in all cases these are stronger at mid length; median carina of the juxtacoxal area either absent, or incomplete or complete; median metanotal areola with or without median longitudinal carina; anteromedian areola of propodeum with or without transverse ridges. Some specimens from Colombia have the marginal carina fused posteriorly with the interantennal carina

Diagnosis and similar species
This species can be distinguished by the following combination of characteristics: lateral carina of frons composed by a strong continuous ridge, epicnemial carination strongest at mid length, transverse groove of the scutellar disk deep with crenulae extending anteriorly but not reaching midway to scutellar sulcus, acuminate anteromedian areola of propodeum, posteriomedian and posteriolateral areola of propodeum fused. Carina of hind trochanter strong. The coloration pattern in this species is strikingly consistent through its entire geographic range.
Several parts of the holotype of this species are missing (right front leg, mid legs, hind legs, and metasoma) thus an extensive section of the redescription includes characters of the holotype of *Disophrys scita* which is in excellent condition.

No differences were observed between the holotypes of *Agathis elegans* Brullé, 1846, *Disophrys scita* Enderlein, 1920, and *Disophrys pulchricornis* Szépligeti, 1908. Thus the last two are considered junior synonyms of the first.

*Z. elegans* shares with *Z. akidna* the color pattern of the wings and body; however, *Z. elegans* has the longitudinal carina of the hind trochanter while that structure is entirely smooth in *Z. akidna*.

**Geographic distribution and elevation range:** Suriname, Guyana, French Guiana, Colombia, Venezuela, Peru, Bolivia, Brazil (Pará, Amapa). 0-270m

**Material examined**


HOLOTYPE: 1 ♀, Surinam, V-IX, Fruhstorfer / Type / *Disophrys scita* Type, Enderl ♀ / MIZ (MZPW) (Museum and Institute of Zoology, Polish Academy of Sciences)

Zelomorpha akidna n. sp.

(Measurements. Mesosoma length 2.57 mm. FW length 6.64 mm.

Head. Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, flat medially and laterally, lacking striations, mediad longitudinal striations absent, or mediad longitudinal striations present, lateral longitudinal striations absent, medial transverse striations absent, short lateral transverse striations absent, lateral and dorsolateral striations radiating from the tentorial pits absent, transverse striations between interantennal carinae absent, dense net of mediad transverse and longitudinal striae absent, fine set of mediad parallel transverse striations absent, with punctures evenly distributed. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons barely indicated by a continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 33, 34. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli smooth, posterad ocelli or foveolated over entire surface. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange absent, with rugae restricted to area immediately basad eye, or with rugae evenly distributed.)
**Mesosoma.** Epicnemial carina complete and evenly curved, with groove narrow, no flat area is visible. Crenulation of epicnemial carina composed of 1–3 strong ridges near angle, or composed of 3–6 large ridges at mid length. Mesopleuron with small punctures evenly distributed. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 4–6 evenly distributed carinae. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, wide, with a complete carina medially flange apex. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove indicated by a single wide smooth depression. Scutellar sulcus deep and subquadrate, with three carinae. Scuto-scute...
Etymology: The specific epithet of this species refers to the almost absent longitudinal carina in the hind trochanter. It comes from the Greek word Akidnos which means weak.

Variation
The species exhibit variation in the shape of the anteriomedial areola of the propodeum; in most of the specimens this is campanulate while a few exhibit a pentagonal shape. The area of vertex posteriad ocelli can be either smooth or entirely foveolate. The rugae of the posteroventral area of gena can be restricted to the dorsal part or can be evenly distributed. The hind trochanter and trochantellus can be either brown or yellow. The metasoma can be entirely yellow or orange with last six segments black.

Diagnosis and similar species
This species can be distinguished from all the other members of the genus by the absence of the longitudinal carina in the hind trochanter, although some specimens may have a weak longitudinal prominence. Other characters that help to distinguish this species are: weak marginal carina, scuto-scutellar articulation indicated by a tenuous line, lateral protuberances on spiracles of T1.

This species resembles Z. elegans in color pattern and general appearance; however, several characters differentiate them, these are: Z. elegans has a strong longitudinal carina on hind trochanter while that structure is entirely absent in Z. akidna; the marginal carina in Z. elegans is more pronounced than in Z. akidna; the spiracles of T1 have lateral protuberances in Z. akidna while these are absent in Z. elegans.

Geographic distribution and elevation range: Surinam, Ecuador, Brazil. 0-345m

Material examined
HOLOTYPE: ♀, VilaVera, BRAZIL, W50°30’ S12°30’, October 1973, M. Alvarenga / AEIC.
PARATYPES: 1 ♂, ECUADOR, Coca [Francisco de Orellana], May 1965, Luis Peña / AEIC.
1 ♀, BRAZIL, Sinop, M. Grosso 12°31’S 55°37’W. Oct. 1976 Brazil, M. Alvarenga / AEIC

Other specimens
ECUADOR: 1 ♀, ECUADOR: Napo Province, Limoncocha, on Rio Napo 8-III-1974, Boyce A.
Zelomorpha cucullifera (Enderlein, 1920) new combination
(Figs. 5E, 20IJ, 35E, 50E)
Disophrys cucullifera Enderlein, 1920 Arch. Naturgesch. 84 A (11): 191 ♀ ♂ MIZ (MZPW) (Museum and Institute of Zoology, Polish Academy of Sciences)

Redescription

Measurements. Mesosoma length 1.9 mm. FW length 6.1 mm.

Head. Medial ridge or convexity of face absent. Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, or mediad longitudinal striations absent, lateral longitudinal striations absent, medial transverse striations absent, short lateral transverse striations present, lateral and dorsolateral striations radiating from the tentorial pits absent, transverse striations between interantennal carinae present, dense net of mediad transverse and longitudinal striae absent, fine set of mediad parallel transverse striations absent, with regular fovea dense medially and sparse laterally. Penultimate labial palptomere less than 25% shorter than apical palptomere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, fused posteriorly with interantennal carina forming a circular ridge, striate laterally. Frontal depression with a few circular rugae. Distance between antennal insertions distinctly longer than their diameters. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli absent. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange present, with parallel rugae reaching distal margin of flange.

Mesosoma. Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of more than eight small, evenly distributed ridges or crenulations. Mesopleuron with small punctures evenly distributed. Sternaulus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 4–6 evenly distributed carinae. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum without carina. Juxtapoxal

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising from a lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSA present, at least weakly, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulos. T1 smooth anteriorly. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly yellow except as follows: dorsal half of head, antenna, apical six metasomal segments, posterior half of hind leg tibia and tarsomeres black-brown. Forewing hyaline except as follows: transverse mediad band extending from parastigma to anteriad apex of stigma; transverse apical band extending between midway posterior stigma apex and wing apex. Hind wing hyaline with two bands that match these of FW.

**Geographic distribution and elevation range:** Mexico, Honduras, Costa Rica, Colombia, Venezuela. 70-1100m.

**Material examined**
- HOLOTYPE: ♀, Mexico, Chiapas, 15.11.07, L. Conradt S. / Type / Disophrys cucullifera Type Enderl. ♀, Dr. Enderlein, det. 1919. (Museum and Institute of Zoology, Polish Academy of Sciences) MIZ (MZPW)
- ALOTYPE: ♂, Mexico, Chiapas, 20.07.07, L. Conradt S. / Type / Disophrys cucullifera Type Enderl. ♂, Dr. Enderlein, det. 1919. (Museum and Institute of Zoology, Polish Academy of Sciences) MIZ (MZPW)


**VENEZUELA**: 1 ♀, Venezuela, Aragua, El Limón, 450m, 2-V-76 / Luz de Mercurio /F. Fernandez Y. / MIZA. 1 ♀, VENEZUELA: Edo. Aragua, Rancho Grande, 1100m, 31-IV-80, J. Gonzalez G. Yepes / MIZA.

**Diagnosis and similar species**

This species can be distinguished by the combination of the following characteristics: marginal carina fused posteriorly with the interantennal carina; frontal depression with some circular rugae; median longitudinal depression posteriad ocelli absent; posterioventral area of gena with parallel rugae reaching the distal flange; dorsal apex of metepisternum without carina; triangular anteromedial areola

**Variation**

Some specimens have a strong internal carina in the internal depression of the eyes that reach the marginal carina close to the ocelli. These species have also a very rugous marginal carina.

**Biology and hosts**

Reared in *Coenipita bibitrix* (Noctuidae) feeding on *Enterolobium cyclocarpum* (Fabaceae) (Costa Rica) and *Gonodonta pyrgo* (Noctuidae) in Venezuela

*Zelomorpha coxatus* (Holmgren, 1868) **new combination**
**Agathis coxatus** Holmgren, 1868, Eugenies Resa, Insecta: 428, ♀ “Puna” (Island near Guayaquil, Ecuador) (Swedish Museum of Natural History, Entomology, NHRS)

**Disophrys coxata** (Holmgren, 1868): Roman, 1910 Etn. Tidskr, 31: 121 **Unjustified enmendation**


**Redescription**

**Measurements.** Mesosoma length 1.6 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, lateral longitudinal striations present, medial transverse striations absent, short lateral transverse striations absent, lateral and dorsolateral striations radiating from the tentorial pits absent, transverse striations between interantennal carinae absent, dense net of mediad transverse and longitudinal striae absent, fine set of mediad parallel transverse striations absent, with punctures densely distributed medially. Penultimate labial palpomere about half length of apical palpomere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli absent. Posterovertrnal margin of gena evenly rounded and flanged. Posterovertrnal area of gena convex, depression dorsad flange absent, with a few subparallel rugae dorsad genal flange.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of more than eight small, evenly distributed ridges or crenulations, or absent. Mesopleuron punctate but lacking punctures medially. Sternalus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 6 evenly distributed faint ridges. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of different sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, slender, straight, with acute apex, with a complete carina located ventrally. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth.
Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove indicated by a single wide smooth depression. Scutellar sulcus deep and subquadrate, with one carina. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum with an acute transverse crest and a longitudinal crest. Longitudinal apical crest of median metanotal areola separated from lateral ridges. Transverse crest of median metanotal areola close to apex. Propodeum with several strong areolae, surface with microsculptures only. Anteromedial areola without transverse ridges, pentagonal, with lateral ridges strong, longer than anterior ridges. Anterolateral areola with an incomplete ridge extending half distance from midlength of anteromedial keel to anterodorsal corner. Anteropleural areola present and smooth. Pleural carina distinct and complete. Transverse ridges of pleural carina absent. Posteromedian areola incomplete, subquadrate, without transverse ridge, with median longitudinal ridge separated from the transverse keel. Posteralateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising from a lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa present, at least weakly, or 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly yellow except as follows: dorsal half of head, antenna, six apical metasomal segments, and hind leg coxa brown. Forewing hyaline except as follows: transverse mediad band extending from parastigma to anteriad apex of stigma; transverse apical band extending between midway posterior stigma apex and wing apex. Hind wing entirely hyaline.

**Diagnosis and similar species**
This species can be distinguished by the following combination of characters: face with diagonal striations; penultimate labial palpomere about half length of apical palpomere; lateral carina of frons separated from interantennal carina; strong transverse carina of suture between metepisternum and metepimeron of unequal sizes; dorsal apex of metaepisternum with one carina and a flat posterior area; juxtacoxal carina slender with acute apex; one carina in the mesocutal sulcus; posterior border of the metanotal medial carina with a longitudinal crest and a transverse crest; median longitudinal ridge of posteromedia areola of propodeum strong;
Characters related with legs such as the length of the tibial spur, basal tooth of claw, and carina of hind trochanter were not observed in the holotype since this specimen does not have these parts; however, other specimens that fit into the description present the characteristic states for the genus; thus, these were assigned to the holotype.

**Geographic distribution and elevation range:** Cost Rica, Ecuador, British Guyana, Brazil (Bahia, Minas gerais). 0-960m

**Material examined**

**HOLOTYPE:** ♀, Puna / Kinb. / Type / Agathis coxatus / Naturhistoriska Riksmuseet Stockholm / Swedish Museum of Natural History, Entomology, NHRS, [Island near Guayaquil, Ecuador] **COSTA RICA:** 1 ♀, Los Almendros, P. N. Guanacaste, Prov Guan., COSTA RICA, 18 a 27 ene 1993, C. Cano, L-N-334800, 369800 / Costa Rica INBIO CRI 001 291144 / INBC. **BRAZIL:** 1 ♀, Encruzilhada, Bah., XI. ’72, 960m. Braz., M. Alvarenga / Homotype Coccygidium (Spilomicrodus) nigriceps (Cam.) compared by Sharkey / Coccygidium nigriceps Tow, 198 End. / AEIC. 1 ♀, Encruzilhada, Bah., XI. ’72, 960m. Braz., M. Alvarenga / CNCI. 8 ♀♀, Encruzilhada, Bah., XI. ’72, 960m. Braz., M. Alvarenga / Coccygidium nigriceps (Cam.) Det. M. Sharkey / CNCI. 1 ♀, Paraopeba, M. Gerais, Brasil, 14-1.1965, J. S. Morgante, col. / MZSP

**Zelomorpha nigriceps** (Cameron, 1911)

(Figs. 10B, 25CD, 40B, 55B)

*Spilomicrodus nigriceps* Cameron, 1911. Timehri, 1: 324 ♀, Br Guyana (on pins) (!London, ♀, 3.c.938 [cotype series of 3]


**Redescription**

**Measurements.** Mesosoma length 2.99 mm. FW length 4.5 mm.

**Head.** Medial ridge or convexity of face absent. Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, lateral longitudinal striations absent, short lateral transverse striations present, with punctures densely distributed medially. Penultimate labial palpomere about half length of apical palpomere. Ventral border of eyes reaching ventral border of
tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression with a few circular rugae. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 43. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with irregular striations laterad ocelli, posterad ocelli or smooth. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posterodorsal margin of gena evenly rounded and flanged. Posterodorsal area of gena convex, depression dorsad flange present, with rugae restricted to area immediately distad eye.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of more than eight small, evenly distributed ridges or crenulations. Mesopleuron with small punctures evenly distributed. Sternaulus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 4–6 strong carinae restricted to dorsal half and a few weak carina in ventral half. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of different sizes, or transversed with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, slender, straight, with round apex, with a complete carina mediad flange apex. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove indicated by a single wide smooth depression. Scutellar sulcus deep and subquadrate, with three carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum with an incomplete median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola separated from lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola with transverse ridges, pentagonal, with lateral ridges strong, longer than anterior ridges, or campanulate. Anterolateral areola with a strong ridge heading half distance from midlength of anteromedial keel to anterodorsal corner, or divided by several ridges converging anterolaterally. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola complete, defined by weak lateral carina, subquadrate, without transverse ridge, with median longitudinal ridge separated from the transverse keel.
Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

Legs and wing venation. Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising from a lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa present, at least weakly, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite more than two times its posterior width.

Color pattern. Mostly yellow except: dorsal half of head and flagellomeres brown. Foreleg and midleg yellow. Hind leg yellow except tibia apex and tarsus which are brown. Forewing hyaline except as follows: transverse mediad band extending from parastigma to anteriad half of stigma; transverse apical band extending between posterior stigma apex and wing apex. Hind wing hyaline with two bands that match these of FW.

Diagnosis and similar species
This species can be distinguished by the following combination of characters: face without striations; penultimate labial palpomere less than 25% shorter than the apical palpomere; frontal depression with a few circular rugae; depression dorsad flange of posteroventral area of gena present; posterior margin of mesopleuron with 4-6 strong ridges restricted to dorsal half; pleural carina of metanotum with transverse ridges. The holotype is mostly testaceous orange; the dark areas in the mesosoma seem to be due to pin oxidation. This species is very close to and Z. coxatus

Geographic distribution and elevation range: Mexico, Guatemala, Costa Rica, British Guiana, Colombia, Venezuela, Ecuador. 100-730m.

Material examined
LECTOTYPE: ♂, Type / B. M. Type, HYM. 3.c.938 / 452 / ♂ Spilomicrodus nigriceps Cameron, C. Van Achterberg Lectotype 1988 / Spilomicrodus nigriceps Cam. Type Br. Guyana / P. Cameron Coll. 1914-110 / BMNH
LECTOPARATYPE: ♂, Type / B. M. Type, HYM. 3.c.938 / 462 / Spilomicrodus nigriceps Cam. Type Br. Guyana / ♂ Spilomicrodus nigriceps Cameron, C. Van Achterberg Lectotype 1988 / P. Cameron Coll. 1914-110 / BMNH
Zelomorpha coxalicus (Cameron, 1887) new combination
(Figs. 5A, 20AB, 35A, 50A)

Microdus coxalis Cameron, 1887 Biologia cent.-am. Hym. 1: 403, ♂

New synonym
Agathis coxalicus (new name for coxalis preoccupied by Spinola 1840, Shenefelt 1970, 328) “Panama, Bugaba” (!London, ♂, 3.c.967)

Redescription

Measurements. Mesosoma length 1.8 mm. FW length 5 mm.

Head. Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, lateral longitudinal striations absent, with regular fovea dense medially and sparse laterally. Penultimate labial palpomere about half length of apical palpomere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression with a few circular rugae. Distance between antennal insertions distinctly longer than their diameters. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli absent.
Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange absent, with rugae restricted to area immediately distad eye.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of more than eight small, evenly distributed ridges or crenulations. Mesopleuron punctate but lacking punctures medially. Sternaulus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 10–12 small uniform carinae. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, wide, with a complete carina mediad flange apex. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove indicated by a single wide smooth depression. Scutellar sulcus deep and subquadrate, with three carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum with an acute transverse crest and a longitudinal crest. Longitudinal apical crest of median metanotal areola separated from lateral ridges. Transverse crest of median metanotal areola close to apex. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola with transverse ridges, acuminate. Anterolateral areola with an incomplete ridge extending half distance from midlength of anteromedial keel to anterodorsal corner. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola complete, defined by distinct lateral carina, subquadrate, without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising from a lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa absent, RS2a subequal to r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly yellow except as follows: dorsal half of head, antenna, mid part of hind leg coxa, apical third of hind tibia, and tarsomeres brown. Forewing hyaline except as follows: transverse mediad band extending from parastigma to anteriad apex of stigma; transverse apical band extending
between midway posterior stigma apex and wing apex. Hind wing hyaline with transverse bands that match these of front wing.

**Geographic distribution and elevation range:** Panama. 133m.

**Material examined**
- 1 ♀, *Microdus coxalis* Cam. Type BCAii 403 / B.C.A.Hymen. I. *Microdus coxalis* Cam. /B.M. TYPE HYM. 3.c.967 / Bugaba, Panama, Champion / BMNH

**Diagnosis and similar species**
This species can be distinguished by the following combination of characters: penultimate labial palpomere less than half the length of the apical palpomere; lateral carina of frons fused with interantennal carina; frontal depression with a few circular rugae; no crenulations in the epicnemial carina; median metanotal areola with a longitudinal acute ridge and a transverse acute ridge. The anteriomedial areola of the holotype has a lateral additional ridge that deformates its campanulate shape. This species is very close to *Z. coxatus*

*Zelomorpha peruensis* (Szépligeti, 1902) **new combination**
(Figs. 12A, 27AB, 42A. 56H. As *D. brasiliensis* 3F, 18KL, 33F, 48F)

*Coccygidium peruensis* (Szépligeti, 1902), Sarmiento & Sharkey, 2005: 66.
*Coccygidium brasiliensis* (Szépligeti, 1902), Sarmiento & Sharkey, 2005: 66.

**Redescription**

**Measurements.** Mesosoma length 4.36 mm. FW length 11.57 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance, or absent. Face with a narrow dorsomedial groove, convex medially with sides flat, lacking striations, with regular fovea evenly distributed leaving flat areas between them. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in
lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, with acute base, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly shorter than their diameters. Number of flagellomeres 43. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a V-shaped carinae, posterad ocelli or smooth. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area, or weak, indicated by narrow groove. Posteroventral margin of gena strongly flanged. Posteroventral area of gena concave, depression dorsad flange absent, smooth.


**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a longer than r-m, RS2b absent, or RS2b present. CUb of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly yellow-orange except as follows: head, antennae, prosternum, anterior half of pronotum, metanotum, metaepisternum, metapimeron, propodeum, and last five abdominal segments
black. Foreleg yellow except black coxa and brown trochanter, trochantellus, and femur. Midleg brown except as follows: coxa and most of femur black; femur with a yellow basal band; tibia yellow basally. Hind leg brown except as follows: coxa black; trochanter, trochantellus and most of the basal part of femur yellow. Forewing hyaline except as follows: costal border, transverse medial band located between parastigma and anterior half of stigma; transverse apical band extending medially midway of distance between stigma apex and wing apex. Hind wing hyaline with infumated apical band that starts at r vein. Some specimens have the laterad area of propleura, foreleg with tibia and four basitarsomeres yellow. Midleg black except as follows: apex of trochantellus, proximal spot in femur, tibia and first tarsomere yellow. Coxa of hind leg with ventral side yellow.

Variation
A specimen from Colombia shows more extended yellow areas. Szépligeti described many species based only on color differences; however, no characters of the external morphology have been found to differentiate between these. That is the case of Z. peruensis and Z. brasiliensis.

Diagnosis and similar species
This species can be distinguished from the related species by the presence of a V-shaped carina in the area of vertex posterior to ocelli. Carina of hind trochantellus weak. T1 length less than 1.5 its maximum width

This species shares with Z. querubina the epicnemial carina interrupmed medially. Z. peruensis shares with Z. querubina, Z. similis, and Z. passi the smooth posterior margin of the mesopleurum. Z. peruensis shares with Z. interstitium having five carinae in the scutellar sulcus.

Geographic distribution and elevation range: Colombia, Peru, Brasil (Mato Grosso, Santa Catarina). 200-620m

Material examined
- 1 ♀, Quincemil, Perú, 10-15 XI-1962 / collection of R. D. Shenefelt / AEIC
Zelomorpha querubina n. sp.
(Figs. 13B, 28CD, 43B, 58A)

**Measurements.** Mesosoma length 4.02 mm. FW length 10.1 mm.

**Head.** Medial ridge or convexity of face absent. Face with a narrow dorsomedial groove, convex medi ally with sides flat, lacking striations, with regular fovea evenly distributed leaving flat areas between them, with punctures sparsely distributed laterally. Penultimate labial palpmere less than 25% shorter than apical palpmere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, with acute base, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 41. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena strongly flanged. Posteroventral area of gena concave, depression dorsad flange absent, smooth.


**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of
hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black except as follows: clipeus, palpi, tegula, and propodeum. T1–4 dark orange. Foreleg yellow with coxa, trochanter, trochantellus femur, and last tarsomere black. Midleg black with proximal part of tibia and first four tarsomeres yellow. Hind leg black with proximal half of femur dark orange. Forewing hyaline except as follows: costal border, transverse medial band located between parastigma, and anterior half of stigma extending posteriorly which are infumate; transverse apical band extending medially midway of distance between stigma apex and wing apex. Hind wing hyaline with infumated apical that starts at conjunction of costal border and R vein.

**Etymology:** The specific epithet of this species comes from the hebrew word “kerubim” which is a kind of angel and it refers to the daughter of the author.

**Diagnosis and similar species**

*Z. querubina* can be distinguished by the following combination of characters: epicnemial carina interrupted medially, juxtacoxal flange rectangular or quadrate, scutellar sulcus shallow and slender, rounded scutellum laterally.

This species, in conjunction, with *Z. peruensis*, *Z. similis*, *Z. passi*, and *Z. hospitator* does not have sternaulus. The shallow and slender scutal sulcus is a trait that this species shares with *Z. peruensis* and *Z. similis*. *Z. querubina* shares with *Z. peruensis* the medially interrupted epicnemial carina.

**Geographic distribution and elevation range:** Brazil (Mato Grosso). 345m

**Material examined**

HOLOTYPE: ♀, BRAZIL, Mato Grosso, Sinop, XI.1975, M. Alvarenga, Mal. Trap. / CNCI

*Zelomorpha trailii* (Cameron, 1905) **new combination**

(Figs. 15B, 30CD, 45B, 59G)
Redescription

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, lacking striations, with regular fovea evenly distributed leaving flat areas between them. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, with acute base, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange present, with a few subparallel rugae dorsad genal flange.


**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of
hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSA present, at least weakly, RS2a longer than r-m, RS2b present. CUb of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly brown except as follows: labrum, palpi, tegula, propodeum, yellow; T1–4 dark orange. Foreleg and midleg yellow. Hind leg orange with most of coxa, apical band in tibia and tarsomeres black. Forewing hyaline except as follows: transverse medial band located between parastigma and anterior half of stigma; transverse apical band extending medially midway of distance between stigma apex and wing apex. Hind wing entirely hyaline.

**Diagnosis and similar species**

This species can be distinguished from similar species by the following combination characters: posterioventral area of gena with a few and weak subparallel rugae dorsad genal flange; epicnemial carina complete; juxtacoxal flange wide; scutellar disk rounded. The T1 of the holotype of this species has a median longitudinal short depression in the posterior half. This species is similar to *Z. querubina*

**Geographic distribution and elevation range:** Brazil (Jurua)

**Material examined**


---

**Zelomorpha similis** (Szépligeti, 1908) **new combination**

(Figs. 14D, 29GH, 44D, 59C)


*Coccygidium similis* (Szépligeti, 1908) Sarmiento & Sharkey, 2005: 66.

**Redescription**

**Measurements.** Mesosoma length 3.67 mm. FW length 10.2 mm.

**Head.** Medial ridge or convexity of face absent. Face with a narrow dorsomedial groove, convex medially with sides flat, lacking striations, with regular fovea evenly distributed leaving flat areas between them. Penultimate labial palptomere less than 25% shorter than apical palptomere. Ventral border
of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes emarginate, not converging ventrally. Posterior orbit of eye not bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, with acute base, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters. Number of flagellomeres 41, 43. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena strongly flanged. Posteroventral area of gena concave, depression dorsad flange absent, smooth.


Legs and wing venation. Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a longer than r-m, RS2b absent. CUb of hind wing absent. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite less than 1.5 times its posterior width.

Color pattern. Mostly orange except as follows: head, antennae, prosternum, anterior half of pronotum, and last three metasomal segments black. Foreleg and midleg yellow except as follows: coxa, trochanter, trochantellus, and femur brown with yellow spots. Hind leg mostly brown with coxa black,
femur yellow with apical brown band, and tibia yellow with several brownish infuscations. Forewing hyaline except as follows: transverse medial band between parastigma and anterior half of stigma; transverse apical band extending medially midway of distance between wing stigma and wing apex. Hind wing hyaline with infumated apical band that starts at conjunction of costal border and R vein. Some specimens are mostly black except as follows: palpi, tegula, propodeum, dorsal part of metaepimeron, first four metasomal segments, yellow-orange. Frontleg yellow except telotarsus tip brown. Midleg yellow except anterior half of coxa and telotarsus tip brown. Hind leg yellow except most of coxa, apex of tibia, and tarsomeres brown. Forewing hyaline except as follows: transverse medial band located between parastigma and anterior half of stigma extending posteriorly; transverse apical band extending medially midway of distance between wing apex and stigma apex. Hind wing hyaline. Some specimens have wings entirely infumate and legs almost completely black.

Variation

Some specimens of Surinam have a darker yellow coloration in the body, being less apparent the contrast between the yellow and black areas. Even, the wings can be completely infumate. The thorax of one of these can be completely brown or brown with orange propodeum. The FW can have one or two transverse bands; some specimens have the wings entirely infumate.

Diagnosis and similar species

Z. similis can be distinguished from similar species by the following combination of characteristics: smooth posterior margin of mesopleura, shallow and slender scutellar sulcus, scutellum rounded laterally, propodeum smooth, and epicnemial carina complete and smooth.

This species shares with Z. peruensis, Z. querubina, and Z. passi the smooth posterior margin of mesopleura; and with Z. peruensis and Z. querubina the shallow and slender scutellar sulcus; however, Z. similis can be distinguished from these by having the epicnemial carina complete.

Geographic distribution and elevation range: Colombia, Surinam, Guyane Francaise, Brazil (Mato Grosso). 60-670m

Material examined

BRAZIL: 1 ♀, BRAZIL, Mato Grosso, Sinop, X.1974, M. Alvarenga, Mal. Trap. / Homotype Dichelosus similis Szépligeti Compared by Sharkey / 6 det. M.J. Sharkey 19 / c.s. 1 / HIC. Specimen used in the new description. COLOMBIA: 1 ♂, COLOMBIA, Guaviare, RN Nukak Maku, 2°10’40”N, 71°11’25”W Cñ

Zelomorpha passi n. sp.
(Figs. 11E, 26IJ, 41E, 56E)

Measurements. Mesosoma length 4.02 mm. FW length 11.57 mm.

Head. Medial ridge or convexity of face absent. Face with a narrow dorsomedial groove, convex medially with sides flat, lacking striations, with regular fovea evenly distributed leaving flat areas between them. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, with acute base, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 42. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea. Median longitudinal depression posteriad ocelli weak,
barely indicated as a shallow area. Posteroventral margin of gena strongly flanged. Posteroventral area of gena concave, depression dorsad flange present, with irregular rugae evenly distributed.


**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia shorter than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa present, at least weakly, RS2a shorter than r-m, RS2b present. CUb of hind wing absent. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black except as follows: palpi, mandibles, and foreleg tarsomeres brown. Posterior apex of pronotum, mesosternum, tegula, anterodorsal apex of metaepimeron, mesoscutum, scutellum, posterolateral borders of metanotum, and S1–2 orange. Hind leg trochanter and trochantellus orange. Wings entirely infumate. *In some specimens the metaepimeron is entirely orange and the metanotum is entirely black.*

**Etymology:** The name of this species honors Dr. Bobby Pass significant scientific figure and chair of the department of entomology at the University of Kentucky for many years, R.I.P.
**Diagnosis and similar species**

*Z. passi* can be distinguished from similar species by the combination of the following characteristics: smooth suture between metaepisternum and metaepimeron, sternaulus absent, and epicnemial carina interrupted ventrally. The epicnemial carina of this species is weak and often interrupted either medially or ventrally; this trait is shared with *Z. stigmata*.

**Geographic distribution and elevation range**: Brasil (Amazonas), Bolivia. 40-345m

**Material examined**

**HOLOTYPE**: 1 ♂, BRAZIL, Mato Grosso, Sinop, X.1976, M. Alvarenga, Mal. Trap / CNCI  
**PARATYPE**: ♂, BOLIVIA: Beni Prov., VII, 10-19, 1960. B. Malkin leg. / Chacobo Indian village, on Río Benicito 66° -12°20’ / FMNH.

Other specimens  
**BRAZIL**: 1 ♀, BRAZIL, Mato Grosso, Sinop, X.1976, M. Alvarenga, Mal. Trap / sp # 1 / CNCI

---

*Zelomorpha dubiosus* (Szépligeti, 1908) **new combination**  
(Figs. 6A, 21AB, 36A, 51A)

(Budapest, ♀ 686).

**Redescription**

**Measurements.** Mesosoma length 4.5 mm. FW length 12 mm.  

**Head.** Medial ridge or convexity of face absent. Face with a narrow dorsomedial groove. Gena in lateral view wider ventrally than dorsally (eyes appear small). Ventral border of eyes not reaching ventral border of tentorial pits. Face convex medially with sides flat, lacking striations, with regular fovea present medially only. Penultimate labial palpomere about half length of apical palpomere. Eyes emarginate. Eye not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge. Lateral carina of frons separated posteriorly from interantennal carina. And with striae laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with several evenly distributed foveae. Median
longitudinal depression posteriad ocelli weak, barely indicated as a shallow depression and lacking a narrow groove. Posteroventral margin of gena strongly flanged, convex, without depression dorsad flange, smooth.


**Color pattern** Mostly orange except as follows: head, posterior half of pronotum, last six metasomal segments black. Legs entirely brown. Forewing infumate except for hyaline transverse bands that start at anteriad 2nd submarginal extending a bit further stigma apex. Hind wing entirely infumate.

**Diagnosis and similar species**

*Z. dubiosus* can be distinguished from similar species by the combination of the following characteristics: epicnemial carina absent ventrally, subapical palpomere abouth half lengh of apical palpomere. The epicnemial carina of this species is interruptted ventrally a trait shared with *Z. stigmata*.

**Geographic distribution and elevation range:** Surinam
Material examined
HOLOTYPE: ♀, Holotypus ♀, *Dichelosus dubiosus* sp. n. Szépl. 1908 / Hym Typ. No. 686. Museum Budapest / Surinam Michaelis / HNHM (Zoological Department, Hungarian Natural History Museum)

_Zelomorpha stigmata_ n. sp.  
(Figs. 14E, 29IJ, 44E, 59D)

**Measurements.** Mesosoma length 4.36 mm. FW length 12.5 mm.

**Head.** Medial ridge or convexity of face absent. Face with a narrow dorsomedial groove, convex medially with sides flat, lacking striations, with regular fovea present medially only, with punctures sparsely distributed laterally. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, with acute base, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 44. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli absent. Posteroventral margin of gena strongly flanged. Posteroventral area of gena concave, depression dorsad flange present, or depression absent, smooth, or with rugae restricted to area immediately distad eye or with rugae evenly distributed.

**Mesosoma.** Epicnemial carina strong dorsally and interrupted ventrally, with groove wide and flat. Crenulation of epicnemial carina absent. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 4–6 strong carinae restricted to dorsal half and a few weak carina in ventral half. Suture between metepisternum and metepimeron incomplete, without acute angles at anterior or posterior borders, without transverse carinae. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum without carina. Juxtacoxal flange present, regularly concave, rectangular, smooth. Anterior area of subpronope wide and flanged. Posteroventral margin of pronotum smooth, or carenated ventrally only. Notaulus absent. Median longitudinal mesoscutal groove indicated by a single wide smooth depression. Scutellar sulcus deep and slender, with one carina, or with 2. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk three-
sided, without lateral carinae, sparsely foveolated. Transverse groove of scutellar disk absent. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum broad, round, without an acute longitudinal crest, and with a broad tip. Longitudinal apical crest of median metanotal areola absent. Transverse crest of median metanotal areola absent. Propodeum without areolae, smooth, surface with both striations and punctures. Pleural carina absent. Posteromedian areola absent, without transverse ridge, without median longitudinal ridge.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia shorter than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a longer than r-m, RS2b present. CUb of hind wing tubular. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black except as follows: palpi yellow; mesopleurum, scutellum, metanotum, propodeum, metasoma, and most of hind leg red-brown. The intensity of black or brown color may variate between specimens. Forewing infumate except for a triangular yellow spot that covers most of stigma and part of marginal cell. Hind wing infumate.

**Etymology:** The specific epithet refers to the pale spot of the FW.

**Diagnosis and similar species**

This species can be distinguished by the following characters: Face with regular fovea present medially only, with punctures sparsely distributed laterally, posterior orbit of eye partially bordered by groove, distance between antennal insertions distinctly longer than their diameters, epicnemial carina strong dorsally and interrupted ventrally. T1 short, less than 1.5 its maximum width. The color pattern is very useful to sort this species out.

**Geographic distribution and elevation range:** Surinam, Colombia, Brazil. 8-560m

**Material examined**


PARATYPE: ♂, COLOMBIA: Meta, La Macarena, Sector La Curía, alt. 560m, I/4-8/97. Col.: D. Campos / ICN-MHN HY2278

214
Other specimens

**COLOMBIA**: 1 ♀, COLOMBIA, Amazonas, PNN Hamacayacu, Malaise Feb. 89, M. Kelsey leg, / *Dichelosus* IAVH 3383. **SURINAM**: 1 ♀, Museum Leiden, SURINAM, Lelydorp, Sumatra road / 7-10.iv.1964, D. C. Geijskes, sand ridges in savannah forest / ♀ *Dichelosus* sp. nov. (congeneric with T. “sp.”), Det. C. v. Archerberg 1981 / NNMN

**Zelomorpha hospitator** (Fabricius, 1775) **new combination**

(Figs 7D, 22GH, 37D, 52D)

*Ichnneumon hospitator* Fabricius, 1775 Syst. Ent. 335 ♀, Nova Hollandia [Recife, Brazil]. ZMUC.


*Bracón ornator* (Fabricius, 1793) Fabricius, J. C. 1804. Systema Piezatorum. Carolum Reichard, Brunsviga: 106


*Coccygidium hospitator* (Fabricius, 1775), Sarmiento & Sharkey 2005: 61.

**Redescription**

**Measurements**. Mesosoma length 4.51 mm. FW length 11.7 mm.

**Head**. Medial ridge or convexity of face absent. Face with a narrow dorsomedial groove, convex medially with sides flat, lacking striations, with regular fovea evenly distributed leaving flat areas between them. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye not bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, with acute base, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly shorter than their diameters. Number of flagellomeres 46. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of
vertex posteriad ocelli with a few medial fovea. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena strongly flanged. Posteroventral area of gena concave, depression dorsad flange present, smooth.


**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia shorter than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, *or 3RSa present, at least weakly;* RS2a longer than r-m, RS2b present, *or RS2b absent.* CUb of hind wing nebulous. T1 with an anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly orange except as follows: head, antenna, anterior half of pronotum, posterior half of fourth metasomal segment and apical five metasomal segments black. Front leg yellow except: most of femur and telotarsomere black; mid leg mostly yellow except: most of femur, most of tibia (only basal and apical apex yellow) and telotarsomere black. Hind leg black or brown except as follows: apex of coxa, trochanter, trochantellus, base and apex of femur, base of tibia yellow. Forewing hyaline except costal border, transverse medial band between parastigma and anterior half of stigma; transverse apical band extending medially midway of distance between stigma apex and wing apex. Hind wing hyaline.

*Three other color patterns are recorded: 1. mostly black except as follows: posterior apex of pronotum,*
mesosternum, tegula, mesoscutum, and scutellum orange. Wings entirely infumate. A second color pattern is as follows: mostly black except: palpi, posterior half of pronotum, mesosternum, metaepimeron, mesoscutum, scutellum, and T1–3 metasomal segments orange. foreleg black except femur apex, tibia and first four tarsomeres yellow. Midleg yellow except coxa, trochanter, and posterior 3/4 of femur orange. Hind leg black except coxa apex, trochanter, trochantellus, femur basal and distal apex, and tibia basal apex orange. Forewing hyaline except as follows: costal border, transverse medial band between parastigma and anterior half of stigma; transverse apical band extending medially midway of distance between stigma apex and wing apex. Hind wing hyaline with infumated apical band that starts at r vein.

**Variation**

Variation has been observed in the size and number of the longitudinal carina in the scutellar sulcus. This species has three types of body color patterns but no other morphological difference has been observed to define these as different species.

There are two types of wing colorations: infumated with yellow stigma or hyaline with a mediad and apical bands.

**Diagnosis and similar species**

The examination of the types shows no difference between *Zelomorpha hospitator* (Fabricius, 1775), *Ichneumon ornator* Fabricius, 1787, and *Dichelosus fuscipennis* Szépligeti, 1902. Thus the latter two are considered junior synonyms.

This species can be distinguished by the epicnemial carina reduced to the dorsal side. The tergal glands of the males look like spicules or hairs in groups of three at the tip of the segments V and VI. These males present a yellowish spot at the posterior half of the stigma as mimicking *Z. xanthostigma*.

**Geographic distribution and elevation range:** French Guiana, Brasil (Amazonas, Pernambuco), Peru. 0-290m

**Material examined**

LECTOTYPE: (here designed): ♀, “hospitator”, mihi [= of me], Nova Hollandia [Recife, Brazil] ZMUC LECTOTYPE: (here designed): ♂ “ornator” mihi [= of me], Cajennae [Cayenne, French Guiana], ZMUC


**Zelomorpha fernandezi** n. sp.

(Fig. 6G, 21MN, 36G, 51G)

**Measurements.** Mesosoma length 3.23 mm. FW length 8.58 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, lacking striations, with regular fovea present medially only, with punctures densely distributed medially. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons barely indicated by a continuous ridge, separated posteriorly from interantennal carina, non striate laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters. Number of flagellomeres 40. Depression laterad lateral ocellus absent. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli absent. Posteroventral margin of gena strongly flanged. Posteroventral area of gena concave, depression dorsad flange absent, smooth.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of several irregular and unevenly distributed ridges. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 4–6 strong carinae restricted to dorsal half and a few weak carina in ventral half. Suture between metepisternum and metepimeron incomplete, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with weak carinae of similar sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising from a lobe. Forewing 3M straight, 3RSa absent, RS2a longer than r-m, RS2b absent. CUb of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly yellow except as follows: head, antenna, propleurum, anterior half of pronotum, posterior part of scutellum, posterior border of metanotum, metaepimeron, and metasomal segments V-VIII black. Foreleg yellow except coxa, trochanter, trochantellus, and most of femur black. Midleg black except as follows: apex of both femur, tibia, and tarsus yellow. Hind leg black except as follows: most of coxa, dorsal side of femur yellow. Forewing hyaline except as follows: costal border, transverse medial band located between parastigma and anterior half of stigma extending posteriorly. Transverse apical band extending medially midway of distance between stigma apex and wing apex. Hind wing hyaline with infumated bands that match distribution of forewing bands. *Some specimens are mostly brown-black except as follows: tegula, first four metasomal segments, front and middle legs, posterior half of hind leg coxa, femur and anterior half of tibia that are yellow or orange.*

**Etymology:** The specific epithet of this species honors the Colombian entomologist and friend Fernando Fernandez.

**Variation**
There are two color patterns the holotype is mostly orange while the paratype is mostly black. No other morphologic differences have been observed
Diagnosis and similar species

This species can be distinguished from similar species by the following characteristics: non-reduced penultimate labial palpmere; lateral carina of frons regular and acute but very small; suture between metaepisternum and metaepimeron incomplete, covered with weak transverse ridges; transverse groove of the scutellum indicated by a row of parallel crenulations. Z. fernandezi shares with Z. variegatus the faint pleural carina of the propodeum.

Geographic distribution and elevation range: Colombia, Peru. 150m

Material examined

HOLOTYPE: ♀, COLOMBIA, Amazonas, PNN Hamacayacu, Caño Mata-mata, Malaise, M. Kelsey, Feb. 89/ T34a / IAVH
PARATYPES: 1 ♀, PERU: Monzon Valley, Tingo Maria, X-26-1954 / E. I. Schlinger & E. S. Ross collectors / CASC
1 ♀, COLOMBIA, Amazonas, Amacayacu Natl. Park, Matamata Station, Tierra Firme, Total sweep, 8-12.mar.2000, Sharkey / HIC

Zelomorpha martahernandezae n. sp.
(Figs. 9C, 24EF, 39C, 54C)

Measurements. Mesosoma length 2.65 mm. FW length 7.25 mm.

Head. Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, lacking striations, with regular fovea present medially only, with punctures sparsely distributed laterally. Penultimate labial palpmere less than 25% shorter than apical palpmere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 39, 43. Depression laterad lateral ocellus absent. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea. Median
longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange absent, smooth.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 3–6 large ridges restricted to mid length. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 4–6 strong carinae restricted to dorsal half and a few weak carinae in ventral half, or with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, or with acute angle at posterior border or with acute angle at anterior border, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum without carina. Juxtacoxal flange present, regularly concave, wide, or wide, smooth. Anterior area of subpronope not modified. Posterolateral margin of pronotum smooth. Notaulus indicated by weak depressions. Median longitudinal mesoscutal groove indicated by a wide, flat, sculptured depression. Scutellar sulcus deep and subquadrate, with four carinae, or with 1 or 3. Scuto-scutellar articulation indicated by a tenuous line, or absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk weak, indicated by an irregular protuberance, scutellum or indicated by a wide depression and a wide ridge. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum broad, round, without an acute longitudinal crest, and with a broad tip, or broad, round, without acute longitudinal crest, and with pointed tip. Longitudinal apical crest of median metanotal areola absent. Transverse crest of median metanotal areola absent. Propodeum without areolae, smooth, surface with both striations and punctures. Pleural carina absent. Posteromedian areola absent, without transverse ridge, without median longitudinal ridge.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa present, at least weakly, or 3RSa absent, RS2a longer than r-m, RS2b absent. CUb of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black except as follows: clipeus, palpi, tegula, propodeum, first four abdominal segments yellow. Foreleg yellow. Midleg yellow except as follows: coxa, trochanter, trochantellus and last tarsomere brown. Hindleg black except as follows: internal longitudinal spot of coxa, anterior third of femur yellow. Forewing hyaline except as follows: transverse medial band located
between parastigma and anterior half of stigma; transverse apical band extending medially midway of
distance between stigma apex and wing apex. Hind wing hyaline with infumated apical band that starts at
R vein. Some specimens have most of mesosoma, posterodorsal apex of pronotum, spots in
metaepimeron, and midleg coxa yellow.

**Etymology:** The specific epithet of this species honors Martha Hernandez, chair of the Tayrona National
Park; she was assassinated while protecting that National Park.

**Variation**
Some specimens may have only one medial transverse crenula in the epicnemial carinae, similar to that
present in Z. boliviensis. The midleg coxa of some specimens is yellow, black, or black with yellow spots.
The number of antennal flagellomeres varies from 39 to 43; the propodeum may be entirely smooth or it
may have weak ridges, especially in the median part of where transverse carina would be. The mesosoma
can be entirely black or entirely yellow.

**Diagnosis and similar species**
This species can be distinguished from similar species by the following combination of characters:
smooth posteroventral area of gena; well developed posterodorsal flange of mesopleuron; complete suture
between metaepisternum and metaepimeron, transversed with strong carina of subequal sizes; scutellum
with a faint transverse groove; 4-6 crenulations at mid height of the epicnemial carina (although some
specimens have only one crenulation).

This species shares with Z. transversa the flat lateral area of ocelli, and the curved posteriorly juxtacoxal
flange; with Z. stigmata it shares the six strong transverse ridges in the dorsal half of the posterior border
of mesosternum.

**Geographic distribution and elevation range:** Colombia, Venezuela, Surinam, French Guyana,
Ecuador, Peru, Brazil (Rondonia). 9-300m

**Material examined**
HOLOTYPE: ♀, Colombia, Magdalena, PNN Tayrona, Zaino, 11°16’N 74°13’W, 13-30.v.2000, H.
Henriquez, 136 / IAVH
PARATYPES: 1 ♂, COLOMBIA, Caquetá, PNN Chiribiquete, Río Cuñaré-Amu, Bosque Amarillo,
0°13’3”N 72°25’22”, W, 300m, Malaise 7-10.iii.2001, M. Ospina & E. González / IAVH
Other specimens


**Zelomorpha puncturata** n. sp.

(Figs. 13A, 28AB, 43A, 57H)

**Measurements.** Mesosoma length 3.28 mm. FW length 8.58 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedical groove, convex medially with sides flat, lacking striations, with regular fovea densely distributed no leaving flat areas between them. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes non emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression
entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 41. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with several evenly distributed foveae. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange absent, smooth.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of about 10 robust transverse ridges, strongest at mid-length, absent in ventral third. Mesopleuron with strong uniformly distributed punctures. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 4–6 strong carinae restricted to dorsal half and a few weak carina in ventral half. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with two subparallel carinae. Juxtacoxal flange present, regularly concave, slender, curved posteriorly, with round apex, with an incomplete carina. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum with a strong set of irregular fovea at mid height. Notaulus indicated by weak depressions. Median longitudinal mesoscutal groove indicated by a wide, flat, sculptured depression. Scutellar sulcus deep and subquadrate, with four carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk indicated by a wide depression and a wide protuberance. Median areola of metanotum with a complete median longitudinal carina. Posterior border of median areola of metanotum broad, round and with an acute longitudinal crest. Longitudinal apical crest of median metanotum areola fused apically with lateral ridges. Transverse crest of median metanotum areola absent. Propodeum without areolae, smooth, surface with microsculptures only. Pleural carina weak and incomplete. Transverse ridges of pleural carina absent. Posteromedian areola absent, without transverse ridge, without median longitudinal ridge.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSA present, at least weakly, RS2a subequall to r-m, RS2b absent. CUb of hind wing nebulus. T1 smooth anteriorly, or with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black except as follows: clipeus, palpi, mandibles, tegula, dorsal part of propodeum, and first four abdominal segments yellow. Foreleg yellow. Midleg yellow. Hindleg black.
except as follows: longitudinal spot in ventral area of coxa, part of trochanter and trochantellus, femur, and most of tibia yellow. Forewing hyaline except as follows: transverse medial band located between parastigma and anterior half of stigma. Transverse apical band extending medially midway of distance between stigma apex and wing apex. Hind wings hyaline with infumated bands that matches these of the front wings. Some specimens are mostly black-brown with dark yellow infuscations as follows: pronotum posterior half, mesoscutum, tegula most of the anterior part of mesosternum, metaepimeron, metanoum, and mediad area of propodeum. Front and midlegs yellow with brown infuscatons on coxa, trochantellus, and femur. Hind leg brown with yellow trochantellus, anterior half of femur, and most fo tibia.

**Etymology:** The specific epithet of this species refers to the strong puncturation of the body.

**Diagnosis and similar species**

This species can be distinguished from the others by the following characteristics: face strongly foveolate; body extensively punctured; mid height of the posterior border of pronotum with a strong set of irregular fovea. Unlike in the related species *Z. compta*, *Z. martahernandezae*, and *Z. interstitium* the longitudinal carina of the hind trochanter in *Z. puncturata* is stongly developed.

*Z. puncturata* shares with *Z. angelica* having two carinae in the dorsal apex of metaepisternum; with *Z. trasnversa*, *Z. melina*, and *Z. jordii* shares the juxtacoxal flange curved posteriorly.

This species shares with *Z. tingomarianensis* having the posterior border of median areola of metanotum broad, round and with an acute longitudinal crest.

**Geographic distribution and elevation range:** Peru, Brasil (Mato Grosso). 120-500m

**Material examined**

HOLOTYPE: ♀, Avispas [Avispa], Peru, 30m nr Marcapata, Sept. 1962, Luis Peña / AEIC

PARATYPE: ♀, Boqueron Loreto, Peru, 5.jul.65 J. M. Schunke/ HIC

♀, BRAZIL, Mato Grosso, Sinop, XI. 1975, M. Alvarenga, Mal Trap. / 1 det. M. J. Sharkey / CNCI

**Zelomorpha octava** n. sp.

(Figs. 10G, 25MN, 40G, 55G)
**Measurements.** Mesosoma length 2.5 mm. FW length 7.4 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, lacking striations, with regular fovea evenly distributed leaving flat areas between them. Penultimate labial palpomere about half length of apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, non striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange absent, smooth, or with a few subparallel rugae dorsad genal flange.

**Mesosoma.** Epicnemial carina complete and evenly curved, or complete and with distinct angle ventrolaterally, with groove wide and flat. Crenulation of epicnemial carina composed of several irregular and unevenly distributed ridges. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 6 evenly distributed faint ridges, or with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum without carina. Juxtacoxal flange present, regularly concave, wide, smooth. Anterior area of subpronope wide and flanged. Postero lateral margin of pronotum smooth. Notaulus indicated by weak depressions. Median longitudinal mesoscutal groove absent. Scutellar sulcus deep and subquadrature, with one carina. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk three-sided, without lateral carinae, sparsely foveolated. Transverse groove of scutellar disk weak and with irregular crenulae. Median areola of metanotum with a complete median longitudinal carina, or without median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum without areolae, smooth, or with a few isolated ridges, surface with microsculptures only. Pleural carina weak and incomplete. Transverse ridges of pleural carina absent. Posteromedian areola absent, without transverse ridge, without median longitudinal ridge. Posterolateral areola or open anteriorly.
**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising from a lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa present, at least weakly, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black except as follows: clypeus, mandibles, palpi, part of prosternum, posterior apex of pronotum, tegula, scrobal and ventral part of mesopleurum, mesoscutum, scutellum, metanotum, dorsal part of propodeum, and segments 1–4 of metasoma yellow. Foreleg yellow with telotarsomere brown. Midleg yellow with coxa, trochanter, trochantellus, median part of femur and telotarsomere brown. Hind leg brown except base and apex of femur light brown. Forewing hyaline except as follows: transverse medial band located between parastigma and anterior half of stigma extending posteriorly; transverse apical band extending medially midway of distance between stigma apex and wing apex. Hind wing hyaline with infumated bands that match distribution of these in forewing. Some specimens are mostly black-brown with yellow areas as follows: posterior apex of pronotum, sides of mesoscutum, front leg, midleg femur, tibia, tarsus, and hindleg tibia. The metasoma black with sternites I-II yellow.

**Etymology:** The specific epithet of this species refers to a label on the type specimen that has the number eight written on it.

**Variation**
There are colors differences between holotype and paratypes. In one specimen there are incomplete lateral ridges of the posterior lateral areola. A specimen from Bolivia has an angulated epicnemial carina.

**Diagnosis and similar species**
*Z. octava* can be distinguished from similar species by the combination of the following characteristics: epicnemial carina with several weak crenulae; penultimate labial palpi 50% shorter than the last one; T1 smooth without a bulge.

This species shares with *Z. crowdus* and *Z. deulufeuti* the strongly reduced penultimate labial palpi. *Z. octava* is extremely similar to *Z. variegatus* but it can be distinguished by the absence of bulge in the T1 and by the smaller crenulation in the epicnemial carina.
**Geographic distribution and elevation range:** Bolivia, Brazil (Mato grosso). 423m

**Material examined**

**HOLOTYPE:** ♀, BRAZIL, Mato Grosso, Sinop, X.1974, M. Alvarenga, Mal. Trap / CNCI


**Other specimens**


---

**Zelomorpha anchicayensis** n. sp.

*(Figs. 1G, 16MN, 31G, 46G)*

**Measurements.** Mesosoma length 3.14 mm. FW length 8.82 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations absent, medial transverse striations present, short lateral transverse striations present, lateral and dorsolateral striations radiating from the tentorial pits absent, transverse striations between interantennal carinae present, with regular fovea dense medially and sparse laterally. Setal punctures of face on elevated protuberances. Penultimate labial palpomere flattened, about half length of apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange absent, smooth.

Legs and wing venation. Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa present, at least weakly, RS2a subequal to r-m, RS2b absent. CUb of hind wing nebulous. T1 with an anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite less than 1.5 times its posterior width.

Color pattern. Mostly orange except as follows: head, apical five metasomal segments, medial part of front and median femur, most of coxae and hind leg brown. Front wing hyaline with two infumated areas one by the pterostigma and the other as an apical band.

Etymology: The specific epithet of this species refers to the type locality.

Diagnosis and similar species
This species can be distinguished by the following combination of characters: face with setal punctures disposed on elevated protuberances, labial palpi flattened penultimate labial palpi about half the length of the apical papomere, T1 with a propounced medial bulge.
Geographic distribution and elevation range: Colombia. 560m

Material examined
HOLOTYPE: 1 ♀, Colombia, Dept. Valle, Central de Anchicayá, 30km E. Buenaventura, tropical very wet forest, 560m / R. C. Wilkerson, 13-16-viii-1975 malaise trap / Coccygidium det. M. Sharkey / FSCA

_Zelomorpha boliviensis_ n. sp.
(Figs. 3D, 18GH, 33D, 48D)

Measurements. Mesosoma length 3.63 mm. FW length 9.8 mm.

Head. Medial ridge or convexity of face absent, _or present_. Face with a wide dorsomedial groove, convex medially with sides flat, lacking striations, with punctures evenly distributed. Penultimate labial palpmere less than 25% shorter than apical palpmere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, with acute base, striate laterally. Frontal depression with a few circular rugae. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 40. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli smooth, posteriad ocelli _or with irregular striations laterad ocelli_. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange absent, smooth.

Mesosoma. Epicnemial carina complete and with distinct angle ventrolaterally, _or complete and evenly curved_, with groove wide and flat. Crenulation of epicnemial carina composed of 1–3 strong ridges near angle, _or absent_. Mesopleuron with small punctures evenly distributed. Sternalulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed, _or smooth_. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum without carina. Juxtacoxal flange present, regularly concave, small, barely developed, _or rounded, smooth_. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus indicated by weak depressions. Median longitudinal

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia shorter than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa present, at least weakly, RS2a subequal to r-m, RS2b present. CUb of hind wing tubular. T1 smooth anteriorly, or with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly light brown with ligther tibiae and tarsi, darker metasoma. Hind leg telotarsus dark brown. Front wing hyaline except as follows: black pterostigma, yellow stigma, infuscate apical band posteriad apex of stigma. Hind wing hyaline with infuscate posterior band matching that of the FW. *Some specimens have metasoma with extensive dark coloration, a specimen from Venezuela has the head entirely black; others are orange with black prosternum, anterior half of pronotum, posterior half of mesopleura, part of metepisternum, metepimeron, front leg coxa, anterior part of trochanter, anterior half of femur; mid leg black from coxa up to anterior half of femur; hind leg dark brown with orange coxa, femur and anterior half of tibia or entirely dark brown.*

**Etymology:** The specific epithet refers to the locality of a type series specimen

**Variation**
Like in several other species of the genus, the male is more sculptured than the female; this is obvious in the posterior margin of mesopleuron, and in the suture between metaepisternum and metaepimeron; In some specimens the lateral carina of frons is complete. A strong bulge in the first metasomal segment is present in some specimens. A specimen from Venezuela differs from the others in the black coloration of the head, but no other character differentiates it from the others. A specimen from Igarapé (Brazil) has black areas in several parts of the body.
Diagnosis and similar species

Z. boliviensis can be distinguished from similar species by the combination of the following characteristics: the depression laterad to the ocelli is particularly strong; circular rugae in the frontal depression; the CUb vein of the hind wing is present basally instead of nebulose like in most of the species of the genus; deltoid or subtriangular scutellar sulcus; carenate posterior border of the mesoscutal sulcus; posterior border of the median metanotal areola as a bulb, with the transverse carina widely separate from the apex; propodeum surface smooth.

This species shares characteristics with other species originally described in the genus Dichelosus such as the smooth propodeum, and the small juxtacoxal flange. Z. boliviensis shares with Z. deulufeuti the deltoid or subtriangular scutellar sulcus. Z. boliviensis shares with Z. crowdusi and with Z. jordii the circular rugae in the surface of the frontal depression.

Geographic distribution and elevation range: Venezuela, Bolivia, Argentina, Brazil (Goiás). 50-1200m

Material examined

HOLOTYPE: ♀, Instituto Oswaldo Cruz, Zona da N. O. B., Salobra, 18-19.x,38 / MSZP
- ♀, Igarapé Gurupi-Uma, Aldeia araçu, Ma. 50 km E. Canindé, V. 1963, Malkin col. / MZSP

Other specimens


Zelomorpha jordii n. sp.
Measurements. Mesosoma length 3.23 mm. FW length 8.97 mm.

Head. Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, or mediad longitudinal striations absent, with regular fovea present medially only, with punctures sparsely distributed laterally. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, with acute base, striate laterally. Frontal depression with a few circular rugae. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 41. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena as a strong posteroventral subquadrate projection. Posteroventral area of gena convex, depression dorsad flange absent, with rugae restricted to area immediately basad eye.

Mesosoma. Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 5–6 small ridges evenly distributed. Mesopleuron punctate but lacking punctures medially. Sternaulus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, slender, curved posteriorly, with round apex, with a complete carina mediad flange apex. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus indicated by weak depressions. Median longitudinal mesoscutal groove indicated by a wide, flat, sculptured depression. Scutellar sulcus deep and subquadrate, with one carina, or with 3. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, without crenulae. Median areola of metanotum with an incomplete median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum without areolae, smooth, surface with both striations and punctures. Pleural carina weak and incomplete.
Transverse ridges of pleural carina absent. Posteromedian areola absent, without transverse ridge, without median longitudinal ridge.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising from a lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black except as follows: palpi, tegula, posterior half of scutellum, metanotum, propodeum, and first four segments of metasoma orange. Antennae brown. Front and Midlegs yellow. Hind legs orange except: most of coxa, trochantellus, apical band of tibia, and tarsi black. Forewing hyaline except as follows: transverse medial band located between parastigma and anterior tip of stigma; transverse apical band extending between wing apex and stigma apex. Hind wing hyaline with infumated apical band.

**Etymology:** The specific epithet of this species honors Dr. Jordi Moya-Laraño colleague and friend arachnologist.

**Diagnosis and similar species**
This species can be distinguished from the species originally described as *Dichelosus* by the following characters: strong posteroinferior projection of the gena, identical to that present in the *Hemichoma*; however, *Z. jordii* does not have the acute peak at the mid-height gena, posterad eye; ridges basad to the lower part of the eye; long sternaulus with several weak ridges; longitudinal carina in the dorsal part of metaepisternum; complete mediad carina in the juxtacoxal flange

Some specimens of this species share with *Z. variegatus* and *Z. crowdusi* the longitudinal striations of the face. *Z. jordusi* shares with *Z. boliviensis* the circular rugae of the frontal depression. It shares with *Z. martahernandezae* and *Z. transversa* the curved posteriorly. *Z. jordii* shares with *Z. boliviensis* and *Z. deulufeuti* the flat anterior part of the T1.

**Geographic distribution and elevation range:** Brazil (Mato Grosso, Pará). 345m

**Material examined**
HOLOYPTE: ♀, Brazil, Mato Grosso, Sinop, XI.1975, M. Alvarenga, Mal. Trap / sp # 8 / CNCI
PARATYPES: ♀, Sinop, M. Grosso, 12°31’S 55°37’W, X. 1974, Brazil, M. Alvarenga / AEIC
- 1 ♀, Canindé, (Rio Gurupi), Pará, Brasil, XII. 1964, B. Malkin col. / MZSP

Zelomorpha tingomarianensis n. sp.
(Figs. 15A, 30AB, 45A, 59F)

Measurements. Mesosoma length 3.48 mm. FW length 9.9 mm.

Head. Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, medial transverse striations present, with regular fovea present mediadly only, with punctures sparsely distributed laterally. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, with acute base, non striate laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters. Number of flagellomeres 41. Depression laterad lateral ocellus absent. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with several evenly distributed foveae. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange absent, with rugae restricted to area immediately distad eye.

Mesosoma. Epicnemial carina complete and with distinct angle ventrolaterally, with groove wide and flat. Crenulation of epicnemial carina composed of 1–3 strong ridges near angle. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 4–6 strong carinae restricted to dorsal half and a few weak carina in ventral half. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum without carina. Juxtacoxal flange present, regularly concave, small, barely developed, smooth. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus indicated by weak depressions. Median longitudinal mesoscutal groove absent. Scutellar sulcus deep and subquadrate, with one carina. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk weak and with irregular crenulae. Median areola of metanotum without median longitudinal

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising from a lobe. Forewing 3M curved, 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly orange except as follows: head, anterior half of pronotum, medial part of mesosternum, mesepimeron, metaepisternum, metaepimeron, last four metasomal segments brown-black. Foreleg yellow except coxa, trochanter, and telotarsomere. Midleg yellow except most of basad coxa, and telotarsomere. Hindleg black except ventroapicad coxa, basad band of femur yellow. Forewing hyaline except as follows: costal border; transverse band between base of wing and basad third of M+CU distance; transverse medial band located between pterostigma and anterior half of stigma; transverse apical band extending medially midway of distance between stigma apex and wing apex. Hind wing hyaline with transverse bands that match these of the front wing.

**Etymology:** The specific epithet of this species refers to the type locality, Tingo Maria, in Peru.

**Diagnosis and similar species**

*Z. tingomarianensis* can be distinguished from similar species by the combination of the following characteristics: face with transverse and longitudinal striations; angulate epicnemial carina; smooth sides of the lateral carina; transverse groove of scutellum weak and with irregular crenulations; posterior border of the median areola of metanotum broad and with the longitudinal crest clearly separated from it; propodeum smooth; weak longitudinal carina of hind leg trochanter; T1 with a medial bulge

This species shares with *Z. angelica* transverse and longitudinal striations of the face; with *Z.deulufeuti* and *Z. fernandezi* shares the smooth sides of the lateral carina. *Z. tingomarianensis* shares with *Z. boliviensis* the angulate epicnemial carina.
Geographic distribution and elevation range: Peru. 290-705m

Material examined
PARATYPES: ♀, PERU: Madre de Dios, Río Tambopata Reserve, 30 air km SW of Puerto Maldonado, 290m, November 1-26 1982, Edward, S. Ross / CASC

Zelomorpha deulufeuti n. sp. 
(Figs. 5H, 20OP, 35H, 50H)

Measurements. Mesosoma length 3.63 mm. FW length 9.21 mm.

Head. Medial ridge or convexity of face absent. Face with a wide dorsomedical groove, flat medially and laterally, lacking striations, with punctures evenly distributed. Penultimate labial palpomere about half length of apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, fused posteriorly with interantennal carina forming a circular ridge, with blunt base, non striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 43. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with several evenly distributed foveae. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange absent, smooth.

mesoscutal groove indicated by two strong depressions. Scutellar sulcus deep and deltoid, with three carinae. Scuto-scutellar articulation indicated by a tenuous line. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with a few open areolae, or with a few open areolae, surface with both striations and punctures. Anteromedial areola absent. Anterolateral areola absent. Anteropleural areola absent. Pleural carina weak and incomplete. Transverse ridges of pleural carina absent. Posteromedian areola incomplete, narrow posteriorly but with lateral ridges separated, without transverse ridge, with median longitudinal ridge separated from the transverse keel. Posterolateral areola open anteriorly, subquadrate, subequal in width to anterolateral areola, posteropleural areola open anteriorly. Transverse keel present only mediadially.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising from a lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a longer than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Orange with head black. Forewing hyaline except as follows: infumate transverse band covering parastigma; infumate transverse apical band extending from stigma apex to wing apex. Hind wing hyaline with infumate band posteriad half way between vein r and wing apex.

**Etymology:** The specific epithet of this species honors Mr. Eric Deulufeu, enthusiastic employee of the flora and fauna sanctuary Los Colorados, type locality of this species.

**Diagnosis and similar species**
The species can be distinguished from similar species by the following characteristics: blunt lateral carina of frons, groove of the epicnemial carina wide and clearly extended forming a depression beyond the epicnemial border, and deltoid scutellar sulcus

This species is similar to *Z. boliviensis* and shares with it the wide dorsomedial groove of the head, the smooth posteroventral area of gena. The head to these two species resembles somehow that of an
Alysiinae wasp. *Z. deulufeuti* shares with *Z. martahernandezae* the posterior border of the scuto-scutellar articulation.

**Geographic distribution and elevation range:** Colombia. 400m

**Material examined**

HOLOTYPE: ♀, COLOMBIA, Bolivar, SFF Los Colorados, Alto el Mirador, 9°54’N 75°7’W, 400m, Malaise, 18.viii.3.ix.2001, E. Deulufeut Leg M. 2051 / IAVH

*Zelomorpha mariae* n. sp.

(Figs. 9B, 24CD, 39B, 54B)

**Measurements.** Mesosoma length 2.99 mm. FW length 8.38 mm.

**Head.** Medial ridge or convexity of face absent. Face without a dorsomedical groove, convex medially with sides flat, lacking striations, with punctures densely distributed medially. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes non emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, with acute base, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters. Number of flagellomeres 38. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli foveolate-striate laterally. Median longitudinal depression posteriad ocelli absent. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena concave, depression dorsad flange absent, with parallel rugae reaching distal margin of flange.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of several irregular and unevenly distributed ridges. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 4–6 strong carinae restricted to dorsal half and a few weak carina in ventral half. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posteroventral border of mesopleuron present. Dorsal apex of metepisternum with two subparallel carinae. Juxtacoxal flange present, regularly concave, wide, or

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa absent, or 3RSa present, at least weakly, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black except as follows: clypeus, palpi, tegula, scrobal and ventral part of mesopleurum, mesoscutum, infuscations of scutellum and metanotum, dorsal part of propodeum, and segments 1–4 of metasoma orange. Some specimens have scutellum, metanotum, and propodeum entirely black. Foreleg orange with coxa, trochanter, trochantellus and apical band of femur brown. Midleg yellow with black-brown infuscations in coxa, trochanter, trochantellus, and posterior half of femur brown. Hind leg brown except: coxa black; infuscations in trochanter, trochantellus, anterior half of femur, and ventral tibia orange. Forewing hyaline except as follows: transverse medial band located between parastigma and anterior half of stigma extending posteriorly; transverse apical band extending between stigma apex and wing apex. Hind wing hyaline with infumated posterior half.

**Etymology:** The specific epithet of this species honors both mother and grandmother of the author

**Variation**
Some specimens have the mesosoma extensively black-brown

**Diagnosis and similar species**

This species shares with *Z. angelica* the strong sculpturation of the posterointernal area of genae.  

*Z. mariae* shares with *Z. puncturata* and *Z. angelica* the two longitudinal carinae in the dorsal apex of metaepisternum. This species shares with *Z. peruensis*, *Z. querubina*, and *Z. similis* the smooth mesoscutum with a very shallow scutellar sulcus. *Z. mariae* and *Z. compta* share the weak sculpturation of the propodeum.

This species can be distinguished from similar species by the following combination of characteristics: area of vertex posteriad ocelli foveolate-striated; eyes reaching the ventral border of the tentorial pits, gena uniformly wide, two longitudinal carinae in the dorsal apex of metaepisternum; mesoscutum entirely smooth; shallow and slender scutellar sulcus; scutellum smooth with a few mediad crenulations; posterior border of the median metanotal areola acute and with an acute longitudinal crest.

**Geographic distribution and elevation range:** Brazil (Rondonia). 165m

**Material examined**


PARATYPES: 2 ♀♀, BRAZIL: RO, Fazenda Rancho Grande, 62km s Ariquemes, 25.XI.1991, S. L. Heydon, Hg vapor & head lamp / UCDC

---

**Zelomorpha variegatus** (Szépligeti, 1908) **new Combination**

(Figs. 15E, 30IJ, 45E, 60C)

* Dichelosus variegatus* Szépligeti, 1908 Annls. Hist.-Nat. Mus. Natn. Hung. 6: 418, ♀

“Bolivien: Mapiri” (♀)

*Coccygidium variegatus* (Szépligeti, 1908) Sarmiento & Sharkey, 2005:66.

**Redescription**

**Measurements.** Mesosoma length 2.65 mm. FW length 7.2 mm.
**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, with regular fovea evenly distributed leaving flat areas between them. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters. Number of flagellomeres 41. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena strongly flanged. Posteroventral area of gena concave, depression dorsad flange present, with irregular rugae evenly distributed.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomer. Longest spur of midleg tibial longer than 1/2 basitarsomer, hind leg tibia longer than 1/2 basitarsomer. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia or with three spines. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa present, at least weakly, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black except as follows: clypeus, mandibles, palpi, posterior apex of pronotum, tegula, mesoscutum, and T1–3 of metasoma yellow. *Some specimens have the mesosoma almost entirely black-brown.* Foreleg and midleg yellow with last tarsomere brown. Hind leg black except apex of coxa and most of femur which are brown. Forewing hyaline except as follows: transverse medial band located between parastigma and anterior half of stigma extending posteriorly; transverse apical band extending medially midway of distance between stigma apex and wing apex. Hind wing hyaline with infumated bands that match distribution of these in forewing.

**Diagnosis and similar species**
This species can be distinguished from similar species by the strong crenulations of the epicnemial carina.

**Variation**
Some specimens from Peru have a darker coloration, while a specimen from Paraguay has extensive areas of mesosoma light brown instead of black.

**Geographic distribution and elevation range:** Guyane française, Colombia, Ecuador, Peru, Bolivia, Brazil (Mato Grosso) Paraguay. 150-750m

**Material examined**
Zelomorpha schunkei n. sp.
(Figs. 14A, 29AB, 44A, 57H)

Measurements. Mesosoma length 3.9 mm. FW length 10.9 mm.

Head. Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, lacking striations, with regular fovea dense medially and sparse laterally. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression with a few circular rugae. Distance between antennal insertions distinctly shorter than their diameters. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli foveolated over entire surface. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena strongly flanged. Posteroventral area of gena concave, depression dorsad flange absent, with irregular rugae evenly distributed.

Mesosoma. Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of more than eight small, evenly distributed ridges or crenulations. Mesopleuron punctate but lacking punctures medially. Sternalus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and shallow, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of different sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum without

Legs and wing venation. Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa absent, RS2a subequal to r-m, RS2b absent. CUb of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite less than 1.5 times its posterior width.

Color pattern. Mostly black except as follows: palpi, tegula, posterior half of scutellum, metanotum, mediad part of propodeum, and first five metasomal tergites orange. Front leg yellow, mid leg yellow except median part of coxa brown. Hind leg brown except apex of coxa, femur and basal part of tibia yellow. Forewing hyaline except as follows: transverse medial band located between parastigma and anterior half of stigma extending posteriorly; transverse apical band extending medially midway of distance between stigma apex and wing apex. Hind wing hyaline with infumate bands that match distribution of these in forewing.

Etymology: The specific epithet of this species honors J. M. Schunke who collected several interesting species of this genus between the 50’s and 60’s.

Diagnosis and similar species
This species can be distinguished by the following combination of characters: frons with a few circular ridges close to the lateral carina; posterioventral area of gena with a few rugosities distad eye; suture
between metaepisternum and metaepimeron weak, almost absent in the lower part but with several transverse ridges of different sizes; propodeum with a few open areola. The suture between metepisternum and metepimeron is complete but very shallow ventrally; posterior border of mesoscutal sulcus vertical and carinated.

**Geographic distribution and elevation range:** Peru. 447m

**Material examined**

**HOLOTYPE:** ♂, PERU: Chanchamayo, 1.vii.1949, J. M. Schunke, B.M. 1950-559 / BMNH

---

**Zelomorpha compta** n. sp.

(Figs. 4E, 19IJ, 34E, 49E)

**Measurements.** Mesosoma length 3.09 mm. FW length 8.97 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedical groove, convex medially with sides flat, lacking striations, with regular fovea present medially only, with punctures sparsely distributed laterally. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons barely indicated by a continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters. Number of flagellomeres 42. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena strongly flanged. Posteroventral area of gena concave, depression dorsad flange present, smooth.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 3–6 large ridges restricted to mid length. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron incomplete, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with weak carinae of similar sizes. Convex flange on posterodorsal border of mesopleuron absent. Dorsal apex of metepisternum without carina. Juxtacoxal
flange present, regularly concave, wide, smooth. Anterior area of subpronope not modified. Posterolateral margin of pronotum smooth. Notaulus absent. Median longitudinal mesoscutal groove indicated by a wide, flat, sculptured depression. Scutellar sulcus deep and subquadrate, with three carinae. Scutoco-
tropical areola absent. Transverse keel absent.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising from a lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa absent, or 3RSa present, at least weakly, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black except as follows: palpi, tegula, median and lateral areola of propodeum, and first five segments of metasoma orange. Antennae brown. Frontleg yellow except: lateral spots of coxa, median spot of femur, and last tarsomere black. Midleg brown except: apical band of femur, and tibia yellow. Hind leg brown with black ventral spot of coxa and femur. Forewing hyaline except as follows: transverse medial band located between parastigma and anterior tip of stigma; transverse apical band extending between stigma apex and wing apex. Hind wing hyaline with infumated apical band.

**Etymology:** The specific epithet of this species refers to the c-shape ridge in the propodeum of the holotype

**Diagnosis and similar species**

*Z. compta* can be distinguished from similar species by the following combination of characteristics: posterodorsal flange of the mesopleurum absent, suture between metaepisternum and metaepimeron transversed with weak carinae of similar sizes.
This species shares with *Z. interstitium* and with *Z. fernandezi* the penultimate labial palpomere being of the same length of the last one. *Z. compta* shares with *Z. fernandezi* the weak lateral carina, the smooth posteroventral area of gena, the weak transverse carina of the suture between metaepisternum and metaepimeron, the strong longitudinal carina of hind trochantellus.

**Geographic distribution and elevation range:** French Guiana. 0m

**Material examined**

**HOLOTYPE:** ♀, Guyane française, Sinnamary, Pointe Combi, 3-24.viii.2000, (Malaise trap, 5°18’N-52°57’W), P CERDAN [CERDA]-lab Hydrobiologie legs/ FSAG

**PARATYPES:** ♀, Guyane française, Sinnamary, Pointe Combi, 2-9.xi.2000, (Malaise trap, 5°18’N-52°57’W), P CERDAN [CERDA]-lab Hydrobiologie legs/ FSAG

1 ♀, GUYANE FRANÇAISE, Sinnamary, Pointe combi, 7-13 ix.2000, (Malaise trap, 5°18’N-52°57’W), P CERDAN [CERDA] lab. Hydrobiologie legs / FSAG

**Other specimens**

**FRENCH GUIANA:** 1 ♀, GUYANE FRANÇAISE, Sinnamary, Barrage de Petit Sout, 11-18 vii.2000, (Malaise trap, 4°04’N-53°03’W), P CERDAN [CERDA] lab. Hydrobiologie legs / FSAG

---

**Zelomorpha transversa** n. sp.

(Figs. 15C, 30EF, 45C, 60A)

**Measurements.** Mesosoma length 3.67 mm. FW length 10.68 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, lacking striations, with regular fovea present medially only, with punctures sparsely distributed laterally. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, with acute base, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly shorter than their diameters. Number of flagellomeres 45. Depression laterad lateral ocellus absent. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea.
Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange absent, with rugae restricted to area immediately distad eye.


**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing absent. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly yellow except as follows: head, prosternum, anterior part of pronotum, mesopleurum, metapleurum, and three apical segments of metasoma black. Foreleg and midleg yellow with coxa entirely or partially black, last tarsomere brown. Hind leg black with tibia yellow. Forewing hyaline except a transverse medial band located between parastigma and anterior half of stigma extending
posteriorly, and a transverse apical band extending medially midway of distance between wing apex and stigma apex. Hind wing hyaline with infumated bands that match distribution of these in forewing.

**Etymology:** The name refers to the partial posterior transverse carina of the propodeum

**Diagnosis and similar species**
This species is similar to *Zelomorpha variegatus* but the epicnemial carina of *Z. transversa* is not crenulate. This species shares with *Z. melina* and with *Z. angelica* the general sculpturation of the propodeum.

This species can be distinguished from similar species by the following combination of characteristics: posterior border of the suture between metaepisternum and metaepimeron carenate, acute, juxtacoxal flange posteriorly curved, transverse ridge of propodeum present only medially.

**Geographic distribution and elevation range:** Colombia, Brazil (Mato Grosso). 345m

**Material examined**
HOLOTYPE: ♀, BRAZIL, Mato Grosso, Sinop, X.1976, M. Alvarenga, Mal. Trap / Homotype *Dichelosus variegatus* Compared by Sharkey / CNCI

*Zelomorpha angelica* n. sp.
(Figs. 1H, 16OP, 31H, 46H)

**Measurements.** Mesosoma length 3.58 mm. FW length 9.85 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, medial transverse striations present, with regular fovea evenly distributed leaving flat areas between them, or with both regular and irregular fovea. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes non emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, with acute base, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters. Number of

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of several irregular and unevenly distributed ridges. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 10–12 small uniform carinae. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of different sizes, or transversed with strong carinae of subequal sizes or transversed with weak carinae of similar sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with two subparallel carinae, metaepisternum or without carina or with one carina. Juxtacoxal flange present, regularly concave, wide, or wide, smooth. Anterior area of subpronope not modified. Posterolateral margin of pronotum smooth. Notaulus indicated by weak depressions. Median longitudinal mesoscutal groove indicated by a wide, flat, sculptured depression. Scutellar sulcus deep and subquadrate, with three carinae, or with 1. Scuto-scutellar articulation absent, or indicated by a tenuous line. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with a few open areolae, surface with both striations and punctures. Anteromedial areola absent or barely indicated by lateral ridges, pentagonal, barely indicated by incomplete lateral ridges. Anterolateral areola absent. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina absent. Posteromedian areola complete, defined by weak lateral carina, posteromedial areola or fused with posterolateral areola, narrow posteriorly but with lateral ridges separated, with a straight transverse ridge, posteriomedial areola or without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, or absent or open anteriorly, subquadrate, subequal in width to anterolateral areola, posteropleural areola open anteriorly. Transverse keel present only medially, or absent.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising from a lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSA
absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly orange except as follows: head, antennae, prosternum, anterior half of pronotum, last 3 metasomal segments black. Antennae black with apex of scape yellow. Foreleg and midleg orange. Hind leg orange except tibia and tarsi that are brown; Forewing hyaline except as follows: costal border, area between parastigma and stigma; transverse apical band extending medially midway of distance between wing stigma and wing apex. Hind wing hyaline with distal half infumated. *Some specimens have brown spots in: front and midleg trochanters, basal band of femora and coxa. The hind leg tibia and tarsus are brown.*

**Etymology:** The specific epithet of this species honors my wife, friend, and colleague Angela Amarillo.

**Variation**

There is variation in the small transverse ridges in the suture between metaepisternum and metaepimeron. The scutellar sulcus can have between one and three carinae. The carenation of the propodeum, particularly in the posterior part, can range from smooth to strong. A specimen from Ecuador is devoid of longitudinal metaepisternal carina, but besides this character, it fits the species description. Some specimens from Colombia, Ecuador, and Peru have more extensive black spots in the legs.

**Diagnosis and similar species**

This species can be characterized by the following combination of characters: face with longitudinal and transverse striations, dorsal apex of metaepisternum with one or two longitudinal carinae, median areola of metanotum without median longitudinal ridge, transverse keel of propodeum present only medially, first abdominal segment smooth, without bulge, longitudinal carina of the hind trochantellus of this species is particularly weak.

This species shares with *Z. melina* and with *Z. transversa* the sculpturation of the propodeum; *Z. angelica* and *Z. deulufeuti* share the weak carenation of the posterior margin of the mesopleuron.

**Geographic distribution and elevation range:** Colombia, Ecuador, Peru, Brazil (Mato Grosso). 150-999m

**Material examined**
HOLOTYPE: ♀, COLOMBIA, Vichada, Gaviotas, 4°34’12”N, 70°26’45”W, Malaise, 20.viii.1995, H. Cortes Leg / IAVH
PARATYPE: ♀, Vila Vera, [Mato Grosso], BRAZIL, W50°30’ S12°30’, October 1973, M. Alvarenga / AEIC

Other specimens

COLOMBIA: 1 ♀, COLOMBIA, Amazonas PNN Hamacayacu [Amacayacu], Malaise, feb 89, M. Kelsey leg., / IAVH 3387. ECUADOR: 1 ♀, Napo & Coca Rivers, [Francisco de Orellana ], v.2-10.65, Ecuador, Luis Peña / AEIC. PERU: 1 ♀, Pilcopata [Pilcopia], Cuzco, [Peru], 11.x.68 / AEIC.


_Zelomorpha melina_ n. sp.
(Figs. 9F, 24KL, 39F, 54F)

**Measurements.** Mesosoma length 3.38 mm. FW length 10.1 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, lacking striations, with regular fovea present medially only, with punctures sparsely distributed laterally. Penultimate labial palpmere subequal in length to apical palpmere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of rugae and fovea, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly shorter than their diameters. Number of flagellomeres 44, 45. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with several evenly distributed foveae. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posterovertral margin of gena strongly flanged. Posterovertral area of gena concave, depression dorsad flange absent, with rugae restricted to area immediately distad eye.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 5–6 small ridges evenly distributed, or composed of 3–6 large ridges at
Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 4–6 strong carinae restricted to dorsal half and a few weak carina in ventral half. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron absent. Dorsal apex of metepisternum without carina. Juxtacoxal flange present, regularly concave, slender, curved posteriorly, with round apex, smooth. Anterior area of subpronope not modified. Posterolateral margin of pronotum smooth. Notaulus indicated by weak depressions. Median longitudinal mesoscutal groove absent. Scutellar sulcus deep and subquadrate, with three carinae. Scutocutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk indicated by a wide depression with some faint crenulae. Median areola of metanotum with an incomplete median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with a few open areolae, surface with both striations and punctures.


**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly orange except as follows: head, antennae, prosternum, anterior half of pronotum, last 2 or 5 metasomal segments black. Foreleg and midleg orange except midleg trochantellus which is light brown. Hind leg orange except as follows: trochanter, trochantellus, distal half of tibia and tarsi brown; Forewing hyaline except as follows: transverse band between parastigma and anterior half of stigma; transverse apical band extending medially midway of distance between wing stigma and wing apex. Hind wing hyaline with distal tip infumate or entirely hyaline. Some specimens have black spots in scrobal area; coxae, trochanters, trochantellus, and most of front and midleg femora. Other specimens
have the mesosoma almost entirely black with orange tegula, part of scutellum, metanotum and dorsal part of propodeum.

**Etymology**: The specific epithet of this species refers to the intense yellow color of some the specimens.

**Variation**
Specimens from French Guiana have a clear posterodorsal convex flange of the mesopeluron; also, these have more extensive black areas spots in their mesosoma, legs; their orange color is darker; otherwise these specimens resemble *Z. melinus* typical description.

**Diagnosis and similar species**
*Z. melina* can be distinguished from similar species by the following combination of characteristics: lateral carina composed of rugae; suture between metaepisternum and metaepimeron without crenated borders; posterodorsal convex flange of the mesopeluron absent; although the posteriomedial areola is fused with the posteriolateral areolae it has weak lateral ridges; metasomal T1 with a clear bulge

This species shares with *Z. transversa* and with *Z. angelica* the sculpturation of the propodeum. *Z. melina* shares with *Z. interstitium* the type of transverse groove of the scutellum which is indicated by a wide depression with several faint crenulae. This species shares with *Z. compta* the absent posterodorsal convex flange of the mesopeluron.

**Geographic distribution and elevation range**: French Guyana, Brazil (Mato Grosso). 41-423m

**Material examined**
HOLOTYPE: - 1 ♀, BRAZIL, Mato Grosso, Sinop, X.1974, M. Alvarenga, Mal. Trap. / CNCI
PARATYPE: ♀, Guyane française, Route de Kaw, Relais Patawa, 52°10’E 4°32’N, iii. 1999 (Malaise trap) A.E.I.guyane-J. Cerda colls. / Dichelosus / FSAG

Other specimens
Zelomorpha crowdusi n. sp.
(Figs. 5D, 20GH, 35D, 50D)

Measurements. Mesosoma length 3.63 mm. FW length 10.14 mm.

Head. Medial ridge or convexity of face present and without a dorsal circular protuberance, or absent. Face with a narrow dorsomedial groove, flat medially and laterally, mediad longitudinal striations present, with regular fovea present medially only, with punctures sparsely distributed laterally. Penultimate labial palpmere about half length of apical palpmere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, converging ventrally. Posterior orbit of eye not bordered by groove. Lateral carina of frons composed of a strong continuous ridge, fused posteriorly with interantennal carina forming a circular ridge, with acute base, striate laterally. Frontal depression with a few circular rugae. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 44. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange absent, with irregular rugae evenly distributed.

Mesosoma. Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicenmal carina composed of several irregular and unevenly distributed ridges. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum without carina. Juxtacoxal flange present, regularly concave, wide, or rounded, smooth. Anterior area of subpronope not modified. Posterolateral margin of pronotum smooth. Notaulus absent. Median longitudinal mesoscucatal groove indicated by a single wide smooth depression. Scutellar sulcus shallow and subquadrate, with three carinae, or with 1. Scuto-scucellar articulation absent. Posterior border of mesoscucatal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep,
without crenulae. Median areola of metanotum with an incomplete median longitudinal carina. Posterior border of median areola of metanotum broad, round, but divided by a V-shaped carinae or rugosity, without the longitudinal crest, or broad, round, without acute longitudinal crest, and with pointed tip. Longitudinal apical crest of median metanotal areola absent. Transverse crest of median metanotal areola as a V-shape carina, well before apex, or absent. Propodeum with a few open areolae, surface with both striations and punctures. Anteromedial areola absent. Anterolateral areola absent. Anteropleural areola absent. Pleural carina weak and incomplete. Transverse ridges of pleural carina absent. Posteromedian areola absent, without transverse ridge, without median longitudinal ridge. Posteropleural areola absent. Transverse keel absent.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia shorter than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing tubular. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly black except as follows: palpi and first four tarsomeres of frontleg dark yellow. T1–2 and coxa dark red. The dark-red area vary among specimens. Forewing infumate except for a triangular yellow spot that covers most of stigma and part of marginal cell. Hind wing infumate. A second color pattern is a follows: mostly black except: palpi, tegula, part of scutellum and metanotum, front leg, midleg femur, tibia and first four tarsomeres yellow; first three metasomal segments, anterior half of fourth tergum, femur and basad apex of tibia of hind leg orange. Forewing hyaline except as follows: transverse medial band located between parastigma and anterior half of stigma; transverse apical band extending medially between stigma apex and wing apex. Hind wing hyaline.

**Etymology:** The name of this species honors my friend Daniel Crowdus at the University of Kentucky.

**Variation**
The males differentiate from females in the following characteristics: the lateral carina of the central areola of the metanotum is clearly interrupted medially; the median groove of the face is surrounded by a protuberance. The epitenial carina may be devoid of transverse ridges. While the male metasoma is brown-reddish, the female metasoma is entirely black.

Specimens from Guiana and Brazil differ in several characteristics; here I describe the states for these of Guiana: juxtacoxal flange subquadrate, posterior border of the central areola of the metanotum partially
smooth. Wings are hyaline with two infumated transverse bands; first three and anterior half of the fourth metasomal segments orange, other segments black; most of anterior, and mid leg, and femur of hind leg yellow; tegula scutellum and metanotum with yellow infuscations.

**Diagnosis and similar species**
This species can be distinguished from the others by the following characteristics: lateral carina of frons complete, frontal depression with circular rugae.

**Geographic distribution and elevation range:** French Guiana, Brasil (Bahia, Paraná, Rio Grande do Sul). 3-980m

**Material examined**

**HOLOTYPE:** ♀, Encruzilhada, Bahia, Brazil, XI 74 980m, M. Alvarenga/ AEIC

**PARATYPES:** 1 ♀, 1 ♂, GUYANE FRANÇAISE. Montagne de Kaw, Relais Patawa, ix.1999 (Malaise) A. E. I. Guyane-J, Cerda legs / FSAG

Other specimens

**BRAZIL:** 1 ♀, BRAZIL: R.G.S. Pelotas, 29 v 1963, C.M. Blezanko, B.M. 1963-759 / BMNH

**FRENCH GUIANA:** 1 ♂, GUYANE FRANÇAISE. Montagne de Kaw, Relais Patawa, vi.1999 (Malaise) A. E. I. Guyane-J, Cerda legs / FSAG. **BRITISH GUIANA:** 1 ♀, Kartabo, Bartica District, British Guiana, 15-vii-1922 / Coccygidium Det. M. Sharkey / AMNH

**Zelomorpha interstitium** n. sp.
(Figs. 7H, 22OP, 37H, 52H)

**Measurements.** Mesosoma length 3.63 mm. FW length 11.1 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedical groove, convex medially with sides flat, lacking striations, with regular fovea dense medially and sparse laterally, with punctures densely distributed medially. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons barely
indicated by a continuous ridge, separated posteriorly from interantennal carina, non striate laterally.
Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their
diameters. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded.
Area of vertex posteriad ocelli with several evenly distributed foveae. Median longitudinal depression
posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena strongly flanged.
Posteroventral area of gena concave, depression dorsad flange absent, smooth.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of
epicnemial carina composed of 3–6 large ridges restricted to mid length. Mesopleuron punctate but
lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation.
Posterior margin of mesopleuron with one or two strong carinae. Suture between metepisternum and
metepimeron incomplete, without acute angles at anterior or posterior borders, without transverse carinae.
Convex flange on posterodorsal border of mesopleuron absent. Dorsal apex of metepisternum without
carina. Juxtacoxal flange present, regularly concave, small, barely developed, smooth. Anterior area of
subpronope not modified. Notaulus indicated by weak depressions. Median longitudinal mesoscutal
groove indicated by a single wide smooth depression. Scutellar sulcus deep and subquadrate, with one
carina. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, with strong
slope. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk indicated by a wide
depression with some faint crenulae. Median areola of metanotum without median longitudinal carina.
Posterior border of median areola of metanotum broad, round, without acute longitudinal ridge, and with
a pointed tip. Longitudinal apical crest of median metanotal areola absent. Transverse crest of median
metanotal areola absent. Propodeum with a few isolated ridges, surface smooth. Anteromedial areola
Posteromedian areola absent, without transverse ridge, without median longitudinal ridge. Posteropleural
areola absent. Transverse keel absent.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2
basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia shorter than 1/2
basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of
hind tibia arising from a lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa
absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulus. T1 with a anteromedian round
bulge clearly separated from lateral tergite border. Length of T1 median tergite less than 1.5 times its
posterior width.

**Color pattern.** Mostly black except as follows: labrum, labial and mandibular palpi, tegula, posterior
part of scutellum, posterior border of metanotum, propodeum, metasomal segments I-II orange. Foreleg
yellow except pretarsus. Midleg yellow except: coxa apex, trochanter, base and apex of femur, tibia and
first four tarsomeres yellow. Hind leg black except: coxa apex, most of femur and tibia base orange.
Forewing hyaline except as follows: transverse medial band located between parastigma and anterior half
of stigma extending posteriorly; transverse apical band extending medially midway of distance between
stigma apex and wing apex. Hind wing hyaline with infumate bands that match these of forewing.

**Etymology**: The specific epithet of this species refers to its intermediate nature between smooth species
and species strongly carenated.

**Diagnosis and similar species**
*Z. interstitium* can be distinguished from similar species by the following combination of characteristics:
lateral carina composed by a weak continuous ridge and without striae, suture between metaepisternum
and metaepimeron absent, posterior margin of mesopleuron with faint rugosities, wide juxtacoxal flange,
notauli indicated by a weak depression, and scutellum rounded.

This species is similar to *Z. fernandezi* and shares with it several characteristics such as: incomplete
suture between metaepisternum and metaepimeron transversed by weak carinae of similar sizes, posterior
margin of mesopleuron with only one or two transverse carinae, transverse groove of scutellum indicated
by a set of weak parallel crenulae, epicnemial carina complete and crenulate.

This species and *Z. fernandezi* are good examples of the artificial nature of *Dichelosus* given the weak
development of both the propodeal carinae and notauli.

**Geographic distribution and elevation range**: Brazil (Rondonia). 165m

**Material examined**
HOLOTYPE: ♀, BRAZIL; Rondonia, Fernandez trail on C-14 off B-65, 60km s Ariquemes, 1.xii.1991,
S. L. Heydon / UCDC

*Zelomorpha lencai* n. sp.
(Figs. 8F, 23KL, 38F, 53F)

**Measurements**: Mesosoma length 3 mm. FW length 8.29 mm.
Head. Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, lateral longitudinal striations present, dense net of mediad transverse and longitudinal striae present, with irregular fovea evenly distributed. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression with a few circular rugae. Distance between antennal insertions subequal to their diameters. Number of flagellomeres 40. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with irregular striations laterad ocelli. Median longitudinal depression posteriad ocelli wide and deep. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange absent, with parallel rugae reaching distal margin of flange.

Mesosoma. Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 5–6 small ridges evenly distributed. Mesopleuron with small punctures evenly distributed. Sternaulus with a notorious depression and a clear set of striations evenly distributed. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with two subparallel carinae. Juxtacoxal flange present, regularly concave, slender, curved posteriorly, with round apex, with two carinae, one complete, one incomplete. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum with a strong set of irregular fovea at mid height. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove indicated by a single wide smooth depression. Scutellar sulcus deep and subquadrate, with three carinae. Scuto-scuteellar articulation absent. Posterior border of mesoscutal sulcus high, carinate, with a strong slope. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum with an acute transverse crest and a longitudinal crest. Longitudinal apical crest of median metanotal areola separated from lateral ridges. Transverse crest of median metanotal areola close to apex. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, pentagonal, with lateral ridges strong, as long as anterior ridges. Anterolateral areola with an incomplete ridge extending half distance from midlength of anteromedial keel to anterodorsal corner. Anteropleural areola present, with some weak rugae. Pleural carina distinct and
complete. Transverse ridges of pleural carina present. Posteromedian areola complete, defined by distinct lateral carina, narrow posteriorly but with lateral ridges separated, without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel strong, dividing propodeum into two distinct planes.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a subequal to r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly black except as follows: labial and mandibular palpi, metaepimeron, propodeum, and metasoma yellow. Front and mid legs black with tarsus yellowish. Hind leg coxa brownish with several areas lighter, femora yellow with anterior third black, tibia and tarsus black.

**Etymology:** The specific epithet of this species refers to the Lenca indigenous culture of Honduras where the holotype of this species was collected.

**Diagnosis and similar species**

This species can be distinguished by the following combination of characters: Face with strong combination of fovea and striations; area of vertex laterad ocelli striated; sternaulus with a set of transverse carina; posterolateral margin of pronotum completely crenated; posterior border of mesoscutum crenated.

**Geographic distribution and elevation range:** Honduras. 610m

**Material examined**


Zelomorpha peronatus (Cameron, 1887)
(Figs. 11H, 26OP, 41H, 56G)
**Microdus peronatus** Cameron, 1887 Biologia Cent.-am. Hym. 1: 403 ♂ ♀, Panama Bugaba, 3.c.966, The Natural History Museum, London (BMNH). **New Synonymy**

**Redescription**

**Measurements.** Mesosoma length 3 mm. FW length 7 mm.

**Head.** Medial ridge or convexity of face absent. Face with a narrow dorsomediad groove, convex medially with sides flat, mediad longitudinal striations present, lateral longitudinal striations present, medial transverse striations absent, short lateral transverse striations present, transverse striations between interantennal carinae absent, with regular fovea dense medially and sparse laterally. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli absent. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange absent, with irregular rugae evenly distributed.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 5–6 small ridges evenly distributed. Mesopleuron with small punctures evenly distributed. Sternaulus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 4–6 evenly distributed carinae. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, slender, curved posteriorly, with round apex, with a complete carina mediad flange apex. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove indicated by a single wide smooth depression. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, pentagonal but with sinuated
lateral ridges. Anterolateral areola with two incomplete ridges heading diagonally half distance from midlength of anteromedial keel. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina absent. Posteromedian areola complete, defined by distinct lateral carina, subquadrate, without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

Legs and wing venation. Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa present, at least weakly, RS2a subequal to r-m, RS2b absent. CUb of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite more than two times its posterior width.

Color pattern. Mostly yellow except as follows: antenna, dorsal half of head, hind leg tibia apical quarter, and tarsus brown. Hind leg trochantellus and femur amber dark. Forewing hyaline except as follows: transverse mediad band extending from parastigma to anteriad half of stigma; transverse apical band extending between halfway posterior stigma apex and wing apex. Hind wing hyaline.

Diagnosis and similar species
This species can be distinguished from similar species by the following combination of characters: transverse groove of scutellar disk deep and with several carinae; median metanotal areola without median ridge; posterior border of median metanotal areola acute and with acute longitudinal crest; posterior border of median metanotal areola without transverse crest; anteromedial areoa of propodeum pentagonal but with sinuated lateral ridges that may alter the general shape; transverse ridges of pleural carina absent; anterior part of T1 with a median round bulge.

Geographic distribution and elevation range: Panama. 133m

Material examined
HOLOTYPE: 1 ♀, Type H. T. / B. M. Type 3.c.966 / Bugaba, Panama, Champion / B. C. A. Hymen. I. Microdus peronatus, Cam. / Microdus peronatus Cam. Type BCAii 403 / BMNH.

Zelomorpha melanostoma (Cameron, 1887) new combination


Redescription

Measurements. Mesosoma length 3.23 mm. FW length 7.74 mm.

Head. Medial ridge or convexity of face present and without a dorsal circular protuberance. Face without a dorsomedial groove, convex medially with sides flat, lacking striations, with regular fovea evenly distributed leaving flat areas between them. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, fused posteriorly with interantennal carina forming a circular ridge, with acute base, striate laterally. Frontal depression entirely smooth, or with a few circular rugae. Distance between antennal insertions subequal to their diameters, or distinctly longer than their diameters. Number of flagellomeres 45, 41. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with several evenly distributed foveae. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange absent, smooth.

Mesosoma. Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina absent. Mesopleuron with small punctures evenly distributed. Sternaulus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of different sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, rectangular, smooth, or with a complete carina mediad flange apex. Anterior area of subpronope not modified. Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove indicated by a single wide smooth depression. Scutellar sulcus deep and subquadrate, with one carina, or with 3. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, with strong slope. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, without
crenulae. Median areola of metanotum without median longitudinal carina, or with an incomplete median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola close to apex. Propodeum with a few isolated ridges, or with several strong areolae, surface with microsculptures only. Anteromedial areola barely indicated by lateral ridges, campanulate. Anterolateral areola absent, or with a strong ridge heading half distance from midlength of anteromedial keel to anterodorsal corner. Anteropleural areola barely indicated by irregular ridges. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedial areola incomplete, posteromedial areola or fused with posterolateral areola, without transverse ridge, without median longitudinal ridge, posteromedial areola or with median longitudinal ridge. Posterolateral areola open mediolaterally, or open anteriolaterally, subquadrate or triangular, subequal in width to anterolateral areola, posteropleural areola closed, posteropleural areola or open anteriorly. Transverse keel diagonal at the lateral areolae, weak and transverse at the medial areola, or absent.

Legs and wing venation. Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia shorter than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa present, at least weakly, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite less than 1.5 times its posterior width.

Color pattern. Mostly yellow except as follows: head, antenna, anterior apex of pronotum, mesopleurum, mesoscutum, scutellum, and last five metasomal segments black. Foreleg and midleg yellow except telotarsomere. Hind leg yellow except: femur apex, tibia and tarsi brown. Forewing hyaline except as follows: transverse band anteriad stigma as wide as the 1st subdiscal cell; transverse apical band extending between posterior stigma apex and wing apex. Hind wing infumate with a medial band that match anterior band of FW.

Variation
The frontal depression can be smooth or have several semicircular rugae. The juxtacoxal flange can be either quadrate or wide, and a carina can be present or absent. The sculpturation of the propodeum can be strong and clearly defined or just indicated by weak prominences. The antennae can be entirely brown or brown with yellow escape and first four flagellomeres. The pronotum coloration varies from entirely black to mostly yellow.
**Diagnosis and similar species**

This species can be distinguished by the following combination of characters: Face without striations; posteroventral area of gena smooth; notaulus absent; juxtacoxal flange rectangular; posterior border of the mesoscutal sulcus vertical, not carinate; deep transverse groove of scutellar disk without carina. T1 short and wide and with a notorious median bulge; the characters of the hind leg rely on non-type material since that structure is missing in the holotype.

The wing color pattern is conspicuous; the median transverse band covers most of the 1st discal and 1st subdiscal cells. It does not include the stigma.

This species shares with *Z. nigriceps* and *Z. euryterga* the different size carinae in the suture between metepisternum and metaepimeron. *Z. euryterga* and *Z. melanostoma* share the vertical posterior border of the mesoscutal sulcus. *Z. melanostoma* and *Z. cracens* share the weak sculpturation of the anteriomedial areola of propodeum.

**Geographic distribution and elevation range**: Mexico, Costa Rica, Panamá, Ecuador. 36-440m

**Material examined**

HOLOTYPE: ♂, Type H. T. / B. M. Type Hym. 3.c.963 / B. C. A. Hymen. I. A. *Microdus melanostoma* Cam. / *Microdus melanostoma* Cam. Type Bea ii 401 / Bugaba 800-1500 ft Champion, BMNH - 1 ♂, MEXICO, Chiapas, Muste, 440m, near Huixtla, 1970, Mal. Trap / CNCI


**Zelomorpha concinna** (Brullé, 1846) **new combination**

(Figs. 4F, 19KL, 34F, 49F.

As *M. championi*: 4A 19AB, 34A, 49A. As *D. conjungens*: 4H, 19OP, 34H, 49H)


National Collection of Insects, Museum National D’Historie Naturelle, Paris (MNHN)

*Microdus fascipennis* Cresson, 1865 Proc. ent. Soc. Philad. 4:64-65, ♀ Cuba. (Philadelphia)

- ♀, Cuba / 208 ♂ [!] / TYPE No. 2667 / Type Cress. Coll. / *M. fascipennis* cress. (Academy of Natural Sciences, Pennsylvania) ANSP USA **New synonymy**

*Microdus pulchripennis* Cameron, 1887, Biologia cent. Am., Hym. 1: 402. “Panama, Volcan de Chiriqui 2500 to 4000 feet” (! London, ♀, 3.c.964) BMNH,

*Microdus championi* Cameron, 1887, Biologia Cent.-am. Hym. 1: 402 ♂ [it is actually ♀], Guatemala: San Gerónimo, 3.c.965, The Natural History Museum, London (BMNH). **New synonymy** (Figs. 4A, 19AB, 34A, 49A)


*Agathis pulchripennis* (Cameron, 1887): Shenefelt 1978, 350. **New synonymy**


*Zelomorphidea fasciipennis*: Bradley 1916 Psyche, Cambr. 23: 140. **New synonymy**
Disophrys flavifemur Enderlein, 1918 (1920), Arch Naturgesch. 84 A (11): 190 ♀. Surinam ex coll. Fruhstorfer / type / Disophrys flavifemur ♀ Dr. Enderlein det 1919 (Museum and Institute of Zoology, Polish Academy of Sciences) MIZ (MZPW). New synonymy

Redescription

Measurements. Mesosoma length 2 mm.

Head. Medial ridge or convexity of face present and without a dorsal circular protuberance, or absent. Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, or mediad longitudinal striations absent, or lateral longitudinal striations present, or mediad transverse striations absent or mediad transverse striations present, short lateral transverse striations present, or transverse striations between interantennal carinae present, or dense net of mediad transverse and longitudinal striae absent, or fine set of mediad parallel transverse striations absent, with regular fovea dense medially and sparse laterally, or with regular fovea dense laterally and sparse medially, or with punctures evenly distributed. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove, or completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina or fused posteriorly with interantennal carina forming a circular ridge, with acute base, striate laterally. Frontal depression with a few circular rugae, or entirely smooth. Distance between antennal insertions subequal to their diameters. Number of flagellomeres 41–45. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex laterad ocelli smooth, or striated. Area of vertex posteriad ocelli smooth, posteriad ocelli or with a few mediad fovea. Median longitudinal depression posteriad ocelli absent, or weak, indicated by narrow groove. Posteroventral margin of gena evenly rounded and flanged, or strongly flanged. Posteroventral area of gena convex, depression dorsad flange absent, or depression present, with rugae restricted to area immediately basad eye, or smooth or with rugae evenly distributed.

Mesosoma. Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 4–9 large evenly distributed ridges, or composed of irregular and unevenly distributed ridges or composed of 3–6 large ridges at mid length. Mesopleuron with small punctures evenly distributed. Sternaulus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 4–6 strong carinae restricted to dorsal half and a few weak carina
in ventral half, or with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, or with acute angle at anterior border, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina, metaepisternum or without carina or with two subparallel carinae. Juxtacoxal flange present, regularly concave, wide, or slender, curved posteriorly, with round apex or rectangular, with a complete carina mediad flange apex, or smooth or with two complete carinae or with two carinae, one complete, one incomplete or with a complete carinae and irregular additional carinae. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth or completely carenated. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove indicated by a single wide smooth depression. Scutellar sulcus deep and subquadrate, with three carinae, or with either 1, 4 or 5. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum with an incomplete median longitudinal carina, or without median longitudinal carina. Posterior border of median areola of metanotum with an acute transverse crest and a longitudinal crest, or acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola close to apex, or absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, pentagonal, with lateral ridges strong, longer than anterior ridges. Anterolateral areola rugous anterolaterally and with some irregular ridges converging anterolaterally, or divided by several ridges converging anterolaterally or with an incomplete ridge heading half distance from midlength of anteromedial keel to anterodorsal corner or with two incomplete ridges heading diagonally half distance from midlength of anteromedial keel. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedial areola complete, defined by distinct lateral carina, posteromedial areola or fused with posterolateral areola or incomplete or complete, defined by weak lateral carina, narrow posteriorly but with lateral ridges separated, posteromedial areola or subquadrate or semicircular by fusion of lateral ridges, without transverse ridge, without median longitudinal ridge, posteromedial areola or with median longitudinal ridge. Posterolateral areola closed, or absent or open mediolaterally, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly
from apical margin, or arising from a lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M straight or 3M curved, 3RSa absent or 3RSa present, at least weakly, or 3RSa present, at least weakly, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly, or with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly yellow except as follows: antenna, dorsal area of head. Hind leg trochantellus yellow or brown Metasoma yellow or orange with brown spots or entirely brown. Forewing hyaline except as follows: transverse mediad band extending from parastigma to anteriad half of stigma; transverse apical band extending between posterior stigma apex and wing apex. Hind wing hyaline with two bands that match these of FW.

**Variation**

This species exhibits ample variation in several characteristics and possibly this can be split into more than one species; however, no morphological character provides strong support to describe new species or to validate any of the synonyms. Below I describe some of the major characters that vary in this species.

The marginal carina can be either separated or fused with the interantennal carina; specimens from Chiapas, Mexico, have a secondary lateral carina of frons; sculpturation of the posteroventral area of gena; crenulation of the epicnemial carina; transverse ridges of the suture between metaepisternum and metaepimeron; longitudinal carina in the dorsal apex of metaepisternum; some specimens from Florida (USA) have a quadrate juxtacoxal carina; the sculpturation of the central areola of metanotum can vary; the anteromedial areola of propodeum can be triangular and acute in some specimens; the spiracles of T1 can be on protuberances; the size of the bulge in the first metasomal segment varies. Specimens from Aragua, Venezuela, have a smooth frontal depression but other than that there are no major differences with other specimens of Z. concinna.

Also, the color pattern varies: the metasoma can be either yellow, brownish infuscations or entirely brown; the extension of the brown color varies in the hind leg. Specimens from Mexico have the hind leg almost entirely brown but most of the anterior part of tibia is yellow.

**Diagnosis and similar species**

No significant differences were found between the holotypes of *Disophrys cramptoni, Disophrys flavifemur, Disophrys conjungens, C. fascipennis, Microdus championi, Microdus pulchripennis* and *Agathis concinna*. Also, the extensive sample of specimens examined that fit into *Z. concinna* exhibit
ample variation and have all the possible combinations of the minor differences observed. Hence, these are considered synonyms.

*Z. concinna* can be distinguished by the following combination of characters: marginal carina separated from the interantennal carina; labial palpomeres of similar size; epicnemial carina composed of irregular and unevenly distributed strong ridges. Apical margin of medial metanotal areola with longitudinal and transverse ridges. Anteromedial areola pentagonal with the lateral ridges straight and twice the length of the anterior ridges. The shape of the anteriomedial area of propodeum is the more distinctive character of this species.

*Z. concinna* can be distinguished from *Z. annulisfovea* by the shape of the anteromedial areola, which is a pentagon with long lateral ridges in *Z. concinna*, the strong transverse ridges of the epicnemial carina present in *Z. concinna* also distinguish this species from *Z. annulisfovea*

*Z. concinna* shares with *Z. miza* the smooth surface of the posterior area of vertex. *Z. concinna* is similar to *Z. nigriceps* sharing many characters; the major difference between them is the relative length of the penultimate labial palpomere, in *Z. concinna* this is about the same length of the last palpomere while in *Z. nigriceps* this is 50% the length of the last one.

It is interesting to notice that the holotype of *Microdus championi* has dark mesoscutum but the picture of this specimen in the original description shows a mesoscutum entirely yellow; it is possible that the holotype suffers a modification of its color due the oxidation of the pin.

**Geographic distribution and elevation range:** EEUU (Florida), Mexico, Cuba, El Salvador, Honduras, Costa Rica, Panamá, Trinidad, Colombia, Venezuela, Surinam, French Guiana, British Guiana, Peru, Bolivia, Brasil (Bahia, Goiás, Mato Grosso, Pará, Rondonia), Paraguay, Argentina. 5-1615m

**Material examined**


HOLOTYPE: ♀, Cuba / 208 ♂ [it is a female] / TYPE No. 2667 / Type Cress. Coll. / *m. fascipennis* Cress., ANSP USA

HOLOTYPE: ♀, Surinam ex coll. Fruhstorfer / type / *Disophrys flavifemur* ♀ Dr. Enderlein det 1919, MIZ (MZPW)

HOLOTYPE ♂, Surinam, V – IX Fruhstorfer / type / *Disophrys conjungens* type Enderl. ♂, Dr. Enderlein, det. 1919, MIZ (MZPW),


HOLOTYPE: ♀, Type H. T. / *Microdus championi* Cam. Type Bca “ii” 402 / B.C.A. Hymen.I. *Microdus championi* Cam. / S Gerónimo, Guatemala, Champion / B.M. Type HYm. 3.c.965


Biology and hosts
Specimens have been collected with light traps. This species has been found parasitizing larvae of Gonodonta pyrgo (Cram.) Noctuidae; this is a moth that feeds on mango fruits. The cocoon is oval white and the exit was made by a semicircular cut at one apex. In Costa Rica, species of Aleiodes (Rogadinae) have the same color pattern of this species. The color pattern seems to be a warning signal (see chapter 5)

**Zelomorpha euryterga** n. sp.

(Fig. 6F, 21KL, 36F, 51F)

**Measurements.** Mesosoma length 2.78 mm. FW length 5.78 mm.
**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, *or mediad longitudinal striations absent*, medial transverse striations present, with punctures evenly distributed. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, fused posteriorly with interantennal carina forming a circular ridge, striate laterally. Frontal depression rugous. Distance between antennal insertions subequal to their diameters. Number of flagellomeres 38. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange absent, smooth.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of about 10 robust transverse ridges, strongest at mid-length, present in ventral third, *or composed of 1–3 stronger ridges near angle*. Mesopleuron punctate but lacking punctures medially. Sternal with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, wide, with a complete carina mediad flange apex. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus indicated by weak depressions. Median longitudinal mesoscutal groove absent. Scutellar sulcus deep and subquadrate, with four carinae. Scuto-scutellar articulation indicated by a tenuous line, *or absent*. Posterior border of mesoscutal sulcus non carinate, with strong slope. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus, scutellum *or with a smooth carina*. Median areola of metanotum with a complete median longitudinal carina, *or without median longitudinal carina*. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, campanulate, *or triangular*. Anterolateral areola present and without ridges. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola incomplete,
semicircular by fusion of lateral ridges, posteromedial areola or subquadrate, without transverse ridge, without median longitudinal ridge, posteromedial areola or with median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly yellow except: palpomeres, antenna, and last five metasomal segments. Foreleg yellow except mediad part of trochanter, femur, and tibia. Midleg yellow with some spots in coxa, trochantellus, most of femur and tibia brown. Hind leg brown with coxa apex, ventral part of trochantellus, femur apex and tibia basal apex yellow. Forewing hyaline except as follows: transverse mediad band extending from parastigma to anteriad half of stigma; transverse apical band extending posteriorly between midway stigma apex and wing apex. Hind wing hyaline. or yellow except head vertex, occiput, antennae, dorsal part of apical three tergites of metasoma, hind leg median part of coxa, hind leg tibia and tarsi black.

**Etymology:** The specific epithet of this species refers to the wide first metasomal tergum.

**Variation**
Some specimens are devoid of crenulations in the transverse groove of the scutellum. The anteromedial areola of propodeum could be either triangular or campanulate. The posteriomedian areola could be incomplete or semicircular and either with or without a median longitudinal ridge.

**Diagnosis and similar species**
This species can be distinguished from similar species by the following combination of characters: face with small sparsely distributed fovea, frontal depression rugous, area of vertex posteriad ocelli smooth, posteroventral area of gena smooth, eyes small with inferior border not reaching the lower border of tentorial pits, epicnemial carina with several ridges, dorsal apex of metaepisternum with one carina, anteromedian areola of propodeum distinctively concave, posteriomedian areola of propodeum convergent posteriorly, T1 short with its maximum width is 1.5 times its length, ovipositor sheats rounded
with a small mediad projection. The posteromediad areola of propodeum is incomplete by fusion of the lateral ridges or it is entirely absent.

This species shares with *Z. fuscurhetha* the smooth posteroventral area of gena. This species shares with *Z. nigriceps* and *Z. melanostoma* the suture between metaepisternum and metaepimeron transversed by ridges of different sizes.

**Geographic distribution and elevation range:** Costa Rica, Colombia, Venezuela, Bolivia. 100-700m

**Material examined**

HOLOTYPE: ♀, COSTA RICA, Heredia Prov., La Selva Biological Station, 10°26´N, 84°01´W, 100m, Canopy fogging, 32, 3.xi.1994, Project ALAS (FVK32) / Coccyygidiun n. sp. 1 det. M. Sharkey / HIC

PARATYPES:

- 1 ♂, Ivon, Beni, Bolivia, WM Mann / February / Mulford Biol Exp. 1921-22 / USNM
- 1 ♀, Estación Pitilla, 700m, 9 km S de Santa Cecilia, Guanac., Pr., Costa Rica, JUL 1988, GNP Biodiversity Survey 330200, 380200 / COSTA RICA INBIO CRI000 129150 / INBC

Other specimens

**COSTA RICA:** 2 ♂♂, Estación Sirena, P. N. Corcovad., Prov., Punta, Costa Rica, 0-100m, ene 1993, G. Fonseca, L S 270500_508300 # 1781 / COSTA RICA INBIO CRI001 694561 / INBC

**VENEZUELA:** 1 ♀, Sta. Rosa, La., 19.20-IV-83, Malaise / UCOB.

**COLOMBIA:** 1 ♀, COLOMBIA: Dept. Valle, Central de Anichacayá, 28-I-1975-2, R. Wilkerson, Malaise trap / FSCA

**Zelomorpha katatonus** n. sp.

*(Figs. 8C, 23EF, 38C, 53C)*

**Measurements.** Mesosoma length 3.3 mm. FW length 8.28 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face without a dorsomediad groove, convex medially with sides flat, lacking striations, or mediad longitudinal striations present, lateral longitudinal striations absent, medial transverse striations absent, with regular fovea dense medially and sparse laterally. Penultimate labial palpmere subequal in length to apical palpmere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes emarginate, not converging ventrally. Posterior orbit of
eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression with a few circular rugae. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 38. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange absent, with irregular rugae evenly distributed.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of more than eight small, evenly distributed ridges or crenulations. Mesopleuron punctate but lacking punctures medially. Sternaulus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with two subparallel carinae. Juxtacoxal flange present, regularly concave, wide, with a complete carina mediad flange apex. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus indicated by weak depressions. Median longitudinal mesoscutal groove absent. Scutellar sulcus deep and subquadrate, with three carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum with a complete median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola strongly developed, separated from lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with irregular striations. Anteromedial areola with transverse ridges, or absent, pentagonal, with lateral ridges strong, shorter than anterior ridges. Anterolateral areola with two incomplete ridges heading diagonally half distance from midlength of anteromedial keel. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina absent. Posteromedian areola incomplete, narrow posteriorly but with lateral ridges separated, without transverse ridge, with median longitudinal ridge separated from the transverse keel. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly
from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3RSa present, at least weakly, RS2a subequal to r-m, RS2b present. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly yellow except: head, antenna, prosternum, anterior half of pronotum, and last three metasomal segments black. Foreleg and midleg black proximal and distal apex of tibia, and tarsi yellow. Hind leg yellow with dorsomedial spot on coxa, trochanter, trochantellus, basal third of femur, tibia external border and tarsi black. Forewing hyaline except as follows: costal border, transverse apical band extending posteriorly between midway stigma apex and wing apex. Hind wing hyaline.

**Etymology:** The specific epithet of this species refers to its wide anteriomedial areola of propodeum and its wide first metasomal segment.

**Diagnosis and similar species**
This species can be distinguished by the following combination of characters: smooth posterioventral area of gena; scuto-scutellar articulation absent; apical longitudinal crest of medial areola of metanotum short but strongly projected and round; anteriomedial areola of propodeum campanulate, as wide as long; posteriomedial areola of propodeum fused with posteriolateral areola, T1 less than 1.5 times as long as wide.

This species is similar to *Z. euryterga* but *Z. katatonus* does not have striations on the face, the lateral carinae of frons are separated from the interantennal carinae, the posterioventral area of gena has irregular rugae evenly distributed, and the longitudinal apical crest of median metanotum areola strongly developed and round. This species, compared with *Z. euryterga*, seems to be found at lower elevations. There is a characteristic ridge between the posterior ocelli. The ocelli look somewhat fused with the skeleton. The hind spur is very strong and wide. The wings of the holotype are partially burned.

**Geographic distribution and elevation range:** Costa Rica, Panamá. 40-150m

**Material examined**
PARATYPES: 1 ♀, Katsi, 2.3 km ESE de Amubri Prov. Limon, COSTA RICA. 70m. 13 ABR 1995. G. Gallardo L. S. 384350 581400#4813 / INBC
Measurements. Mesosoma length 2.74 mm. FW length 7 mm.

Head. Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, lateral longitudinal striations present, or lateral longitudinal striations absent, medial transverse striations present, transverse striations between interantennal carinae present, with irregular fovea evenly distributed, with punctures evenly distributed. Setal punctures of face on elevated protuberances. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, or composed of two incomplete parallel carinae, fused posteriorly with interantennal carinae forming a circular ridge, striate laterally. Frontal depression with a few circular rugae. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 38, 36. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli foveolate-striate laterally. Median longitudinal depression posteriad ocelli wide and deep. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange present, with rugae restricted to area immediately basad eye, or with rugae evenly distributed or with parallel rugae reaching distal margin of flange.

Mesosoma. Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 4–9 large evenly distributed ridges, or composed of 1–3 stronger ridges.
near angle. Mesopleuron with small punctures evenly distributed. Sternaulus with a notorious depression and up to three weak ridges, or barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed, or with 4–6 carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width or with transverse carinae extending posteriorly at least half width of suture, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with two subparallel carinae. Juxtacoxal flange present, regularly concave, wide, with a complete carina located ventrally, or with a complete carina mediad flange apex. Anterior area of subpronope not modified. Posteriolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove absent. Scutellar sulcus deep and subquadrate, with three carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum with an incomplete median longitudinal carina, or without median longitudinal carina or with a complete median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola strongly developed, separated from lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with irregular striations. Anteromedial areola without transverse ridges, pentagonal, with lateral ridges strong, as long as anterior ridges, or acuminate. Anterolateral areola rugous anterolaterally and with some irregular ridges converging anterolaterally. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola complete, defined by weak lateral carina, like an inverted pentagon with wide apex, without transverse ridge, with median longitudinal ridge separated from the transverse keel. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel strong, dividing propodeum into two distinct planes.

Legs and wing venation. Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising from a lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa present, at least weakly, RS2a longer than r-m, RS2b absent. CUb of hind wing absent. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

Color pattern. Mostly yellow except: antenna, hind leg trochanter, trochantellus, tibia apex, and tarsi black. Forewing hyaline except transverse apical band extending posteriorly between midway stigma
apex and wing apex. Hind wing hyaline with transverse apical band that match that of the FW. In some specimens the head is dark brown dorsally turning yellow ventrally. Wings hyaline with infumate apex.

**Etymology**: The specific epithet of this species honors Dr. Daniel Janzen who has provided a significant number of specimens of the genus and also information about their hosts.

**Variation**
The setal punctures of face on the holotype are located on elevated protuberances. This characteristic has been observed on this specimen only. There is variation in the following characters: the sculpturation of the posterioventral area of gena can be restricted to the base of the eye or can extend toward the ventral border. The transverse carinae of the suture between metepisternum and metepimeron can be restricted to the depression or extended further posteriorly. The dorsal side of the head can be yellow or dark brown.

**Diagnosis and similar species**
This species can be distinguished by the following combination of characters: face with strong diagonal striations, interantennal carinae fused with lateral carinae, frontal depression with a few circular rugae, posterioventral area of gena with strong depression dorsad flange and several subparallel rugae, suture between metepisternum and metepimeron with strong carinae sometimes extending beyond posteriorly at least half width of suture, transverse keel of propodeum strong, dividing it into two planes. The shape of the median metanotal areola is very different in this species compared with related species.

**Geographic distribution and elevation range**: Costa Rica. 50-700m

**Material examined**

**HOLOTYPE**: ♂, COSTA RICA, Heredia, Est. Biol. La Selva, 50-150m, 10°26´N 84° 01´W, Nov 1995, INBio-OET / 1 noviembre 1995, Bosque primario, M/04/486, / INBIOCRI002289997 / INBC

**PARATYPES**: - 1 ♂, COSTA RICA: Puntarenas, RF Golfo Dulce, el 200m, 24km W Piedras Blancas, P.Hanson, x.1992 / TAMU
- 1 ♂, Rancho Quemado, 200m, Peninsula de Osa, Prov. Punta., COSTA RICA. 200m, 1. nov-1 dic 1992, A. L. Marín, L S 292500_511000 #3197 / COSTA RICA INBIO CRI001994460 / INBC

Other specimens


**Zelomorpha cuyaguana** n. sp.

(Figs. 5F, 20KL, 35F, 50F)

**Measurements.** Mesosoma length 2.5 mm. FW length 6.27 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face without a dorsomedial groove, flat medially and laterally, lacking striations, with regular fovea evenly distributed leaving flat areas between them. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, fused posteriorly with interantennal carina forming a circular ridge, striate laterally. Frontal depression rugous. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 34. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with irregular striations laterad ocelli. Median longitudinal depression posteriad ocelli wide and deep. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange present, with irregular rugae evenly distributed.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 4–9 large evenly distributed ridges. Mesopleuron punctate but lacking punctures medially. Sternalus with a notorious depression and a clear set of striations evenly distributed. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between
metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum without carina. Juxtacoxal flange present, regularly concave, rectangular, with a complete carina and irregular additional carinae. Anterior area of subpronope not modified. Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove indicated by two strong depressions. Scutellar sulcus deep and subquadrate, with three carinae. Scuto-scutellar articulation indicated by a tenuous line. Posterior border of mesoscutal sulcus non carinate, with strong slope. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, without crenulae. Median areola of metanotum with a complete median longitudinal carina. Posterior border of median areola of metanotum acute, formed by convergent lateral borders. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola close to apex. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, acuminate. Anterolateral areola divided by several ridges converging anterolaterally. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola complete, defined by distinct lateral carina, like an inverted pentagon with wide apex, without transverse ridge, with median longitudinal ridge separated from the transverse keel. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel strong, dividing propodeum into two distinct planes.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa absent, RS2a subequal to r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly yellow except: antenna, fore and midleg telotarsi, hind leg trochanter, trochantellus, base and apex of tibia, and tarsi black. Forewing infuscate except transverse apical band extending between base of 2 cubital cell and radial cell apex. Hind wing hyaline with transverse apical band that match that of the FW.

**Etymology:** The specific epithet of this species is stated after the type locality Cuyagua (Venezuela)

**Diagnosis and similar species**
This species can be distinguished by the following combination of characters: T1 less than 1.5 long than apical width, sternaulus with strong transverse striations, dorsal apex of mesepisternum without longitudinal carina, juxtacoxal flange rectangular

**Geographic distribution and elevation range:** Venezuela. 280m

**Material examined**


---

**Zelomorpha cracens** n. sp.

(Figs. 5C, 20EF, 35C, 50C)

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, lacking striations, with punctures densely distributed medially. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes emarginate, not converging ventrally. Posterior orbit of eye not bordered by groove. Lateral carina of frons composed of rugae and fovea, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters. Number of flagellomeres 44. Depression laterad lateral ocellus absent. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with several evenly distributed foveae. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange absent, smooth.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 5–6 small ridges restricted to ventral half. Mesopleuron punctate but lacking punctures medially. Sternaulus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 4–6 strong carinae restricted to dorsal half and a few weak carina in ventral half. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum without carina. Juxtacoxal flange present, regularly concave, wide, smooth. Anterior area of subpronope...

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly yellow except: head, antenna, anterodorsal apex of pronotum, metaepimeron, metaepisternum, part of lateral propodeum, and apical six metasomal segments black-brown. Foreleg and midleg yellow with brown telotarsomere tip. Hind leg black except most of tibia which is brown. Forewing hyaline except as follows: transverse mediad band extending from parastigma to anteriad half of stigma; transverse apical band extending midway between posterior stigma apex and wing apex. Hind wing hyaline with two bands that match these of FW. **Some specimens are mostly brown-black except labrum, palpi, posterior apex of pronotum, mesoscutum, tegula, first three metasomal segments, and front and mid legs yellow, or mostly brown-black except labrum, palpi, suture between pronotum and mesosternum, tegula, first four metasomal segments, front and mid legs yellow; hind leg black with femur and anterior band of tibia yellow, posterior half of metasoma clear brown or mostly brown-black except palpi, suture between pronotum and mesosternum, tegula, metaepisternum, metaepimeron, propodeum, metasoma, first three metasomal segments, front and mid legs yellow; hind leg yellow except trochanter, trochantellus, most of tibia and tarsomeres which are brown.
**Etymology**: The specific epithet of this species comes from the Latin word *cracens* and refers to the slender and graceful shape of its body.

**Variation**
Three color patterns have been observed in this species. A specimen from Peru have all the an orange dark coloration instead of the typical yellow color.

**Diagnosis and similar species**
This species can be distinguished by the following combination of characters: notauli strong, anteromedial areola of propodeum acuminate, indicated by weak lateral ridges, posteriolateral areola fusionated with the posteriomedial areola, posteriopleural areola open anteriorly, longitudinal carina of hind trochanter weakly indicated.

Although this species has strong notauli and propodeal carina, it has several characteristics that resemble the species of *Hemichoma* such as: face with strong longitudinal mediad carina, posterior orbit of eye without groove, face without striations, lateral carina of frons composed of rugae. *Z. cracens* shares with *Z. euryterga* the absence of carina in the dorsal apex of mesepisternum.

**Geographic distribution and elevation range**: Panama, Colombia, Ecuador, Peru. 270-598m

**Material examined**
**HOLOTYPE**: 1 ♀, Ecuador, Napo, Tena, 16-VII-1989, L. Stange & R. Miller / FSCA.
**PARATYPES**:
- 1 ♂, ECUADOR: Sucumbios, Rio Napo, Sacha lodge, 0°05’S 76°05W, 290m, 24.V.-3.VI.94 P. Hibbs. MT / HIC
- 1 ♂, Napo & Coca Rivers, V.2-10.65, Ecuador, Luis Peña / AEIC

Other specimens
**PANAMA**: 1 ♀, Canal Zone, Pan., Barro Colorado I., VIII 174, R B & L S Kimsey / UCDC
**ECUADOR**: 1 ♂, 2 ♀♀, ECUADOR: Sucumbios, Rio Napo, Sacha lodge, 0°05’S 76°05W,
**COLOMBIA**: 1 ♀, Anchicaya Dam, 1200’, 17km, E Buenaventura, Colom., Feb. 18-2070, H. F. Howden / AEIC. 270m, 14-24.V.94 P. Hibbs. MT / HIC. 1 ♂, 1 ♀, ECUADOR: Sucumbios, Rio Napo, Sacha lodge, 0°05’S 76°05W, 290m, 20-30.V.94 P. Hibbs. MT / HIC. 1 ♂, ECUADOR: Sucumbios, Rio
Napo, Sacha lodge, 0°05'S 76°05W, 290m, 24.V.-3.VI.94 P. Hibbs. MT / HIC.


---

**Zelomorpha platamon** n. sp.
(Figs. 12D, 27GH, 42D, 57C)

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 4–9 large evenly distributed ridges. Mesopleuron punctate but lacking punctures medially. Sternaulus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 4–6 strong carinae restricted to dorsal half and a few weak carina in ventral half. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, wide, with a complete carina mediad flange apex. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus indicated by weak depressions. Median longitudinal mesoscutal groove indicated by a single wide smooth depression. Scutellar sulcus deep and subquadrate, with three carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum without median longitudinal carina, or with an incomplete median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola with transverse ridges, triangular, or pentagonal, with lateral ridges strong, shorter than anterior ridges. Anterolateral areola with two incomplete ridges heading diagonally half distance from midlength of anteromedial keel, and with an incomplete lateral keel. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola fused with posterolateral areola, without transverse ridge, without median longitudinal ridge. Posteropleural areola absent. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly
from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite less than 1.5 times its posterior width.

**Color pattern.** Mostly yellow except: dorsal part of head, antenna anterior half of pronotum, and last six metasomal segments black-brown. Foreleg yellow with telotarsomere apex brown. Midleg brown with most of coxa yellow; trochanter, trochantellus, apex of femur, base of tibia and tarsus with yellow infuscations. Hind leg brown. Forewing hyaline except as follows: transverse mediad band extending from parastigma to anteriad half of stigma; transverse apical band extending midway between posterior stigma apex and wing apex. Hind wing hyaline with infumate bands that match these of FW. *Male coloration of front leg is as follows: yellow with black coxa, and most of femur. Midleg yellow with most of coxa and femur black. Hind leg brown with yellow both proximal and distal apex of coxa, trochanter, trochantellus, femur, and most of anterior part of tibia.*

**Etymology:** The specific epithet of this species refers to its wide first metasomal segment

**Variation**
There is variation in the sculpturation of the face; males can exhibit stronger longitudinal ridges while females can be smooth. The median longitudinal carina of the median areola of metanotum can be present or absent. The anteromedial areola of propodeum can be either pentagonal or triangular.

**Diagnosis and similar species**
This species can be distinguished by the following combination of characters: posteroventral area of gena evenly rugous, without a major depression, dorsal apex of metaepisternum with one carina, juxtacoxal flange with a complete carina mediad apex, scuto-scutellar articulation absent, postero mediad areola of propodeum weakly defined by incomplete convergent ridges so that it is fused with posterolateral areola, carina of hind trochantellus strong, bulge on T1 absent, T1 length less than 1.5 times its width.

**Geographic distribution and elevation range:** Panama, Brazil (AM). 35-79m

**Material examined**
HOLOTYPE: 1 ♀, Taracuá, (Río Uaupés), AM, Brasil, VIII.1964, Pereira & Machado / MZSP
**Zelomorpha adynata** n. sp.
(Figs. 1B, 16AB, 31B, 46B )

**Measurements.** Mesosoma length 3.2 mm. FW length 8.63 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, lacking striations, with regular fovea dense medially and sparse laterally. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes emarginate, not converging ventrally. Posterior orbit of eye not bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 42. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena strongly flanged. Posteroventral area of gena concave, depression dorsad flange absent, smooth.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of several irregular and unevenly distributed ridges. Mesopleuron punctate but lacking punctures medially. Sternaulus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and shallow, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes, or transversed with strong carinae of different sizes. Convex flange on posteroventral border of mesopleuron present. Dorsal apex of metepisternum without carina. Juxtacoxal flange present, regularly concave, slender, curved posteriorly, with round apex, or wide, smooth. Anterior area of subpronope wide and flanged. Posteroventral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove absent. Scutellar sulcus deep and subquadrate, with three carinae. Scutoscutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum with a complete median longitudinal carina. Posterior border of median areola of metanotum acute, with median longitudinal crest clearly separated from lateral borders. Longitudinal apical crest of median metanotal areola separated from lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae,
surface with both striations and punctures. Anteromedial areola barely indicated by lateral ridges, or without transverse ridges, cuspitate. Anterolateral areola present and without ridges, or with two incomplete ridges heading diagonally half distance from midlength of anteromedial keel. Anteropleural areola present, with several strong rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina absent. Posteromedian areola incomplete, posteromedial areola or fused with posterolateral areola, narrow posteriorly but with lateral ridges separated, posteromedial areola or semicircular by fusion of lateral ridges, without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola open anteriorly. Transverse keel absent between pleural areola.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa present, at least weakly, RS2a longer than r-m, RS2b absent. Cub of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly black except as follows: part of labrum, palpi, pronotum except a spot in anterior apex, anterior area to epicnemial carina, scrobal area, mesoscutum and tegula orange. Scutellum and metanotum orange with brown infuscations. Propodeum brown. First three metasomal segments orange. Front and mid legs yellow with metatarsal tip brown. Hind leg black with femur and anterior band of tibia yellow. Forewing hyaline except as follows: transverse mediad band extending from parastigma to anteriad half of stigma; transverse apical band extending between posterior stigma apex and wing apex. Hind wing hyaline with two bands that match these of FW.

**Etymology:** The specific epithet of this species refers to the weak carenations of the propodeum

**Variation**
Males can have a groove surrounding the posterior orbit of the eye while females do not. The sculpturation of the propodeum is stronger in males than in females. The juxtacoxal flange could be either curved posteriorly or very wide. The lateral ridges of the anteriomedial areola could be strong. The anterolateral areola of propodeum could be smooth or could have a few ridges. A specimen from Peru is notoriously larger than the others but no other difference was found.

**Diagnosis and similar species**
This species can be distinguished by the following combination of characters: anteriomedial areola of propodeum cuspidate; transverse keel between pleural and most of lateral areolae incomplete; apical crest of median metanotal areola separated from laetral ridges; weak carina of hind trochantellus. This species is close to *Z. cracens* and *Z. metahirsuta*

**Geographic distribution and elevation range:** Ecuador, Peru, Brazil (Para). 240-705m.

**Material examined**

**HOLOTYPE:** ♀, Jacareanga, Pará, Braz., XII-68, Moacir Alvarenga / AEIC

**PARATYPES:** 1 ♀, Neshuya, 240m, Loreto, PERU, 25-28.nov.,1964, coll. J. Schunke / LACM

Other specimens


**Zelomorpha metahirsuta** n. sp.

(Figs. 9G, 24MN, 9G, 54G)

**Measurements.** Mesosoma length 3.1 mm. FW length 8.04 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, lacking striations, with both regular and irregular fovea, with punctures densely distributed medially. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes emarginate, not converging ventrally. Posterior orbit of eye not bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 43. Depression laterad lateral ocellus absent. Gena at mid-height, posteriad eye evenly rounded. Area of
vertex posteriad ocelli with several fovea concentrated medially. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange absent, with irregular rugae evenly distributed.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 4–9 large evenly distributed ridges. Mesopleuron punctate but lacking punctures medially. Sternaulus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 4–6 strong carinae restricted to dorsal half and a few weak carina in ventral half. Suture between metepisternum and metepimeron complete and shallow, with acute angle at anterior border, or with both anterior and posterior borders with acute angles, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, rounded, with a complete carina and irregular additional carinae. Anterior area of subpronope wide and flanged. Posteralateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove absent. Scutellar sulcus deep and subquadrate, with three carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum acute, formed by convergent lateral borders. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface densely covered by a whitish pubescense. Anteromedial areola without transverse ridges, cuspitate. Anterolateral areola present and without ridges. Anteropleural areola present, with several strong rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina absent. Posteromedian areola fused with posterolateral areola, without transverse ridge, without median longitudinal ridge. Posteropleural areola open anteriorly. Transverse keel absent between pleural areola.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsonsomere. Longest spur of midleg tibial longer than 1/2 basitarsonsomere, hind leg tibia longer than 1/2 basitarsonsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa absent, RS2a longer than r-m, RS2b absent. CUb of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite more than two times its posterior width.
Color pattern. Mostly black except as follows: labrum, palpi, anterior and posterior apex of pronotum, anterior area to epicnemial carina, scrobal area, mesoscutum, tegula, scutellum or entirely yellow, metanotum, and propodeum brown with yellow infuscations. First four metasomal segments, and front and mid legs yellow. Hind leg black with femur and anterior band of tibia yellow. Forewing hyaline except as follows: costal border, transverse mediad band extending from parastigma to anteriad half of stigma; transverse apical band extending between posterior stigma apex and wing apex. Hind wing hyaline with two bands that match these of FW.

Etymology: The specific epithet of this species refers to the dense pilosity of both metaepimeron and propodeum.

Variation
The posterioventral area of gena can be either smooth of strongly sculptured. A female from Costa Rica presents a different color pattern and the sculpturation of the sternaulus is a bit stronger.

Diagnosis and similar species
This species can be distinguished by the following combination of characters: propodeal carination similar to that described for Z. cracens but with a dense puff of white long hairs in the anteropleural areola and anteromedian areola cuspitate.; suture between metaepisternum and metaepimeron shallow; juxtacoxal flange with a complete mediad carina; longitudinal carina of hind trochanter weakly developed. This species is very close to Z. cracens.

Geographic distribution and elevation range: Costa Rica, Ecuador. 290-300m

Material examined
HOLOTYPE: ♂, ECUADOR, Morona Santiago, Miazal, 50km, SE, Macas, 1-4.VII.1993, 300m, M & J Wasbauer / HIC
PARATYPES: 1 ♂, ECUADOR: Sucumbios, Rio Napo, Sacha Lodge, 0°05´S 76°05W, 290m, MT, 24.V-3 VI 94 P. Hibbs /HIC
1 ♂, ECUADOR, Napo, Prov., Sacha, 7.III.1983, L. Huggert / CNCI

Other specimens
ECUADOR: 1 ♂, ECUADOR, Morona Santiago, Miazal, 50km, SE, Macas, 1-4.VII.1993, 300m, M & J Wasbauer / HIC. COSTA RICA: 1 ♀, COSTA RICA / HIC
*Zelomorpha mexicana* n. sp.  
(Figs. 9H, 24OP, 39H, 54H)

**Measurements.** Mesosoma length 3.53 mm. FW length 9.31 mm.

**Head.** Medial ridge or convexity of face absent. Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, lateral longitudinal striations present, with punctures evenly distributed. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes emarginate, converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression with a few circular rugae. Distance between antennal insertions subequal to their diameters. Number of flagellomeres 42. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex laterad ocelli striated. Area of vertex posteriad ocelli with a few medial fovea. Median longitudinal depression posteriad ocelli wide and deep. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange absent, with rugae restricted to area immediately basad eye.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 3–6 large ridges restricted to mid length. Mesopleuron with small punctures evenly distributed. Sternalus with a notorious depression and up to three weak ridges, *or with a notorious depression and a clear set of striations evenly distributed.* Posterior margin of mesopleuron with 4–6 strong carinae restricted to dorsal half and a few weak carina in ventral half. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, slender, straight, with round apex, with a complete carina and irregular additional carinae. Anterior area of suppronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove indicated by a single wide smooth depression. Scutellar sulcus deep and subquadrate, with three carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum with an incomplete median longitudinal carina. Posterior border of median areola of metanotum with an acute transverse crest and a longitudinal crest.
Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola close to apex. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, pentagonal, with lateral ridges strong, shorter than anterior ridges. Anterolateral areola with an incomplete ridge extending half distance from midlength of anteromedial keel to anterodorsal corner. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola complete, defined by weak lateral carina, narrow posteriorly but with lateral ridges separated, with a straight transverse ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 with an anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly yellow except by a few dark spots dorsad head, and flagellomeres brown. Foreleg and midleg yellow. Hind leg yellow except apical third of tibia and tarsus which are brown. Forewing hyaline except transverse mediad infumate band extending from parastigma to anteriad half of stigma; transverse apical infumate band extending between posterior stigma apex and wing apex. Hind wing hyaline with two infumate bands that match these of FW.

**Etymology:** The specific epithet of this species refers to the country of the type locality.

**Variation**
In some specimens the bulge on T1 can be absent. The extension of the brown spots in the metasoma varies.

**Diagnosis and similar species**
This species can be distinguished by the following combination of characters: face striated longitudinally but covered by small punctures, frontal depression with several circular incomplete rugae, striae on the area of vertex lateral ocelli, posterior margin of mesopleuron with transverse carina in the dorsal half, posteriomedial areola with incomplete parallel ridges and a posteromediad ridge.
This species is similar to *Z. cramptoni*. *Z. mexicana* shares with *Z. rugocapitis* and with some specimens of *Z. cramptoni* the striae on the area of vertex lateral ocelli. *Z. mexicana* shares with *Z. miza* the sculpture of the sternalus. *Z. mexicana* and *Z. concinna* share the sculpture of the juxtacoxal area having a complete mediad carina and severa irregular carinae that give a rugous appearance. *Z. emissaria*, *Z. concinna*, and *Z. mexicana* share the shape of the posterior margin of the metanum, with a transverse ridge and an incomplete mediad longitudinal carina.

**Geographic distribution and elevation range:** Mexico. 139-914m

**Material examined**

HOLOTYPE: ♀, MEXICO: Chiapas, Municipio de Villa de Corzo, above colonia Vicente on road from Guerrero to Finca Custepec, 914 m, 10.VIII.1981, D. E. Breedlove / CASC


**Zelomorpha emissaria** n. sp.

(Fig. 6C, 21EF, 36C, 51C)

**Measurements.** Mesosoma length 2.5 mm. FW length 7.55 mm.

**Head.** Medial ridge or convexity of face absent. Face with a narrow dorsomedial groove, convex medially with sides flat, short lateral transverse striations present, with irregular fovea evenly distributed. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, fused posteriorly with interantennal carina forming a circular ridge, striate laterally. Frontal depression with a few circular rugae. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 39. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with irregular striations laterad ocelli. Median longitudinal depression posteriad ocelli absent. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange absent, with irregular rugae evenly distributed.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of several irregular and unevenly distributed ridges. Mesopleuron with small
punctures evenly distributed. Sternaulus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 4–6 strong carinae restricted to dorsal half and a few weak carina in ventral half. Suture between metepisternum and metepimeron complete and deep, with acute angle at anterior border, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, slender, straight, with round apex, with a complete carina mediad flange apex. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum crenated ventrally. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove absent. Scutellar sulcus deep and subquadrate. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum with a complete median longitudinal carina. Posterior border of median areola of metanotum with an acute transverse crest and a longitudinal crest. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola close to apex. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, pentagonal, with lateral ridges strong, shorter than anterior ridges. Anterolateral areola with an incomplete ridge extending half distance from midlength of anteromedial keel to anterodorsal corner. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola complete, defined by distinct lateral carina, subquadrate, without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Forewing 3M curved, 3RSa present, at least weakly, RS2a longer than r-m, RS2b absent. CUb of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly yellow with most of head, and parts of metasomal sterna black. Antenna and most of metasoma brown. Palpi and clypeus yellow. Foreleg and midleg yellow with telotarsomeres brown. Hind leg light brown with trochanter yellow. Abdomen brown with irregular yellow spots. Forewing infumate except by a hyaline transverse mediad band as wide as the stigma. Brown costal vein. Hind wing hyaline.
Etymology: The specific epithet of this species refers to the name of the Argentinian province where the holotype comes from, Misiones.

Diagnosis and similar species
This species can be distinguished from similar species by the following combination of characters: area of vertex posteriad ocelli with several irregular striae. Dorsal half of the posterior margen of mesopleuron with 4-6 transverse carinae. Suture between metaepisternum and metaepimeron with anterior border margined. Juxtacoxal flange slender and regularly concave. Posterolateral margin of pronotum with ventral transverse ridges. Posterior border of mesoscutal sulcus carinate. Median areola of metanotum with a complete median longitudinal carina. Apex of ovipositor sheaths square. Gena sculptured with dense small protuberances which gives to it a reticulate appearance.

This species shares with Z. miza and Z. nigriceps the rugous surface of the frontal depression. Z. emissaria shares with Z. concinna the shape of the posterior border of the metanotum.

Geographic distribution and elevation range: Argentina. 150m

Material examined

Zelomorpha rarolopha n. sp.
(Figs. 13C, 28EF, 43C, 58B)

Measurements. Mesosoma length 2.74 mm. FW length 7.84 mm.

Head. Medial ridge or convexity of face absent. Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, with irregular fovea evenly distributed. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, fused posteriorly with interantennal carina forming a circular ridge, striate laterally. Frontal depression with a few circular rugae. Distance between antennal insertions distinctly shorter than their diameters. Number of flagellomeres 38. Depression laterad lateral
ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli smooth.
Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral
margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange absent,
with rugae restricted to area immediately basad eye.

**Mesosoma.** Epiconemial carina complete and evenly curved, with groove wide and flat. Crenulation of
epiconemial carina composed of several irregular and unevenly distributed ridges. Mesopleuron with small
punctures evenly distributed. Sternaulus with a notorious depression and up to three weak ridges.
Posterior margin of mesopleuron with 4–6 strong carinae restricted to dorsal half and a few weak carina
in ventral half. Suture between metepisternum and metepimeron complete and deep, with both anterior
and posterior borders with acute angle, with transverse carinae restricted to suture width, with strong
carinae of subequal sizes. Convex flange on posterior dorsal border of mesopleuron present. Dorsal apex of
metepisternum with two subparallel carinae. Juxtacoxal flange present, regularly concave, slender, curved
posteriorly, with round apex, with a complete carina mediad flange apex. Anterior area of subpronope
wide and flanged. Posteralateral margin of pronotum smooth. Notaulus strong, converging on a midpit.
Median longitudinal mesoscutal groove indicated by a single wide smooth depression. Scutellar sulcus
deep and subquadrate, with three carinae. Scuto-scutellar articulation absent. Posterior border of
mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse
groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola
of metanotum with an incomplete median longitudinal carina. Posterior border of median areola of
metanotum with an acute transverse crest and a longitudinal crest. Longitudinal apical crest of median
metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola close to
apex. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial
areola with transverse ridges, pentagonal, with lateral ridges strong, shorter than anterior ridges.
Anterolateral areola with two incomplete ridges heading diagonally half distance from midlength of
anteromedical keel, and with an incomplete lateral keel. Anteropleural areola present, with some weak
rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian
areola complete, defined by distinct lateral carina, subquadrate, without transverse ridge, with median
longitudinal ridge separated from the transverse keel. Posterolateral areola closed, subquadrat, subequal
in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching
posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2
basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2
basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising from a
lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa absent, RS2a shorter than r-m,
RS2b absent. CUb of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly yellow except most of head, flagellomeres and apex of apical four metasomal segments. Foreleg yellow with brown telotarsomere. Midleg yellow with femur and telotarsomere brown. Hind leg brown except coxa, most of trochantellus and anterior apex of tibia which are yellow. Forewing hyaline except as follows: costal border, transverse mediad band extending from parastigma to anteriad half of stigma; transverse apical band extending between posterior stigma apex and wing apex. Hind wing hyaline with two bands that match these of FW.

**Etymology**: The specific epithet of this species means “small ridge”; rarus (L.) = small, lophos (Gr.) = ridge, and it refers to the distinctive carenated border of the groove between metaepistenum and metaepimeron; this is a major distinctive character for this species.

**Diagnosis and similar species**
This species shares several characters with *Z. emissaria* such as the type of fovea in the face. *Z. rarolopha* shares with *Z. mexicana, Z. emissaria, Z. panopa*, and *Z. concinna* the shape of the posterior border of the metanotum.

*Z. rarolopha* can be distinguished from the other species by the following combination of characters: lateral carina of frons fusionated with the interantennal carina, frontal depression with several circular rugae, posterior margin of mesopleuron with 4-6 transverse ridges in dorsal half, carenate both anterior and posterior border of the suture between metapiesternum and metaepimeron, dorsal apex of metapiesternum with two longitudinal carina, posterolateral margin of pronotum smooth, posterior border of mesoscutal sulcus smooth, RS2 vein of FW shorter than rm.

**Geographic distribution and elevation range**: Brazil

**Material examined**
HOLOTYPE: ♀, Vila Vera, BRAZIL, W50°30' S12°30', October 1973, M. Alvarenga / AEIC

*Zelomorpha rugocapitis* n. sp.
(Figs. 13E, 28IJ, 43E, 58D)
Measurements. Mesosoma length 3.14 mm. FW length 8.43 mm.

Head. Medial ridge or convexity of face absent. Face with a narrow dorsomedial groove, convex medially with sides flat, fine set of mediad parallel transverse striations present, with punctures densely distributed medially. Penultimate labial palpmere about half length of apical palpmere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 42. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex laterad ocelli striated. Area of vertex posteriad ocelli with several evenly distributed foveae. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroverntal margin of gena strongly flanged. Posteroverntal area of gena concave, depression dorsad flange present, with rugae restricted to area immediately basad eye.

Mesosoma. Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 3–6 large ridges restricted to mid length. Mesopleuron with small punctures evenly distributed. Sternaulus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 6 evenly distributed faint ridges. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, wide, with two complete carinae. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove indicated by a single wide smooth depression. Scutellar sulcus deep and subquadrate, with five carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, wide, with a median crenula. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum acute, with median longitudinal crest clearly separated from lateral borders. Longitudinal apical crest of median metanotal areola separated from lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with irregular striations. Anteromedial areola without transverse ridges, pentagonal, with lateral ridges strong, shorter than anterior ridges. Anterolateral areola with a strong ridge heading half distance from midlength of anteromedial keel to anterodorsal corner. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola complete,
defined by distinct lateral carina, subquadrate, without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising from a lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a longer than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly yellow with dorsal half of head and antenna brown. Foreleg and midleg yellow. Hind leg yellow with posterior half of tibia, and tarsus brown. Forewing hyaline except transverse mediad band extending from parastigma to anteriad half of stigma; transverse apical band extending medially midway of distance between stigma apex and wing apex. Hind wing hyaline with two bands that match these of FW.

**Etymology:** The specific epithet of this species is a compound word that comes from the latin words rugae = wrinkle and capitis = head. It refers to the strong sculpturation of the face.

**Diagnosis and similar species**
This species can be distinguished from *Z. nigriceps* by the strong sculpturation of the face; the vertex area lateral to the ocelli is also sculpturated. Other characters that are common in this species are: Penultimate labial palpomere is 50% shorter than the last one. The transverse groove of scutellum is deep and wide, with a clear flat surface, with a median longitudinal crenula.

This species shares with *Z. cramptoni* and with *Z. pseudobaios* the reduced penultimate labial palpomere which is 50% shorter than the last one. *Z. rugocapitis* and *Z. pseudobaios* share the striation in the area of vertex lateral ocelli.

**Geographic distribution and elevation range:** Peru. 157m

**Material examined**
*Zelomorpha panopa* n. sp.
(Figs. 11D, 26GH, 41D, 56D)

**Measurements.** Mesosoma length 3.97 mm. FW length 11.22 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face without a dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, lateral longitudinal striations absent, medial transverse striations absent, short lateral transverse striations absent, lateral and dorsolateral striations radiating from the tentorial pits absent, transverse striations between interantennal carinae absent, dense net of mediad transverse and longitudinal striae absent, fine set of mediad parallel transverse striations absent, with regular fovea dense medially and sparse laterally. Penultimate labial palpmere subequal in length to apical palpmere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes emarginate, not converging ventrally. Posterior orbit of eye not bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 44. Depression laterad lateral ocellus absent. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange present, with rugae restricted to area immediately basad eye.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of several irregular and unevenly distributed ridges. Mesopleuron with small punctures evenly distributed. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with two subparallel carinae. Juxtacoxal flange present, regularly concave, wide, with a complete carina mediad flange apex. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove absent. Scutellar sulcus deep and subquadrat, with one carina. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum with an incomplete median longitudinal carina. Posterior border of median areola of metanotum with an acute
transverse crest and a longitudinal crest. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola close to apex. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, acuminate. Anterolateral areola present and without ridges. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola complete, defined by weak lateral carina, narrow posteriorly but with lateral ridges separated, without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

Legs and wing venation. Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising from a lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite more than two times its posterior width.

Color pattern. Mostly yellow except as follows: head and flagellomeres brown. Metasoma dark yellow basally turning brown apically. Foreleg and midlegs yellow. Hind leg brown except basal part of coxa. Forewing hyaline except as follows: costal border, transverse mediad band extending from parastigma to anteriad half of stigma; transverse apical band extending between posterior stigma border and wing apex. Hind wing hyaline with distal half infumated and a hyaline spot near to anterodorsal apex.

Etymology: The specific epithet of this species comes from the Greek word Panope which is a sea Nymph. This name serves a twofold purpose; honors Debra Murray colleague who provided several useful ideas for this revision; her last name means "by the sea." Also, the epithet refers to the name of the Brazilian coastal state of Bahia where the type specimen was captured.

Diagnosis and similar species
This species closely resembles *Z. fuscurhetha* sharing with it several significant characteristics such as the shape of the anteromediad areola of propodeum; however, *Z. panopa* can be distinguished from it and from other species by the following combination of traits: face with a few mediad longitudinal striations, eyes reaching the lower limit of the tentorial pits, the epicnemial carina has a few irregular transverse ridges, posterior margin of mesopleuron with robust transverse carinae, juxtacoxal flange wide, median longitudinal mesoscutal groove absent, posterior border of the median areola of metanotum with a
transverse crest, postero mediad areola defined by incomplete ridges that narrow posteriorly, carina of hind trochantellus clearly developed

**Geographic distribution and elevation range:** Brazil (Bahia). 45m

**Material examined**
HOLOTYPE: ♀, Cepec Itabuna, Bahia, Brazil, 25 marzo 1979, F. P. Benton / BMNH

_Zelomorpha fuscruetha_ n. sp.
(Fig. 6H, 21OP, 36H, 51H)

**Measurements.** Mesosoma length 3.53 mm. FW length 10.19 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face without a dorsomedial groove, convex medially with sides flat, lacking striations, with regular fovea dense medially and sparse laterally. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes non emarginate, not converging ventrally. Posterior orbit of eye not bordered by groove. Lateral carina of frons composed of a strong continuous ridge, or composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters. Number of flagellomeres 42, 44. Depression laterad lateral ocellus absent. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with several evenly distributed foveae. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange absent, smooth.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 5–6 small ridges evenly distributed, or composed of 5–6 small ridges restricted to ventral half. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 10–12 small uniform carinae. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with a longitudinal and a transverse carinae disposed as a T. Juxtacoxal flange present, regularly concave, slender, curved posteriorly, with round apex, with a complete carina mediad flange

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a longer than r-m, RS2b absent. Cu of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly yellow except as follows: head, antennae, last four metasomal segments black. Front and midleg yellow. Hind leg black except basal half of coxa. Forewing hyaline except as follows: transverse mediad band as wide as 1st discal cell; transverse apical band extending between posterior stigma border and wing apex. Hind wing hyaline two bands that match these of front wing.

**Etymology:** The specific epithet of this species refers to the black color of the hind legs

**Variation**
The species exhibit variation in the following characters: the face of some specimens is covered by very dense foveolae leaving no flat surface, definition of the lateral carina of the frons varies, sculpturation of the juxtacoxal flange, strength of the lateral ridges of the posteromedial areola. There is variation in the extension of the brown coloration in the hind leg
**Diagnosis and similar species**

This species can be distinguished from similar species by the combination of the following characteristics: Medial ridge of the face covers most of the face length. Depression laterad ocelli absent. Eyes not reaching the lower limit of the tentorial pits, Smooth posteroventral area of gena. The carinae of the dorsal apex of the metaepisternum disposed as a T. Scuto-scutellar articulation present.

This species resembles in several characteristics the species originally described as *Biroia*; however, unlike in those, the notauli of *Z. fuscurhetha* is strong. *Z. fuscurhetha* shares with *Z. nigricoxa*. The posterior border of the median areola of metanotum defined by the convergent lateral borders; also, it shares the penultimate labial palpi being of similar size to the last one. This species shares with *Z. tropicola* the acuminate shape of the anteromedial areola and the general appearance of the propodeal carination.

**Geographic distribution and elevation range:** French Guyane, Colombia, Ecuador. 250, 320m

**Material examined**

**HOLOTYPE:** ♀, COLOMBIA, Putumayo, PNN La Paya, Cabaña Viviano, 0°7’S 74°56’W, 320m, Malaise, 1-15.xii.2001, E. Lozano, Leg., M. 2795 / IAVH

**PARATYPES:** 1 ♀, COLOMBIA, Putumayo, PNN La Paya, Cabaña Viviano, 0°7’S 74°56’W, 320m, Malaise, 30.xi.15.xii.2001, E. Lozano, Leg., M. 2794 / IAVH. 1 ♀, ECUADOR: Napo, Yasuni Res. Sta. 30 sept-11 oct 2002, C. Brammer, 250m, M. T. 0°40’566”S 76°23’851”W

Other specimens

**FRENCH GUIANA:** 1 ♀, Guyanne francaise, Roura, Pont route N2 sur la comté, ix.2000 (Malaise trap 4°39’37.07”N 52°21’15.72”W) /FSAG. **COLOMBIA:** 4 ♂♂, COLOMBIA, Putumayo, PNN La Paya, Cabaña Viviano, 0°7’S 74°56’W, 320m, Malaise, 30.xi.15.xii.2001, E. Lozano, Leg., M. 2794 / IAVH. 1 ♂, COLOMBIA, Putumayo, PNN La Paya, Cabaña Viviano, Bosque Ripario, 0°7’S 74°56’W, 320m, Malaise, 15-30.x.2001, R. Cobete, Leg., M. 2437 / IAVH.

**Zelomorpha nigricoxa** (Enderlein, 1920) new combination

(Figs. 10C, 25EF, 40C, 55C)

Redescription

**Measurements.** Mesosoma length 2.99 mm. FW length 7.11 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face without a dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, medial transverse striations present, short lateral transverse striations present, with punctures densely distributed medially. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, fused posteriorly with interantennal carina forming a circular ridge, with acute base, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions subequal to their diameters. Number of flagellomeres 36. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange absent, with rugae restricted to area immediately basad eye.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 5–6 small ridges evenly distributed. Mesopleuron with small punctures evenly distributed. Sternaulus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 4–6 evenly distributed carinae. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, slender, straight, with round apex, with a complete carina mediad flange apex. Anterior area of subpronope not modified. Posterolateral margin of pronotum carenated ventrally. Notaulus indicated by weak depressions. Median longitudinal mesoscutal groove indicated by a single wide smooth depression. Scutellar sulcus deep and subquadrate, without carinae, or with 3. Scuto-scuteal articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum with an acute transverse crest and a longitudinal crest. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola...
close to apex. Propodeum with several strong areolae, surface with both striations and punctures.
Anteromedial areola without transverse ridges, triangular. Anterolateral areola with two incomplete ridges
heading diagonally half distance from midlength of anteromedial keel. Anteropleural areola present, with
some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present.
Posteromedian areola complete, defined by distinct lateral carina, posteromedial areola or incomplete,
narrow posteriorly but with lateral ridges separated, without transverse ridge, without median longitudinal
ridge, posteromedial areola or with median longitudinal ridge. Posterolateral areola closed, subquadrate,
subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching
posteropleural keel.

Legs and wing venation. Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2
basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2
basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising from a
lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa present, at least weakly, RS2a
shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median
tergite less than 1.5 times its posterior width.

Color pattern. Mostly dark brown except as follows: labrum, part of clypeus, mandibles, lower part
of gena, sides of prosternum, pronotum, tegula, sides of mesosternum, scutellum, metanotum,
propodeum, S1–3, and anterior half of S4 yellow. Scape light brown. Front and midleg yellow with
telotarsus tip and claw brown. Hind leg yellow except: most of coxa, posterior third of tibia and
tarsomeres brown. Forewing hyaline except as follows: transverse mediad extending from parastigma to
anteriad half of stigma; transverse apical band extending between posterior stigma apex and wing apex.
Hind wing hyaline with two bands that match these of FW.

Variation
The median longitudinal ridge of the posteriomedial propodeal areola is either present or absent; the
metasoma can be entirely dark brown or black with anterior segments yellow. In some specimens the
anteriormedia areola of metanotum may have a pentagonal appearance due the strength of the diagonal
ridges of the anteriolateral areola.

Diagnosis and similar species
This species can be distinguished from similar species by the following combination of characters:
marginal carina fused with the interantennal carina; frontal depression smooth; genal rugae subparallel
and basal flange; mesoscutal punctures evenly distributed; notauli weakly indicated as in some species
originally described as Biroia; posterior border of median metanotal areola with an acute transverse crest
and a longitudinal crest; triangular anteromedial areola; T1 median metasomal tergite less than 1.5 the length of its maximum width

**Geographic distribution and elevation range:** Mexico, Costa Rica. 0, 5 m.

**Material examined**

**HOLOTYPE:** ♂, Mexico Chiapas L. Conradt S. 16.7.07 / Type / *Disophrys nigricoxa* type Enderl. ♂, Dr. Enderlein det. 1919 / MIZ (MZPW) (Museum and Institute of Zoology, Polish Academy of Sciences)

**CO-TYPE:** ♂, Mexico Chiapas L. Conradt S. 20.7.07 / Co-Typus / *Disophrys nigricoxa* type Enderl. ♂, Dr. Enderlein det. 1919 / MIZ (MZPW) (Museum and Institute of Zoology, Polish Academy of Sciences)

**COSTA RICA:** 1 ♂, Cuatro Esquinas, P. N. Tortuguero, Prov. Limon, COSTA RICA, 0m, April 1989, R. Aguilar & J. Solano, 280000, 590500 / Costa Rica, INBIO CRI000084499 / INBC. 1 ♂, Costa Rica, Boca de Barranca, Puntarenas province, 12-14 June 1972, Hogue & Dockweiler / LACM

**Zelomorpha melanota** (Viereck, 1912)

(Figs. 9E, 24IJ, 39E, 54E)


**Redescription**

**Measurements.** Mesosoma length 3.53 mm. FW length 10.49 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations absent, or mediad longitudinal striations present, lateral longitudinal striations present, medial transverse striations absent, short lateral transverse striations absent, lateral and dorsolateral striations radiating from the tentorial pits absent, transverse striations between interantennal carinae absent, with regular fovea present medially only. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal
insertions distinctly longer than their diameters. Number of flagellomeres 41–43. Depression laterad lateral ocellus absent. Genae at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea, posterad ocelli or smooth. Median longitudinal depression posteriad ocelli absent. Posteroventral margin of genae strongly flanged. Posteroventral area of genae concave, depression dorsad flange absent, with rugae restricted to area immediately basad eye.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 4–9 large evenly distributed ridges, or absent or composed of 5–6 small ridges evenly distributed. Mesopleuron punctate but lacking punctures medially. Sternaulus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, slender, curved posteriorly, with round apex, or wide, with a complete carina mediad flange apex. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove indicated by a single wide smooth depression. Scutellar sulcus deep and subquadrate, with one carina, or with 3. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, without crenulae, scutellum or deep, with crenulae extending anteriorly but not reaching midway to scutellar sulcus. Median areola of metanotum with a complete median longitudinal carina, or without median longitudinal carina or with an incomplete median longitudinal carina. Posterior border of median areola of metanotum with an acute transverse crest and a longitudinal crest. Longitudinal apical crest of median metanotal areola separated from lateral ridges. Transverse crest of median metanotal areola well before apex. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, pentagonal, with lateral ridges strong, longer than anterior ridges. Anterolateral areola with an incomplete ridge extending half distance from midlength of anteromedial keel to anterodorsal corner. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina absent. Posteronmental areola incomplete, subquadrate, without transverse ridge, with median longitudinal ridge separated from the transverse keel. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly
from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa present, at least weakly, or 3RSa absent, RS2a subequal to r-m, RS2b absent, or RS2b present. CUb of hind wing nebulous. T1 with an anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly dark orange except as follows: antenna, dorsal half of head, apex of hind leg tibia and tarsi black. Forewing hyaline except as follows: transverse mediad band extending from parastigma to anteriad half of stigma; transverse apical band between posterior stigma border and wing apex. Hind wings hyaline two bands that match these of front wings. *In some specimens the head is entirely dark orange, the dark parts of the hind legs are brown, and the metasoma have dark spots.*

**Variation**

This species exhibit variation in the following characters: sculpturation of the face, median longitudinal carina of the central areola of metanotum, sculpturation of the epicnemial carina, length of the lateral ridges of the posteriomedial areola of metanotum, and shape of the juxtacoxal flange.

**Diagnosis and similar species**

This species is very similar to *Z. miza*; the major difference between these is the lack of transverse carina extending beyond the posterior border of the depression between metaepisternum and metaepimeron.

**Geographic distribution and elevation range:** French Guiane, Brazil (Mato Grosso, Goiás), Bolivia, Paraguay. 92-100m

**Material examined**

LECTOTYPE: ♀ Sapucay, Paraguay / 29.8.1901 / Type No. 14734 U.S.N.M. / *Zelomorphidea melanota*

Type ♀ Vier. / ♀ *Zelomorphidea melanota* Vier. C. van Achterberg 1981 Holotype [!] / USNM


*Zelomorpha miza* n. sp.

(Figs. 10A, 25AB, 40A, 55A)
Measurements. Mesosoma length 4.07 mm. FW length 11.71 mm.

Head. Medial ridge or convexity of face absent. Face without a dorsomedial groove, flat medially and laterally, mediad longitudinal striations present, lateral longitudinal striations present, with punctures densely distributed medially. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression with a few circular rugae. Distance between antennal insertions subequal to their diameters. Number of flagellomeres 42, 44. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli absent. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena concave, depression dorsad flange absent, with rugae restricted to area immediately basad eye.

Mesosoma. Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 5–6 small ridges evenly distributed, or composed of more than eight small ridges, evenly distributed. Mesopleuron punctate but lacking punctures medially. Sternaulus with a notorious depression and up to three weak ridges, or with a notorious depression and a clear set of striations evenly distributed. Posterior margin of mesopleuron with 6 evenly distributed faint ridges. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with the ventral transverse carinae extending posteriorly at least half width of suture, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with a longitudinal and a transverse carinae disposed as a T, metaepisternum or with two subparallel carinae. Juxtacoxal flange present, regularly concave, slender, curved posteriorly, with round apex, with two carinae, one complete, one incomplete. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove indicated by a single wide smooth depression. Scutellar sulcus deep and subquadrate, with three carinae, or with 2. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, wide, with a median crenula. Median areola of metanotum without median longitudinal carina, or with an incomplete median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge, or with an acute transverse crest and a longitudinal crest. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent, or close to apex. Propodeum with several strong
areolae, surface with irregular striations. Anteromedial areola without transverse ridges, pentagonal, with lateral ridges strong, shorter than anterior ridges. Anterolateral areola with a strong ridge heading half distance from midlength of anteromedial keel to anterodorsal corner. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola complete, defined by distinct lateral carina, subquadrate, without transverse ridge, without median longitudinal ridge, posteromedial areola or with median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa present, at least weakly, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly yellow with head and antenna brown. Foreleg and midleg yellow. Hind leg yellow with trochanter and femur orange. Tibia and tarsi brown. Abdomen dark yellow with irregular brown dorsal spots. Forewing hyaline except as follows: transverse mediad infumate band extending from parastigma to the anteriad half of stigma; transverse apical infumate band extending between stigma apex and wing apex. Hind wing hyaline with two infumate bands that match these of FW. *Some specimens have more extensive brown color in hind leg.*

**Etymology:** The specific epithet of this species honors the Museo de Zoología Agrícola “Francisco Fernández Yepez” (MIZA acronym). This Institution has provided a significant number of interesting specimens for this revision.

**Variation**
Specimens of this species exhibit variation in: crenulations of the face, sculpturation of the medial areola of the metanotum, crenulation of the epicnemial carina. The sternaulus can be either smooth or covered by weak crenulae. The hind leg can be yellow with posterior half of femur, tibia, and tarsi brown or it can be yellow with trochanter, femur, tibia and tarsi brown.

**Diagnosis and similar species**
This species can be distinguished from similar species by the strong transverse crenula between metaepisternum and metaepimeron; the lowest crenula extends posteriorly midway of distance between anterior and posterior border of the metaepimeron. Other useful characters to recognize this species are: frontal depression with several circular rugae; dorsal apex of metaepisternum with two carinae disposed as a T (present in several specimens). The longitudinal carinae in the mesoscutal sulcus are concentrated medially. Bulge present in T1. This species is similar to Z. rugocapitis and Z. melanota and these share the deep and wide transverse groove of the scutellum.

**Geographic distribution and elevation range:** Mexico, Costa Rica, Venezuela, French Guiana, Ecuador. 0-890m

**Material examined**

**HOLOTYPE:** ♀, Venezuela, Táchira, Quebrada La Uracá, San Félix, 300m, 17-22-vi-1998, J. DeMarmels,-A. Chacón / MIZA


**Other specimens**


_Zelomorpha lineata_ n. sp.

(Figs. 8G, 23MN, 38G, 53G)

**Measurements.** Mesosoma length 2.69 mm. FW length 6.81 mm.

**Head.** Medial ridge or convexity of face absent. Face without a dorsomedial groove, convex medially with sides flat, lacking striations, with regular fovea dense medially and sparse laterally. Penultimate labial palpmere subequal in length to apical palpmere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes emarginate, converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 38. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange present, with a few subparallel rugae dorsad genal flange.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 4–9 large evenly distributed ridges. Mesopleuron with small punctures evenly distributed. Sternalus with a notorious depression and up to three weak ridges. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, with acute angle at anterior border, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtaposcal flange present, regularly concave, rounded, with a complete carina and irregular additional carinae. Anterior area of subpronope
wide and flanged. Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove indicated by a wide, flat, sculptured depression. Scutellar sulcus deep and subquadrate, with three carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola long and horizontal, strongly projected. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, pentagonal, very thin, anterior ridges shorter than lateral ridges. Anterolateral areola with an incomplete ridge extending half distance from midlength of anteromedial keel to anterodorsal corner. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola complete, defined by distinct lateral carina, subquadrate, without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly brown except as follows: clypeus, labrum, palpi, ventral area of escape, mesoscutum, tegula, posterior half of metanotum, and first three metasomal segments yellow. Front and midleg yellow. Hind leg mostly brown except: yellow infuscations in coxa, trochanter, trochantellus, femur and tibia. Front wing hyaline except infumated: costal border, transverse mediad band extending before parastigma to anteriad half of stigma, transverse apical band extending between stigma apex and wing apex. Hind wing hyaline with two bands that match these of FW.

**Etymology:** The specific epithet of this species refers to the thin anterio-medial areola delimited by parallel lateral ridges.

**Diagnosis and similar species**
This species can be distinguished by the following combination of characters: posterioventral area of gena almost smooth, with a few subparallel rugae dorsad genal flange; epicnemial carina with 4-9 strong crenulae evenly distributed; posterior margin of mesopleuron with 8-10 strong carinae uniformly distributed. Juxtacoxal carina rounded and with several irregular ridges.

**Geographic distribution and elevation range:** Peru. 750m

**Material examined**

HOLOTYPE: ♂, Quincemil, Peru, 750m, nr. Marcapata, oct 20-30 1962, Luis Peña / AEIC

*Zelomorpha baios* n. sp.

(Figs. 2G, 17MN, 32G, 47G)

**Measurements.** Mesosoma length 2.49 mm. FW length 6.68 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face without a dorsomedial groove, convex medially with sides flat, lacking striations, with punctures densely distributed medially. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes emarginate, converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, with acute base, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 41. Depression laterad lateral ocellus absent. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli smooth, posterad ocelli or with several evenly distributed foveae. Median longitudinal depression posteriad ocelli absent, or weak, indicated by narrow groove. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange absent, with rugae restricted to area immediately basad eye.

**Mesosoma.** Epicanemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of several irregular and unevenly distributed ridges. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 5 robust carinae and one weak carina in between each of these, or with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, with acute angle at anterior border, with transverse carinae restricted to suture width,
with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present.
Dorsal apex of metepisternum with two subparallel carinae, metaepisternum or without carina. Juxtacoxal
flange present, regularly concave, wide, smooth. Anterior area of subpronope wide and flanged.
Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal
mesoscutal groove absent. Scutellar sulcus deep and subquadrature, with three carinae. Scuto-scutellar
articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk
rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly
but not larger than sulcus. Median areola of metanotum without median longitudinal carina. Posterior
border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of
median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola
absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial
areola without transverse ridges, ensiform. Anterolateral areola present and without ridges. Anteropleural
areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural
carina present. Posteromedian areola complete, defined by weak lateral carina, posteromedial areola or
incomplete, wide posteriorly, without transverse ridge, without median longitudinal ridge. Posterolateral
areola closed, subquadrature, subequal in width to anterolateral areola, posteropleural areola closed.
Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2
basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2
basitarsomere. Carina of hind trochantellus weakly indicated (the trochantellus has a flat area). Apex of
hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M
curved, 3RSa absent, RS2a subequal to r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth
anteriorly. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly black except as follows: clipeus, palpi, most of pronotum, tegula, scrobal area
of mesopleuron, mesoscutum, scutellum, sides of metanotum, and first three metasomal segments
orange. *Some specimens have black scutellum and metanotum.* Front legs yellow with brown infuscations
in telotarsomere. Mid leg yellow with apex of tibia with brown infuscations, telotarsomere brown. Hind
leg black except as follows: apex of coxa yellow, posterior half of femur orange. FW hyaline with
infuscations as follows: base of wing, costal border, median transverse band between parastigma and
anterior apex of stigma. Transverse apical band extending between posterior stigma apex and wing apex.
Hind wing hyaline with two transverse bands that match apical bands of FW.

**Etymology:** The specific epithet of this species refers to its small size
Variation
The species exhibit variation in the sculpturation of the face; some individuals have clear longitudinal striations while others are devoid of these. There is variation in the sculpturation of the area posteriad ocelli; some specimens exhibit a smooth surface while others have fovea and a thin medial longitudinal groove. Some specimens do not have the little crenulae in between the large crenulae of the posterior margin of mesopleura; also there is variation in the number and location of the transverse carina in between the metaepisternum and metaepimeron. The number of carina in the dorsal apex of metaepisternum varies from none to two. Some specimens have black scutellum and metanotum, and only the first two metasomal segments orange.

Diagnosis and similar species
This species can be distinguished from similar species by the following characters: labial palpi of similar size; acute triangular shape of the anteromedian propodeal carina; divergent lateral ridges of the posteromedial areola of propodeum.

Geographic distribution and elevation range: Guyane Francaise, Ecuador, Venezuela, Peru, Bolivia. 290-820m

Material examined
HOLOTYPE: ♀, Venezuela, Amazonas, P.N. Parima, Tapirapeco / Parima, 820m, 2°05’N, 64°1’W, 8-10-II-92 / Exp. Terramar, J. Clavijo, A. Chacon / MIZA
PARATYPES: 1 ♀, Guyane française, Sinnamary, Barrage de Petit Saut, 30.IX-5.X.2000, (Malaise trap, 4°, 04’N - 53°03’W); P. CERDAN [CERDA]-lab., Hydrobiologie legs. / FSAG

Other specimens
FRENCH GUIANA: 1 ♀, Guyane française, Sinnamary, Barrage de Petit Saut, 30.IX-5.X.2000, (Malaise trap, 4°, 04’N - 53°03’W); P. CERDAN [CERDA]-lab., Hydrobiologie legs. / FSAG.
PERU: 1 ♂, Peru: Madre de Dios, Rio Tambopata Reserve, 30 air km SW of Puerto Maldonado, 290m, November 1-26 1982, Edward S. Ross / CASC.

**Zelomorpha pseudobaios** n. sp.  
(Figs. 12G, 27MN, 42G, 57F)

**Measurements.** Mesosoma length 2.41 mm. FW length 6.39 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides *flat, mediad* longitudinal striations present, with regular fovea dense medially and sparse laterally. Penultimate labial palpomere less than 25% shorter than apical palpomere, or about half length of apical palpomere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes emarginate, converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, fused posteriorly with interantennal carina forming a circular ridge, with acute base, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 37. Depression laterad lateral ocellus absent. Gena at mid-height, posteriad eye evenly rounded. Area of vertex laterad ocelli striated. Area of vertex posteriad ocelli with a few medial fovea. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange absent, with irregular rugae evenly distributed.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of several irregular and unevenly distributed ridges. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 10–12 small uniform carinae. Suture between metepisternum and metepimeron complete and deep, with acute angle at anterior border, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with two subparallel carinae. Juxtacoxal flange present, regularly concave, wide, with a complete carina mediad flange apex. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove indicated by a wide, flat, sculptured depression.
Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum with an incomplete median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, ensiform. Anterolateral areola rugous anterolaterally and with some irregular ridges converging anterolaterally. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola complete, defined by distinct lateral carina, subquadrate, without transverse ridge, with median longitudinal ridge separated from the transverse keel. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising from a lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa absent, RS2a longer than r-m, RS2b absent. CUb of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly yellow with most of head and antenna brown. Palpi yellow. Foreleg and midleg yellow with telotarsomereres darker. Hind leg brown with coxa, trochantellus, and most of tibia yellow. Femur light brown. Abdomen dark yellow with irregular brown spots. Forewing hyaline except as follows: transverse mediad band extending from parastigma to anteriad half of stigma; transverse apical band extending between stigma apex and wing apex. Hind wing hyaline with two bands that match these of FW.

**Etymology:** The specific epithet of this species refers to the similarity between this species and *Z. baios.*

**Diagnosis and similar species**

This species can be distinguished by the following combination of characteristics: area of vertex lateral ocelli with several striae; juxtacoxal area with a complete medial carina; anteromedial areola triangular; posteromedial areola of propodeum defined by semiparallel ridges; carina of the hind trochanter strong; bulge on T1 present. In some specimens the second tarsomere of the front leg is rather long compared with the others.
This species is similar to *Z. baios* and shares many characteristics with it such as: anteromedial areola of propodeum thin and acute. *Z. pseudobaios* shares with *Z. rugocapitis* the striations in the area of vertex lateral ocelli. *Z. pseudobaios* have large eyes while *Z. baios* have small eyes never reaching the inferior border of the tentorial pits in frontal view.

**Geographic distribution and elevation range:** French Guiana, Venezuela. 97m

**Material examined**


PARATYPES: 1 ♀, Guyanne Francaise, Montagne de Kaw, Relais Patawa, viii.1999, (Malaise), A.E.I.guyane-J. Cerda legs. / FSAG


**Zelomorpha petila** n. sp.

(Fig. 12B, 27CD, 42B, 57A)

**Measurements.** Mesosoma length 2.68 mm. FW length 6.53 mm.

**Head.** Medial ridge or convexity of face absent. Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, lateral longitudinal striations present, with regular fovea dense medially and sparse laterally. Penultimate labial palpmere subequal in length to apical palpmere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes emarginate, converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, with acute base, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 39. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with a few medial fovea. Median longitudinal depression posteriad ocelli weak, indicated by narrow groove. Posteroventral margin of gena strongly flanged. Posteroventral area of gena convex, depression dorsad flange present, with irregular rugae evenly distributed.
**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 3–6 large ridges restricted to mid length. Mesopleuron with small punctures evenly distributed. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 10–12 small uniform carinae. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, wide, with a complete carina medially flush apex. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove indicated by a wide, flat, sculptured depression. Scutellar sulcus deep and subquadrate, with three carinae, or with 1. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum without median longitudinal carina, or with an incomplete median longitudinal carina or with a complete median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola fused apically with lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, ensiform. Anterolateral areola present and without ridges, or with an incomplete ridge heading half distance from midlength of anteromedial keel to anterodorsal corner or with two incomplete ridges heading diagonally half distance from midlength of anteromedial keel. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola complete, defined by distinct lateral carina, subquadrate, without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa present, at least weakly, or 3RSa absent, RS2a subequal to r-m, RS2b absent. CUb of hind wing nebulous. T1 with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly yellow with most of head, and antenna brown. Some specimens have the apical 10 antennal segments yellow. Palpi yellow. Foreleg and midleg yellow. Hind leg yellow with
posterior half of tibia and tarsi brown. Some specimens have the hind leg almost entirely brown or brown with most of tibia yellow. Abdomen dark yellow with irregular brown spots. Forewing hyaline except as follows: transverse mediad band extending from parastigma to anteriad half of stigma; transverse apical band extending between stigma apex and wing apex. Hind wing hyaline with two bands that match these of FW.

**Etymology**: The specific epithet of this species refers to the thin anteromedial areola of propodeum.

**Variation**
The species exhibit variation in the following characters: median areola of metanotum with or without median longitudinal ridge; anterolateral areola of propodeum with or without incomplete ridges heading diagonally; the lateral ridges of the anteromedial areola can be irregular; 3RSa vein present or absent; the antenna can be either entirely brown or brown with the last 10-8 antennomeres yellow; the metasoma can be entirely dark yellow or black with the first three segments dark yellow; the hind leg femur can have irregular brown infuscations.

**Diagnosis and similar species**
This species can be distinguished from similar species by the following characters: penultimate labial palpi 25% smaller than the apical one; posterior border of median metanotal areola acute and with an acute longitudinal crest; acute triangular shape of the antermedian propodeal carina; parallel lateral ridges of the posteromedial areola of propodeum; suture between metaepisternum and metaepimeron transversed with carinae of subequal sizes; in this species the suture between metaepisternum and metaepimeron is shallower than usual; 3RSa vein of FW present. This species shares with *Z. baios* and with *Z. pseudobaios* the thin anteromedial propodeal areola.

**Geographic distribution and elevation range**: Costa Rica, Venezuela, Brasil (Minas Gerais). 70-900m

**Material examined**
PARATYPES:
- 1 ♂, Amubrí, A. C. Amistad, Prov. Limón, COSTA RICA, 70m, 4-21 Dec 1993, G. Gallardo, L S 385500_578000 #2480 / COSTA RICA, INBIO CRI 001646448 / INBC
Other specimens


*Zelomorpha arizonensis* Ashmead, 1900

(Figs. 2E, 17IJ, 32E, 47E)


**Redescription**

Even though Achterberg & Maetô (1990) provided a more complete description of the species due to the extremely brief original description. A redescription is provided here because two reasons: it is in the same format of characters use for all the species of this revision and, several new species that closely resemble *Z. arizonensis* are described here and thus a more detailed description of *Z. arizonensis* is necessary.

**Measurements.** Mesosoma length 1.71 mm. FW length 3.5 mm.

**Head.** Medial ridge or convexity of face absent. Face with a narrow dorsomedial groove, convex medially with sides flat, lateral longitudinal striations present, with regular fovea present medially only.
Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, fused posteriorly with interantennal carina forming a circular ridge, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 42. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroverntral margin of gena evenly rounded and flanged. Posteroverntral area of gena convex, depression dorsad flange absent, with rugae restricted to area immediately basad eye.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of about 10 robust transverse ridges, strongest at mid-length, present in ventral third. Mesopleuron with strong uniformly distributed punctures. Sternalus with a notorious depression and a clear set of striations evenly distributed, or with a notorious depression and strong transverse striations forming an irregular dorsal margin. Posterior margin of mesopleuron with 7–8 robust carinae evenly distributed. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with two subparallel carinae. Juxtacoxal flange present, regularly concave, slender, curved posteriorly, with round apex, with a complete carina and irregular additional carinae. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum carenated ventrally and with a strong set of irregular dorsal fovea, or with a strong set of irregular fovea at mid height. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove absent. Scutellar sulcus deep and subquadrarte, with three carinae. Scuto-scuteellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola separated from lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, or with transverse ridges or barely indicated by lateral ridges or with a mediad longitudinal ridge, triangular, or pentagonal but with sinuated lateral borders or acute triangle or campanulate. Anterolateral areola with an incomplete ridge extending half distance from midlength of anteromedial keel to anterodorsal corner, or with two incomplete ridges heading diagonally half distance from midlength of anteromedial keel. Anteropleural
areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola complete, defined by distinct lateral carina, posteromedial areola or absent or incomplete, narrow posteriorly but with lateral ridges separated, without transverse ridge, posteriomedial areola or with a straight transverse ridge, with median longitudinal ridge separated from the transverse keel, posteriomedial areola or without median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel diagonal at the lateral areolae, weak and transverse at the medial areola, or regular, reaching posteropleural keel.

Legs and wing venation. Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising from a lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa present, at least weakly, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite more than two times its posterior width.

Color pattern. Entirely orange except antennae and disperse brown infuscations in several parts of the body. Wings entirely hyaline. Some specimens have extensive brown areas by mesosoma and metasoma.

Variation
The shape of the anteriomedial areola is variable ranging from being triangular to campanulate, even in some specimens is partially lost. Some specimens have a median longitudinal ridge; this character variates from very strong to faint. The striations of the sternaulus variate from being very faint to being composed by deep and elongated foveae. The shape of the posteriomedial areola is variable ranging from quadrate and smooth to almost vanish and with a median longitudinal ridge.

Some specimens from Texas and Arizona (USA) have dark infuscations on the anterior half of mesosternum, pronotum, propodeum, and metasoma; even though when present, this coloration is very notorious, its Distribution and elevation range along the body is variable and no other morphologic character separates these specimens from the entirely yellow wasps; thus I have not found enough evidence to separate these from the typical Z. arizonensis. Some specimens have a very slender anteriomedial areola of propodeum resembling that of Z. lenisterna; however, these species do not share other characters proper of Z. lenisterna such as the strong sculpturation of the sternaulus or the shape of the interantennal carinae. Some specimens from the arid area between Texas-Arizona-Mexico exhibit strong sculpturation on the sternaulus.
**Diagnosis and similar species**

The sculpture of the posterior border of the pronotum is the more characteristic feature of this species. Most of the specimens have a crenate or striated sternaulus but specimens with a completely smooth sternaulus can be found. A paralectotype was used to describe characters of the hind leg tibia because this structure is missing in the lectotype.

**Geographic distribution and elevation range:** USA (Texas, Arizona), Mexico, Honduras, Nicaragua, El Salvador, Dominican Republic, Costa Rica, Colombia, Venezuela. 3-2143m

**Material examined**

Long series of specimens, especially from Costa Rica were examined; however, only records that show the widespread distribution and elevation range are listed here.

- PARATYPES 4 ♀♂, Laredo, 27.5 Tex, / Paratype No. 16221, U.S.N.M. [one specimen with an additional label “*Zelomorpha arizonensis*”] / USNM


Biology and hosts

The cocoon is oval white silky surface (10.5mm long 4.5mm maximum width) the adult opening is a semiapical circular cut on one side. The cocoons have been found in litter or on the ground. The rearing data of Dan Janzen’s project indicated that from the host pupation time to the wasp eclosion there are about 19 days (18-20 range).

Twelve Lepidoptera species have been recorded as host of this species, most of these are Noctuids and only one has been recorded from the Crambidae family (*Omiodes cuniculalis*), the noctuid hosts are: *Azeta ceramina*, *Azeta signans*, *Baniana veluticollis*, *Bulia mexicana*, *Coenipeta bibitrix*, *Concana mundissima*, *Melipotis acontiodes*, *Melipotis perpendicularis*, *Melipotis cellaris*, *Mocis latipes*, and *Zale* sp. These hosts have been found in several plant species of the families Fabaceae, Malpighiaceae, Poaceae, Chrysobalanaceae, and Caesalpiniaceae; the species are: *Digitaria* sp, *Zea mays*, *Brassica oleracea var capitata*, *Acosmium panamense*, *Caesalpinia exostema*, *Enterolobium cyclocarpum*, *Haematoxylum brasiletto*, *Hiraea reclinata*, *Hirtella racemosa*, *Indigofera costaricensis*, *Licania arborea*, *Lonchocarpus acuminatus*, *Lonchocarpus orotinus*, *Mimosa pigra*, *Parkinsonia aculeata*, *Platymiscium parviflorum*, *Prosopis juliflora*, *Quercus oleoides*, *Rottboellia cochinchinensis*, and *Zygia longifolia*
Stylopized specimens have been collected from Baja California (Mexico). It is interesting to note the deformed middle left leg of a specimen from Sabino Canyon (Arizona USA). In general, malformations are rarely seen in the genus. In Costa Rica, this species has been found in dry, coastal, and deciduous forests.

**Zelomorpha acuta** n. sp.
(Figs. 1A, 16AB, 31A, 46A )

**Measurements.** Mesosoma length 2.23 mm. FW length 7.99 mm.

**Head.** Medial ridge or convexity of face absent. Face with a narrow dorsomedial groove, convex mediad with sides flat, mediad longitudinal striations present, lateral longitudinal striations present, medial transverse striations present, short lateral transverse striations absent, with regular fovea dense mediadly and sparse laterally. Penultimate labial palpomere subequal in length to apical palpomere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, fused posteriorly with interantennal carina as a triangular apex where closer to the vertex, striate laterally. Frontal depression rugous. Distance between antennal insertions subequal to their diameters. Number of flagellomeres 41. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with irregular fovea and striations over entire surface. Median longitudinal depression posteriad ocelli absent. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange absent, with irregular rugae evenly distributed.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of about 10 robust transverse ridges, strongest at mid-length, present in ventral third. Mesopleuron with very strong punctures more dense anteriomedially. Sternaulus with a notorious depression and a clear set of striations evenly distributed. Posterior margin of mesopleuron with 10–12 small uniform carinae. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width or with transverse carinae extending posteriorly at least half width of suture, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with two subparallel carinae. Juxtacoxal flange present, regularly concave, slender, curved posteriorly, with 337
round apex, with two complete carinae, or with a complete carinae and irregular additional carinae. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum completely crenated. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove indicated by a single wide smooth depression. Scutellar sulcus deep and subquadrate, with four carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum with a complete median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola separated from lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, or with longitudinal ridges, pentagonal, very thin, anterior ridges shorter than lateral ridges. Anterolateral areola with a strong ridge heading half distance from midlength of anteromedial keel to anterodorsal corner, or with two incomplete ridges heading diagonally half distance from midlength of anteromedial keel, and with an incomplete lateral keel. Anteropleural areola present, with multiple fovea. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola complete, defined by distinct lateral carina, subquadrate, without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrate, narrower than anterolateral areola, posteropleural areola closed. Transverse keel regular, reaching posteropleural keel, or reaching posteropleural keel, double at median and lateral areola area.

Legs and wing venation. Basal tooth of foretarsal claw truncate. Foreleg tibial spur longer than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising from a lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa present, at least weakly, RS2a longer than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite more than two times its posterior width.

Color pattern. Entirely orange except antennae and disperse brown infuscations in several parts of the body. Wings hyaline.

Etymology: The specific epithet of this species refers to the slender and elongate anteromedial areola of propodeum.

Geographic distribution and elevation range: USA (Florida), Honduras, Cuba, Bahamas, Cayman Islands. This species has been commonly captured through the Florida keys. 0-1173m.
Material examined

HOLOTYPE: ♀, FLORIDA: Monroe Co. 1 mi SW Islamorada, Upper Matecumbe Key, 21-VI-1974 / At (UV) Black light / J. B. Heppner collector / FSCA

PARATYPES:

Other specimens


Variation
In some specimens the lateral carina at the posterior ocelli becomes a wide blunt structure. The anteromedial areola usually is a very thin pentagon; however, some specimens have the lateral ridges are incomplete or irregular, not in contact with the other ridges; also, some specimens have there a medial longitudinal ridge. Mesopleuron with very strong punctures, these are usually denser either anteriomedially or close to the sternaulus. The median longitudinal ridged of both anteromediad and posteromediad areolas of propodeum may be present or not. The transverse carina of the depression between metaepisternum and metaepimeron can either be restricted to the depression or can extend posteriorly beyond it. Some specimens exhibit a double transverse keel of propodeum. A specimen from Cuba is dark testaceous with brown-black spots on metapleuron and propodeum.

Diagnosis and similar species
This species is very close to Z. arizonensis but it can be sorted out by the following combination of characters: anteromedial areola of propodeum very slender, not triangular, sternaulus with dense carenations that extend forward but do not reach the epicnemial carina (exceptionally some specimens have a weak carenation), lateral carina of frons fused with the interantennal carina forming a triangular corner where closer to lateral ocelli, area of vertex posterad ocelli with irregular fovea and striations. The mesosoma of this species is very hirsute. The juxtacoxal area is strongly sculptured.
Zelomorpha oxybela n. sp.
(Figs. 11A, 26AB, 41A, 56A)

**Measurements.** Mesosoma length 2.14 mm. FW length 4.95 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, lateral longitudinal striations present, medial transverse striations absent, short lateral transverse striations absent, with irregular fovea evenly distributed. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view uniform width along its length (eyes appear large). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression rugous. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 37. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli absent. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange absent, with irregular rugae evenly distributed.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of more than eight small, evenly distributed ridges or crenulations. Mesopleuron with small punctures evenly distributed. Sternaulus with a notorious depression and a clear set of striations evenly distributed. Posterior margin of mesopleuron with 4–6 evenly distributed carinae. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae extending posteriorly at least half width of suture, with strong carinae of different sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with two subparallel carinae. Juxtacoxal flange present, regularly concave, slender, straight, with acute apex, with two incomplete carinae and irregular rugae. Anterior area of subpronope disk-shaped. Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove indicated by a single wide smooth depression. Scutellar sulcus deep and subquadrate, with three carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, with strong slope. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum without median longitudinal carina, or with an incomplete median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical
crest of median metanotal areola long and horizontal, strongly projected. Transverse crest of median metanotal areola well before apex. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, acute triangle. Anterolateral areola divided by several ridges converging anterolaterally. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola complete, defined by weak lateral carina, posteromedia areola or incomplete, subquadrate, without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel lower at laterad areola that at both mediad and pleural areola.

Legs and wing venation. Basal tooth of foretarsal claw truncate. Foreleg tibial spur longer than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising from a lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa present, at least weakly, RS2a subequal to r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite more than two times its posterior width.

Color pattern. Entirely orange except brown antennae and some darkening in telotarsomereres.

Etymology: The specific epithet of this species is a compound word that comes from the Greek words oxys = sharp, and belos = dart; this name refers to the acute triangular shape of the anterio medial areola of propodeum

Variation
The mediad longitudinal ridge of the median areola of metanotum could be present or absent. The posteriormediated areola could be incomplete, almost fused with the posteriolateral areola

Diagnosis and similar species
This species can be distinguished by the following combination of characters: anterimedium areola of propodeum as an extremely acute triangle; the sides of this triangle are straight and without any curvature or notch. The sternaulus is weakly carenated. The medial areola of metanotum is strongly diagonal to scutellum posterior border like a triangle with a wide base. The median metanotal areola ends well before apex. An interesting characteristic of this species is the shape of the transverse ridge of the propodeum is closer to the anterior part at both the mediad and pleural areola, but it is farther away from it at the laterad areola. Also, the transverse carinae of the suture between metepisternum and metepimeron extend posteriorly further the limit of the suture.
This species is very similar to *Z. acuta* however, these differ in the sculpturation of the sternaulus which is comparatively weak in the former while it is very developed in the latter; also, they differ in shape of the anteriomediad areola of propodeum, while in *Z. acuta* the sides of it are subparallel and an anterior angle could be present, in *Z. oxybela* these are straight and form an acute triangle.

**Geographic distribution and elevation range:** Mexico, Costa rica, Nicaragua, Honduras, Colombia, Venezuela, Argentina. 10-856m

**Material examined**

**HOLOTYPE:** ♀, Quibor, Venezuela, Lara, m., 2-3-III-1985 / En Trampa Malaise/ MJMO

**PARATYPES:** ♀, COLOMBIA, Magdalena, PNN Tayrona, Neguanje, 11°20´N 74°2´W, 10m, Malaise, 5-21.iii.2001, R. Henriquez leg., M. 1481 / IAVH


Other specimens


**Zelomorpha lenisterna** n. sp.

(Figs. 8E, 23IJ, 38E, 53E)

**Measurements.** Mesosoma length 2.6 mm. FW length 6.61 mm.

**Head.** Medial ridge or convexity of face absent, *or present.* Face without a dorsomedial groove, convex medially with sides flat, mediad longitudinal striations present, lateral longitudinal striations absent, medial transverse striations present, short lateral transverse striations present, with regular fovea dense medially and sparse laterally. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view uniform
width along its length (eyes appear large). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 38, 40. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with irregular fovea and striations over entire surface. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange absent, with parallel rugae reaching distal margin of flange.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of more than eight small, evenly distributed ridges or crenulations. Mesopleuron with small punctures evenly distributed. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 4–6 evenly distributed carinae. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes, or transversed with strong carinae of different sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with two subparallel carinae. Juxtacoxal flange present, regularly concave, wide, with an incomplete carina. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove indicated by a single wide smooth depression. Scutellar sulcus deep and subquadrate, with four carinae, or with 1. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, gently sloped. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotol areola long and horizontal, strongly projected. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola with a strong posterior transverse ridge, or without transverse ridges or with a mediad longitudinal ridge, lanceolate, or pentagonal, with lateral ridges strong, longer than anterior ridges or campanulate. Anterolateral areola present and without ridges, or with an incomplete ridge heading half distance from midlength of anteromedial keel to anterodorsal corner. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola fused with posterolateral areola, posteromedial areola or incomplete or complete, defined by distinct lateral carina, posteromedial areola or subquadrate, without transverse ridge, without median longitudinal ridge, posteromedial areola or with
median longitudinal ridge. Posteropleural areola closed. Transverse keel reaching posteropleural keel, double at median and lateral areola area, or regular, reaching posteropleural keel.

Legs and wing venation. Basal tooth of foretarsal claw truncate. Foreleg tibial spur longer than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising from a lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa present, at least weakly, RS2a subequal to r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly, or with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite more than two times its posterior width.

Color pattern. Entirely orange except antennae and disperse brown infuscations in several parts of the body. Wings hyaline.

Etymology: The specific epithet of this species refers to the smooth mesosternum.

Variation
There is variation in the following structures: sculpturation of the face which can be strong or almost absent, the number of longitudinal ridges in the scutellar sulcus, the transverse keel of the propodeum which can be either simple or double, and it can be more proximal medially and more apical laterally. Anteriomediad areola of propodeum with up to two transverse ridges or none, juxtacoxal flange can have a transverse carinae, the T1 can be smooth or with a large median bulge. A specimen from Santa Rosa (Costa Rica) has a very faint sternaulus depression. A specimen from Catamayo (Ecuador) is devoid of the anteriomediad areola, this is replaced by a mediad ridge that ends in a short transverse ridge and by several diagonal irregular ridges that are projected anteriorly; however, no other difference was found to sort out this specimen as another species. The length of the lower genal margin ranges from very small to large as in Z. ocellata, in specimens from Mexico, the margin is large but in the holotype, the margin is small; however, no other character distinguish between these species.

A series of 17 specimens from PNN Utria, (Chocó, Colombia) and two from Zambrano (Bolívar, Colombia) exhibe a color pattern similar to that of these three Z. dengoii, Z. ocellata, or Z. bicarinata but no morphologic character was found to differentiate these wasps from Z. lenisterna perhaps future studies will elucidate the status of these individuals.

Diagnosis and similar species
This species can be distinguished by the following combination of characters: in frontal view tentorial fovea above lower margin of eyes, smooth sternaulus, interantennal carinae separated from marginal carina, epicnemial carina with numerous and small ridges, posterolateral margin of pronotum smooth. A few specimens of *Z. arizonensis* can have a smooth sternaulus, however, both the posterior border of the pronotum and the internatennal carenation do not fit the description of *Z. lenisterna*.

**Geographic distribution and elevation range:** USA (Arizona), Mexico, Costa Rica, Honduras, Haiti, Colombia, Venezuela, French Guiana, Suriname, Trinidad and Tobago, Ecuador, Brazil (Roraima, Bahia), Peru, Bolivia, Argentina. 0-1400m

**Material examined**

**HOLOTYPE:** ♀, COLOMBIA, Vichada, PNN Tuparro, Pie Cerro Tomas, 5°21’N, 67°51’W, 250m, Malaise, 22.v.3.vi.2001, W. Villalba leg., M.1792 / IAVH

**PARATYPES:**
- 1 ♀, VENEZUELA, Oil F. NE L Maracaibo, JMaldonadoC / USNM

Other specimens


Biology and hosts
This species has been captured in both coastal and edge forests; there are several reports of black light trapping.

_Zelomorpha colossa_ n. sp.
(Figs. 4D, 19GH, 34D, 49D)

**Measurements.** Mesosoma length 3.92 mm. FW length 8.38 mm.

**Head.** Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a wide dorsomedial groove, convex medially with sides flat, medially longitudinal striations present, with regular fovea dense medially and sparse laterally. Penultimate labial palpomere less than 25% shorter than apical palpomere. Ventral border of eyes reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth, _or with a few circular rugae_. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 42. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli with irregular fovea and striations over entire surface, posteriad ocelli _or smooth_. Median longitudinal depression posteriad ocelli absent. Posteroverentral margin of gena evenly rounded and flanged. Posteroverentral area of gena convex, depression dorsad flange absent, smooth.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 3–6 large ridges restricted to mid length, _or composed of 4–9 large ridges evenly distributed_. Mesopleuron with small punctures evenly distributed. Sternaulus with a notorious depression and a clear set of striations evenly distributed. Posterior margin of mesopleuron with 10–12 small uniform carinae. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of different sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtapodal flange present, regularly concave, wide, with a complete carina and irregular additional carinae. Anterior area of subpronope not modified. Posterolateral margin
of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove absent. Scutellus sulcus deep and subquadrate, with four carinae, or with 3. Scuto-scutelelar articulation absent. Posterior border of mesoscutal sulcus non carinate, with strong slope. Scutellus disk three-sided, without lateral carinae, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum with a complete median longitudinal carina, or without median longitudinal carina. Sides of median areola of metanotum almost vertical to scutellum border, or strongly diagonal to scutellum border, as a triangle with a wide base. Posterior border of median areola of metanotum with a transverse carina well before apex. Longitudinal apical crest of median metanotal area strongly developed, separated from lateral ridges. Transverse crest of median metanotal areola well before apex. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, triangular, or pentagonal, with lateral ridges strong, longer than anterior ridges or acute triangle. Anterolateral areola divided by several ridges converging anterolaterally. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola incomplete, subquadrate, without transverse ridge, with median longitudinal ridge separated from the transverse keel. Posterolateral areola open medially, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel strong, dividing propodeum into two distinct planes.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur shorter than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising from a lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Entirely yellow except brown flagellomeres, hind femur apex and tarsomeres. Metasoma yellow dark with several brown infuscations; FW stigma yellowish. Ample dorsal area of metasoma brown.

**Etymology:** The specific epithet of this species comes from the Latin word colossus = large, big, and it refers to the size of this species.

**Variation**

The frontal depression can be entirely smooth or with some circular rugae; the epicnemial carinae can be restricted to the medial part or can be evenly distributed; the triangular anteriomedial areola of propodeum can be very acute. The distal part of the metasoma can be mostly dark brown. The shape of
the medial areola of metanotum is different, completely triangular and without the medial longitudinal ridge; also, the anteriomedial areola of propodeum can be pentagonal, no other difference is found between male and female.

**Diagnosis and similar species**
This species can be distinguished by the following combination of characters: gena in lateral view wider ventrally than dorsally although the eyes reach over the ventral border of the eyes; posterioventral area of gena almost smooth; scutellar disk three-sided without lateral ridges; median areola of metanotum with a complete a very strong longitudinal ridge; anteriomedial areola of propodeum triangular; posteriomedial areola of propodeum incomplete, partially defined by weak lateral ridges; median longitudinal ridge of posteriomedian areola of propodeum present

**Geographic distribution and elevation range:** Mexico. 70-98m

**Material examined**
- 1 ♀, MEXICO, San Luis Potosi, Hotel Covadonga, ca. Valles, 6-VI-1974, C. Porter & C. Calmbacher / USNM

Other specimens
MEXICO: 2 ♀♀, MEXICO, San Luis Potosi, Hotel Covadonga, ca. Valles, 6-VI-1974, C. Porter & C. Calmbacher / USNM

**Zelomorpha scitula** n. sp.  
(Figs. 13H, 28OP, 43H, 58G)

**Measurements.** Mesosoma length 2.71 mm. FW length 7.74 mm.
**Head.** Medial ridge or convexity of face present and with a dorsal circular protuberance. Face without a dorsomedial groove, convex medially with sides flat, lacking striations, with regular fovea dense medially and sparse laterally. Penultimate labial palpomere less than 25% shorter than apical palpomere.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of about 10 robust transverse ridges, strongest at mid-length, absent in ventral third. Mesopleuron with small punctures evenly distributed. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 10–12 small uniform carinae. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, slender, curved posteriorly, with round apex, smooth. Anterior area of subpronope wide and flanged. Posteralateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove absent. Scutellar sulcus deep and subquadrate, with three carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, with strong slope. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola separated from lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, acuminate. Anterolateral areola with an incomplete ridge extending half distance from midlength of anteromedial keel to anterodorsal corner. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola incomplete, like an inverted pentagon with wide apex, without transverse ridge, with median longitudinal ridge separated from the transverse keel. Posterolateral areola open medially, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel proximad at mediad areola, distad at lateral areola.
**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur longer than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising from a lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M straight, 3RSa absent, RS2a subequal to r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly, or with a anteromedian round bulge clearly separated from lateral tergite border. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Entirely yellow except: antennae brown except four apical flagellomeres, dorsal part of head, telotarsomeres, hind leg trochanter and trochantellus tibia apex, and tarsomeres. Metasoma with dorsal part darker than the rest of body.

**Etymology:** The specific epithet of this species comes from the latin word Scitulus and refers to the beauty of the species.

**Diagnosis and similar species**
This species can be distinguished by the following combination of characters: gena in lateral view wider ventrally than dorsally, ventral border of eyes do not reach the tentorial pits, posterioventral area of gena with a depression dorsal margin; juxtacoxal area smooth, no carina present; posteriomedial areola of propodeum incomplete delimited by weak incomplete lateral ridges; some specimens have the median bulge clearly separated from the lateral border in the anterior part of T1.

**Geographic distribution and elevation range:** Peru. 290, 600m

**Material examined**
HOLOTYPE: 1 ♀, PERU: Monzon Valley, Tingo Maria, x-21-1954 / E. S. Schlinger, E.S. Ross collectors / CASC.
PARATYPE: 1 ♀, PERU: Madre de Dios; Rio Tambopata Res. 30 air km SW Pto. Maldonado, 290m, 21-25 xi 1979, J. B: Heppner, subtropical moist forest / Zelomorpha det. S. shaw 1981/ USNM.

**Zelomorpha ocellata** n. sp.
(Figs. 10H, 25OP, 40H, 55H)

**Measurements.** Mesosoma length 1.61 mm. FW length 4.31 mm.
**Head.** Medial ridge or convexity of face absent. Face with a narrow dorsomedial groove, flat medially and laterally, lacking striations, with regular fovea evenly distributed leaving flat areas between them. Penultimate labial palpmere subequal in length to apical palpmere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 36. Depression laterad lateral ocellus absent. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli weak, barely indicated as a shallow area. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange absent, or depression present, smooth, or with rugae restricted to area immediately basad eye.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of more than eight small, evenly distributed ridges or crenulations, or composed of 1–3 stronger ridges near angle. Mesopleuron entirely smooth. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 4–6 evenly distributed carinae. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, wide, smooth, or with a complete carina located ventrally. Anterior area of subpronope wide and flanged. Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove indicated by a single wide smooth depression. Scutellar sulcus deep and subquadrate, with three carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, with strong slope. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum without median longitudinal carina. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola separated from lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, pentagonal, with lateral ridges strong, as long as anterior ridges. Anterolateral areola with an incomplete ridge extending half distance from midlength of anteromedial keel to anterodorsal corner. Anteropleural areola present, with several strong rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola fused with posterolateral areola, posteromedial areola or complete, defined by weak lateral carina,
without transverse ridge, without median longitudinal ridge. Posteropleural areola closed. Transverse keel regular, reaching posteropleural keel.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur longer than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising from a lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing absent. T1 smooth anteriorly. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Mostly orange-yellow with black as follows: antennae flagellum except seven apical flagellomeres, hindleg tibia apex, tarsi, and telotarsus. Wings entirely infumated. The antennae can be completely black or black with the apical seven flagellomeres yellow.

**Etymology:** The specific epithet of this species comes from the Latin word ocellus (gender male); it refers to the small eyes of this species.

**Variation**
The posterioventrad area of gena can be entirely smooth or it can have a few longitudinal striations basad the eye. The coloration of the scapus and the apical flagellomeres can be either black or dark yellow; also, the front wing can be entirely infumated or infumated with a transverse hyaline area in the subapical third.

**Diagnosis and similar species**
This species can be distinguished by the following combination of characters: in lateral view the gena is wider ventrally than dorsally and the eyes are smaller comparative to other species, in frontal view tentorial fovea below the lower margin of eyes; smooth sternaulus, interantennal carinae separated from marginal carina, posterolateral margin of pronotum smooth, propodeum with posteriomedial and posteriolateral areola fused. This species is similar to *Z. elegans* but the more characteristic difference is the T1; in the latter this is short and wide while in *Z. ocellata* it is long and slender. *Z. ocellata* is also similar to *Z. lenisterna* but the eyes of *Z. ocellata* are small and consequently the genal area looks large in lateral view. The color pattern is also useful to distinguish this species of *Z. arizonensis*; it is yellow with black in the following parts: antennae, hind leg tibia base and apex, and tarsi. The wings are either entirely infumated or infumated with a hyaline area in the subapical quarter.

**Geographic distribution and elevation range:** Colombia, French Guyane, Ecuador, Peru. 0-580m.
Material examined

HOLOTYPE: ♀, COLOMBIA, Caquetá, PNN Chiribiquete, Río Cuñaré-Amu, Bosque Verde oscuro, 0°12’34” N, 72°24’55”W, 300m, Malaise, 14-17.ii.2001, M. Ospina & E. González / IAVH.

PARATYPES: ♂, COLOMBIA, Meta, PNN La Macarena, La Curia, Bosque Galeria, 580m, XII 93, E. Palacio leg. / ICN-MHN Hy 2287 / UNCB. 1 ♀, GUYANE FRANÇAISE. Montagne de Kaw, Relais Patawa, [PK 37], [1-20, vii.] 2000, (Malaise) A. E. I. Guyane-J. Cerda legs. / FSAG.

Other specimens


Zelomorpha dengoii n. sp.

(Figs. 5G, 20MN, 35G, 50G)

Measurements. Mesosoma length 1.61 mm. FW length 4.29 mm.

Head. Medial ridge or convexity of face present and without a dorsal circular protuberance. Face without a dorsomedial groove, flat medially and laterally, lacking striations, with irregular fovea evenly distributed, or with regular fovea dense laterally and sparse medially. Penultimate labial palpmere subequal in length to apical palpmere, or about half length of apical palpmere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes emarginate, not converging ventrally. Posterior orbit of eye completely bordered by groove. Lateral carina of frons composed of a strong continuous ridge, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 31. Depression laterad lateral
ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli absent. Posteroventral margin of gena evenly rounded and flanged. Posteroventral area of gena convex, depression dorsad flange absent, or depression present, with a few subparallel rugae dorsad genal flange.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 4–9 large evenly distributed ridges. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 4–6 strong carinae restricted to dorsal half and a few weak carina in ventral half. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of different sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, wide, with a complete carina and irregular additional carinae. Anterior area of subpronope not modified. Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove indicated by a single wide smooth depression. Scutellar sulcus deep and subquadrate, with three carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, with strong slope. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly reaching midway to scutellar sulcus. Median areola of metanotum without median longitudinal carina, or with a complete median longitudinal carina. Sides of median areola of metanotum almost vertical to scutellum border, or strongly diagonal to scutellum border, as a triangle with a wide base. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola separated from lateral ridges. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, or with transverse ridges, acuminate. Anterolateral areola with an incomplete ridge extending half distance from midlength of anteromedial keel to anterodorsal corner. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina present. Posteromedian areola complete, defined by distinct lateral carina, like an inverted pentagon with wide apex, posteromedial areola or narrow posteriorly or like an inverted triangle, without transverse ridge, posteriomedial areola or with a straight transverse ridge, without median longitudinal ridge, posteromedial areola or with median longitudinal ridge. Posterolateral areola closed, subquadrate, subequal in width to anterolateral areola, posteropleural areola closed. Transverse keel proximad at mediad areola, distad at lateral areola, or regular, reaching posteropleural keel.
**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur longer than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising from a lobe. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a shorter than r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite more than two times its posterior width.

**Color pattern.** Entirely yellow except brown antennae, metasomal segments 5–7, telotarsomeres, midleg and hind leg tibia apex, hind femur apex, hind tibia base and hind leg tarsomeres. *Scape yellow, hind trochanter brown, metasoma entirely yellow. Front wing hyaline with infuscate apex.*

**Etymology:** The specific epithet of this species honors Ms. María E. Dengo Obregón, outstanding member of the INBio general assembly

**Variation**
The face can be either uniformly puncturated or densely puncturated medially. Somes specimens have a transverse carina in the anteriomediad areola of propodeum. Specimens from Mexico exhibit a yellow scape. Some specimens exhibit the anteriomediad areola of propodeum wide, almost as wide as large. Some specimens have the FW hyaline with the apex infuscate. The hind trochantellus and the last metasomal tergites can be either entirely yellow or infuscated.

**Diagnosis and similar species**
This species can be distinguished by the following combination of characters: in lateral view the gena is wider ventrally than dorsally and the eyes are small, in frontal view tentorial fovea below the lower margin of eyes, smooth sternaulus, interantennal carinae separated from marginal carina, posterolateral margin of pronotum smooth, posteriomedial areola of propodeum separated from posteriolateral areola; usually, the sides of median areola of metanotum diagonal to scutellum border giving it the shape of a triangle. This species is similar to *Z. ocellata* but *Z. ocellata* have the posteriomediad and the posteriolateral areolae fused and the median areola of scutellum is not triangular.

**Geographic distribution and elevation range:** México, Costa Rica, Panamá, Colombia, Venezuela, Trinidad and Tobago, French Guyane, Peru, Ecuador, Bolivia, Brazil, Argentina. 0-1400m

**Material examined**
HOLOTYPE: ♀, COSTA RICA, Heredia, Est. Biol. La Selva. 50-150m, 10°26’N, 84°01’W, sep 1998, INBio-OET / 17 septiembre 1998, M/18/717 Borde suampo / INBIO CRI002282730 / INBC.

PARATYPES: 1 ♂, COSTA RICA, Prov. Guanacaste, P. N. Palo Verde, Stor Palo Verde, 200 NE de est., 0-50m, 6 abr-12 may 2000, I. Jiménez, Malaise, L_N_260952_385020 #56547 / HIC.

1 ♀, MEXICO, Tamaulipas, Gómez Farias, T. Malaise, 26.xii.1998-7.i.1999], Bosque / MUAM

Other specimens


Measurements. Mesosoma length 2.35 mm. FW length 5.98 mm.

Head. Medial ridge or convexity of face present and without a dorsal circular protuberance. Face with a narrow dorsomedical groove, flat medially and laterally, short lateral transverse striations present, with both regular and irregular fovea, with punctures evenly distributed. Penultimate labial palpmere subequal in length to apical palpmere. Ventral border of eyes not reaching ventral border of tentorial pits. Gena in lateral view wider ventrally than dorsally (eyes appear small). Eyes emarginate, not converging ventrally. Posterior orbit of eye partially bordered by groove. Lateral carina of frons composed of two incomplete parallel carinae, separated posteriorly from interantennal carina, striate laterally. Frontal depression entirely smooth. Distance between antennal insertions distinctly longer than their diameters. Number of flagellomeres 33. Depression laterad lateral ocellus present. Gena at mid-height, posteriad eye evenly rounded. Area of vertex posteriad ocelli smooth. Median longitudinal depression posteriad ocelli absent. Posteroventral margin of gena evenly rounded and flanged.
Posteroventral area of gena convex, depression dorsad flange present, with semiparallel dorsal rugae and irregular ventral rugae.

**Mesosoma.** Epicnemial carina complete and evenly curved, with groove wide and flat. Crenulation of epicnemial carina composed of 3–6 large ridges restricted to mid length. Mesopleuron punctate but lacking punctures medially. Sternaulus barely depressed and smooth, with one posteroventral crenulation. Posterior margin of mesopleuron with 5 robust carinae and one weak carina in between each of these. Suture between metepisternum and metepimeron complete and deep, without acute angles at anterior or posterior borders, with transverse carinae restricted to suture width, with strong carinae of subequal sizes. Convex flange on posterodorsal border of mesopleuron present. Dorsal apex of metepisternum with one carina. Juxtacoxal flange present, regularly concave, wide, with a complete carina mediad flange apex. Anterior area of subpronope not modified. Posterolateral margin of pronotum smooth. Notaulus strong, converging on a midpit. Median longitudinal mesoscutal groove absent. Scutellar sulcus deep and subquadrate, with three carinae. Scuto-scutellar articulation absent. Posterior border of mesoscutal sulcus non carinate, with strong slope. Scutellar disk rounded, sparsely foveolated. Transverse groove of scutellar disk deep, with crenulae extending anteriorly but not larger than sulcus. Median areola of metanotum without median longitudinal carina. Sides of median areola of metanotum strongly diagonal to scutellum border, as a triangle with a wide base. Posterior border of median areola of metanotum acute and with a longitudinal ridge. Longitudinal apical crest of median metanotal areola long and horizontal, strongly projected. Transverse crest of median metanotal areola absent. Propodeum with several strong areolae, surface with both striations and punctures. Anteromedial areola without transverse ridges, campanulate. Anterolateral areola with a strong ridge heading half distance from midlength of anteromedial keel to anterodorsal corner. Anteropleural areola present, with some weak rugae. Pleural carina distinct and complete. Transverse ridges of pleural carina absent. Posteromedian areola complete, defined by distinct lateral carina, like an inverted pentagon with wide apex, without transverse ridge, without median longitudinal ridge. Posterolateral areola closed, subquadrate, narrower than anterolateral areola, posteropleural areola closed. Transverse keel proximad at mediad areola, distad at lateral areola.

**Legs and wing venation.** Basal tooth of foretarsal claw truncate. Foreleg tibial spur longer than 1/2 basitarsomere. Longest spur of midleg tibial longer than 1/2 basitarsomere, hind leg tibia longer than 1/2 basitarsomere. Carina of hind trochantellus present and well developed. Apex of hind tibia arising directly from apical margin. Basal teeth of hind tarsal claw truncate. Forewing 3M curved, 3RSa absent, RS2a subequal to r-m, RS2b absent. CUb of hind wing nebulous. T1 smooth anteriorly. Length of T1 median tergite more than two times its posterior width.
**Color pattern.** Entirely yellow except: antennae except nine apical flagellomeres brown, telotarsomeres, trochantellus, hind tibia base and apex, hind leg tarsomeres. *In some specimens the antenna is entirely brown.*

**Etymology:** The specific epithet of this species is composed by the Latin words two or double (bi) and ridge (carina); it refers to the incomplete double ridges on the marginal carina.

**Variation**
The body could be entirely yellow or yellow with brown dorsal spots on the apical segments 5-8. Also, the hind trochanter and trochantellus can be either brown or yellow. A specimen from Bolivia has the interantennal carinae of frons continuous with the lateral carinae and a hyaline area subapical to FW.

**Diagnosis and similar species**
This species can be distinguished by the following combination of characters: in lateral view the gena is wider ventrally than dorsally and the eyes are smaller comparative to other species, in frontal view tentorial fovea is below the lower margin of eyes, posterioventral area of gena strongly sculptured, smooth sternaulus, interantennal carinae with an incomplete double ridge, posteriomedial areola of propodeum separated from posteriolateral areola. The posteriomedial areola shape is as an inverted pentagon with a blunt apex. This species can be differentiated from *Z. ocellata* by the combination of two characters the double marginal carinae and the shape of the posteriomedial areola of propodeum.

**Geographic distribution and elevation range:** Colombia, Ecuador, Brazil (Roraima), Argentina. 250-600m

**Material examined**
HOLOTYPE: ♀, Napo & Coca Rivers,. V.2-10.65, Ecuador, Luis Peña / AEIC
PARATYPES: 1 ♀, Coca [Francisco de Orellana], Ecuador, May 1965, Luis Peña / AEIC - 1 ♂, Surumu, Roraima, IX 1966, Brazil, M. Alvarenga / AEIC

Other specimens
**COLOMBIA:** 1 ♀, COLOMBIA, Amazonas, PNN Hamacayacu, Caño Mata Mata, Malaise, M. Kelsey, Feb 89 / IAVH [3380] / IAVH. **ECUADOR:** 1 ♂, Coca [Francisco de Orellana], Napo R., Napo, ECUADOR, 22-30.iv.65, 250m, L. Peña / AEIC. **BOLIVIA:** 1 ♂, Palos Blancos, AltoBeni, Bolivia,
4. 4. 2. Species of unknown status

The following species were not examined. There are few doubts that these belong to the genus *Zelomorpha* if their original descriptions are considered.

*Liopisa peruensis* (Szépligeti, 1904)
This is the only species of *Liopisa* described by Enderlein in 1920 with *Euagathis peruensis* Szépligeti, 1904 as the type species. The characters to propose this genus was the presence of notauli and the absence of propodeal areola. Although the type was not examinated, the original description of the species plus the generic description suggest that this genus could be a synonym of *Zelomorpha*.

*Dichelosus demerarus* Enderlein, 1920
Arch. Naturgesch. 84 A (11): 197, ♀, British Guiana, Panama (Stettin, ♀)

*Disophrys imperfecta* Szépligeti, 1908

*Disophrys ophthalmica* Szépligeti, 1908
Lectotype designated by Papp in Shenefelt 1970 Hym. Cat. Pars. 6: 401

*Disophrys nigriceps* Szépligeti, 1908: 415

*Disophrys nigricepsbol* (Shenefelt, 1970)
Replacement name for *D. nigriceps* Szépligeti, 1908 designated by Shenefelt 1970 Hym. Cat. Pars. 6: 400. This species was described by Szépligeti, 1908 Annales Musei Nationalis Hungarici 6: 415, “♂” = ♀ “Bolivien: Mapiri” (MZPW, Budapest, 759)

*Disophyrs variegata* Szépligeti, 1908: 415 (not *Dichelosus variegatus* Szépligeti, 1908: 418)

Copyright © Carlos Eduardo Sarmiento-Monroy 2006
Chapter 5. The function of the color pattern in *Zelomorpha concinna*: a study case

A noteworthy characteristic of the members of *Zelomorpha* is the wide array of color patterns; there are entirely testaceous species and entirely black species at the extremes, and in between, there is a diverse combination of yellow, orange, brown and black colors in wings, legs, head, mesosoma, and metasoma. The entirely testaceous species exhibit large eyes and ocelli which suggest nocturnal habits as has been found in other Hymenoptera.

Several non-opposite hypotheses can be proposed to explain the function of colors, these are: species recognition, camouflage, and mimicry; however, given the widespread presence of some of the more common color patterns found in *Zelomorpha* in other insects with a wide range of defensive traits, it is likely that the color patterns in *Zelomorpha* species function as part of a multi-species mimicry system. One of the more common color patterns found in the genus is a combination of yellow and black as follows: head, apical metasomal segments black on a yellow background, wings hyaline with two transverse infumated bands. This pattern is present in numerous species and also in some of the more commonly captured species such as *Z. concinna*.

Multi-species mimicry systems consist of multiple species exhibiting varying degrees of resemblance, palatability, and abundance. Thus, predators face spectrums of these three qualities (Ritland 1994; Speed et al. 2000; Edmunds 2000; Beatty et al. 2004).

The evolutionary outcome of species interactions under gradients of palatability and abundance depends on the relative palatability and abundances of the species involved (Gilbert 1983). Two competing models characterize multi-species mimicry systems. Classic Müllerian mimicry suggests that member species have a similar level of palatability and that they benefit one another through the shared cost of “educating” predators. If there are palatability differences, the effects on prey fitness are diminished through an additive effect whereby several moderately defended prey produce an effect equal to that of a single well defended species (Joron & Mallet 1998). Alternatively, the quasi-Batesian mimicry model proposes that the additive effect has minimal importance and that predators are likely to attack less protected species, especially in times of hunger (Simmons & Weller 2002).

These models differ in two major predictions. First, the Müllerian model predicts that moderately defended species will gain more protection when they are common, whereas the quasi-Batesian model
proposes that moderately defended species will gain more protection when they are rare. Second, the Müllerian model predicts that abundant, moderately defended species will add protection to more distasteful species, whereas the quasi-Batesian model infers that abundant moderately defended species will reduce the protection of highly defended prey (Joron & Mallet 1998; Speed et al. 2000).

If the classic Müllerian model applies to a mimicry system, no relationship between the abundance and palatability of the species involved should be expected. If the quasi-Batesian model is correct a negative relationship between the relative abundance and relative palatability of the species involved is expected; better defended species should be relatively more common than moderately defended species.

This relationship may be the result of frequency-dependent selection in which the negative effect of moderately defended prey on better defended prey is diluted if the less defended species are maintained at lower population sizes relative to those of the better defended species. This is simply an extension of Bates’ argument to a continuum of palatabilities and abundances (Fisher 1954).

A third prediction exclusive to the quasi-Batesian model states that when both palatable and highly defended prey are abundant, both moderately and highly defended prey will experience similar predation rates. If the palatable prey and the highly defended prey are rare, then moderately defended prey will experience higher rates of predation.

To date, most debate concerning these models and the origin of mimicry has centered on simulation analyses, but few real systems have been studied empirically (Joron & Mallet 1998; Speed et al. 2000; Beatty et al. 2004). Parasitoid ichneumonoid wasps constitute an excellent group to study mimicry because they are diverse, abundant, and they often exhibit bright color patterns that have been postulated to have an aposematic function (Figure 14) (Quicke 1986, Gauld & Gaston 1994).

In this chapter two goals were pursued, first to study whether the color pattern of a brightly colored species of Zelomorpha, Z. concinna, has a defensive function, and second, to study the role of Zelomorpha concinna in a multi-species mimicry system under the perspective of the predictions of the two models of mimicry. Z. concinna belongs to a multi-species mimicry system that also includes wasps of the family Ichneumonidae (Hymenoptera), as well as coleopterans of the family Lycidae. To test whether the relationship between abundance and palatability follows the prediction of the Müllerian or that of the quasi-Batesian model, species members of these three families were studied. The prediction of
the quasi-Batesian model, that when highly defended prey and palatable prey are abundant, the predation rate on moderately defended prey will be low was also tested.

5. 1. Methods
The study was conducted at Tayrona National Park, Colombia (11°20'N, 74°02'W) in June and July of 2001. This is a coastal, semi-arid, area with a mixture of 20-year-old forests, more mature secondary forests, and coconut plantations. The abundance of insects with yellow-black color patterns was recorded by net-coll ecting while walking at a regular pace along three transects that were 550 m, 160 m, and 600 m long for 26 days between 6:00 am and 1:30 pm. Each transect was sampled $8.7 \pm 1.7$ days, for $3.8 \pm 0.2$ hours per day. Relative abundance was assessed as the number of individuals caught per unit time. The average (individuals/hour) for each prey species, and each sampling date, for each transect was calculated. Then the average for each transect, for each day, for each species was calculated, and finally the average abundance across transects for each species over the entire span of the collection events was assessed.

Predators were wild *Anolis tropidogaster* Hallowell lizards (Iguanidae; Anolinae) ($n = 15$, rostrum-cloacal length average = 4.51 cm, range = 3.6-4.9 cm), which were caught locally where they were abundant. *Anolis* species have been successfully used in mimicry studies (Odendaal et al. 1987). To reduce hunting behavior variation due to differences in food stores (Sexton et al. 1966) and to allow for acclimation, lizards were kept individually in cages for four days before the tests and they received one insect daily. Brown cockroaches and crickets (10 mm long) collected in the area were used as food.

Tests were conducted in hexagonal cages (60 cm each side, 50 cm height) built with green plastic walls held by an external frame of wood and wire; the cap was a fine, black screen and the bedding was a thick layer of sand. Five sides were partially covered with wooden walls to reduce external perturbations. Disperse palm leafs, 2.5 m above the cages, were set to simulate partial tree shadow. Pieces of wood provided hiding places and the cages were watered daily.

Live insects were offered to the lizards using a thick wire, 1.2 m long, to which was attached a thin, transparent, nylon line, much as in a fishing pole (Boyden 1976). The insect was tethered to the line by one of its hind legs. Six insect species were selected as prey (see results): the braconid wasps *Zelomorpha concinna* (Brullé, 1846) ($n = 43$), *Monarea* sp. ($n = 11$), the Ichneumonid wasps *Digonogastra* sp. ($n = 6$), and *Acrotaphus* sp. ($n = 13$), the beetle *Xenochalepus* sp. (Lycidae) ($n = 7$), and *Ptecticus* sp. flies (Diptera: Stratiomyidae) ($n = 8$). These species were selected because of their similar color pattern.
(Figure 14) and behavior. _Ptecticus_ sp. flies were used as the null model to compare the response of lizards to non-patterned species since they lack the alternate yellow and black color pattern, and they are similar in size and shape to the patterned prey. To test the warning function of color, both _Ptecticus_ sp. flies painted to mimic the warning pattern of _Z. concinna_ (n = 37), and _Z. concinna_ painted entirely dark brown (n = 17) were offered to the lizards. To test for effect of the paint itself, _Ptecticus_ sp. flies painted entirely dark brown (n = 8) were offered to the lizards. Insects were painted with nut brown non-toxic food colorant (Ateco ®).

Two or three insects captured the morning of the test or during the previous day, were offered to the lizards in the afternoon. There were intervals of 10-15 min between offerings. Offering an insect to a lizard was considered an observation (N = 150). A new nylon line was used each time to tie the insect. The order and frequency of insect presentations relied on the availability of specimens. After the experiment ended, all lizards were released in the area in which they were caught.

Six lizard behaviors were defined and ranked to score the relative palatability of prey; these are: 1) The lizard remains motionless and does not attack the prey. 2) The lizard advances quickly towards the prey, bites it quickly, spits it out and does not eat it. 3) The lizard advances quickly towards the prey, bites it quickly, and chews and swallows it, but chewing takes a long time (chewing usually takes less than 1 minute but in this category chewing takes 4 or more min with visible pauses between each mouth movement). 4) The lizard advances quickly towards the prey and bites it quickly, spits it out, and then rapidly eats it. 5) The lizard spends 5-10 seconds looking at the prey and then advances quickly and eats it quickly. 6) The lizard advances quickly towards the prey, and chews and swallows quickly without a clear pause. These ranks are used in this paper as indicators of prey palatability; prey with higher ranking were considered to be more attractive to predators than prey with lower ranking. When comparing lizard responses to artificially and naturally colored palatable prey, _Ptecticus_ sp., these ranks were used as an indication of lizard response to the warning coloration.

To study the relationship between relative abundance and relative palatability, abundances for each species were ranked and the average palatability response for each prey species across lizards was recorded and species were subsequently ranked for palatability. Because not all prey species were offered to all lizards, the calculation of the palatability differed in sample size among prey species. A one-tailed Kendall-Tau analysis was used to test whether there was a correlation between ordered abundances and ordered palatabilities (Siegel & Castellan 1988).
Generalized Estimating Equations (GEE) with the dependent variable ordinal multinomial were used (Moya-Laraño et al. 2003). The GEE model was implemented using the SAS software including the statement REPEATED in the GENMOD procedure and MULTINOMIAL in the distribution statement (Allison 1999). This procedure allows the use of repeated measures (prey species) and maintains statistical robustness (Agresti 2002). P-values were obtained by comparing each prey species to a reference prey. Three GEE models were used. The first model tested whether there was a change in lizard behavior as the study elapsed (either according to previous number or prey offered that same day (satiation,) or number of days elapsed, or number of prey offered). Because all the above variables can be simultaneously influenced by prey species and because prey species can influence lizard response, PREY was used as a co-variate. The second model tested whether patterned prey were less palatable than non-patterned flies; the latter was chosen as the reference to which each of the five patterned species was compared. Each of the five p-values were corrected using Holm¨s correction for multiple testing (Legendre & Legendre 1998). In addition, the overall response of patterned species relative to the fly using a CONTRAST statement and Wald´s test option (Allison 1999), was compared. The third model tested the effect of the paint (painted fly vs. unpainted fly) and warning coloration (painted vs. unpainted Z. concinna, and entirely painted flies vs. unpainted flies and flies painted with the mimicry pattern) on species palatability. Contrasts were constructed by forming groups that were in accord with each hypothesis. First, a contrast tested whether the paint influenced lizard behavior; if there were no significant differences in lizard response between painted and unpainted flies, these would be clumped together and tested against the artificially colored flies. If there were significant differences due to the effect of paint, only painted flies would be compared to artificially colored ones.

Color characterization, color similarity, and intrinsic species conspicuousness were assessed using segment’s method, clustering analysis, and the conspicuousness method respectively (Endler 1990). Transmission percentage readings of each patch of color of each species were taken using a Miniature Spectrophotometer USB 2000 (OceanOptics, Inc.). Readings from each color patch were taken twice; up to three specimens from each species were measured. These values were averaged to obtain a value for each species. The area of each patch of color was calculated as the area of each patch relative to that of the whole insect. Areas were measured with a digital image analyzer (Auto-montage, Synoptics 2003). The relationship between conspicuousness and relative palatability was explored using a Kendall-Tau analysis.

5. 2. Results
Twenty-two species, represented by 439 individuals with bright yellow-black color patterns were caught.
Seventeen species were captured during the first five days, four more were captured the twelfth day, one additional species was captured after that. An average of five individuals was recorded per hour of collecting. *Xenochalepus* sp, *Monarea* sp, *Digonogastra* sp, *Acrotaphus* sp, and *Z. concinna* share the closest resemblance in color pattern. The flight of the four wasp species is fast and evasive through lower vegetation with frequent sudden landings. *Xenochalepus* sp (1.19 ± 0.01 individuals/hour), and *Z. concinna* (0.28 ± 0.14 individuals/hour) were noticeably abundant. *Acrotaphus* sp (0.07 ± 0.01 individuals/hour), *Digonogastra* sp (0.04 ± 0.02 individuals/hour), and *Monarea* sp (0.02 ± 0.03 individuals/hour) accounted for 3.4% of the insects captured. *Xenochalepus* sp, and *Z. concinna* share a flashing behavior, after landing they keep their wings horizontal and transverse to the body while walking randomly before folding their wings over the body.

**Figure 14.** Some of the insects captured in the area of study. a. Unpainted *Ptecticus* sp fly, b. Painted *Ptecticus* sp mimicking *Z. concinna*, c. *Zelomorpha concinna*, d. *Xenochalepus* sp, e. *Digonogastra* sp, f. Argid sawfly (not included in the analyses because the clear color pattern differences), g. *Acrotaphus* sp, h. *Trichoscelia* sp (Mantispidae), and i. *Monarea* sp.

There was no evidence of satiation or change in lizard behavior or as the study elapsed (GEE on behavioral ranks with prey type as co-variate: day of test, $\chi^2 = 0.22$, d.f. = 1, $P = 0.635$; previous number of prey offered, $\chi^2 = 0.34$, d.f. = 1, $P = 0.560$; satiation, $\chi^2 = 2.73$, d.f. = 1, $P = 0.098$) and thus none of the above variables were included in further models. Patterned insects had lower palatability than the non-patterned flies. After Holm’s correction, all colored prey had significantly lower palatability than the fly (Table 3). The contrast analysis showed that overall, the patterned prey had lower palatability than flies (Wald’s $\chi^2 = 19.5$, d.f. = 1, $P < 0.0001$).
Table 3. Palatability of colored prey relative to non-colored fly species

<table>
<thead>
<tr>
<th>Prey</th>
<th>Estimatea</th>
<th>SE</th>
<th>P-valueb</th>
<th>Ranks(^c)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Digonogastra</em> sp</td>
<td>-2.643</td>
<td>0.8556</td>
<td>0.006</td>
<td>1.80 ± 0.49</td>
</tr>
<tr>
<td><em>Acrotaphus</em> sp</td>
<td>-2.2707</td>
<td>0.7659</td>
<td>0.006</td>
<td>1.67 ± 0.38</td>
</tr>
<tr>
<td><em>Xenochalepus</em> sp</td>
<td>-3.7687</td>
<td>1.1592</td>
<td>0.006</td>
<td>1.17 ± 0.17</td>
</tr>
<tr>
<td><em>Monarea</em> sp</td>
<td>-2.229</td>
<td>0.7753</td>
<td>0.004</td>
<td>2.52 ± 0.71</td>
</tr>
<tr>
<td><em>Zelomorpha concinna</em></td>
<td>-3.5964</td>
<td>0.7199</td>
<td>0.000</td>
<td>1.61 ± 0.26</td>
</tr>
</tbody>
</table>

a – A negative value means that the prey is less palatable than the non-patterned fly, b – These p-values have been adjusted for multiple testing, c – Average ranks

The paint had no effect on lizard behavior (painted vs. unpainted fly: Wald’s \(\chi^2 = 0.4\), d.f. = 1, \(P = 0.529\)). Entirely painted flies did not induce a different response on the lizards relative to painted flies resembling mimicry pattern and unpainted flies (Wald’s \(\chi^2 = 0.14\), d.f. = 1, \(P = 0.713\)). Painted *Z. concinna* individuals had a higher palatability rank than unpainted ones (painted vs. unpainted *Z. concinna*: Wald’s \(\chi^2 = 4.42\); d.f. = 1, \(P = 0.0355\)), indicating that lizards tended to treat camouflaged unpalatable prey more like truly palatable prey. There was a negative correlation between the palatability (Table 3) and the abundance of the patterned species (Kendall correlation, \(T = -1\), \(N = 5\), \(P = 0.008\), Figure 15).

The spectrums of both yellow and black patches were similar within and across prey species. No cluster tree concurred with the ranked order generated by the palatability tests. Conspicuousness analysis ordered species from higher to lower as follows: *Digonogastra* sp, *Monarea* sp, *Acrotaphus* sp, *Z. concinna*, and *Xenochalepus* sp. There was a positive correlation between the palatability of each species and their conspicuousness (Kendall correlation, \(T = 0.8\), \(N = 5\), \(P < 0.05\)).
5.3. Discussion

Evidence supports the existence of a mimicry complex. First, the species share a similar color pattern and inhabit the same habitat. Second, all patterned prey had lower palatability than palatable, non-patterned prey. Third, by disrupting the pattern in unpalatable prey, the lizards increased attacks on that species. No evidence showed that flies painted to mimic these species with the natural black-yellow coloration were avoided. In this case lizards might have been able to distinguish the flies as such despite the artificial warning coloration, suggesting that the manipulations were insufficient to match real mimics. Also, it could be that other cues such as odors accompany the unpalatable prey.

The negative relationship between palatability and abundance shown by the data fits the prediction of the quasi-Batesian model. This model, which extends Bates’ theory to a continuum of palatability, could be maintained by frequency-dependent selection, whereby more palatable species are maintained at lower abundances than the less palatable ones. Several mechanisms could explain this relationship; selection may favor a relatively lower fecundity or a higher rate of dispersal of the more palatable species. Alternatively, the cost of defense could constitute a tradeoff with fecundity; thus, some species may experience a significantly higher cost by having the defensive trait than others. Also, there is the
possibility that the less defended species are less conspicuous and thus, were collected less frequently. Further studies will have to test whether these ideas have merit.

Previous studies suggest that the number of days that the lizards were kept in this study was sufficient to detect learning if it had occurred (Stanger-Hall et al. 2001; Shafir & Roughgarden 1994). In no case was there a noticeable change in hunting preferences displayed by the lizards, suggesting that this study reflects what is happening in the wild and that the lizards learnt to distinguish prey before the experiments were conducted.

Predators categorize prey species in mimicry systems according to their resemblance to more toxic prey (Caley & Schluter 2003), their nutrient content, and predator hunger level (Sexton et al. 1966). Simulation models found that predators cycle between frequent attacks and no attacks on toxic prey as a result of changes in the frequency of non-toxic prey (Franks & Noble 2004). Accordingly, Sherratt (2003) and Kokko et al. (2003) showed that predators clearly differentiated between aposematic and non-aposematic prey when the latter were abundant, though this difference may disappear when edible prey are scarce.

With the exception of Xenochalepus sp, the relative abundance of the prey in the palatability tests resembles that designed by Speed et al. (2000) in their experiments with wild birds and pastry prey. In one of their experiments both the edible prey and the unpalatable prey were abundant while the moderately defended preys were rare. These experiments concur with Speed et al. findings and show that, under these abundance conditions, moderately defended prey have similar predation rates as those of well defended prey and that there is a difference in predation rates between protected and edible prey.

No characteristic of the two colors was correlated with species palatability. This suggests that it is the color pattern that signals the insect’s defenses to the predators. Surprisingly, a positive relationship between palatability and conspicuousness, as it was measured here, was found. It may be possible that the more palatable species generate a stronger signal to enhance signal reception by predators. Another possibility is that the flight pattern and general movement of more palatable species disrupts the perception of the warning signal by the predators and visual signal emission is enhanced to compensate.

The debate between proponents of the quasi-Batesian and Müllerian mimicry models has focused on the effect of prey palatability on predators, but it has ignored the possible effects of very palatable prey. Although this was not tested directly, it is possible that such prey-predator systems, involving warning
signal colors, may conform to either Müllerian or quasi-Batesian models, depending on the relative abundance of prey.

Experiments were conducted with permission of the National Parks division of the Colombian Ministry of Environment. Also, the Animal Behavior Society Guidelines were followed.

Copyright © Carlos Eduardo Sarmiento-Monroy 2006
Appendix 1. Pictures of the Species of *Zelomorpha* and *Hemichoma*

The figures appear in alphabetical order of the specific epithet.

---

Figure 2. A. Z. annulifovea, B. Z. araguaensis, C. Z. areolaris, D Z. ariasae, E. Z. arizonensis, F. H. atrata, G. Z. baios
Figure 5. A. *Z. coxalicus*, B. *Z. coxatus*, C. *Z. cracens*, D. *Z. crowdusi*,
Figure 8. A. Z. janzeni, B. Z. jordii, C. Z. katatonus, D. Z. kolapta, E. Z. lenisterna, F. Z. lencaï, G. Z. lineata.
Figure 11. A. Z. oxybela,  B. Z. pallida,  C. H. punucea,  D. Z. panopa,  
Figure 32. A. Z. annulifovea, B. Z. araguanensis, C. Z. areolaris, D. Z. ariasae, E. Z. arizonensis, F. H. atrata, G. Z. baios
Figure 34. A. M. championii, B. Z. cherylae, C. Z. chispanensis, D. Z. colossa, E. Z. compta, F. Z. concinna, G. H. confusa, H. Z. conjuges.
Figure 38. A. Z. janzeni, B. Z. jordii, C. Z. katatonus, D. Z. kolapta, E. Z. lenisterna, F. Z. lencaI, G. Z. lineata.
Figure 41. A. Z. oxybela, B. Z. pallida, C. H. paurocea, D. Z. punopa, 
Figure 44. A. Z. schunkei, B. H. setnannii, C. Z. sharkeyi, D. Z. similis, E. Z. stigmata, F. B. surinamensis, G. Z. tarsalis.
Figure 47. A. Z. annulifovea, B. Z. araguaensis, C. Z. areolaris, D. Z. ariasae, E. Z. arizonensis, F. H. atrata, G. Z. baios
Figure 52. A. Z. gregarium, B. Z. hallwachsaec, C. Z. houduensis,
Figure 53. A. Z. janzeni, B. Z. jordii, C. Z. katatonus, D. Z. kolapta, E. Z. lenisterna, F. Z. lencai, G. Z. lineata.
Figure 55. A. Z. mirza, B. Z. nigriceps (type), C. Z. nigricoxa, D. Z. nigrobalteata (type), E. Z. obscura, F. H. occipitalis, G. Z. octava, H. Z. ocellata.
Figure 60. A. Z. transversa, B. Z. tropicola, C. Z. variegatus, D. Z. vesmaeli, E. Z. webbi, F. Z. xanthostigma.
Appendix 2. Characters Used in the Keys for Zelomorpha and Hemichoma

1. medial ridge or convexity of face
   1. absent
   2. present, without a dorsal circular protuberance
   3. present, with a dorsal circular protuberance

2. face
   1. without a dorsomedial groove
   2. with a narrow dorsomedial groove
   3. with a wide dorsomedial groove

3. face
   1. flat medially and laterally
   2. convex medially with sides flat

4. face
   1. lacking striations
   2. with striations

5. face
   1. mediad longitudinal striations absent
   2. mediad longitudinal striations present

6. face
   1. lateral longitudinal striations absent
   2. lateral longitudinal striations present

7. face
   1. mediad transverse striations absent
   2. mediad transverse striations present

8. face
   1. short lateral transverse striations absent
   2. short lateral transverse striations present

9. face
   1. lateral and dorsolateral striations radiating from the tentorial pits absent
   2. lateral and dorsolateral striations radiating from the tentorial pits present

10. face
    1. transverse striations between interantennal carinae absent
    2. transverse striations between interantennal carinae present

11. face
    1. dense net of mediad transverse and longitudinal striae absent
    2. dense net of mediad transverse and longitudinal striae present

12. face
    1. fine set of mediad parallel transverse striations absent
2. fine set of mediad parallel transverse striations present

13. face
   1. with regular fovea evenly distributed leaving flat areas between them
   2. with regular fovea densely distributed no leaving flat areas between them
   3. with regular fovea dense laterally and sparse medially
   4. with regular fovea dense medially and sparse laterally
   5. with regular fovea present medially only
   6. with irregular fovea evenly distributed
   7. with both regular and irregular fovea
   8. with both regular and irregular fovea no leaving flat areas between them

14. face
   1. with punctures evenly distributed except a wide area between tentorial pits
   2. with punctures evenly distributed
   3. with punctures densely distributed medially
   4. with punctures more sparsely distributed around the clypeus
   5. with punctures sparsely distributed laterally

15. setal punctures of face
   1. not on regular depressions
   2. on elevated protuberances

16. penultimate labial palpmere
   1. longer than apical palpmere
   2. as long as apical palpmere
   3. less than 25% shorter than apical palpmere
   4. about half length of apical palpmere
   5. flattened, about half length of apical palpmere

17. ventral border of eyes
   1. reaching ventral border of tentorial pits
   2. not reaching ventral border of tentorial pits

18. gena in lateral view
   1. uniform width along its length (eyes appear large)
   2. wider ventrally than dorsally (eyes appear small)

19. eyes
   1. non emarginate
   2. emarginate

20. eyes
   1. not converging ventrally
   2. converging ventrally

21. posterior orbit of eye
   1. not bordered by groove
   2. partially bordered by groove
   3. completely bordered by groove
22. lateral carina of frons
   1. absent
   2. barely indicated by a continuous ridge
   3. composed of rugae and fovea
   4. composed of two incomplete parallel carinae
   5. composed of a strong continuous ridge

23. lateral carina of frons
   1. separated posteriorly from interantennal carina
   2. fused posteriorly with interantennal carina forming a circular ridge
   3. fused posteriorly with interantennal carina as a triangular apex where closer to the vertex

24. lateral carina of frons
   1. with acute base
   2. with blunt base

25. lateral carina of frons
   1. non striate laterally
   2. striate laterally

26. frontal depression
   1. entirely smooth
   2. rugous
   3. foveolate
   4. with a few circular rugae

27. distance between antennal insertions
   1. distinctly shorter than their diameters
   2. subequal to their diameters
   3. distinctly longer than their diameters

28. last flagellomere
   1. rounded
   2. acuminate
   3. acuminate and flattened laterally

29. depression laterad lateral ocellus
   1. absent
   2. present

30. gena at mid-height, posteriad eye
   1. evenly rounded
   2. with an acute peak

31. area of vertex laterad ocelli
   1. smooth
   2. striated
32. area of vertex posteriad ocelli
   1. smooth
   2. with a few medial fovea
   3. with several evenly distributed foveae
   4. foveolate-striate laterally
   5. foveolated over entire surface
   6. with irregular striations laterad ocelli
   7. with a V-shaped carinae
   8. with irregular fovea and striations over entire surface
   9. with several fovea concentrated medially

33. median longitudinal depression posteriad ocelli
   1. absent
   2. with a V-shaped carina
   3. wide and deep
   4. weak, barely indicated as a shallow depression and lacking a narrow groove
   5. weak, indicated by narrow groove

34. posteroventral margin of gena
   1. slender and barely flanged
   2. evenly rounded and flanged
   3. strongly flanged
   4. with a strong posteroventral projection composed by a subquadrate concave area

35. posteroventral area of gena
   1. concave
   2. convex

36. posteroventral area of gena
   1. depression dorsad flange absent
   2. depression dorsad flange present

37. posteroventral area of gena
   1. smooth
   2. with rugae restricted to area immediately basad eye
   3. with rugae restricted to area immediately distad eye
   4. with irregular rugae evenly distributed
   5. with parallel rugae reaching distal margin of flange
   6. with semiparallel dorsal rugae and irregular ventral rugae
   7. with a few subparallel rugae dorsad genal flange
   8. with a few rugae and a puff of hairs ventrally

38. epicnemial carina
   1. complete and evenly curved
   2. complete and with distinct angle ventrolaterally
   3. strong dorsally and interrupted ventrally
   4. interrupted at midlength
   5. dorsal only, very weak

39. epicnemial carina
   1. with groove narrow, no flat area is visible
2. with groove wide and flat
3. with groove extended posteriorly beyond epicnemial border

40. crenulations of epicnemial carina
   1. separated from sternaulus
   2. with some crenulae fused with these of sternaulus

41. crenulation of epicnemial carina
   1. absent
   2. composed of several irregular and unevenly distributed ridges
   3. composed of 4 large ridges, two at height of scrobal groove and two in lower part
   4. composed of 3-6 large ridges restricted to mid length
   5. composed of 4-5 large ridges restricted to dorsad half
   6. composed of 4-9 large evenly distributed ridges
   7. composed of 5-6 small ridges restricted to ventral half
   8. composed of 5-6 small ridges evenly distributed
   9. composed of more than eight small, evenly distributed ridges or crenulations
10. composed of 1-3 strong ridges near angle
11. composed of a strong ridge at height of scrobal groove
12. composed of about 10 robust transverse ridges, strongest at mid-length, absent in ventral third
13. composed of about 10 robust transverse ridges, strongest at mid-length, present in ventral third
14. composed of about 10 robust transverse ridges, absent in dorsal third
15. composed of two stronger ridges widely separated, located on each side of angle

42. mesopleuron
   1. entirely smooth
   2. punctate but lacking punctures medially
   3. with small punctures evenly distributed
   4. with irregular foveae below level of sternaulus, causing sternaulus to appear rugous
   5. with punctures more concentrated anterodorsally
   6. with strong uniformly distributed punctures
   7. with very strong punctures more dense anteriomedially

43. sternaulus
   1. absent
   2. barely depressed and smooth, with one posteroventral crenulation
   3. with a notorious depression and up to three weak ridges
   4. with a notorious depression and a clear set of striations evenly distributed
   5. with a notorious depression and strong transverse striations forming an irregular dorsal margin
   6. with a notorious depression and strong striations forming a dorsal border and some fused with these of epicnemial carina

44. posterior margin of mesopleuron
   1. smooth
   2. with 6 evenly distributed faint ridges
   3. with 4-6 evenly distributed carinae
   4. with 10-12 small uniform carinae
   5. with 4-6 strong carinae restricted to dorsal half and a few weak carina in ventral half
   6. with 7-8 robust carinae evenly distributed
   7. with 5 robust carinae and one weak carina in between each of these
   8. with one or two strong carinae
45. suture between metepisternum and metepimeron
   1. incomplete
   2. complete and deep
   3. complete and shallow

46. suture between metepisternum and metepimeron
   1. without acute angles at anterior or posterior borders
   2. with acute angle at posterior border
   3. with acute angle at anterior border
   4. with both anterior and posterior borders with acute angle

47. suture between metepisternum and metepimeron
   1. without transverse carinae
   2. with transverse carinae restricted to suture width
   3. with transverse carinae extending posteriorly at least half width of suture
   4. with the ventral transverse carinae extending posteriorly at least half width of suture

48. suture between metepisternum and metepimeron
   1. with strong carinae of subequal size
   2. with strong carinae of different size
   3. with weak carinae of similar size

49. convex flange on posterodorsal border of mesopleuron
   1. absent
   2. present

50. dorsal apex of metepisternum
   1. without carina
   2. with one carina
   3. with two subparallel carinae
   4. with three subparallel carinae
   5. with two carina meeting as an inverted Y
   6. with a longitudinal and a transverse carinae disposed as a T

51. juxtacoxal flange
   1. absent
   2. present

52. juxtacoxal flange
   1. regularly concave
   2. strongly concave
   3. clearly convex posteriorly

53. juxtacoxal flange
   1. slender, straight, with round apex
   2. slender, curved posteriorly, with round apex
3. slender, straight, with acute apex
4. wide
5. rounded
6. rectangular
7. small, barely developed

54. juxtacoxal area
   1. smooth
   2. rugous
   3. with an incomplete carina
   4. with a complete carina mediad flange apex
   5. with a complete carina located ventrally
   6. with a complete carina located dorsally
   7. with two complete carinæ
   8. with two incomplete carinae and irregular rugæ
   9. with two incomplete carinae
   10. with two carinæ, one complete, one incomplete
   11. with two carinæ, one very high
   12. with a complete carina and irregular additional carinæ
   13. with three complete carinæ

55. anterior area of subpronope
   1. not modified
   2. disk-shaped
   3. wide and flanged

56. posterolateral margin of pronotum
   1. smooth
   2. completely carenated
   3. carenated ventrally
   4. with a strong set of irregular fovea at mid height
   5. carenated ventrally and with a strong set of irregular dorsal fovea

57. notaulus
   1. absent
   2. strong
   3. indicated by weak depressions

58. median longitudinal mesoscutal groove
   1. absent
   2. indicated by two strong depressions
   3. indicated by a single wide smooth depression
   4. indicated by a wide, flat, sculptured depression

59. scutellar sulcus
   1. deep and subquadrate
   2. deep and slender
   3. shallow and slender transversally
   4. shallow and subquadrate
   5. deep and deltid
60. scutellar sulcus
   1. with one carina
   2. with two carinae
   3. with three carinae
   4. with four carinae
   5. with five carinae
   6. with six carinae
   7. without carinae

61. scuto-scutellar articulation
   1. absent
   2. indicated by a tenuous line

62. posterior border of mesoscutal sulcus
   1. non carinate, gently sloped
   2. non carinate, with strong slope
   3. carinate, gently sloped
   4. high, carinate, with a strong slope

63. scutellar disk
   1. rounded
   2. three-sided, without lateral carinae
   3. three-sided with angle outlined by strong carinae
   4. three-sided, without lateral carina, and wider than long

64. scutellar disk
   1. entirely smooth
   2. rugous
   3. sparsely foveolated
   4. mostly smooth, with some longitudinal striations

65. transverse groove of scutellar disk
   1. absent
   2. indicated by a few mediad crenulations
   3. indicated by a row of parallel crenulations
   4. indicated by a wide depression with some faint crenulae
   5. indicated by a wide depression and a wide protuberance
   6. weak, indicated by an irregular protuberance
   7. weak and with irregular crenulae
   8. as a smooth carina
   9. deep, without crenulae
   10. deep, with crenulae extending anteriorly reaching midway to scutellar sulcus
   11. deep, with crenulae extending anteriorly but not larger than sulcus
   12. deep, wide, with a median crenula

66. median areola of metanotum
   1. without median longitudinal carina
   2. with an incomplete median longitudinal carina
   3. with a complete median longitudinal carina

67. sides of median areola of metanotum
1. almost vertical to scutellum border
2. strongly diagonal to scutellum border, as a triangle with a wide base

68. posterior border of median areola of metanotum
   1. acute and with a longitudinal ridge
   2. acute, formed by convergent lateral borders
   3. acute, with median longitudinal crest clearly separated from lateral borders
   4. broad, round, without acute longitudinal ridge, and with a pointed tip
   5. broad, round, without an acute longitudinal crest, and with a broad tip
   6. broad, round, but divided by a V-shaped carinae or rugosity, without the longitudinal crest
   7. broad, round and with an acute longitudinal crest
   8. with a transverse carina well before apex
   9. with an acute transverse crest and a longitudinal crest

69. longitudinal apical crest of median metanotal areola
   1. absent
   2. fused apically with lateral ridges
   3. separated from lateral ridges
   4. long and horizontal, strongly projected
   5. strongly developed, separated from lateral ridges

70. transverse crest of median metanotal areola
   1. absent
   2. close to apex
   3. well before apex
   4. as a V-shape carina, well before apex

71. propodeum
   1. without areolae, smooth
   2. with a few isolated ridges
   3. with a few open areolae
   4. with several strong areolae

72. propodeum
   1. surface smooth
   2. surface with microsculptures only
   3. surface with both striations and punctures
   4. surface with irregular striations
   5. surface with strong rugosities distorting most primary ridges that form areolae
   6. surface densely covered by a whitish pubescense

73. anteromedial areola
   1. absent
   2. without transverse ridges
   3. with transverse ridges
   4. barely indicated by lateral ridges
   5. with a strong anterior transverse ridge
   6. with a strong posterior transverse ridge
   7. with longitudinal ridges
   8. with a mediad longitudinal ridge
74. anteromedial areola
   1. acuminate
   2. acuminate, barely indicated by weak lateral carina
   3. triangular
   4. pentagonal, with lateral ridges strong, shorter than anterior ridges
   5. pentagonal, barely indicated by incomplete lateral ridges
   6. pentagonal, with lateral ridges strong, longer than anterior ridges
   7. pentagonal, with lateral ridges strong, as long as anterior ridges
   8. pentagonal, very thin, anterior ridges shorter than lateral ridges
   9. pentagonal but with situated lateral ridges
   10. acute triangle
   11. campanulate
   12. deltoid
   13. ensiform
   14. pentagonal, with double carina in several parts
   15. lanceolate
   16. cuspitate

75. anterolateral areola
   1. absent
   2. present and without ridges
   3. divided by several ridges converging anterolaterally
   4. with a strong ridge heading half distance from midlength of anteromedial keel to anterodorsal corner
   5. with an incomplete ridge extending half distance from midlength of anteromedial keel to anterodorsal corner
   6. with two incomplete ridges heading diagonally half distance from midlength of anteromedial keel, and with an incomplete lateral keel
   7. with two incomplete ridges heading diagonally half distance from midlength of anteromedial keel
   8. rugous anterolaterally and with some irregular ridges converging anterolaterally
   9. with two incomplete ridges one heading diagonally half distance from midlength of anteromedial keel, the other parallel to the transverse keel

76. lateral keel
   1. absent
   2. present

77. anteropleural areola
   1. absent
   2. barely indicated by irregular ridges
   3. present and smooth
   4. present, with some weak rugae
   5. present, with multiple fovea
   6. present, with several strong rugae

78. pleural carina
   1. absent
   2. weak and incomplete
   3. distinct and complete

79. transverse ridges of pleural carina
1. absent
2. present

80. posteromedian areola
   1. absent
   2. fused with posterolateral areola
   3. incomplete
   4. complete, defined by distinct lateral carina
   5. complete, defined by weak lateral carina

81. posteromedian areola
   1. subquadrate
   2. semicircular by fusion of lateral ridges
   3. narrow posteriorly but with lateral ridges separated
   4. wide posteriorly
   5. like an inverted triangle
   6. like an inverted pentagon with wide apex
   7. very thin

82. posteromedian areola
   1. without transverse ridge
   2. with a straight transverse ridge
   3. with a curved transverse ridge
   4. with an angulated transverse ridge

83. posteromedian areola
   1. without median longitudinal ridge
   2. with median longitudinal ridge separated from the transverse keel
   3. with median longitudinal ridge fused with transverse posteriomediad carenae and extended close to
      the transverse keel
   4. with median longitudinal ridge fused with transverse posteriomediad carenae, ending far from
      transverse keel

84. posterolateral areola
   1. absent
   2. open mediolaterally
   3. open anteriolaterally
   4. open mediolaterally
   5. open anteriorly
   6. closed

85. posterolateral areola
   1. subquadrate
   2. triangular

86. posterolateral areola
   1. subequal in width to anterolateral areola
   2. narrower than anterolateral areola

87. posteropleural areola
   1. absent
2. closed
3. open anteriorly

88. transverse keel of propodeum
   1. absent
   2. regular, reaching posteropleural keel
   3. strong, dividing propodeum into two distinct planes
   4. present only medially
   5. reaching posteropleural keel, double at median and lateral areola area
   6. diagonal at the lateral areolae, weak and transverse at the medial areola
   7. reduced or absent medially
   8. strong medially, absent between the lateral areola
   9. absent between pleural areola
   10. proximad at mediad areola, distad at lateral areola
   11. lower at laterad areola that at both mediad and pleural areola

89. basal tooth of foretarsal claw
   1. acute
   2. truncate
   3. rounded

90. foreleg tibial spur
   1. shorter than 12 basitarsomere
   2. longer than 12 basitarsomere

91. elongate tail of foreleg tibial spur
   1. absent
   2. present

92. longest spur of midleg tibia
   1. shorter than 12 basitarsomere
   2. longer than 12 basitarsomere

93. longest spur of hind leg tibia
   1. shorter than 12 basitarsomere
   2. longer than 12 basitarsomere

94. carina of hind trochantellus
   1. absent
   2. weakly indicated (the trochantellus has a flat area)
   3. present and well developed

95. apex of hind tibia
   1. with one spine
   2. with two spines
   3. with three spines
   4. without spines

96. apex of hind tibia
   1. arising directly from apical margin
   2. arising from a lobe
3. with a wide proximal notch  
4. with widely separated spines  
5. short and wide arising of a distal wide notch  

97. ridge of setae in hind basitarsomere  
   1. absent  
   2. present  

98. basal teeth of hind tarsal claw  
   1. rounded  
   2. truncate  
   3. acute  

99. combined length of hind tarsomeres  
   1. longer than or subequal to tibia  
   2. shorter than tibia  

100. forewing  
    1. 3M straight  
    2. 3M curved  

101. forewing  
    1. 3RSa absent  
    2. 3RSa present, at least weakly  

102. forewing  
    1. RS2a shorter than r-m  
    2. RS2a subequal to r-m  
    3. RS2a longer than r-m  

103. forewing  
    1. RS2b absent  
    2. RS2b present  

104. CUb of hind wing  
    1. absent  
    2. nebulous  
    3. tubular  

105. T1  
    1. smooth anteriorly  
    2. with a anteromedian round bulge clearly separated from lateral tergite border  
    3. with a anteromedian bulge defined by a ridge  
    4. with anterolateral protuberances on spiracles  

106. length of T1 median tergite  
    1. more than two times its posterior width  
    2. less than 1.5 times its posterior width  

107. head  
    1. entirely yellow-orange
2. yellow with dark testaceous vertex
3. entirely black or brown
4. black dorsally, transitioning to yellow
5. black with yellow or dark-yellow palpi and labrum
6. black with yellow mouthparts part of clypeus and gena

108. mesosoma
1. entirely yellow or orange
2. entirely brown or black
3. with areas black or brown and yellow or orange

109. FW
1. entirely hyaline
2. hyaline with infumate transverse medial band
3. hyaline with infumate apical band
4. hyaline with infumate stigmal area and costal border
5. hyaline with two transverse infumate bands
6. hyaline with three transverse infumate bands
7. hyaline, black pterostigma, yellow stigma, and infuscate apical band posteriad stigma apex
8. infumate with transverse hyaline band or semicircular spot
9. infumate with hyaline apex
10. infumate with stigmal area hyaline
11. entirely infumate

110. HW
1. entirely hyaline
2. entirely infumate
3. infumate with a semicircular medial hyaline area
4. hyaline with two transverse infumate bands
5. hyaline with distal area infumate
6. hyaline with three transverse bands
7. hyaline with infumate dorsoproximal area
8. hyaline with median infumate band
### Appendix 3. Matrices for phylogenetic analyses

**3. A. Matrix of the morphological data.** This matrix replaces character 5 (face sculpturation) and character 46 (areola of propodeum) with separated characters for the qualities of each structure. Details are provided in the text.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
<td>1234567890</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Species</th>
<th>I</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coccygidium comstocki</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coccygidium desertorum</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coccygidium luteum</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypsostyphus concolor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coccygidium luteum</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Z. ariasa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. petzi</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. araguenis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. gregarium</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. webbi</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. pseudorugosa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. rugosa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. hondurensis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. pennator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. eurugosa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. anator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. illi</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. kolapta</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. prudens</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. areolaris</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. obscura</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. pallida</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. vesmaeli</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. amoena</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. akrolophos</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. sharkeyi</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. hallwachse</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. tropica</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. tarsalis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. campestr</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. chiapanensis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. xanthostigma</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. pentagonalis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. salvadorensis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. erugocephala</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. rufimana</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. cellatapula</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. peruensis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. quercubina</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. traili</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. similis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. passi</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. dubiosus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. stigmata</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. hospitator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. fernandezi</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. marthahernandezae</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. puncturata</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. octava</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. anchicayensis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. boliviensis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. jordii</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. victoriae</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. compta</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. crowdusi</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. interstitium</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. tingomarianensis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. variegatus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. schunkel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z. transversa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. B. Character list of the morphologic database for the phylogenetic analyses

1. labiomandibular complex: 1 = elongate, 2 = reduced
2. medial ridge or convexity of face: 1 = absent, 2 = present, without a dorsal circular protuberance, 3 = present, with a dorsal circular protuberance
3. dorsomedial groove of face: 1 = absent, 2 = present
4. face convexity: 1 = absent, 2 = present medially
5. face striations: 1 = absent, 2 = present
6. medial longitudinal striations of face: 1 = absent, 2 = present
7. lateral longitudinal striations of face: 1 = absent, 2 = present
8. medial transverse striations of face: 1 = absent, 2 = present
9. short lateral transverse striations of face: 1 = absent, 2 = present
10. setal punctures of face: 1 = not on regular depressions, 2 = on elevated protuberances
11. penultimate labial palpomere: 1 = longer than apical palpomere, 2 = subequal in length to apical palpomere, 3 = less than 25% shorter than apical palpomere, 4 = about half length of apical palpomere
12. ventral border of eyes: 1 = reaching ventral border of tentorial pits, 2 = not reaching ventral border of tentorial pits
13. gena in lateral view: 1 = uniformly wide along its length, 2 = wider ventrally than dorsally
14. eyes: 1 = non emarginate, 2 = emarginate
15. eyes: 1 = not converging ventrally, 2 = converging ventrally
16. posterior orbit of eye: 1 = not bordered by groove, 2 = partially bordered by groove, 3 = completely bordered by groove
17. lateral carina of frons: 1 = continuous ridge, 2 = interrupted, composed of rugae and fovea
18. lateral carina of frons: 1 = separated posteriorly from interantennal carina, 2 = fused posteriorly with interantennal carina
19. lateral striae on lateral carina of frons: 1 = absent, 2 = present
20. frontal depression: 1 = entirely smooth, 2 = rugous, 3 = foveolate, 4 = with a few circular rugae
21. last flagellomere: 1 = rounded, 2 = acuminate
22. depression laterad lateral ocellus: 1 = absent, 2 = present
23. gena at mid-height, posteriad eye: 1 = evenly rounded, 2 = with an acute peak
24. area of vertex laterad ocelli: 1 = smooth, 2 = striated
25. sculpturation of vertex posterad ocelli: 1 = present, 2 = absent
26. posteroventral margin of gena: 1 = evenly rounded and flanged, 2 = strongly flanged, 3 = with a strong posteroventral projection composed by a subquadrare concave area
27. posteroventral area of gena: 1 = concave, 2 = convex
28. posteroventral area of gena: 1 = depression dorsad flange absent, 2 = depression dorsad flange present
29. posteroventral area of gena: 1 = smooth, 2 = rugous
30. epicnemial carina: 1 = complete, 2 = interrupted
31. crenulations of epicnemial carina: 1 = separated from sternaulus, 2 = with some crenulae fused with these of sternaulus
32. crenulation of epicnemial carina: 1 = absent, 2 = present
33. sternaulus: 1 = absent, 2 = present and crenulated, 3 = present and with crenulae extending to epicnemial carina
34. posterior margin of mesopleuron: 1 = smooth, 2 = carinate
35. suture between metepisternum and metepimeron: 1 = incomplete, 2 = complete
36. suture between metepisternum and metepimeron: 1 = without transverse carinae, 2 = with transverse carinae
37. convex flange on posterodorsal border of mesopleuron: 1 = absent, 2 = present
38. dorsal apex of metepisternum: 1 = without carina, 2 = with one carina, 3 = with two carinae, 4 = with three carinae, 5 = with a longitudinal and a transverse carinae disposed as a T
39. juxtacoxal flange: 1 = absent, 2 = present
40. juxtacoxal flange: 1 = barely developed, 2 = slender, 3 = wide, 4 = rectangular
41. posterolateral margin of pronotum: 1 = smooth, 2 = carenate or foveolate
42. notaulus: 1 = absent, 2 = indicated by weak depressions, 3 = strong
43. shape of scutellar sulcus: 1 = subquadrate, 2 = slender transversally, 3 = deltoid
44. shape of scutellar disk: 1 = rounded, 2 = with three obvious sides
45. sides of median areola of metanotum: 1 = almost vertical to scutellum border, 2 = strongly diagonal to scutellum border, as a triangle with a wide base
46. propodeum: 1 = smooth, 2 = weakly foveolate, 3 = strongly areolae
47. transverse ridge on anteromedial areola: 1 = absent, 2 = present
48. longitudinal median ridge of anteromedial areola: 1 = present, 2 = absent
49. anteromedial areola: 1 = acuminate, 2 = triangular, 3 = pentagonal, with lateral ridges strong, shorter than anterior ridges, 4 = pentagonal, with lateral ridges strong, longer than anterior ridges, 5 = pentagonal, with lateral ridges strong, as long as anterior ridges, 6 = acute triangle, 7 = campanulate, 8 = deltoid, 9 = ensiform, 10 = lanceolate, 11 = cuspite
50. anterolateral areola: 1 = absent, 2 = present and without ridges, 3 = present and with ridges
51. lateral keel: 1 = absent, 2 = present
52. anteropleural areola: 1 = absent, 2 = present and smooth, 3 = present, with rugae
53. pleural carina: 1 = absent, 2 = present
54. posteromedian areola: 1 = absent, 2 = present
55. transverse ridge of posteromedian areola: 1 = absent, 2 = present
56. longitudinal ridge of posteromedian areola: 1 = absent, 2 = present
57. posterolateral areola: 1 = subequal in width to anterolateral areola, 2 = narrower than anterolateral areola
58. basal tooth of foretarsal claw: 1 = acute, 2 = truncate, 3 = rounded
59. elongate tail of foreleg tibial spur: 1 = absent, 2 = present
60. carina of hind trochantellus: 1 = absent, 2 = weakly indicated (the trochantellus has a flat area), 3 = present and well developed
61. ridge of setae in hind basitarsomere: 1 = absent, 2 = present
62. 3RSa of forewing: 1 = absent, 2 = present, at least weakly
63. RS2a of forewing: 1 = shorter than r-m, 2 = subequal to r-m, 3 = longer than r-m
64. RS2b of forewing: 1 = absent, 2 = present
65. CUb of hind wing: 1 = absent, 2 = nebulous, 3 = tubular
66. Anterior part of T1: 1 = smooth, 2 = with a median round bulge clearly separated from lateral tergite border, 3 = with a median bulge defined by a ridge
67. length of T1 median tergite: 1 = more than two times its posterior width, 2 = less than 1.5 times its posterior width
### 3. C. Data matrix from 28S gene

<table>
<thead>
<tr>
<th>Species</th>
<th>Sequence 1</th>
<th>Sequence 2</th>
<th>Sequence 3</th>
<th>Sequence 4</th>
<th>Sequence 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earinus sp</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>Bassus sp</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>Cremnops sp</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>Cremnops sp</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>Cremnops sp</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>Cremnops sp</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>Coccygidium</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>Coccygidium</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>Coccygidium</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>Coccygidium</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>Coccygidium</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>H. atrata</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>H. atrata</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>H. atrata</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>H. atrata</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>Z. fernande</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>Z. gregario</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>Z. arizonen</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>Z. arizonen</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>Z. arizonen</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>Z. arizonen</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>Z. metahirs</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>Z. n. sp A</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>Z. elegans</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>Z. baios</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>Z. concinna</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>Z. concinna</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>Z. concinna</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>Z. concinna</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>Z. concinna</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>Z. similis</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>Z. similis</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>Z. ocellata</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>Z. lenister</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
<tr>
<td>Z. melanota</td>
<td>AAAATTGGCC</td>
<td>CACTTGGA-</td>
<td>CTCTAATCC-</td>
<td>AAT-CTCTGG</td>
<td>TTCTATAA--</td>
</tr>
</tbody>
</table>

454
---CGGAAGGA ACCAGCTACT AGATGGTTCG ATTAGTCTTT
TGAGGGAAAC TTCGAGGAGA ACCAGCTACT AGATGGTTCG ATTAGTCTTT
TGAGGGAAAC TTCGAGGAGA ACCAGCTACT AGATGGTTCG ATTAGTCTTT
TGAGGGAAAC TTCGAGGAGA ACCAGCTACT AGATGGTTCG ATTAGTCTTT
TGAGGGAAAC TTCGAGGAGA ACCAGCTACT AGATGGTTCG ATTAGTCTTT
---CGGAAGGA ACCAGCTACT AGATGGTTCG ATTAGTCTTT
TGAGGGAAAC TTCGAGGAGA ACCAGCTACT AGATGGTTCG ATTAGTCTTT

CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC
CGCCCCTATA CCCAGTTCC- GACGATCGAT TTGCACGTCA GAATCGCTAC

459
GGACCTCCAT CAGGGTTTCC CCTGACTTCG TCCTGACCAG GCATAGTTCA
GGACCTCCAT CAGGGTTTCC CCTGACTTCG TCCTGACCAG GCATAGTTCA
GGACCTCCAT CAGGGTTTCC CCTGACTTCG TCCTGACCAG GCATAGTTCA
GGACCTCCAT CAGGGTTTCC CCTGACTTCG TCCTGACCAG GCATAGTTCA
GGACCTCCAT CAGGGTTTCC CCTGACTTCG TCCTGACCAG GCATAGTTCA
GGACCTCCAT CAGGGTTTCC CCTGACTTCG TCCTGACCAG GCATAGTTCA
GGACCTCCAT CAGGGTTTCC CCTGACTTCG TCCTGACCAG GCATAGTTCA
GGACCTCCAT CAGGGTTTCC CCTGACTTCG TCCTGACCAG GCATAGTTCA
GGACCTCCAT CAGGGTTTCC CCTGACTTCG TCCTGACCAG GCATAGTTCA
CCATCTTTCG GGTCCCAACA TGTATGCTCT AGGTGCGCCT CATCTCGAA
CCATCTTTCG GGTCCCAACA TGTACGCTCT AGGTGCGCCAA CATCTCGGAA
CCATCTTTCG GGTCCCAAACT GTAGCTGCTT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACCG GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACCG GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACGC GTACGCTCT AGGTGCGCCA CATCTCGGAA
--------- --------- --------- --------- ---------
CCATCTTTCG GGTCCCAACG TGTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACG TGTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACG TGTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACG TGTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACG TGTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACG TGTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACG TGTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACG TGTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACG TGTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACG TGTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACG TGTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACG TGTACGCTCT AGGTGCGCCA CATCTCGGAA
CCATCTTTCG GGTCCCAACG TGTACGCTCT AGGTGCGCCA CATCTCGGAA
461
3. D. Data matrix from COI gene
42 895
Braconinae
Braconinae
Cremnops sp
Cremnops sp
Cremnops sp
Coccygidiu
H_bico1or
H_bicolor
H_bicolor
Z_fernande
Z_similis
H_boringi
Z_fernande
Z_stigmata
Z_concinna
Z_concinna
Z_concinna
Z_concin37
Z_similis
Z_concinna
Z_lenister
Z_oxybela
Z_fernande
Z_fernande
Z_concinna
H_bicolor
Z_lenister
H_bico1or
Z_concinna
Z_concinna
Z_gregarum
Z_dengoii
Z_dengoii
Z_dengoii
Z_vesmaeli
Z_n sp A
Z_arizonen
Z_arizonen
Coccygidiu
Z_ocellata
Z_concinna
Z_melanota

C-CATATTAT
C-CATATTAT
---------CTCATATTAT
------------------CTCATATTAT
CTCATATTAT
CTCATATTAT
CTCATGCAAT
CTCATGTAAT
CTCATATTAT
CTCATGTAAT
CTCATGTAAT
CTCATGTAAT
---------CTCATGTAAT
CACATGTAAT
CTCATGTAAT
CTCATGTAAT
CTCATGTTAT
----TGTAAT
CTCATGTAAT
CTCATGTTAT
CTCATGTAAT
CTCATATTAT
CTCATGTAAT
CTCATATTAT
------------------CTCATGTTAT
CTCATGTAAT
CTCATGTAAT
-TCATGTAAT
CTCACGTTAT
CTCATGTAAT
CTCATGTTAT
--CACGTGAT
CTCATATTAT
GTCATGTA-T
-TCATGTAAT
----------

TTATAAT-GA
TTATAAT-GA
---------TTATAAT-GA
------------------TTATAAT-GA
TTATAAT-GA
TTATAAT-GA
TTATAAT-GA
TTATAAT-GA
TTATAAT-GA
TTATAAT-GA
TTATAAT-GA
TTATAAT-GA
---------TTATAAT-GA
TTATAAT-GA
TTATAAT-GA
TTATAAT-GA
TTATAAT-GA
TTATAAT-GA
TTATAATTGA
TTATAAT-GA
TTATAAT-GA
TTATAAT-Ga
TTATAAT-GA
TTATAAT-GA
---------TTACAAT-GA
TTATAAT-GA
TTATAAT-GA
TTATAAT-GA
TTATAAT-GA
TTATAAT-GA
TTATAAT-GA
TTATAAT-GA
TTATAAT-GA
TTATAAT-GA
TTATA-T-GA
TTATAAT-GA
----------

AAGAGGAGAA
AAGAGGAAAA
---------AAGAGGAAAA
------------------AAGGGGCAAG
AAGAGGTAAA
AAGAGGTAAA
AAGAGGCAAA
AAGAGGCAAA
AAGAGGTAAA
AAGAGGAAAA
AAGAGGTAAA
AAGAGGTAAA
---------AAGAGGAAAA
AAGGGGAAAA
AAGAGGTAAA
AAGAGGTAAA
GAGAGGTAAG
GAGAGGTAAA
AAGAGGAAAA
AAGAGGTAAA
AAGAGGTAAA
AAGAGGTAAA
AAGAGGTAAG
AAGGGGCAAG
---------AAGGGGTAAA
AAGAGGAAAA
AAGAGGTAAA
AAGAGGTAAA
AAGTGGTAAA
AAGTGGTAAA
AAGAGGAAAA
GAGAGGTAAG
AaGAGGTAAG
AGGGGGAAAA
--GGGGTAAG
AAGAGGGAAA
----GGTAAA

AA-G-AAACT
AAAG-AAACT
---------AAAG-AAACA
--------CC
--------CT
AATG-AAACG
AATG-AAACA
AATG-AAACA
AGTG-AAACT
AGTG-AAACT
AATG-AAACT
AATG-AAGTT
AGTG-AAACT
AATGCAAACT
---------A
AATG-AAACA
AATG-AAACA
AGTG-AAACT
AATG-AAACA
AATG-AAACT
-CTG-AGACT
AATG-AAGTT
AATG-AAACT
AATGCAAACT
AATG-AAACA
AGAG-AAACT
AATG-AAACG
---------T
AATG-AAA-T
AGAG-AAACA
AATG-AAACT
AATG-AAACT
AATG-AAACA
AGTG-A--CT
AATG-AAACT
AATG-AAACT
AGTG-AAACT
AATG-AAACT
AATG-AAACT
AATG-AAACT
AATG-AAACA

TTTGGAGTTT
TTTGGaGTTT
---------TTTGGAA--TTGGGAA--TTTGGA---T
TTTGG----T
TTTGGA---T
TTTGGA---T
TTTGG----T
TTTGG----T
TTTGG----T
TTTGG----T
TTTGG----T
TTTGG----T
TTTGG----T
TTTGG----T
TTTGG----T
TTTGG----T
TTTGG----T
TTTGG----T
TTTGG----T
TTTGG----T
TTTGG----T
TTTGG----T
TTTGGA---T
TTCGG----T
TTTGG----T
TTTGG----T
TTtGGG---T
TTTGG----T
TTTGG----T
TTTGG----T
TTTGG----T
TTTGGA---TTTGGA---TTTGG----T
TTTGG----T
TTTGGA---T
TTTGG----T
TTTGGA---TTTGGA---T

T------AGG
T------AGG
----------C--ATTAGG
-C--ATTAGG
T---ATTAGG
TC--ATTGGG
T---ATTGGG
T---ATTGGG

AATAATTTAT
AATAATTTAT
---------AATAGTTTAT
AATAGTTTAT
AATAATTTAT
AATAATTTAT
TATAATTTAT
TATAATTTAT

GCAATATTAA
GCAATATTAA
---------GCAATAATAA
GCAATAATAA
GCAATAATAA
GCTATAGTAA
GCAATAATAA
GCAATAATAA

CAATTGGATT
CAATTGGATT
---------CTATTGGATT
CTATTGGATT
CTATTGGATT
CTATTGGATT
CAATTGGATT
CAATTGGATT

TTTAGGGTTT
TTTAGGGTTT
---------TTTAGGATTT
TTTAGGATTT
TTTAGGTTTT
TTTGGGTTTT
TTTAGGTTTT
TTTAGGTTTT

481


AAATTTT--C CTCC---TC- ATA-TTC-AT AG-TTAT-AA T----
ATA------- ---------- ---------- ---------- -----"
REFERENCES


EDMUNDS, M. 2000 Why are there good and poor mimics? Biological Journal of the Linnean Society. 70, 459-466.


FABRICIUS, J. C. 1775. Systema entomologiae, sistens insectorum classes, ordines, genera, species, adiectis synonymis, locis, descriptionibus, observationibus. Libraria Kortii, Flensburgi et Lipsiae, 832 p
FABRICIUS, J. C. 1787. Mantissa insectorum sistens eorum species nuper detectas adiectis characteribus
348 p.

519 pp.


Cladistics 10: 315-319.


FLEISHMAN, L. 1988a. Sensory and environmental influences on display form in Anolis auratus, a

FLEISHMAN, L. 1988b. The social behavior of Anolis auratus, a grass anole from Panama. Journal of

Society of London B. 271, 1859-1865.

GALTIER, N. 2004. Sampling properties of Bootstrap support in molecular phylogeny: influence of

GAULD, I., GASTON, K. 1994 The taste of the enemy-free space: parasitoids and nasty hosts. In


macrocaterpillar fauna, and its food plants and parasitoids, of Area de Conservacion Guanacaste (ACG), 

JIGGINS, C., R. NAISBIT, R. COE, J. MALLEY. 2001. Reproductive isolation caused by colour pattern 

JORON, M., MALLEY, J.L.B. 1998 Diversity in mimicry: Paradox or paradigm? Trends in Ecology and 
Evolution. 13: 461-466.

KIRCHOFF, B., RICHTER, S., REMINGTON, D., WISNIEWSKI, E. 2004. Complex data produce 

KOKKO, H., MAPES, J, LINDSTRÖM, L. 2003 Alternative prey can change model-mimic dynamics 


KURHADE S., NIKAM, P. 1004. On a new species of Zelomorpha Ashmead (Hymenoptera: 
Braconidae) from India). Journal of the Bombay Natural History Society 91: 120-123.

(Hymenoptera: Braconidae), with a key to world species. Contributions in Science. 497:1-82


LOCKHART, P., S. CAMERON. 2001. Trees for Bees. Trends in Ecology and Systematics. 16 (2): 84-
87.


MAGNUSSON, W., E. VIEIRA-DA-SILVA. 1993. Relative effects of size and species on the diets of 


MARDULYN, P., J. WHITFIELD. 1999. Phylogenetic signal in the COI, 16S and 28S genes for inferring relationships among genera of Microgastrinae (Hymenoptera; Braconidae):

MCLAIN, D. 1984. Coevolution: Mullerian mimicry between a plant bug (Miridae) and a seed bug (Lygaeidae) and the relationship between host plant choice and unpalatability. Oikos. 43: 143-148.


NIXON, K. C. 1999. Winclada (BETA) ver. 0.9.9 Published By The Author, Ithaca, Ny.


Vita

Name: Carlos Eduardo Sarmiento-Monroy

Date of birth: May 30, 1966

Place of birth: Bogota, Colombia (S.A.)

Educational institutions attended
1997   M.Sc. Biology-Systematics. Universidad Nacional de Colombia, Colombia
1990   Bachelor Biology teaching. Universidad Pedagógica Nacional, Colombia

Professional positions held
2005-current  Assistant professor, Instituto de Ciencias Naturales, Universidad Nacional de Colombia
             Bogota, Colombia
2000  Research Assistant, Instituto Alexander Von Humboldt, Bogota, Colombia.
1998-2000 Assistant Professor, Pontificia Universidad Javeriana, Bogota, Colombia.

Honors and Awards
2004   Bobby C. Pass Scholarship Fund. University of Kentucky
2002   Fellowship. Association for Faculty Emeriti. University of Kentucky
2002-2004 Student Support Funding for travel to professional meeting/conference, Graduate School
       UKY
2001   Academic Scholarship, Department of Entomology UKY,
2001-2005 Research Assistantship. Department of Entomology UKY.
1997   Honored Masters thesis, Universidad Nacional de Colombia
1994   Teaching Assistantship. Biology Department, Universidad Nacional de Colombia.
1990   Student Grant Instituto Colombiano Agropecuario.

Publications

Peer review journals

Submitted

- RODRÍGUEZ-J., A., SARMIENTO C. E. Bergmann’s Rule and Body Resource Allocation in a High
- GARCÍA Z., ROJAS, S., SARMIENTO C. E. Morphologic differentiation of social vespids
  (Hymenoptera: Vespidae) across the Andes. Entomologia experimentalis et applicata

In press
- SARMIENTO, C. Vespidae. In: Especies amenazadas en Colombia. Instituto de Ciencias Naturales,
  Instituto Humboldt-Universidad Nacional de Colombia.

2005

2004


2003


Before 2003

**Book chapters**