Lundiana 9(2):111-153, **2008**

ISSN 1676-6180

Revision of the species of the subgenera of *Exomalopsis* Spinola, 1853 ocurring in South America. II – *Phanomalopsis* Michener & Moure, 1957 (Hymenoptera, Apidae)

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Abstract

A revision and phylogenetic analysis of the species of *Exomalopsis (Phanomalopsis)* are presented. *E. diminuta* Silveira is removed from this subgenus. This species and *E. dubia,* described here as new, may be part of *E. (Diomalopsis);* however, they are left as *incertae sedis* in *Exomalopsis* until their males are discovered. Twelve species are recognized in *E. (Phanomalopsis),* four of which *(E. eremalis, E. griswoldi, E. gualamba* and *E. perikalles)* are described as new. The males of *E. jenseni* Friese, *E. dasypoda* Strand, and *E. atlantica* Silveira and the female of *E. testaceinervis* Brèthes are described for the first time. New synonymies are recognized and a key is presented for the identification of the species. Phylogenetic analyses reveal three main lineages in the subgenus – 1) *E. solitaria* Brèthes, restricted to temperate semidesert areas of Argentina and Bolivia and which is sister to all other species; 2) the *aureosericea* species-group, including *E. trifasciata* Brèthes, *E. perikalles* sp.n., *E. atlantica* Silveira and *E. aureosericea* Friese, which inhabit temperate semidesert and subtropical areas in southern South America (the two former ones) and tropical areas of southeastern Brazil (the two latter); and 3) the *jenseni* species-group, comprising *E. snowi* Cockerell, *E. griswoldi* sp.n., *E. testaceinervis, E. dasypoda, E. eremalis* sp.n., *E. jenseni* Friese and *E. gualamba* sp.n., which, except for the first two, inhabit temperate semidesertic areas of South America. *E. snowi* occurs from Panama to southern United States and *E. griswoldi* in xeric areas near the coasts of Venezuela and Colombia but also southward in Roraima state, in Brazil.

Keywords: Wild bees, Exomalopsini, Neotropics, Taxonomy, Phylogeny.

Introduction

Phanomalopsis was erected by Michener & Moure (1957) to include a group of species occurring almost all over the geographic range of *Exomalopsis s l.* Its North American species were reviewed by Timberlake (1980) but the species occurring in South America, on the other hand, were described in isolated papers (Friese, 1899, 1908; Brèthes, 1910; Strand, 1910; Silveira, 1996) and were never the object of a comprehensive review.

Phylogenetic analyses carried out by Silveira (1995b) showed that, as originally defined, *Phanomalopsis* was not monophyletic and, for this reason, he limited its scope with the exclusion of a group of species for which he proposed the subgenus *Stilbomalopsis.* While *Stilbomalopsis* is mostly restricted to the semidesertic areas of Mexico and southwestern United States, *Phanomalopsis* is composed mainly of South American species, with only *Exomalopsis snowi* Cockerell, 1906 reaching North America (Silveira, 1995b). This new definition of *Phanomalopsis* by Silveira (1995b) has been maitained in the recent taxonomic literature on bees (e.g. Michener, 2000, 2007; Silveira et al., 2002; Silveira, 2007). The species of *Phanomalopsis sensu* Silveira (1995b) were recently catalogued by Silveira (2007).

The monophyly of *Phanomalopsis s.s.*is known to be supported by a single undubious synapomorphy (Silveira, 1995b): the complex (but variously modified) apical process of the male seventh sternum, which bears two free basilateral lobes under its ventral surface. The two long, widely separate arms of the apical process of the male eighth sternum is another synapomorphic character, which appears homoplastically in a species of *Anthophorula.* The phylogenetic relationships of

Received: 15-VI-07
Accepted: 27-VII-09
Distributed: 18-IX-09

Phanomalopsis with the other subgenera of *Exomalopsis,* however, could not be elucidated by Silveira (1995b), with *Phanomalopsis* appearing either as the sister group to all other subgenera or as sister to *Stilbomalopsis* or to *Exomalopsis s.s.*

Here the species of *Phanomalopsis, sensu* Silveira (1995b), are revised and an analysis of the phylogenetic relationships among its species is presented.

Material and methods

Specimens studied

Following is a list of institutions from which specimens have been borrowed. Their names are followed by the names of the curators responsible for loans and by an acronym used in the following sections of this paper: American Museum of Natural History, New York, U.S.A. (J.G.Rozen, AMNH); Academy of Natural Sciences of Philadelphia, Philadelphia, U.S.A. (D.Azuma, ANSP); California Academy of Sciences, San Francisco, California, U.S.A. (W.Pulawski, CASF); Cornell University Insect Collections, Ithaca, U.S.A. (G. C. Eickwort/B. N. Danforth, CUIC); University of California, Davis, California, U.S.A. (L.S.Kimsey, DAVIS); Fundação Zoobotânica do Rio Grande do Sul, Porto Alegre, Brazil (M. Hoffman, FZRS); Coleção Camargo, Faculdade de Filosofia Ciências e Letras de Ribeirão Preto, Ribeirão Preto, Brazil (J.M.F.Camargo, JMFC); Instituto Miguel Lillo of the Universidad Nacional de Tucumán, Tucumán, Argentina (A. Willink, LILLO); Departmento de Entomología, Museo Argentino de Ciencias Naturales, Buenos Aires, Argentina (A.Roig-Alsina and A.Bachmann, MACN); Museu Regional de Entomologia da Universidade Federal de Viçosa, Viçosa, Minas Gerais, Brazil (P.S.F.Fiuza, MEUV); The Museum of Natural History, London, U.K. (L.Ficken, MNHL); Department of Entomology, Michigan State University, East Lansing, U.S.A. (F.W.Stehr and V.Scott, MSU); Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil (C.R.F.Brandão, MZUSP); Natural History Museum of Los Angeles County, Los Angeles, U.S.A. (R.R. Snelling, NHMLA); Naturhistorisches Museum Wien, Vienna, Austria (M.Fischer, NHMW); National Museum of Natural History of the Smithsonian Institution, Washington, U.S.A. (R. McGuinley, NMNH); Museum National d'Histoire Naturalle, Paris, France (J.Casevitz-Weulersse, PARIS); Museo de La Plata, La Plata, Argentina (Ricardo Ronderos, PLATA); Museo de la Plata, La Plata, Argentina – Oglobin Collection (PLATO); Snow Entomological Museum, Lawrence, U.S.A. (R.W.Brooks, SNOW); State University of New Jersey, New Brunswick, U.S.A. (M.L.May, SUNJ); Texas Agriculture Experimental Station, Texas, U.S.A. (TAES); University of California, Riverside, California, U.S.A. (S.I.Frommer, UCRIV); Universidad Católica de Valparaíso, Valparaíso, Chile (H.Toro and L.Ruz, UCV); Coleções Taxonômicas da Universidade Federal de Minas Gerais, Belo Horizonte, Brazil (F.A.Silveira, UFMG); Departamento de Entomologia, Universidade Federal do Paraná, Curitiba, Paraná, Brazil (M.C.Almeida, UFPR); University of Nebraska State Museum, Nebraska, U.S.A. (Dr.B.Ratcliffe and M.E.Jameson, UNSM); USDA Bee Biology and Systematics Laboratory, Logan, U.S.A. (T.L.Griswold, UTAH); Zoologisches Museum der Humboldt-Universität, Berlin, Germany (F.Koch, ZMHU).

Sexual dimorphism in Exomalopsis

Sexual dimorphism in *Exomalopsis* poses a problem in matching the sexes of each species. Determination of correspondence between male and female is a subjective decision in the absence of direct observations of mating pairs or of males and females collected in the same nest. Although these kinds of data are rare for *Exomalopsis,* there is no reason to doubt that most matchings made by previous authors are correct. Matching of sexes in this genus has been accomplished on the basis of similarity between male and female. This is increasingly difficult to do as the number of similar species in a given area increases. It is, thus, useful to have the features used in matching sexes explicitly stated. Some patterns that have helped in this task during this revision are the following: 1) Males are on average smaller than females; 2) size of males is generally more variable than that of females; 3) large males of a species more closely resemble the females in features such as color and pilosity patterns than the smaller ones; 4) colors of male legs, tegulae and pilosity generally are not darker than those of the females, and are commonly lighter and 5) wing color and pilosity patterns in male and female tend to be similar.

Phylogenetic analysis

Hypotheses on the phylogenetic relationships among the species of *Phanomalopsis* were constructed by means of cladistic analyses employing external morphological characters of adult males and females plus characters of male hidden sterna and genitalia. Eight species were employed as outgroups; they belonged to *Anthophorula* subgenera *Anthophorisca* and *Isomalopsis* and to *Exomalopsis* subgenera *Diomalopsis, Exomalopsis* and *Stilbomalopsis*. These and the 13 species initially presumed to belong in *Phanomalopsis* are listed in the Appendix I.

The data set was built in Winclada v.1.00.08 (Nixon, 2002). Multicharacter transformation series were considered unordered and cladistic analyses were conducted in NONA v.2.0 (Goloboff, 1999), using the following settings for the tree searches: 10,000 subsearches were performed, each one of them comprising the construction of a Wagner tree using random taxon entry sequence, followed by TBR branch swapping with up to 100 most parsimonious trees retained from each replicate that yielded most parsimonious trees (hold 1000000; hold/100; mult*10000;); after all replicate searches had been conducted, shortest trees retained from the subsearches were TBR-swapped to completion (max*;). In a second search, the Ratchet method (Nixon, 1999) was employed using Winclada and NONA with the following parameters: 20,000 interations per replicate, 100 trees held per replicate; six characters resampled (~ 10% of the total number of characters). Winclada was set to perform two simultaneous ratchet runs in five sequential runs. The resulting tree was visualized and saved as a graphic file using Winclada.

Illustration of transformation series

Some of the transformation series employed in the phylogenetic analyses were employed and/or described and/or illustrated previously in other papers, especially Silveira (1995b), sometimes described and/or interpreted slightly

differently. References to figure numbers in those papers are given between parenthesis in italics and lower case *(fig.)* to avoid confusion with figures presented in this paper.

Morphological terminology

Morphological terminology used here is mainly that of Michener (1944), with the following additions by Silveira (1995a,b): The word *face* refers to the clypeus, supraclypeal area and paraocular area together. *Vertex* is used in reference to the topmost area of the head, between the lateral ocelli and the eye. The occipital carina and occipital fringe of previous authors are referred to as the *postocellar ridge* and *postocellar fringe*, respectively. Following Timberlake (1980), the band of erect plumose hairs along the posterior margin of the scutellum is called the *scutellar fringe* and the patch of erect plumose hairs on mid metanotum, contiguous with the scutellar fringe, is called the *metanotal tuft*. Metasomal terga and sterna are referred to, respectively, as T1, T2, etc., and S1, S2, etc. In referring to regions of the antenna, it is assumed that it is extended so that its long axis is perpendicular to the plane of the face and parallel to the long axis of the bee body. In referring to parts of the legs, it is assumed that the legs are extended ventrad, so that their long axes are perpendicular to the long axis of the bee body in lateral view. Terms applied are inner and outer surfaces (corresponding to ventral and dorsal surfaces when one considers the legs extended away from the bee body in the horizontal plane), and anterior and posterior edges.

Descriptions of species

In the beginning of the description of each sex for each species, it is indicated whether or not the specimen described is a type. When it is not, its collecting locality and date, collector and depository institution is indicated in parenthesis. *Exomalopsis jenseni* is redescribed thoroughly; the description of the other species, however, is limited to the characters that vary among them. Male descriptions are limited to those features in which they differ from female.

Size of punctures is expressed in an absolute but subjective scale in which punctures in a size class (minute, very fine, fine, moderately coarse and coarse) should be about the same size in small and large bees. Density of punctures, however, is expressed relative to the size of punctures (number of puncture diameters between the margins of two closest punctures). Thus, distance between dense, fine punctures is actually smaller than that between dense, coarse punctures. Punctures uniformly spread on a surface one-puncture diameter apart from each other are said to be dense. When punctures are not uniformly distributed, this is described by using terms such as moderately dense (most punctures are about one puncture diameter apart from one another, but some are more dispersed). When punctures of two distinct size classes are intermixed, their densities are described separately [*e.g.,* fine, dense punctures (one diameter apart) intermixed with coarse, sparse punctures (three diameters apart)].

Measurements of several structures are given in the descriptions. They are taken as follows: Widths (*e.g.,* of the eyes or metasoma) and diameters (*e.g.,* of the ocelli or flagellum) are always the maximum widths or diameters measurable. The diameters of the scape and of the fifth flagellomere are measured at half their lengths. Measurements taken on the head are shown in Fig. 1. The lengths of the pterostigma and of the marginal cell are measured on the margin of the wing. The length of the body is taken in dorsal view and is the distance between the disc of the clypeus and the posterior margin of propodeum plus the length of metasoma. Question marks indicate measurements that could not be taken on the specimen described.

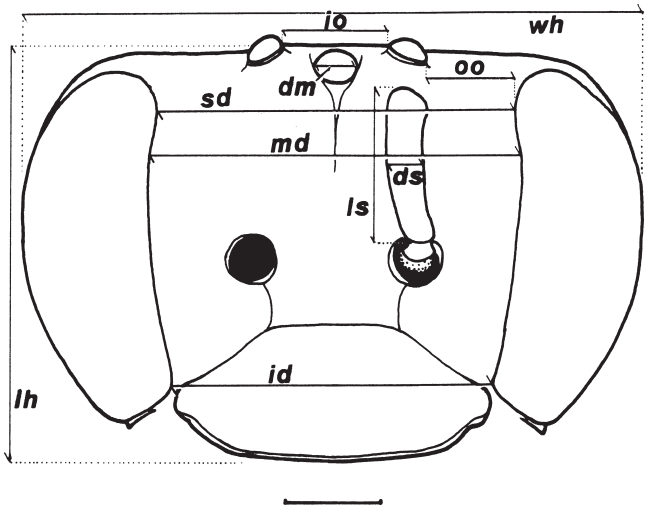

Figure 1 - Frontal view of head of *Exomalopsis (Phanomalopsis) jenseni* (female – hairs ommited) showing measurements taken for description of species. *dm* = diameter of mid ocellus; *ds* = diameter of scape; *id* = inferior distance between the eyes; *io* = interocellar distance; *lh* = length of head; *ls* = length of scape; *md* = maximum distance between the eyes; *oo* = ocello-ocular distance; *sd* = minimum superior distance between the eyes; *wh* = width of head.

Results

Transformation series

A total of 153 characters distributed in 57 transformation series were employed in the analyses. They are listed below:

01. Mandible of male: (0) without yellow pigmentation; (1) with yellow-pigmented area at least at base.

02. Labrum of male: (0) without yellow pigmentation; (1) with yellow-pigmented area.

03. Labrum of female: (0) flat, trapezoidal with longitudinal median line glabrous, sometimes elevated in relation to the rest of the disc and delimited by two rows of hairs [Fig. 2A]; (1) concave, triangular, with longitudinal median line undifferentiated [Fig. 2B].

04. Punctures on disc of clypeus of female: (0) mostly dense; (1) mostly sparse; (2) absent.

05. Clypeus of male: (0) without yellow pigmentation; (1) with yellow-pigmented area.

06. First flagellomere of male (measured dorsally): (0) less than three-fourths of length of second; (1) more than three-fourths of length of second.

07. Paraocular carina, on females, near lateral corner of clypeus: (0) absent; (1) present.

08. Vertex, behind eye, in frontal view: (0) not visible above eye [Fig. 3B]; (1) visible above eye [Fig. 3A].

09. Vertex of female, between ocellus and eye: (0) not excavated; (1) gently excavated; (2) deeply excavated [Silveira, 1995b – *fig. 1]*.

10. Postocellar ridge of female: (0) absent or weakly marked; (1) present, sometimes limited to portion just to sides of lateral occeli.

11. Hamuli of female: (0) 11 or less than 11; (1) more than 11.

12. Hamuli: (0) evenly spaced; (1) unevenly spaced [Almeida & Silveira, 1999 – *fig. 2]*.

13. Submarginal cells: (0) three; (1) two.

14. Punctures on disc of mesoscutum of female: (0) reaching area(s) beyond parapsidial lines, sometimes leaving one or two impunctate areas posteriorly [Fig. 4B]; (1) mostly restricted to the area anterior to parapsidial lines [Fig. 4A].

15. Punctures on disc of scutellum of female: (0) absent; (1) mostly fine, except sometimes at midline; (2) mostly coarse.

16. Punctures on disc of scutellum of female: (0) absent; (1) mostly sparse; (2) mostly dense.

17. Punctures on disc of scutellum of male: (0) absent; (1) mostly fine; (2) mostly coarse.

18. Punctures on disc of scutellum of male: (0) absent; (1) mostly sparse; (2) mostly dense.

19. Apical third of metapostnotum of female, above propodeal pit: (0) punctate as on propodeum or reticulate; (1) with well-delimited, shining, non-punctate area.

20. Propodeal articulating orifice: (0) directed upwards or slightly upwards; (1) directed downwards in an oblique plane [Silveira, 1995b – *fig. 5]*.

21. Transverse carina of T1 of male: (0) absent; (1) present, but weakly defined; (2) present and well defined (but less than on female); (3) present and as well defined as on female.

22. Disc of T1 of female, measured lengthwise at middle line: (0) longer than marginal area; (1) shorter than but not less than one-third as long as marginal area; (2) approximately one-third as long as marginal area or less.

23. Punctures on disc of T1 of female: (0) mostly coarse; (1) mostly fine; (2) absent.

24. Punctures on disc of T1 of female: (0) mostly dense; (1) mostly sparse; (2) absent.

25. Tomentum on marginal area of T2 of female: (0) present, forming a band, sometimes interrupted medially, that does not extend to margin of tergum; (1) present, sometimes interrupted medially, extending to margin of tergum; (2) absent.

26. Tomentum on marginal area of T3 of female: (0) present, forming a band, sometimes interrupted medially, that does not extend to margin of tergum; (1) present, sometimes interrupted medially, extending to margin of tergum; (2) absent.

27. Apical fringe of T5 of female: (0) with only common hairs (gently curved, poorly branched) [Almeida & Silveira, 1999 – *fig. 1b]*; (1) with special hairs (straight, with densely plumose apices) [Almeida & Silveira, 1999 – *fig. 1a]*.

28. Basitibial plate of female: (0) longer than wide (Fig.5B); (1) approximately as long as wide (Fig. 5A).

29. Apex of basitibial plate of female: (0) broadly rounded (Fig. 5A); (1) narrowly rounded (Fig. 5B).

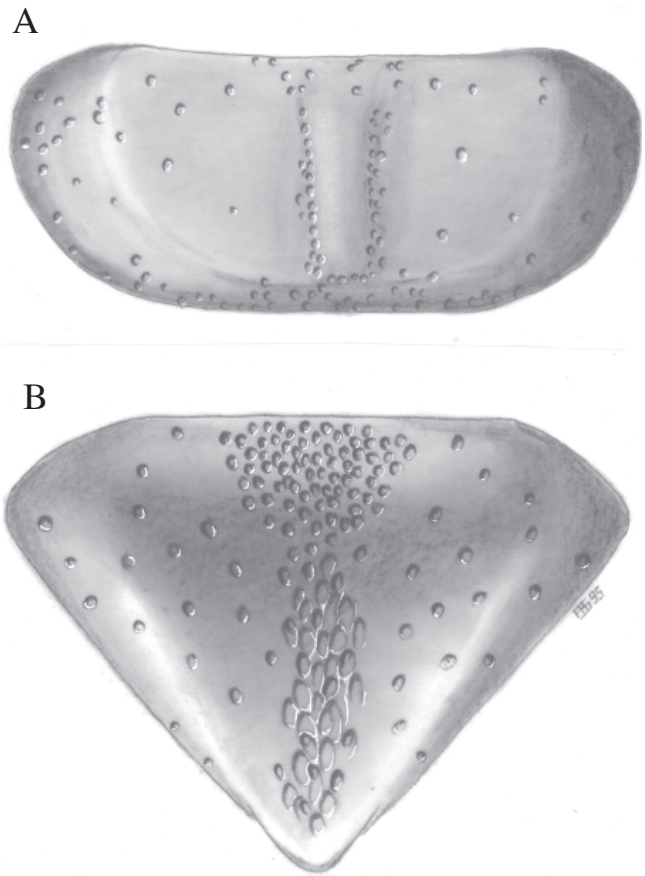

Figure 2 - Labra of **A)** *Exomalopsis (Exomalopsis) auropilosa* Spinola and **B)** *Exomalopsis (Phanomalopsis) snowi* Cockerell. Hairs ommited. (Reproduced from Silveira, 1995b, with permission of the University of Kansas Science Bulletin).

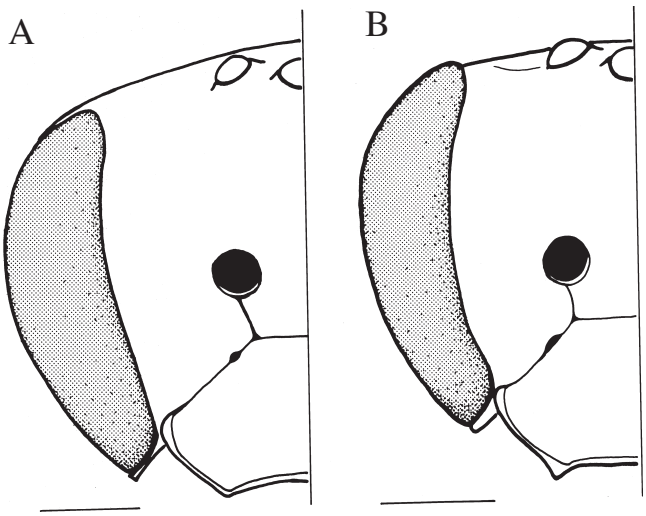

Figure 3 - Frontal views of heads of **A)** *Exomalopsis (Stilbomalopsis) birkmanni* Cockerell and **B)** *Exomalopsis (Exomalopsis) auropilosa* Spinola. Scale lines = 0.50 mm. (Reproduced from Silveira, 1995b, with permission of the University of Kansas Science Bulletin).

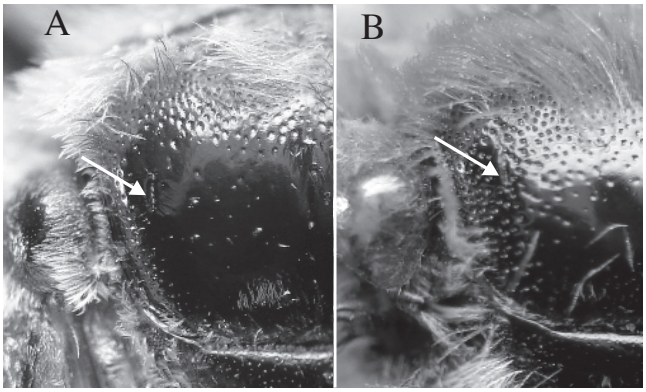

Figure 4 - Left portions of mesoscutum of **A)** *Exomalopsis (Phanomalopsis) jenseni* and **B)** *E. (Phanomalopsis) perikalles.* Arrows indicate the left parapsidal lines.

30. Basitibial plate of female: (0) simple, its central area bare or with normal simple pilosity, its margin in same plane as disk; (1) with central area covered by velvet-like pilosity and separated by groove from raised margin.

31. Dorsal longitudinal carina of posterior trochanter in both sexes: (0) absent; (1) present [Fig. 6].

32. S6 of male: (0) uniformly flat; (1) with median elevated area that broadens toward apex of sternum, forming carina or spine at each side.

33. Disc of S7 of male [Silveira, 1995b – *fig.8]:* (0) bilobed, lobes much broader than long; (1) sub-quadrangular, with lateral edges arcuate, closest to each medially; (2) with lateral margins sub-parallel at basal half, abruptly converging toward apex; (3) sub-quadrangular with apex narrower than base, with basilateral expansions; (4) sub-triangular.

34. Apical process of S7 of male [Silveira, 1995b – *fig.8]:* (0) absent; (1) present, with one lobe; (2) present, with two basilateral lobes; (3) present as a narrow transverse sclerite fused laterally to the arms of disc.

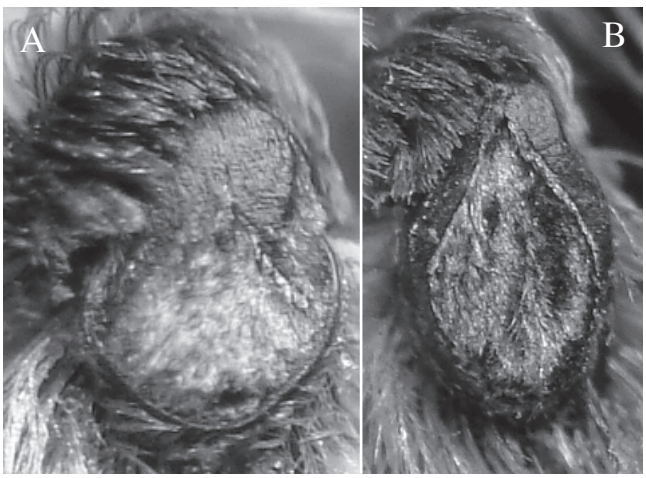

Figure 5 - Basitibial plates of **A)** *Exomalopsis (Phanomalopsis) jenseni* and **B)** *E. (Phanomalopsis) perikalles.*

35. Apical process of S7 of male: (0) absent; (1) with dorsal face expanded wing-like; (2) dorsal face not expanded.

36. Lateral process of disc of S7 of male [Silveira, 1995b – *fig. 8]:* (0) absent; (1) present.

37. Marginal flange of apical half of disc of S7 (besides lateral process): (0) absent; (1) present [Fig. 7C].

38. Disc of S7 of male: (0) with membranous area present, wider on apex than on base [Silveira, 1995b – *fig. 8h];* (1) with membranous area present, narrower on middle than on base or apex [Silveira, 1995b – *fig. 8b];* (2) without membranous area [Silveira, 1995b – *figs. 8a,d,e,f,g].*

39. Apical process of S8 of male: (0) short, with two short "V"-like arms [Silveira, 1995b – *fig. 9f];* (1) long, with a single bare, broad lobe separated from disc by strongly constricted stalk [Silveira, 1995b – *fig. 9e];* (2) long with single, broad, flat hairy lobe, separated from disc by long strongly constricted stalk [Silveira, 1995b – *fig. 9g];* (3) long with single broad lobe separated form disc by very short constricted stalk [Silveira, 1995b – *fig. 9a];* (4) produced into two short, robust, widely

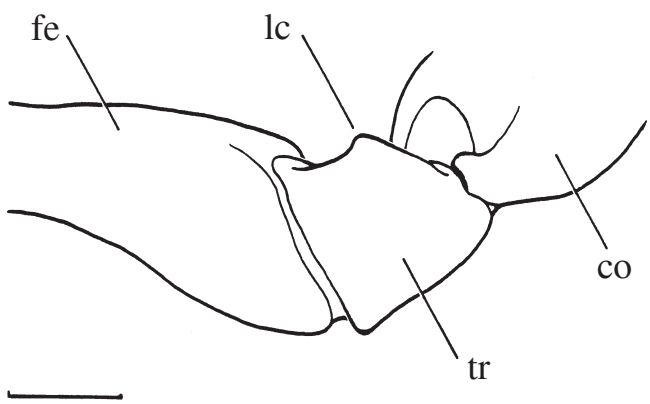

Figure 6 - Posterior view of hind trochanter of *Exomalopsis (Phanomalopsis) jenseni* Friese (♀). *co* = coxa; *fe* = femur; *lc* = longitudinal carina of trochanter; *tr* = trochanter. Scale line = 0.40 mm.

separated arms, without membranous area, attached to single base [Silveira, 1995b – *fig. 9c];* (5) produced into two long, narrowing gradually, widely separated arms, at least partially membranous, attached to single base [Michener & Moure, 1957 – *fig. 59];* (6) short, without projection [Michener & Moure, 1957 – *figs. 68, 71].*

40. Basal tuft of apical process of S8 of male: (0) absent [Silveira, 1995b – *fig. 9f]*; (1) adjacent to apical tuft [Figs. 7D, 8A-C]; (2) separated from apical tuft [Figs. 8D,E, 14].

41. Basal tuft of apical process of S8 of male: (0) absent; (1) short, restricted to base of apical process [Figs 7D; 8A-E]; (2) long, extended to base of lateral arms of apical process.

42. Basal lobe of basal tuft of apical process of S8 of male: (0) absent [Fig. 8C]; Michener & Moure, 1957 – *fig. 59];* (1) present [Figs. 7D, 8B,D, 14].

43. Pockets on the postero-lateral margin of disc of S8 of male: (0) absent; (1) present, at least partially contained inside disc perimeter [Michener & Moure, 1957 – *fig. 59]*; (2) present, projected outside the disc perimeter [Silveira, 1995b – *fig. 9c].*

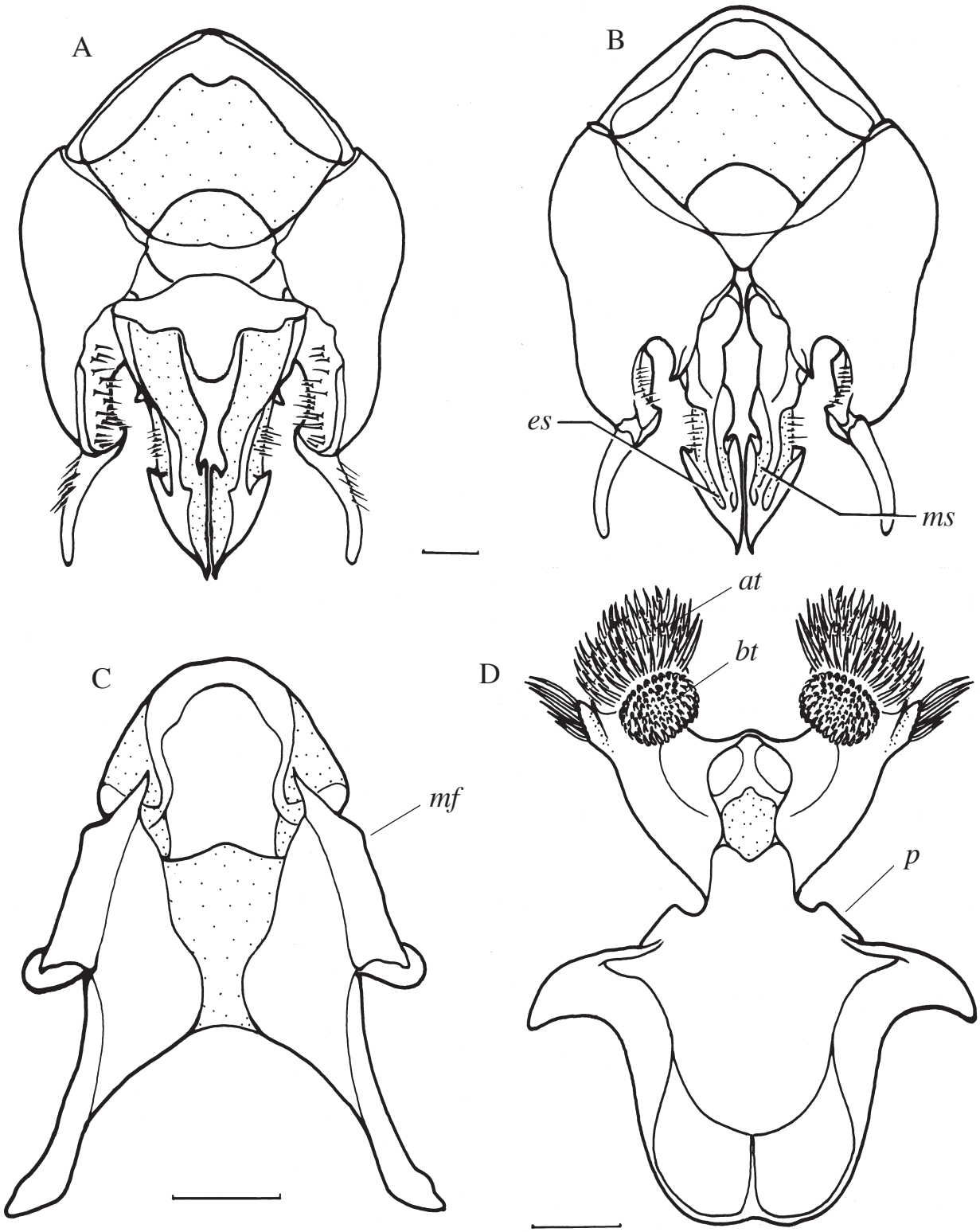

Figure 7 - Genitalia and hidden sterna of *Exomalopsis (Phanomalopsis) jenseni* Friese (♂): **A)** dorsal an **B)** ventral views of genitalia; **C)** dorsal view of S7 and **D)** ventral view of S8. *at* = apical tuft of apical process of S8; *bt* = basal tuft of apical process of S8; *es* = external sinus of penis valve; *mf* = marginal flange of apical half of disc of S7; *ms* = mesal sinus of pennis valve; *p* = pocket of the postero-lateral margin of disc of S8. Scale bar = 0.20 mm.

44. Posterior margin of dorsal bridge of penis valves, medially: (0) entire, notched or with small lobe [Silveira, 1995b – *figs. 10, 11a]*; (1) expanded into a lobe that extends between (but not over) the penis valves [Fig. 7A].

45. Expansion of dorsal bridge of penis valves, on posterior margin: (0) absent; (1) broad, but longer than wide; (2) narrow; (3) wider than long.

46. Ventral lobe of penis valves: (0) absent; (1) present [Silveira, 1995b – *fig. 11b].*

47. Ventral surface of penis valve, subapically: (0) evenly sclerotized in continuity with lateral surfaces of penis valve; (1) separated from lateral surfaces by mesal and external membranous sinuses [Fig. 7B].

48. Ventral internal surface of penis valve, subapically: (0) smooth; (1) microrugulate on margin.

49. Lateral process of penis valve: (0) spinaform; (1) elongate, projected behind; (2) short; (3) absent; (4) producing pocket.

50. Dorsal angle of lateral process of penis valves: (0) absent; (1) without projection; (2) with projection directed upwards.

51. Ventral angle of lateral process of penis valve (formed by posterior and ventral margins in lateral view): (0) absent; (1) obtuse; (2) abrupt (90º or less).

52. Internal dorsal transverse ridge of gonocoxite: (0) absent; (1) present [Silveira, 1995b – *fig. 10].*

53. Internal spine of ventral lobe of gonocoxite: (0) absent; (1) present [Silveira, 1995b – *fig. 11b].*

54. Dorsal flange of gonocoxite: (0) absent; (1) present, short and apical [Silveira, 1995b – *fig. 14]*; (2) present, elongate (reaching apex) [Michener & Moure, 1957 – *fig. 1];* (3) present, short, subapical [Silveira, 1995b – *fig. 11a].*

55. Basal lobe of dorsal flange of gonocoxite: (0) absent: (1) present.

56. Gonostylus: (0) broad, broader at apex than at base, flattened dorso-ventrally, originating at tip of gonocoxite [Silveira, 1995b – *fig. 13]*; (1) long, slender [Fig. 7A,B], sometimes with spherical apex; (2) short, triangular in profile broader at base than at apex [Silveira, 1995b – *figs. 10, 14].*

57. Hairs on disc of S3-S5 of female: (0) normal; (1) short, erect and hooked.

The data matrix employed for cladistic analysis is shown in the Appendix I. Since the males of *Exomalopsis diminuta* and *E. (Diomalopsis) alexanderi* and the female of *E. (P.) eremalis* sp.n. are not known, data referring to them are missing in the matrix (coded as "?"). Males of *E. (P.) dasypoda* and *E. (P.) testaceinervis* were not available for this study and, for this reason, characters for them are present in the data matrix only when they could be taken from the descriptions and drawings in Silveira (1995a).

Phylogenetic analyses

A single most parsimonious tree (length = 158; consistency index = 58 and retention index = 79) was found by Nona. The tree topology and the character distributions on it are shown in Fig. 9.

The results show *Phanomalopsis,* as presently defined, to be polyphyletic. The analyses suggest that *E. diminuta,* previously treated as part of *Phanomalopsis* (Silveira, 1995a, 1996; Silveira et al., 2002), does not belong in this subgenus. In the trees obtained, this species appears with *E. dubia* (described in Appendix II) in a polytomy with the species of *E. (Diomalopsis).*

Monophyly of the subgenus *Phanomalopsis* (minus *E. diminuta)* is supported in all trees obtained as well as its sister-group relationship to *Stilbomalopsis* (Figs. 9, 10). Additionally, all phylogenetic hypotheses suggest *Phanomalopsis* to be divided in three main lineages. The first of them, sister to the others, includes only *E. solitaria* (Fig. 10). The second (hereafter, the *aureosericea* species-group) contains two clades composed, respectively, of *E. trifasciata* and *E. perikalles* sp. n. and of *E. atlantica* and *E. aureosericea.* The third lineage [the *jenseni* species-group of Silveira (1995a)], contains *E. snowi, E. testaceinervis, E. dasypoda, E. jenseni, E. eremalis, E. griswoldi* and *E. gualamba* (the last three species described as new below).

Taxonomy

Considering the results of the cladistic analyses, *E. diminuta* is here removed from *Phanomalopsis.* This species and *E. dubia* sp.n., are suggested to be the two basal branches of *Diomalopsis*. However, since this subgenus is not in the scope of this paper and given that the eventual discovery of the males of *E. diminuta* and *E. dubia* can bring new light to the phylogenetic position of these species, we decided not to propose (possibly, prematurely) their formal inclusion in *Diomalopsis.* Instead, we leave them in *incertae sedis* (Fig. 10), until their phylogenetic position can be confirmed with confidence.

Exomalopsis subgenus *Phanomalopsis* Michener & Moure

Exomalopsis (Phanomalopsis) Michener & Moure, 1957:430; Hurd, 1979:2116; Timberlake, 1980:79, 83; Silveira, 1995b:450, 2007:265; Michener, 2000:664; Silveira *et al.,* 2002:126.

Type species: *Exomalopsis jenseni* Friese, 1908 (original designation).

Diagnosis

In both sexes: lateral ocelli above summit of head; area between lateral ocellus and eye broad, gently excavated (more so in males); postocellar ridge absent or very weakly-developed. **Female:** vertex, in frontal view, straight; superior margin of eyes below (sometimes almost at the same level as) summit of head behind it; premarginal line of T1 depressed, forming goove; disc of T1 punctate and pilose (sometimes only partially), at least one-third as long as marginal area; marginal area of T1 glabrous and shining, except sometimes for area behind dorsolateral convexities. **Male:** labrum and clypeus dark; S6 entirely flat; apical process of S7 complex, with two basi-lateral lobes on the ventral surface; apical process of S8 produced into two long arms, sometimes with hairs and complex accessory lobes.

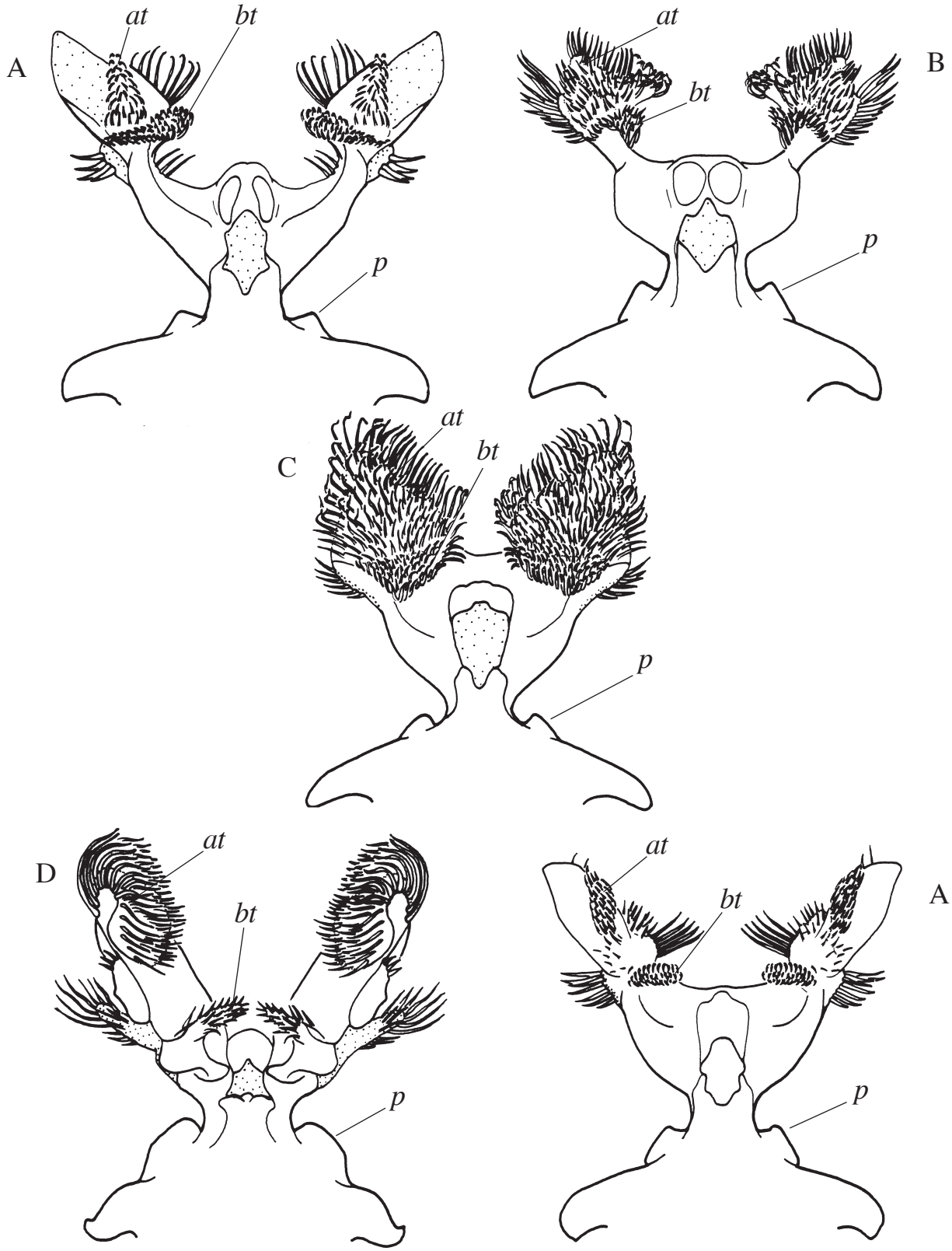

Figure 8 - Ventral view of the apical process of S8 of males of the *Exomalopsis (Phanomalopsis) jenseni* species group: **A)** *E. dasypoda* Strand; **B)** *E. eremalis* sp.nov.; **C)** *E. gualamba* sp.nov.; **D)** *E. snowi* Cockerell and **E)** *E. testaceinervis* Brèthes. *at* = apical tuft of apical process of S8; *bt* = basal tuft of apical process of S8; *p* = pocket of the postero-lateral margin of disc of S8.

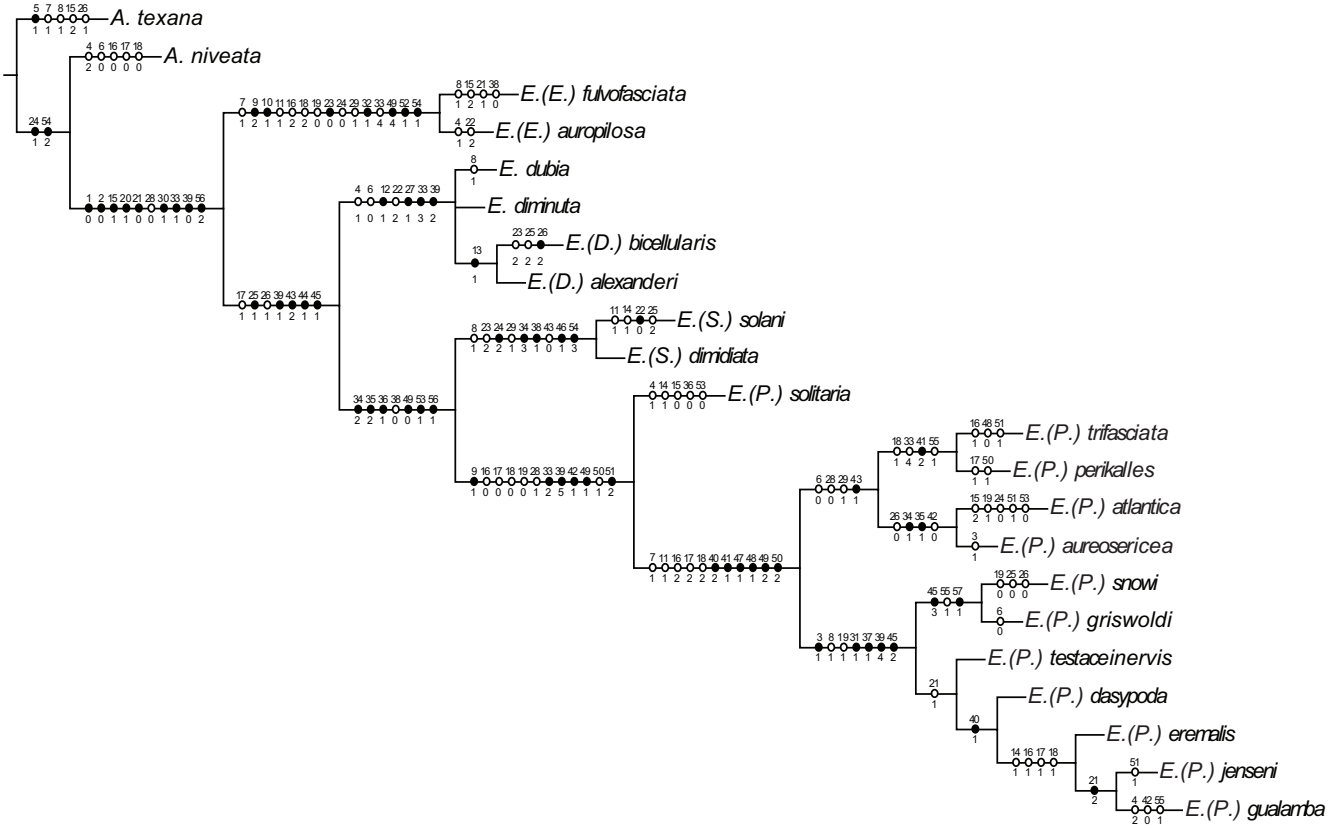

Figure 9 - Most parsimonious hypothesis and character distribution for 21 species of Exomalopsini produced using 57 transformation series. Length = 158 steps; ci = 0.59; ri = 0.79. Characters mapped using ACCTRAN optimization; full circles = uncontradicted apomorphies, empty circles = homoplasious apomorphies.

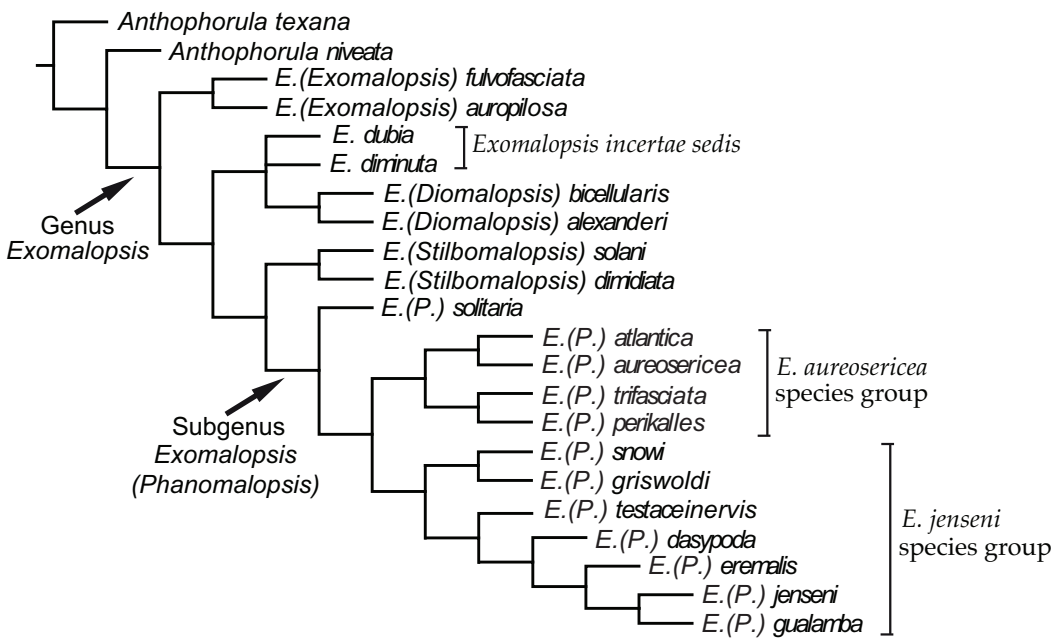

Figure 10 - Most parsimonious tree obtained for 21 species of Exomalopsini (see Fig. 9 for details), showing taxonomic groups supported in this phylogenetic hypothesis.

Key to the species of *Exomalopsis (Phanomalopsis)*

Females

(Note: the female of *E. eremalis* is not known)

01. Punctures on disc of mesoscutum mostly restricted to the area anterior and external to parapsidal lines, leaving most of mesoscutum smooth and shiny (Fig. 4A) **02**

— Punctures on disc of mesoscutum reaching area(s) beyond and between parapsidal lines, sometimes leaving one or two impunctate areas posteriorly (Fig. 4B) **04**

02. Small bees (length ≈ 6 mm); less than twelve hamuli per wing; posterior band of basitibial scopa light (white, yellowish or light fuscous); posterior trochanter without dorsal carina; tegula light yellow or light ferruginous..... ***E. solitaria* Brèthes, 1910**

— Larger bees (length > 7 mm); generally more than twelve hamuli per wing; posterior band of basitarsal scopa dark; posterior trochanter with dorsal carina (Fig. 6); tegula varying from black to light ferruginous **03**

03. Tegula dark (dark brown or black); wings hyaline and fuscous on apex ..... ***E. jenseni* Friese, 1908**

— Tegula ferruginous or yellowish; wings hyaline with yellowish tint ..... ***E. gualamba* sp. nov.**

04. Vertex behind eye, in frontal view, slightly visible above eye (Fig. 3A); labrum triangular and concave without a median elevated and impunctate longitudinal line (Fig. 2B); dorsal carina of posterior trochanter present (Fig. 6); basitibial plate as long as broad and with apex broadly rounded (Fig. 5A) **05**

— Vertex behind eye, in frontal view, not visible above eye (Fig. 3B); labrum rectangular or trapezoidal, almost flat except for a median elevated longitudinal line (sometimes slightly concave) (Fig. 2A); posterior trochanter without dorsal carina; basitibial plate longer than broad and generally with apex narrowly rounded (Fig. 5B) (broadly rounded in *E. aureosericea)* **08**

05. Hairs on discs of abdominal sterna hooklike **06**

— Hairs on discs of abdominal sterna straight or gently curved **07**

06. Larger bees (9.4 mm or larger); tomentose bands on T2-T4 variable, rarely as in *E. griswoldi,*below. Central America and southern North America ..... ***E. snowi* Cockerell, 1906**

— Smaller bees (8.7 mm or smaller); light tomentose apical bands on T2-T4 wide, covering the apical zones up to their margins but interrupted laterally by an apical fringe of black hairs and receding laterally, leaving a shiny impunctate area. Dry coast of Colombia and Venezuela, and northern Brazil ..... ***E. griswoldi* sp. nov.**

07. Hairs on mesosoma black ..... ***E. testaceinervis* Brèthes, 1910**

— Hairs on mesosoma ferruginous ..... ***E. dasypoda* Strand, 1910**

08. Pubescence of mesosoma ferruginous; tegula generally ferruginous, sometimes blackish ferruginous with brownish margins **09**

— Pubescence on mesosoma pale yellow or other color pattern, but never ferruginous; tegula generally dark (dark brown or black) **10**

09. Tegula dark (blackish ferruginous with margins brownish ferruginous); punctures covering all of mesoscutum; scopa black, except for a light tuft on apex of basitibial plate and a white band along frontal edge of basitarsus.... ***E. atlantica* Silveira, 1996**

— Tegula entirely ferruginous; mesoscutum, posteriorly, with a smooth area; scopa mostly ferruginous, except sometimes blackish posteriorly on the basitarsus and at the apex of basitibial plate ..... ***E. perikalles* sp. nov.**

10. Anterior face of tibial scopa black; punctures on disc of clypeus mostly sparse (one and a half to four puncture diameters apart); punctures on posterior half of mesoscutum generally finer than on anterior half and without impunctate areas ..... ***E. aureosericea* Friese, 1899**

— Anterior face of tibial scopa white or light yellow; punctures on clypeus moderately dense (one to two puncture diameters apart) to dense (one puncture diameter or less apart); punctures on posterior half of mesoscutum always as coarse as on anterior half and always leaving well defined areas impunctate and shiny ..... ***E. trifasciata* Brèthes, 1910**

Males

01. Punctures on disc of mesoscutum mostly restricted to the area anterior and external to parapsidal lines, leaving most of mesoscutum smooth and shiny (as in Fig. 4A) **02**

— Punctures on disc of mesoscutum reaching area(s) beyond and between parapsidal lines, sometimes leaving one or two impunctate areas posteriorly (as in Fig. 4B) **04**

02. Small bees (< 6.0 mm); fore wing homogeneously hyaline; posterior trochanter without dorsal carina; punctures on metapostnotum mostly dense (one puncture diameter or less apart); T1 without dorsal carina or ridge ..... ***E. solitaria* Brèthes, 1910**

— Larger bees (≈ 7.0 mm); fore wing hyaline with fuscous apex; posterior trochanter with dorsal carina (Fig. 6); punctures on metapostnotum mostly sparse (at least more than one puncture diameter apart); transverse carina or ridge of T1 present **03**

03. Tegula brownish or black; hairs on mesosoma mostly light yellow, but with a band of black hairs anterior to smooth area of disc of mesoscutum and another anteriorly on scutellar fringe; internal ventral surface of penis valves, subapically, serrate; dorsal flange of gonocoxite long, extending along more than half of gonocoxite length (Fig. 7A); S8 as in Fig. 7D ..... ***E. jenseni* Friese, 1908**

— Tegula ferruginous or yellowish; hairs on mesosoma ferruginous or light yellow, with no bands of black hairs; internal ventral surface of penis valves smooth; dorsal flange of gonocoxite subapical and short; S8 as in Fig. 8C ..... ***E. gualamba* sp. nov.**

04. Dorsal carina of posterior trochanter present (Fig. 6); arm of S8 short, robust and without membranous structures (Fig. 8A,B,D,E) **05**

— Dorsal carina of posterior trochanter absent; arm of S8 long, narrowing gradually and with membranous structures internally **09**

05. Yellow tomentose bands on T2-T4 merging with lateral light bands of terga, but interrupted subapically leaving a band of shining integument with sparse, fine punctures from which long, fine, simple setae arise; T1 without transverse carina or ridge **06**

— Yellow tomentose bands on T2-T4 concealing integument to apices of terga, but interrupted laterally (at least in T3 and T4) by black pubescence; transverse carina of T1 clearly demarcated at least medially **07**

06. Dry coast of Colombia and Venezuela, and northern Brazil. S8 as in Fig. 14 ..... ***E. griswoldi* sp. nov.**

— Central America and southern North America. S8 as in Fig. 8D ..... ***E. snowi* Cockerell, 1906**

07. Punctures on disc of T1 coarser than those on disc of scutellum, separated by one puncture diameter or less ..... ***E. eremalis* sp. nov.**

— Punctures on disc of T1 much finer than those on disc of scutellum, separated by one puncture diameter or more **08**

08. Pubescence on mesosoma with some ferruginous hairs intermixed with black ones (especially laterally) or entirely ferruginous; midapical area of apical process of S8 with two lateral spots darker than surrounding integument (Fig. 8A) ..... *E. dasypoda* Strand, 1910

— Pubescence laterally and dorsally on mesosoma entirely black; midapical area of apical process of S8 more or less uniformly sclerotized (Fig. 8E) ..... ***E. testaceinervis* Brèthes, 1910**

09. Hairs on mesoscutum dark brown or blackish ..... ***E. aureosericea* Friese, 1899**

— Hairs on mesoscutum light brown, creamy white or light ferruginous **10**

10. Mesoscutum densely punctate with two slightly protuberant areas posteriorly in which punctures are finer and denser than anteriorly and between which punctures are sparser ..... ***E. atlantica* Silveira, 1996**

– Posterior area of mesoscutum impunctate and shiny, without posterior protuberant areas **11**

11. Ventral surface of posterior trochanter without an apical expansion ..... ***E. trifasciata* Brèthes, 1910**

– Ventral surface of posterior trochanter with an apical triangular expansion directed downward ..... ***E. perikalles* sp. nov.**

***Exomalopsis (Phanomalopsis) jenseni* Friese**
(Figs. 1, 4A, 5A, 6, 7)

Exomalopsis jenseni Friese, 1908:386; Silveira, 1996:82 [lectotype designation], 2007:265.

Female (lectotype)

Body color – black except as follows: tegula blackish brown; flagellum ventrally and last flagellomere dorsally, S2-S4 dark brown; legs and S1 light brown; pterostigma and veins brownish; base and apex of mandible, mandibular condyle dark ferruginous; strigilus and spurs light ferruginous; apical margin of metasomal sterna yellowish; wings hyaline, dusky at apices.

Pubescence – mostly creamy white; black on anterior rows of postocellar fringe, posterior rows of anterior pilose area of mesoscutum and anterior rows of scutellar fringe; brownish on apex of hind femur over basitibial plate; apical fringe of metasoma brown to dark brown; apex of scopa posteriorly light brown; pale yellow on most of scopa; bright yellow tomentum on T1 laterally and T2 to T4. Hairs fine, semierect, about two times as long as flagellar diameter on clypeus and gena, forming tuft on midbasal area of labrum; mostly longer on trochanters and fore and hind femora; longer and denser on sides and venter of thorax, fore tibia, midbasitarsus and lateral angles of T1; much denser and decumbent on paraocular area; shorter on supraclypeal and interantennal areas; more densely plumose on anterior portion of mesoscutum, scutellar fringe and metanotal tuft; shorter, thinner and decumbent on basal and lateral areas of propodeum and between longer hairs of pronotum near lobe, trochanters and femora; minute and sparse on upper frons and vertex; appressed and dense on marginal zones of T2 to T4 and on lateral area of T1; semierect and straight, forming apical fimbriae on S2 to S5, denser on S5 than on S2 to S4. Internal margin of eye with paraocular cilia.

Punctures – on labrum moderately fine and sparse around edges (one or more diameters apart), very dense and finer on midbasal area under clypeal tuft; on clypeus moderately coarse and irregularly sparse (one or more diameters apart) intermixed with very fine sparse punctures, apical margin with a row of moderately coarse and minute punctures densely arranged; on apical margin of clypeus moderately coarse, fine and dense (arranged in a line); on supraclypeal area very fine and sparse laterally, leaving disc smooth and shiny; on subantennal and paraocular areas hidden by tomentum; on frons moderately fine and moderately dense (one to three diameters apart), progressively finer toward vertex; on vertex, between ocelli, minute but with few coarser punctures; on gena fine and sparse (two to four diameters apart), becoming minute along posterior margin of eye, coarser towards back of head; on postocellar region moderately coarse and dense (less than one diameter apart); on mesoscutum restricted to transverse band anterior to parapsidal lines, very fine and moderately sparse (two to three diameters apart) anteriorly (two to three diameters apart), moderately coarse and dense (less than one to two diameters apart) on posterior part of band, leaving most of disc smooth and shiny, along posterior margin minute and moderately dense; on scutellum very fine to minute and sparse on disc, coarse and very dense (less than one diameter apart) under scutellar fringe; on metanotum fine and dense laterally, coarser under tuft; coarse and very dense on disc of mesepisternum, becoming finer and more sparse posteriorly; on propodeum fine and dense; on metapostnotum minute and more sparse, intermixed with fine and sparse punctures, but leaving large portion of disc smooth and shiny; on disc of TI moderately fine and dense (one or less diameters apart) laterally, sparser and finer toward median area and leaving a large smooth and shiny median area anterior to premarginal line; marginal zone smooth and shiny; on marginal zones of T2 to T4 minute and sparse, hidden under tomentum.

Structure – labrum concave with apical margin pointed; clypeus very slightly convex; paraocular carina weak, evident only along lower portion of eye margin below level of antennal socket; frontal carina and sulcus present; vertex, behind eye, in frontal view, visible above eye; area between lateral ocellus and eye mostly convex, slightly excavated in front; postocellar ridge absent; fourteen hamuli per wing; posterior margin of pterostigma inside marginal cell abruptly truncate; posterior trochanter with dorsal pointed carina; basitibial plate with central velvet-like pilose area separated by groove from raised margin, plate approximately as long as wide with apical margin broadly rounded; pre-marginal line of T1 depressed, forming sulcus; disc of T1 about as long as marginal zone on median line.

Measurements (mm) – approximate body length: 7.8; of forewing: 7.4. Length and width of head: 1.92, 2.67. Maximum, inferior and superior distance between eyes: 1.72, 1.42, 1.59. Interocellar and ocello-ocular distances: 0.44; 0.40. Diameter of mid and lateral ocelli: 0.22; 0.21. Length and diameter of scape: 0.76; 0.15. Length of pedicel, 1st, 2nd, 3rd and terminal flagellomere: 0.18; 0.24; 0.17; 0.19; 0.31. Diameter of 5th flagellomere: 0.17. Length and width of mesoscutum: 1.45; 2.14. Length and width of prestigma: 0.22; 0.20. Length and width of pterostigma: 0.61; 0.26. Length and width of marginal cell: 1.10; 0.52.

Variation – hair color sometimes lighter, the creamy white hairs becoming almost purely white and the bright yellow tomentum on the metasomal terga becoming pale yellow. Amount of black hair in the postocellar fringe, on mesoscutum, scutellum and scopa sometimes reduced, being occasionally absent on scopa.

One specimen from Santa Cruz de la Sierra, Bolivia (deposited at SUNJ), has brownish black hairs also on the fore tibia and basitarsus and on the mid basitarsus. This is also a relatively huge specimen (about 12 mm long) and may belong to another species. However, it agrees with *E. jenseni* in all other features.

Male (Argentina, Buenos Aires, Felipe Sola; February, 1953. At SNOW).

Body color – As in female, but fore and mid basitarsus sometimes also light ferruginous.

Pubescence – similar to that on female, but with no black hairs on postocellar fringe, mid tibia or hind basitarsus; with very few black hairs on mesoscutum and scutellum; apical fringe of metasoma generally light yellow, sometimes with some brownish hairs; tomentum on T1 to T4 light yellow. Hairs longer than on female; denser on labrum, clypeus,

paraocular area and frons, completely hiding their surfaces; tomentum on metasomal terga somewhat sparser and less appressed.

Punctures – on labrum and face hidden by pubescence; on upper frons finer than on female, on vertex denser; on mesoscutum, more sparse and extending farther posteriorly, between parapsidal lines; almost completely absent on disc of scutellum; finer (but still coarse) and sparser on sides of thorax; coarser on propodeum; sparser on anterior vertical surface of T1; coarser and extending throughout disc and marginal zone on dorsal surface of T1.

Structure – labrum flat, apical margin smoothly curved; clypeus sligthly more protuberant than on female; paraocular carina weaker than on female; area between lateral ocellus and eye much more excavated than on female; transverse carina present; premarginal line of T1 not depressed. Genitalia and hidden sterna as shown in Fig.5

Measurements (mm) – body length: 7.1; of forewing: 6.7. Length and width of head: 1.90; 2.72. Maximum, inferior and superior distance between eyes: 1.69; 1.38; 1.59. Interocellar and ocello-ocular distances: 0.47; 0.37. Diameter of mid and lateral ocelli: 0.23; 0.21. Length and diameter of scape: 0.72; 0.20. Length of pedicel, 1st, 2nd, 3rd and terminal flagellomere: 0.20; 0.21; 0.26; 0.26; 0.36. Diameter of 5th flagellomere: 0.21. Length and width of mesoscutum: 1.64; 2.22. Length and width of prestigma: 0.21; 0.12. Length and width of pterostigma: 0.65; 0.27. Length and width of marginal cell: 0.99; 0.53.

Variation – hair color sometimes lighter – almost whitish in one specimen from La Pampa Province (labeled as from "Eva Perón"), Argentina; sometimes mostly yellow.

Material examined

Lectotype (♀) **–** Argentina, Mendoza; 22.1.1907 [Jensen]. *Exomalopsis jenseni* 1907, Friese det ♀. TYPUS. LECTOTYPUS *Exomalopsis jenseni* Friese. Zool. Mus. Berlin. Deposited at ZMHU.

Additional material – A total of 522 specimens (93 ♀♀, 429 ♂♂) from the following localities: **ARGENTINA: Buenos Aires** (Adroque, Bella Vista, Buenos Aires, C. de Mayo, Estación Felipe Sola, Sierra de la Ventana, Tornquist, Villa Elisa, Zelara); **Chaco** (Basail, Resistencia); **Cordoba** (Arguello, Agua de Oro); **Entre Ríos** (Primero de Mayo, Pronunciamento); **Formosa** (Gran Guardia); **La Pampa** [= Eva Perón] (Conhello, Cuchillo-Co, Hucal, Jacinto Aráuz, La Escondida); **La Rioja** (Estación Amado, Villa Unión); **Mendoza** (Mendoza); **Neuquén** (Zapala); **Río Negro** (Conesa, Laborde, Río Colorado, San Antonio Oeste); **San Juan** (Pie de Palo); **Santa Fé** (Carcarana, La Gallareta, Reconquista, Rosario, Vera, Villa Ana, Villa Guillermina); **Santiago del Estero** (Choya, Icano, Isca Yacu, La Banda); **Tucumán** (Tafí Viejo). **BOLIVIA: Santa Cruz de la Sierra** (?). **BRAZIL: Rio Grande do Sul** (Rio Grande). The specimens are deposited at BMNH, CUIC, LILLO, MACN, MSU, NHMW, PARIS, PLATA, SNOW, SUNJ, UNSM and UTAH.

Known activity period

November – April.

Exomalopsis (Phanomalopsis) atlantica Silveira

Exomalopsis (Phanomalopsis) atlantica Silveira, 1996:82, 2007:265.

Female (holotype)

Body color – black except as follows: apical half of mandible and tarsal claws redish; flagellum ventrally, fore and mid basitarsi, and margin of tegula dark brown; hind basitarsus, distitarsus, base of tarsal claws, wing veins and pterostigma, ferruginous. Wings hyaline with ferruginous tint, apices light dusky. Strigilus light ferruginous; spur of mid tibia blackish brown; spur of hind tibia dark brown.

Pubescence – fuscous on labrum, clypeus, supraclypeal area, paraocular cilia, vertex, anterior rows of pre-occipital fringe, ventrally on mesepisternum, laterally on T3-T5; whitish fuscous on gena and on median region of frons; ferruginous laterally on frons, posteriorly on pre-occipital fringe, on pronotal collar, mesoscutum, scutellum, metanotum, mesepisternum close to pronotal lobe and under tegula, and on inner surface of fore basitarsus; light ferruginous on paraocular area, medially on anterior vertical surface of T1; pale ferruginous on flat ventral surface of fore coxa; yellowish ferruginous on tomentose bands of T2-T5 (band of T2 reaching apical margin of tergum; bands of T3-T5 interrupted before apical margin); black on outer surface of fore basitarsus and apical fringe of T5. Scopa mostly black; small light tuft on apex of basitibial plate; white on frontal margin of basitarsus. Hairs on labrum limited to apical fringe, sparse basal line and two parallel median dense narrow rows (limiting a smooth row); on clypeus, portion of supraclypeal area close to antennal sockets and on paraocular cilia, long, fine and semierect; on rest of supraclypeal area very sparse; on frons longer and sparse; on vertex short and sparse; on paraocular area decumbent; on gena moderately long and sparse; on pre-occipital fringe long; on pronotal collar, mesoscutum, scutellum and metanotum, long and dense (but not hiding the body surface); on mesepisternum long; on flat ventral surface of fore coxa short, decumbent and dense; on anterior vertical surface of T1 moderately long, becoming longer laterally; apical margins of T3-T5 with simple, long and decumbent setae; on disc of S1, plumose and long; on discs of S2-S5 shorter, fine and sparse.

Punctures – on clypeus moderately coarse (one to three diameters apart from each other), leaving median longitudinal band smooth; on supraclypeal area fine and moderately dense laterally (one diameter apart), sparser medially (two diameters apart), leaving a median longitudinal band smooth; on frons fine and moderately dense (one to two diameters apart); on paraocular area finer and sparse; on vertex and gena very fine and sparse (two to five diameters); on vertex between ocelli coarser and dense (one diameter or less apart); on mesoscutum coarse and dense (less than one diameter apart) except two small posterior areas with slightly finer and sparser punctures; on scutellum and metanotum slightly finer but dense (less than one diameter apart); on mesepisternum coarse and dense (less than one diameter apart); on propodeum coarser and sparser (one diameter or less apart), on metapostnotum finer and dense (less than one diameter apart), smooth apically; on anterior vertical surface of T1 moderately fine and very sparse; on disc of T1

moderately fine (one diameter apart), progressively sparser toward pre-marginal line (one to three diameters apart); on pre-marginal line dense (one diameter or less apart); on disc of T2 moderately fine and dense (one diameter or less apart); on marginal areas of T2-T4 fine and sparse (one to three diameters apart); on S2-S4 moderately fine and sparse (one to three diameters apart), on disc forming a densely punctuate band close to pre-marginal line; on S5 and S6 denser and more uniformly distributed.

Structure – labrum trapezoid, flat with a median slightly elevated smooth longitudinal band; clypeus gently and uniformly convex, apical edge margined, its corners near mandible articulations ending as concave blade; anterior tentorial pit deep, its diameter about as large as those of punctures on clypeus; supraclypeal area slightly convex, lateral surface almost plane toward antennal sockets; frontal carina reduced to line beginning at the frontal depression; frons flat; frontal sulcus represented just by gentle depression near median ocellus; vertex gently excavated; pre-occipital carina absent; posterior margin of pterostigma inside marginal cell, truncate, forming angle of approximately 150°; transverse sulcus of T1 shallow but visible; disc of T1 2/5 of dorsal tergum surface.

Measurements (mm) – approximate body length = 9.0; of forewing 8.4. Length and width of head = 2.13, 3.01. Maximum, inferior and superior distance between eyes = 1.99, 1.74, 1.81. Interocellar and ocellar-ocular distances = 0.47, 0.45. Diameters of mid and lateral ocelli = 0.27, 0.24. Length and diameter of scape = 0.96, 0.17. Length of pedicel, 1st, 2nd, 3rd and terminal flagellomeres = 0.19, 0.28, 0.30, 0.30, 0.42. Diameter of 5th flagellomere = 0.19. Length and width of mesoscutum = 2.12, 2.57. Length and width of prestigma = 0.26, 0.13. Length and width of pterostigma = 1.09, 0.32. Length and width of marginal cell (measured on wing margin) = 2.06, 1.93.

Male (Boracéia S.P. Est. Biológica; 5-Febr-1960; PJSMoure & PDHurd)

Body color – black except: mandible blackish ferruginous; outer surface of hind leg dark ferruginous; tegula, pterostigma, wing veins, outer surface of mid leg and apical margin of sterna ferruginous; fore leg and inner surface of hind leg light ferruginous. Wings ferruginous, apex of forewing darkened by pubescence.

Pubescence – bright yellow to light ferruginous, except: brownish on discs of T1 and T2; brownish with some yellowish hairs intermixed on basal half of mid tibia and on find tibia. Most hairs dirty and tangled (hard to tell something more than their color).

Punctures – on clypeus moderately fine and irregularly sparsed (one and a half to five diameters apart), intermixed with minute and sparse punctures; on supraclypeal area moderately fine and moderately dense (one to two diameters apart); on paraocular area very fine and sparse (two to four diameters apart), except for a row of moderately coarse punctures close to eye margin; on upper frons moderately fine and moderately dense (one to two diameters apart); on vertex between ocelli moderately fine and moderately dense, sparser toward lateral ocellus; on vertex between eye and lateral ocellus fine and moderately sparse (one to three diameters apart); on gena fine and sparse (two to four diameters apart), finer toward eye margin; on anterior half of mesoscutum coarse and dense (one diameter or less apart), on posterior half sparser medially (two diameters or less apart), but finer and denser close to and over post-lateral protuberances, leaving a small area on the apex of each protuberance smooth and shiny; on scutellum and metanotum coarse and dense (less than one diameter apart), finer toward marginal areas; on metapostnotum coarse, dense (less than one diameter apart) and biselate – integument irregular among punctures; on propodeum coarse and dense (one diameter or less apart); on metapostnotum coarse and dense (less than one diameter apart) basally, inpunctate and shiny but lightly reticulate apically; on anterior vertical surface of T1 moderately coarse and moderately dense (one to two diameters apart), on disc of T1 and on T2 denser.

Structure – labrum rectangular, flat, apical margin straight; transverse carina of T1 present; premarginal line of T1 not depressed. Fourteen hamuli on both posterior wings.

Measurements (mm) – approximate body length = 9.1; of forewing 7.8. Length and width of head = 2.55, 1.95. Maximum, inferior and superior distance between eyes = 1.66, 1.45, 1.60. Interocellar and ocellar-ocular distances = 0.50, 0.44. Diameters of mid and lateral ocelli = 0.23, 0.22. Length and width of mesoscutum = 1.63, 2.10. Length and width of prestigma = 0.22, 0.22. Length and width of pterostigma = 0.96, 0.27. Length and width of marginal cell (measured on wing margin) = 0.82, 0.52.

Material examined

Holotype (♀) **–** Salesópolis – SP; Brasil, 20.12.92; [Wolfgang Wilms]. Estação Ecológica da Boracéia, 800-900 m; 23°32'S; 45°51'W. Deposited at MZUSP.

Additional material – One specimen (♂) from **BRAZIL: São Paulo** (Est. Biológica Boracéia) Deposited at UFPR.

Known activity period

December and February.

***Exomalopsis (Phanomalopsis) aureosericea* Friese**

Exomalopsis aureosericea Friese, 1899:253,254; Silveira, 1996:82 [lectotype designation], 2007:265.

Female (lectotype)

Body color – black except as follows: flagellum dorsally, first flagellomere, pedicel and tegula dark brown; S1-S3 brown, S4-S6 progressively darker; flagellum ventrally (except 1st flagellomere) yellowish light brown; apical margin of clypeus second third of mandible and mandibular condyle blackish ferruginous (darker on margin of clypeus); tibiae and femora internally ferruginous; basitarsi, spurs and strigilis light ferruginous; pterostigma and wing veins largely yellowish (C and R brown). Wings hyaline with yellowish tint, slightly dusky.

Pubescence – mostly blackish except as follows: fuscous on labrum, paraocular area and ventrally on mesosoma; ferruginous internally on basitarsal scopa; creamy on tomentose bands of T1-T4; whitish on metasomal sterna and anteriorly on basitarsal scopa. Hairs moderately short, semierect and moderately plumose on labrum, long on two longitudinal median stripes; on

clypeus fine, semierect and moderately long; on paraocular area plumose and dense; on frons moderately long, erect and moderately plumose; on gena moderately long, semidecumbent and moderately plumose; on mesoscutum plumose, moderately long and erect; on mesepisternum, scutellar and metanotal fringes long, plumose and erect; on propodeum and metapostnotum moderately short, semierect and plumose; on anterior vertical surface and lateral areas of T1 moderately long, fine and semierect. T1-T4 with medially interrupted bands of light tomentum (T4 also with darker tomentum). Apical fringe of T5 longer than on T4, both plumose. Hairs denser on apex than on base of wings.

Punctures – on labrum fine and dense (less than one diameter apart) along the two rows of punctures parallel to median smooth area, fine and sparse laterally (more than two diameters apart); on disc of clypeus fine and moderately sparse (one to three diameters apart) leaving a median longitudinal band impunctate and an apical transverse band sparsely punctate; on supraclypeal area very fine and sparse (more than two diameters apart), sparser toward frontal line; on frons fine and sparse (two to three diameters apart); on vertex, between eyes and ocelli very fine and very sparse (more than three diameters apart), between the ocelli fine and moderately dense (one to three diameters apart); behind the ocelli moderately coarse and dense; on gena minute and sparse (three to five diameters apart), coarser and biselate moving away from eye margin; on mesoscutum moderately coarse and dense (one diameter or less apart), finer and sparser on two areas at posterior third; on disc of scutellum coarse and dense (less than one diameter apart), finer and sparser on two bands: one anterior and transverse, the other longitudinal and median; on metanotum, coarse and dense (less than one diameter apart); on propodeum and metapostnotum moderately coarse and dense (one diameter or less apart); on disc of T1 fine and sparse (three to five diameters apart), with row of minute and sparse punctures over transverse sulcus, marginal zone largely impunctate, laterally minute and sparse (two to four diameters apart); on disc of T2 very fine and moderately dense (one to two diameters apart).

Structure – labrum almost flat (except for a longitudinal median elevated line) and trapezoidal, apical margin slightly roundly projected; vertex gently excavated; vertex, behind eye, in frontal view, not visible above eye; pre-occipital carina absent; basitibial plate longer than wide, with apex narrowly rounded; disc of T1 about 3/5 of dorsal surface of tergum.

Measurements (mm) – approximate body length = 9.1; of forewing 8.7. Length and width of head = 2.18, 2.83. Maximum, inferior and superior distance between eyes = 1.96, 1.65, 1.76. Interocellar and ocellar-ocular distances = 0.45, 0.42. Diameters of mid and lateral ocelli = 0.26, 0.24. Length and diameter of scape = 0.82, 0.19. Length of pedicel, 1st, 2nd, 3rd and terminal flagellomeres = 0.20, 0.25, 0.25, 0.22, 0.36. Diameter of 5th flagellomere = 0.18. Length and width of mesoscutum = 1.95, 2.85. Length and width of prestigma = 0.23, 0.23. Length and width of pterostigma = 0.85, 0.31. Length and width of marginal cell (measured on wing margin) = 1.05, 0.60.

Variation – transverse tomentose bands of terga sometimes continuous (specimens from Paraná state, Brazil), sometimes medially intertupted (specimens from states of Bahia, Espírito Santo, Minas Gerais, and São Paulo – Brazil.); these bands varying from bright yellow to whitish. Punctation on metapostnotum of specimens from Paraná state (Brazil) are similar to that on propodeum, in those specimens to the north, however, the apical portion of the metapostnotum is impunctate and sometimes reticulate. Pubescence on mesosoma varies from black to brown. Wing tint varies from yellow to fuscous; wing veins vary from yellow to dark ferrugineous. Dark portions of scopa sometimes lighter.

Male (Local: Araponga MG; Data: 25/03/86; Col. G. Melo).

Body color – black except as follows: flagellum dorsally, mid basitarsus and mid tibia blackish ferruginous; flagellum ventrally dark ferruginous; pterostigma, wing veins, inner face of legs, fore tarsus, fore femur, fore tibia, mid and hind mediotarsi, mid and hind distitarsi ferruginous. Wing yellowish dusky.

Pubescence – mostly blackish, light fuscous on head (except postocellar fringe), mid basitarsus, apex and fore of hind basitarsus; fuscous on mesosoma ventrally; bright yellow on bands of hairs on T2-T4.

Punctures – on labrum moderately fine and moderately sparse (one to three diameters apart from each other); on clypeus very fine and sparse (three or more diameters apart); on upper frons fine and sparse (one to three diameters apart); on vertex between ocelli and between eye and ocellus very fine and sparse (two or more diameters apart); behind ocelli moderately coarse and dense (less than one diameter apart); on gena fine and sparse (one to four diameters apart); on mesosoma coarse and dense (less than one diameter apart), with two small impunctate areas posteriorly; on scutellum, metanotum, propodeum and metapostnotum moderately coarse to coarse and dense (less than one diameter apart), intermixed with finer punctures; on T1 coarse and dense (one or less than one diameter apart); on disc of T2 coarse and dense (less than one diameter apart).

Structure – labrum rectangular, flat, apical margin straight; transverse carina of T1 present; premarginal line of T1 not depressed. Ten hamuli on left wing and eleven on right wing. Genitalia and hidden sterna were illustrated by Michener & Moure (1957 – Figs. 58-60)

Measurements (mm) – approximate body length = 6.8; of forewing 7.0. Length and width of head = 1.83, 2.27. Maximum, inferior and superior distance between eyes = 1.46, 1.25, 1.42. Interocellar and ocellar-ocular distances = 0.34, 0.21. Diameters of mid and lateral ocelli = 0.21, 0.20. Length and diameter of scape = 0.57, 0.20. Length of pedicel, 1st, 2nd, 3rd and terminal flagellomeres = 0.15, 0.15, 0.29, 0.28, 0.35. Diameter of 5th flagellomere = 0.18. Length and width of mesoscutum = 1.36, 1.81. Length and width of prestigma = 0.21, 0.18. Length and width of pterostigma = 0.78, 0.26. Length and width of marginal cell (measured on wing margin) = 0.82, 0.48.

Variation – hair color on legs (especially hind leg) varies from black to white. Pubescence of mesosoma varies from fuscous to black; on head pubescence varies from whitish to brown.

Material examined

Lectotype (♀) – Brasil; *Exomalopsis aureosericea* ♀ det. Friese 1898 Type Zool. Mus. Berlin". Deposited at ZMHU.

Additional material – A total of 65 specimens (40 ♀♀, 25 ♂♂) from **BRAZIL: Bahia** (Vitória da Conquista); **Espírito Santo** (Cariacica, Santa Tereza, São Roque); **Minas Gerais** (Araponga, Baependi, Gonçalves, Itamonte, Passos); **Paraná** (Curitiba, Guarapuava); **Santa Catarina** (Nova Teutônia); **São Paulo** (Campos do Jordão, Rio Claro). The specimens belong to the following collections: MEUV; NHMW, UFMG, UFPR, SNOW, SUNJ and ZMHU.

Known activity period

January to December.

***Exomalopsis (Phanomalopsis) dasypoda* Strand**
(Fig. 8A)

Exomalopsis dasypoda Strand,1910:515; Silveira, 2007:265.

Female (holotype).

Body color – black, except as follows: flagellum dorsally, gena and legs (except hind tibia and tarsus) brown; flagellum ventrally light brown; basal half of mandible dark ferruginous; tegula, pterostigma and wing veins light ferruginous; apical margins of metasomal sterna light yellow; wings hyaline with ferruginous reflection.

Pubescence – blackish on head (except labrum), largely on legs (except whitish on coxae, trochanters and femora and on mid and hind basitarsi), on posterior band of scopa and anteriorly on hind tibia, laterally on marginal zones of T2 – T4 (lighter laterally), on apical fimbria of T4 and on apical fringe of metasoma (with brown tips); on preoccipital fringe black (branches of some hairs yellowish); inferiorly on paraocular area yellow intermixed with black hairs (looking like brown); on labrum yellowish; light ferruginous on pronotal collar, mesoscutum, scutellum, mesepisternum laterally and anterior surface and disc of T1; pale yellow on tomentose bands of T2 to T4; whitish on ventral surface of mesosoma and on metasomal sterna. Tomentose bands of T2 to T4 terminated laterally before edge of terga by black pubescence; hairs on metasomal sterna straight.

Punctures – on labrum fine, very dense under tuft, moderately fine and moderately sparse laterally (one to four diameters apart), apex impunctate; on clypeus moderately coarse and dense, intermixed with few very fine and minute, sparse punctures (two to five diameters apart); on supraclypeal area and subantennal area moderately fine and dense, progressively sparser medially, intermixed with minute sparse punctures; on paraocular area hidden under tomentum; on frons moderately fine and dense (less than two diameters), becoming minute under ocelli; on vertex between lateral ocellus and eye minute to very fine and very sparse (more than three diameters apart); on vertex, between ocelli, very fine to fine and moderately dense (one to two diameters apart); on gena fine and sparse, finer toward eye margin; on mesoscutum minute along anterior margin, coarse and very dense anterior to parapsidal lines, progressively sparser posteriorly on sides, leaving two small ill-defined lateral impunctate areas posteriorly; on scutellum moderately coarse and dense (between half and one diameter apart) on disc, denser under fringe; on metanotum moderately coarse and very dense; on mesepisternum coarse and very dense on disc, fine and sparse on anterior surface; on propodeum fine and very dense on lateralmost areas, progressively sparser downward, progressively finer and sparser toward propodeal pit; on metapostnotum very fine and dense basally, impunctate and shiny apically; on T1 very fine and moderately dense on anterior surface, very fine and moderately dense on disc (one or more diameters apart), becoming finer toward premarginal line, but not reaching it, marginal zone smooth; on disc and marginal zone of T2 very fine and moderately sparse (two to three diameters apart), hidden under pubescence; on following terga hidden under pubescence.

Structure – Sixteen hamuli on left wing and eighteen on right; disc of T1 as long as marginal zone on midline.

Measurements (mm) – approximate body length: 8.6; of forewing: 7.7. Length and width of head: 2.05; 2.99. Maximum, inferior and superior distance between eyes: 1.97; 1.63; 1.80. Interocellar and ocello-ocular distances: 0.54; 0.44. Diameter of mid and lateral ocelli: 0.24; 0.23. Length and diameter of scape: 0.86; 0.17. Length of pedicel, 1st, 2nd, 3rd and terminal flagellomeres: 0.21; 0.25; 0.21; 0.20; 0.37. Diameter of 5th flagellomere: 0.18. Length and width of mesoscutum: 1.84; 2.41. Length and width of prestigma: 0.28; 0.20. Length and width of pterostigma: 0.67; 0.25. Length and width of marginal cell: 1.30; 0.51.

Male (Argentina, Chaco, Resistencia; November 5, 1945 [A.Ogloblin]. Deposited at PLATA).

Body color – black, except as follows: flagellum ventrally, tegula, pterostigma, wing veins and distitarsi ferruginous; flagellum dorsally brown; legs brownish-black; wings hyaline with ferruginous reflection.

Pubescence – white on face, anteroapically on mid and hind tibia, anteriorly on mid and hind basitarsi and on metasomal sterna; black on gena, postocellar fringe, most of legs, marginal zone of T1, apical fimbria of T1 to T5, laterally on marginal zones of T2 to T5, on apical fringe of metasoma; ferruginous on pronotal collar, mesoscutum, scutellum, metanotum and mesepisternum; pale yellow on tomentose bands of T2 to T5, which are terminated before lateral edges of metasoma by black pubescence.

Punctures – on labrum and face hidden by pubescence; on upper frons and vertex between ocelli and eye very fine and dense (one diameter apart); on gena fine and moderately dense (one to two diameters apart), minute and dense along eye margin; on postocellar region fine and dense; on pronotum hidden; on mesoscutum moderately coarse and very dense anterior to parapsidal lines (one half diameter apart), progressively coarser posteriorly and leaving two small posterior areas impunctate; on scutellum moderately coarse, irregularly dense on disc, very dense under fringe; on metanotum fine and very dense on lateralmost area beyond transmetanotal suture, very fine and dense on midlateral areas, fine and very dense under tuft; on mesepisternum moderately coarse and very dense on disc, progressively finer and sparser on anterior surface toward pronotum; on propodeum fine to moderately coarse on upper lateral areas, progressively finer toward apex of metapostnotum, which is impunctate; on T1 fine and dense on anterior surface and disc, very fine and moderately dense on

marginal zone (one to two diameters apart); on T2 to T5 hidden under pubescence.

Structure – transverse carina of T1 present. Apex of S8 as shown in Fig.6A.

Measurements (mm) – approximate body length: 7.1; of forewing: 6.4. Length and width of head: 1.90; 2.83. Maximum, inferior and superior distance between eyes: 1.70; 1.49; 1.66. Interocellar and ocello-ocular distances: 0.46; 0.40. Diameter of mid and lateral ocelli: 0.21; 0.19. Length, frontal and lateral widths of eye: 1.64; 0.48; 0.69. Length and diameter of scape: 0.74; 0.19. Length of pedicel, 1st, 2nd, 3rd and terminal flagellomeres: 0.16; 0.21; 0.23; 0.23; 0.36. Diameter of 5th flagellomere: 0.20. Length and width of mesoscutum: 1.59; 2.22. Length and width of prestigma: 0.21; 0.10. Length and width of pterostigma: 0.59; 0.24. Length and width of marginal cell: 1.07; 0.56.

Variation – one male from Bolivia has the pubescence mostly black on mesosoma with just a tuft of ferruginous hair under the wings on the upper area of mesepisternum and lateralmost area of propodeum (see "Comments," below).

Material examined

Holotype (♀) – Asuncion, Paraguay, Trinidad; 11.IV.06 ♀ [J.D. Anisits]. Type. *Exomalopsis dasypoda* m. Strand det. Deposited at ZMHU.

Additional material – A total of 11 specimens (9 ♀♀ and 2 ♂♂) from **ARGENTINA: Entre Rios** (1º de Mayo, Pronunciamento); **Formosa** (Gran Guardia); **Chaco** (Basail, Resistencia); **Santa Fé** (Villa Ana). **BOLIVIA:** Santa Cruz (5 km W. of Montero, 300 m). **BRAZIL: Mato Grosso** (40 km S Poconé). **PARAGUAY:** (Asunción, San Bernardino). Deposited at BMNH, PLATA, SUNJ, UFPR.

Known activity period

November to April.

Comments

Strand (1910:516) mistakenly took the large marginal zone of T1 for T2, when he described the 'second abdominal segment' as impunctate, hairless and very shiny. In the same way, what he calls segments 3, 4, 5 and 6 are actually T2, T3, T4 and T5.

E. dasypoda and *E. testaceinervis* Brèthes are so similar to one another that for a while they were intended to be synonymized, especially given that only a few specimens of each were seen. The only consistent difference found between their females was pilosity color on the mesosoma (black in *testaceinervis*, ferruginous in *dasypoda*). The examined females of *E. dasypoda* are also somewhat larger and have slightly coarser punctures than the two examined females of *E. testaceinervis*. These characters, however, are somewhat variable in some other species in the genus (and for this reason were not employed in the cladistic analyses) and the observed differences might be an effect of the small sample available for study.

The males of these species are still more difficult to tell apart. Only three males assignable to *E. dasypoda* or *E. testaceinervis* were found. Two of them had i) two areas darker than the surrounding integument on the mid apical margin of the apical process of S8; ii) a weakly defined carina on T1 (character 23-1) (absent – character 23-0 – in the other) and iii) basal and apical tufts of the apical process of S8 adjacent one to another (character 43-1) (separate – character 43-2 – in the other specimen). Since those two males have ferruginous color in the mesosomal pubescence, they were assigned to *E. dasypoda,* while the third one was assigned to *E. testaceinervis.* That one of these two males assigned to *E. dasypoda* has mostly black hairs on the dorsal areas of the mesosoma suggests that such variation in color may also eventually be found among females. Study of the genitalia of the holotype of *testaceinervis* could help in correctly identifying this species. However, the type is in such bad condition that it was decided not to dissect it.

Notewithstanding, these species never appeared as sisters in the phylogenetic analyses. Characters separating them in the trees are characters 23-1/0 and 43-1/2, as outlined above.

***Exomalopsis (Phanomalopsis) eremalis* sp.nov.**
(Figs. 8B, 11)

Diagnosis

Only one specimen is known of this species. It is similar to, although considerably larger than, the known males of *E. dasypoda* and *E. testaceinervis*. It can be distinguished from these by the punctures on the disc of T1, which are coarser than those on the disc of the scutellum (finer in *dasypoda* and *testaceinervis*) and separated by one puncture diameter or less (one or more diameters apart on the two other species). The lateral lobe of the apical process of S8 is also different (Fig. ?).

Female. Unknown.

Male (holotype).

Body color – black, except as follows: flagellum ventrally, tegula, pterostigma, wing veins, strigilis, spurs and distitarsi ferruginous; flagellum dorsally and metasomal sterna blackish brown; wings hyaline, lightly fumose at apex.

Pubescence ? white on face, on posterior fimbriae of fore and mid tibiae, laterally on fore and mid tibiae and most of hind tibia; anteriorly on hind basitarsus, on trochanters and femora and on anterior vertical surface of T1; pale yellow on postoccipital fringe, disc of T1 and marginal zone of T2 to T4; brownish black on apex of hind femur over basitibial plate, laterally and posteriorly on hind basitarsus; black laterally on T2 to T4 and on all of T5 and T6.

Punctures – on labrum fine, moderately sparse on apical half (less than one to three diameters apart), very dense basally (half a diameter apart or less); on face hidden under tomentum; on upper frons, near ocelli, very fine and moderately sparse (one to two diameters apart); on vertex, between lateral ocellus and eye, minute and sparse (two diameters or more apart); on gena fine and moderately sparse toward back of head (one diameter or more apart), minute and moderately sparse along posterior eye margin; on postocellar region fine and dense (one diameter apart); under pronotal collar moderately coarse and very dense, intermixed anteriorly with minute punctures which do not form a

distinct band; on mesoscutum fine and moderately dense medially near pronotum (less than one to more than one diameter apart), progressively coarser posteriorly, leaving posterior to parapsidal lines two broad impunctate areas separated by a longitudinal line of punctures and not reaching lateral margins of scutum; on scutellum very fine to fine and moderately sparse (one to two diameters apart) on disc, fine and very dense under fringe; on metanotum fine and very dense on lateralmost area (beyond spiracle), minute to very fine and moderately dense (one diameter or more apart) midlaterally, fine and very dense under tuft; on mesepisternum coarse and very dense on disc, finer and sparser below on anterior surface; on propodeum coarse and very dense, sparser toward propodeal pit; on metapostnotum moderately coarse and dense basally, impunctate and shiny apically; on anterior vertical surface of T1 fine and dense (one diameter apart), coarser toward upper lateral areas but finer and very dense on band along transverse carina and leaving impunctate a small upper medial circular area; on disc of T1 fine, very dense along transverse carina, sparser and again denser toward premarginal line; on marginal zone of T1 very fine and sparse (two to three diameters apart).

Structure – transverse carina on T1 present but weak. Apex of S8 as shown in Fig.6B.

Measurements – approximate body length: 8.2; of forewing: 7.3. Length and width of head: 2.17; 3.07; Maximum, inferior and superior distance between eyes: 1.79; 1.50; 1.75. Interocellar and ocello-ocular distances: 0.55; 0.37. Diameter of mid and lateral ocelli: 0.25; 0.21. Length and diameter of scape: 0.84; 0.21. Length of pedicel, 1st, 2nd, 3rd and terminal flagellomeres: 0.17; 0.20; 0.27; 0.27; 0.39. Diameter of 5th flagellomere: 0.22. Length and width of mesoscutum: 1.88; 2.35. Length and width of prestigma: 0.21; 0.12. Length and width of pterostigma: 0.62; 0.29. Length and width of marginal cell: 1.35; 0.67.

Material examined

Holotype (♂) – ARGENTINA, Catamarca, Londres; February 1, 1970 [L.E. Pena]. AMNH.

Known activity period

February.

Etymology

From the Greek *eremia* (desert), referring to the habitat of the species.

***Exomalopsis (Phanomalopsis) griswoldi* sp.nov.**
(Figs. 12, 13, 14)

Diagnosis

This species is known only from the dry coastal region of Colombia and Venezuela and from a low-altitude area of natural open fields in the northern Brazilian state of Roraima. It can be distinguished from all other species in the subgenus, except for the very similar *E. snowi,* for its hooked hairs on the abdominal sterna. According to the phylogenetic analysis presented above, *E. griswoldi* and *E. snowi* are sister species and their similarity is probably due to a relatively short divergence period. The females of *E. griswoldi* can be distinguished from those of *E. snowi* for their consistently smaller size and the tomentose apical bands on T2 to T4, which resemble those of *E. dayspoda* and *E. testaceinervis,* and which cover the marginal zones up to their apices, but recede laterally, where they are terminated by black hair and by an area of impunctate integument. Their males, however (15 were examined), could not be distinguished from the males of *E. snowi* by external morphological characters and only hardly by their slightly different hidden sterna (Figs. 8D, 14).

Female (holotype).

Body color – black, except: transverse stripe near base of mandible, dark ferruginous; ventral face of flagellum, distitarsi, strigilus, spurs, tegula, pterostigma and wing veins, light ferruginous; scape, flagellum dorsally and legs, dark brown; wings hyaline.

Pubescence – white on clypeus, paraocular areas, frons, gena, ventral parts of mesosoma and metasoma, coxae, trochanters, femora, most mid tibia and basitarsi, anterior and posterior floccus of tibial scopa and anterior floccus of basitarsal scopa; bright ferruginous on postocellar fringe, most of mesoscutum, scutellar fringe, metanotum, upper half of mesepisternum, lateralmost portions of propodeum near wing insertion and internal surfaces of mid and hind basitarsi; pale yellow on disc of mesoscutum around impunctate areas, disc of scutellum and of T1, premarginal bands of T2-T5 and apical fringe of T6; black on upper portions of gena and paraocular cilia, on apical and posterior margin of outer surface of mid tibia, posterior fringe of mid basitarsus, mid and apical portions of tibial scopa, posterior floccus of basitarsal scopa, apical fringes of T2-T5. Hairs, on labral tuft, fine, semierect, about two times as long as flagellar diameter; on clypeus and on supraclypeal area laterally, minutely and sparsely branched, semierect, between one and two times as long as flagellar diameter; on paraocular areas, densely plumose and apressed; on frons and postocellar fringe, densely plumose, three times as long as flagellar diameter, semierect; on mesoscutum, scutellar fringe and metanotal tuft, densely plumose, one and a half to two times as long as flagellar diameter; on mesepisternum, about two times as long as flagellar diameter near pronotal lobe, up to four times as long as flagellar diameter ventrally; on femora, fine, erect, about two times as long as flagellar diameter; on outer surface of mid tibia, as long as or longer than flagellar diameter and somewhat apressed; on outer surface of mid basitarsus, longer (two to three times as long as flagellar diameter anteriorly, four or more times as long as flagellar diameter posteriorly); on anterior vertical surface of T1, plumose, erect, two or more times as long as flagellar diameter near transverse carina and medially, somewhat apressed laterally and close to premarginal line; apressed on marginal areas of T2-T5; on disc of S3-S5 short and hooked, on marginal areas moderately long and semierect, on marginal fimbria long, minutely and sparsely branched. The tomentose bands on the metasomal terga, which cover the marginal zones up to their apices, but recede laterally, where they are terminated by black hair and by an area of impunctate integument.

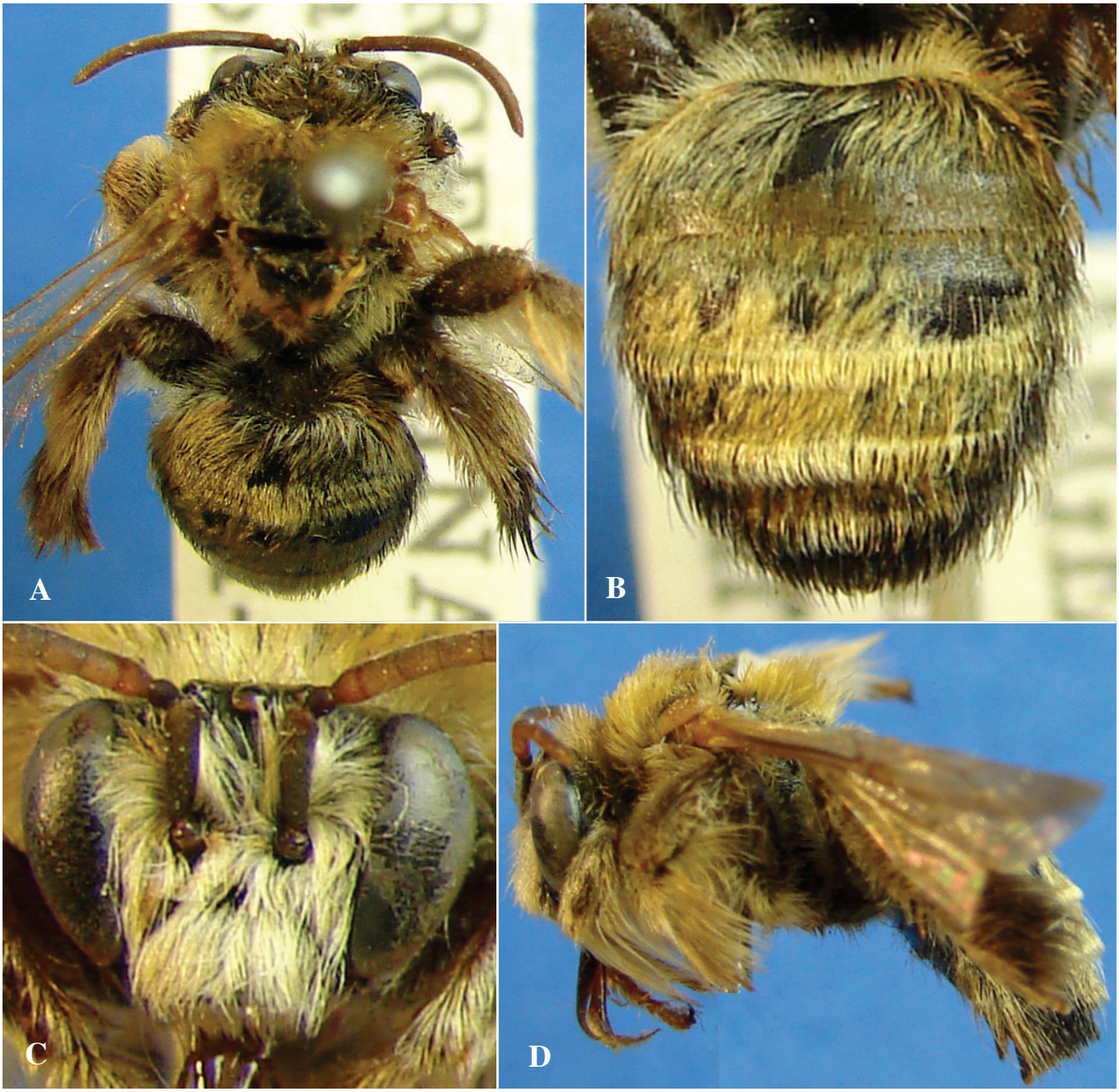

Figure 11 - *Exomalopsis eremalis* sp. n. Holotype ♂: A – dorsal view of head and mesosoma; B – dorsal view of metasoma; C – frontal view; D – lateral view.

Punctures – on labrum, moderately coarse and dense around edges (punctures one or less diameters apart from each other), very dense on mid basal area under clypeal tuft; on clypeus, moderately coarse and dense (slightly less to slightly more than one diameter apart) intermixed with few minute very sparse punctures (ten or more diameters apart); on supraclypeal area, laterally, thinner than on clypeus, leaving a broad median longitudinal area smooth and shiny; on paraocular areas, hidden by tomentum; on frons, fine and moderately dense (one diameter apart) progressively finer but still dense toward the vertex; on posterior surface of postocellar region, moderately fine and moderately dense (one diameter apart); on gena, minute and dense (less than one diameter apart) near eye margin, becoming fine and sparse on back of head (three diameters apart); moderately coarse and very dense under pronotal collar (about half a diameter apart); on mesoscutum, moderately coarse, very

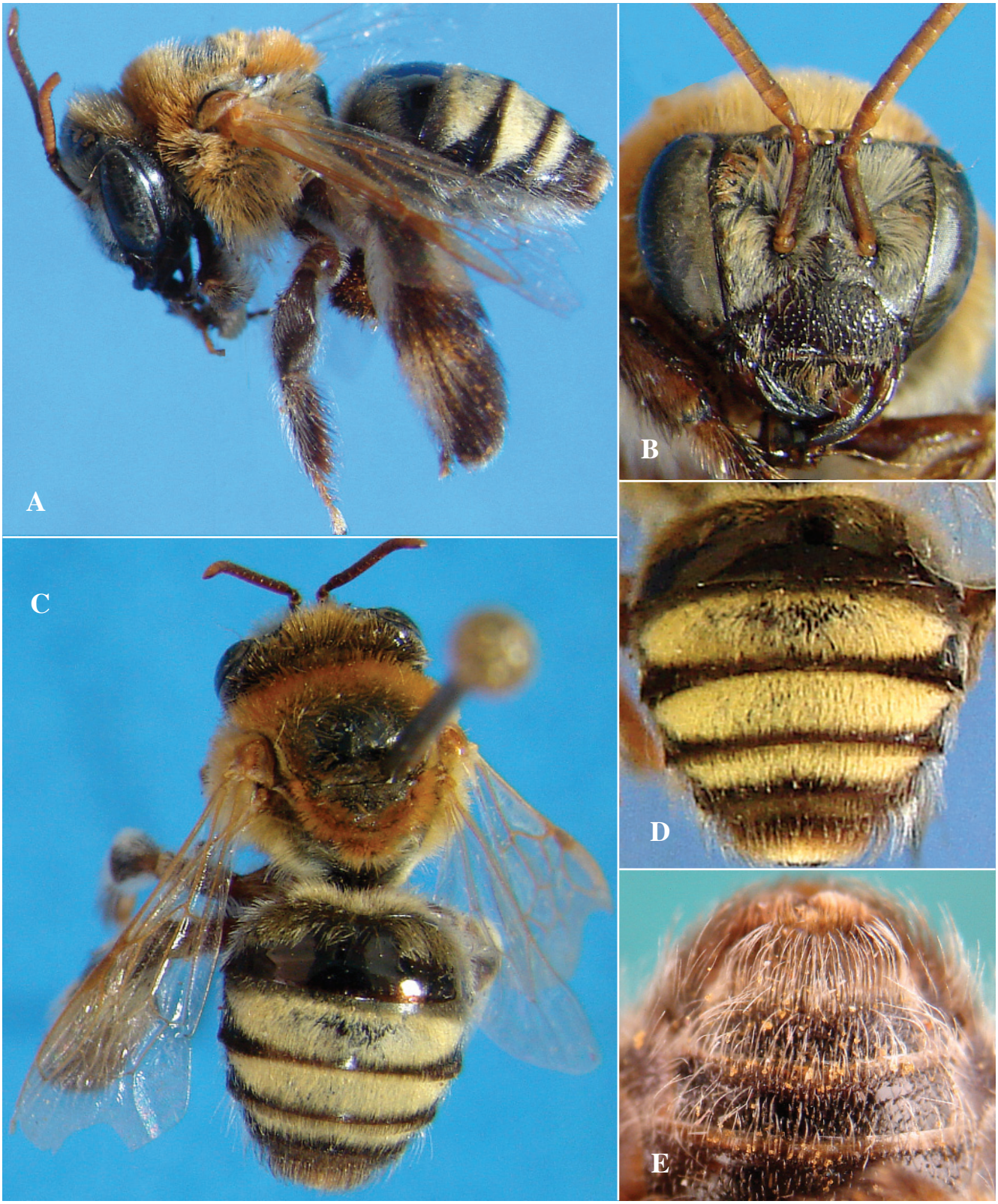

Figure 12 - *Exomalopsis griswoldi* sp. nov. Holotype &: A – lateral view; B – frontal view; C – dorsal view; D – dorsal view of metasoma; E – ventral view of metasoma (note the short hook-like hairs on disc of sterna 3, 4, and 5).

Figure 13 - *Exomalopsis griswoldi* sp. nov. Paratype ♂ from Lake Valencia, Aragua, Venezuela (UTAH): A – lateral view; B – dorsal view of head and mesosoma; C – dorsal view of metasoma; D – frontal view.

dense anteriorly and near posterior margin (less than one diameter apart), sparse (two to three punctures apart) on disc, and leaving two posterior shiny impunctate areas separated by a median punctate area; on disc of scutellum, moderately fine and dense (less than one diameter apart), intermixed with minute sparse punctures (one to two diameters apart); under the scutellar fringe coarse and very dense (punctures adjacent to each other); on mesepisternum, coarse, dense on disc (less than one diameter apart), moderately sparse (one to two diameters apart), intermixed with minute punctures on its anterior surface; on metanotum, fine and moderately dense (about one puncture apart), coarse and very dense under tuft; on propodeum, moderately coarse and dense (less than one diameter apart) on upper lateral areas, becoming finer towards latero inferior areas and minute towards medial area; on metapostnotum moderately coarse and very dense basally, on vertical surface laterally fine and dense, becoming finer and more sparse towards medial and apical areas; on anterior vertical surface of T1, fine and moderately sparse (one to two diameters apart); on disc of T1, reaching premarginal line, fine and moderately sparse (one to two diameters apart) laterally, progressively sparcer toward midline (which is impunctate); marginal zone of T1, smooth and shiny; on marginal zones of T2-T4, very fine and moderately sparse (one to two diameters apart), hidden under tomentum, but receading from margin laterally, delimiting two latero-marginal subtriangular shiny areas.

Structure – labrum concave with apical margin pointed; clypeus very slightly convex; frontal carina ill-develloped; frontal sulcus present; paraocular carina weak, evident only along lower portion of eye margin, below level of antenal socket; superior edge of eye slightly below level of summit of head behind it; area between ocellus and eye gently excavated; postocellar ridge absent, but vertex relatively narrow; posterior margin of pterostigma inside marginal cell abruptly truncate; premarginal line of T1 depressed, forming thin, shallow sulcus; disc of T1 0.4 times as long as marginal zone on midline.

Measurements (mm) – body length: 8.7; of forewing: 6.7. Length and width of head: 2.17; 3.24. Maximum, inferior and superior distance between eyes: 2.14; 1.76; 1.90. Interocellar and ocello-ocular distances: 0.64; 0.48. Diameter of mid and lateral ocelli: 0.25; 0.23. Length and diameter of scape: 0.87; 0.18. Length of pedicel, 1st, 2nd, 3rd and terminal flagellomeres: 0.18; 0.28; 0.20; 0.20; 0.34. Diameter of 5th flagellomere: 0.19. Length and width of mesoscutum: 2.32; 2.56. Length and width of prestigma: 0.21; 0.07. Length and width of pterostigma: 0.66; 0.25. Length and width of marginal cell: 1.21; 0.57.

Variation – some of the females examined had their pubescence lighter in coloration than the holotype on postocellar fringe, mesoscutum and scutellum. The postocellar fringe and hairs on mid anterior portion of mesoscutum being creamy-white. In some specimens the black hairs are more widespread on tibial scopa than on the holotype, leaving just a small white spot anteriorly and another posteriorly.

Male (L Valencia; Aragua, Vzla; IX-21-1973 // B Villegas; Colr).

Body color – as in female, but stripe near base of mandible light ferruginous; veins and pterostigma brownish ferruginous; apex of wing dusky.

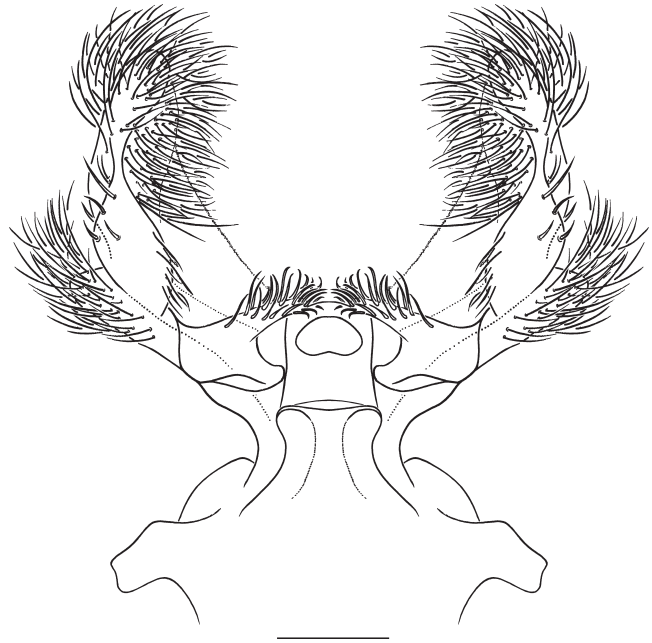

Figure 14 - *Exomalopsis griswoldi* sp. nov. Ventral view of the apical process of S8 of males. Scale bar = 0.20 mm.

Pubescence – creamy white, except, lighter on gena; brownish black on posterior half of outer surface of mid tibia and hind tibia and basitarsus and on apex of marginal zone of T2-T6; light yellow on bands of T2-T6. Hairs longer than that of female; covering the surface of clypeus, paraocular areas and frons; tomentum on metasomal bands less appressed than on female, bands not as broad; apical black fimbria of terga sparser and longer than on female

Punctures – on labrum, very fine, sparse on apical two-thirds of disc (one to five diameters apart), dense on basal third (one or less diameter apart); on clypeus, a mixture of very fine moderately dense (one diameter apart) and minute very sparse punctures; on paraocular areas and lower frons, hidden under pubescence; on upper frons and on area between lateral ocellus and eye, very fine, uniformely sparse (two to three diameters apart); on mesoscutum, moderately coarse, more uniformely dense than on female; the posterior impunctate areas smaller than on female; on disc of scutellum, moderately coarse and more uniformely dense than on female (one diameter apart); on mesepisternum, moderately coarse and irregularly spaced on disc (less than one to three diameters apart), fine and sparse on anterior surface (two or more diameters apart); on propodeum, uniformely and moderately coarse and moderately dense; on metapostnotum moderately coarse and dense laterally on base, denser medially, impunctate and shiny elsewhere; on vertical anterior surface of T1, coarser (but still fine) and sparser than on female (one or more diameters apart); on disc of T1, as in female; on marginal zone of T1, minute and sparse (three or more diameters apart); on disc of T2-T4, moderately fine and dense (one or less diameters apart), on marginal zones minute and very sparse (three or more diameters apart), becoming denser (one to two diameters apart) by margin of terga.

Structure – labrum flat, apical margin gently curved, almost straight; clypeus slightly more protuberant; paraocular carina weaker than on female; area between lateral ocellus and eye much more excavated than on female; premarginal line of T1 not depressed. Apical process of S8 as in Fig. 14.

Measurements (mm) – body length: 6.4; of forewing: 6.3. Length and width of head: 1.64; 2.61. Maximum, inferior and superior distance between eyes: 1.65; 1.31. Diameter of mid and lateral ocelli: 0.21; 0.16. Length and diameter of scape: 0.62; 0.17. Length of pedicel, 1st, 2nd, 3rd and terminal flagellomeres: 0.15; 0.21; 0.25; 0.25; 0.37. Diameter of 5th flagellomere: 0.18. Length and width of mesoscutum: 1.58; 1.91. Length and width of prestigma: 0.16; 0.10. Length and width of pterostigma: 0.62; 0.25. Length and width of marginal cell: 1.04; 0.44.

Variation – in some specimens, all metasomal pubescence, including the marginal fimbria, is light ferruginous, while in others the hairs on marginal zone of T1 are also brownish black.

Material examined

Holotype (♀) **–** VENEZUELA, Lara, 20 km East of Carora; June 24, 1976 [A.S.Menke & D. Vincent]. Deposited at the collection of the USDA's Bee Biology & Systematics Laboratory, Utah State University, Logan, Utah, U.S.A.

Paratypes – BRAZIL, **Roraima** – Surumu; XI-1966 [M. Alvarenga]; 1 ♀. **COLOMBIA**, **Magdalena** – Magdalena, Pozo Colorado, 11 km W of Santa Marta; April 25-30, 1968 [Borys Malkin]; 2 ♀♀. Magdalena, Pozo Colorado, 11 km SW of Santa Marta; June 1, 1968; [Borys Malkin]; 2 ♂♂. Magdal(ena), Santa Marta; X-8-71 [GE Bohart]; 4 ♂♂. Magdalena, PNN Tayrona Neguanje, 11º20' N, 74º2'W, 10 m; Malaise trap; 05-21-III-2001 [R. Henriquez] 1 ♀ and 1 ♂. **VENEZUELA: Aragua** – Aragua, Ocomave de la Costa; 16-X-1966 [R.L.Dressler]; 1 ♀. **Carabobo** – Valencia, Aragua, L.(ake?); September 21, 1973 [B. Villegas]; 3 ♂♂. Same locality and date [R.M. Bohart]; 1 ♀ and 1 ♂. **Distrito Federal** – Distrito Federal, Parroquia Catia La Mar, Escuela Naval, approximately 10º36' N, 67º02'W, 5 m above sea level; xerofilous vegetation ('espinal'); May 17, 1988 [Nelson Ramirez]; on *Capparis odoratissima*; 1 ♀ and 1 ♂ (male broken). Same locality and same collector; September 6, 1989; on *Malhaonea attonis*; 1 ♂. **Zulia –** Zulia, Carrasquero; May 29-30, 1976 [A.S.Menke & D. Vincent], 1 ♀ and 2 ♂♂ (UTAH). Deposited at AMNH, CORNELL, UFMG, UFPR, YORK.

Known activity period

March – June, August-October in Colombia and Venezuela; November in Brazil.

Etymology

This species is named after Dr. Terry Griswold.

***Exomalopsis (Phanomalopsis) gualamba* sp.nov.**
(Figs. 8C, 15, 16)

Diagnosis

This species from northwestern Argentina and Paraguay (probably extending to the semi-arid areas of Bolivia) is structurally similar to *E. jenseni*, from which it can be distinguished by the ferruginous tegula, pterostigma and wing veins (in *jenseni,* the tegula is brownish-black to black, the pterostigma and wing veins are brownish), the bright ferruginous hairs on mesosoma (mostly white in *jenseni*) and the lack of black bands of hairs on the mesosoma and scutellar fringe (present in *jenseni*). The color of mesosomal pubescence resembles that of *E. dasypoda*, but it can be distinguished from that species by the impunctate disc of the mesoscutum (divided into two smaller punctate areas in *dasypoda*), and by the tomentose bands of T2 to T4 that merge with the pale pubescence laterally on the terga (terminated laterally by black pubescence in *dasypoda*).

Female (holotype).

Body color – black, except as follows: base of mandible dark ferruginous; distitarsi, strigilis, spurs, tegula, wing veins (except brownish subcosta) light ferruginous; flagellum ventrally, legs (except tarsi) and metasomal sterna dark brown. Wings hyaline.

Pubescence – white on labrum, clypeus, paraocular area, frons, gena, postocellar region, posterior rows of postocellar fringe, venter of mesosoma, coxae, trochanters, femora, mid tibia anteriorly, outer surface of mid basitarsus, tibial scopa, basitarsal scopa basally and anteriorly, anterior vertical surface and disc of T1 and metasomal sterna; black on upper frons under white hairs, on anterior rows of postocellar fringe, on outer surface of mid tibia apically and posteriorly, on apex of hind femur over basitibial plate, posteriorly on posterior floccus of basitarsal scopa; brownish black on apex of T4 and T5; ferruginous on pronotal collar, mesoscutum, scutellar fringe and metanotal tuft and on upper area of mesepisternum under wing insertion; yellow tomentum on T2 to T4. Tomentose bands on marginal zones of T2 to T4 extending to apical margins of terga; hairs on metasomal sterna straight.

Punctures – on labrum almost entirely restricted to basal tuft, where they are fine and very dense with few very fine punctures scattered on disc and across base of labrum; on clypeus moderately coarse and irregularly sparse (one or more diameters apart) intermixed with fine and sparse punctures; on supraclypeal area fine and dense laterally (one or less diameter apart), progressively finer and sparser toward disc; on subantennal and paraocular areas hidden under tomentum; on frons, very fine and sparse (two or more diameters apart), finer and denser on vertex and, especially, just anterior to ocelli; on gena fine and sparse, minute and denser toward eye margin; on postocellar region moderately coarse and dense (less than one diameter apart); coarse and very dense (punctures touching each other) under pronotal collar, separated from impunctate shiny disc of pronotum by several rows of minute and dense punctures; on mesoscutum moderately coarse and dense (one or less diameter apart) anterior to parapsidal lines, sparser along lateral borders of scutum, even sparser (two to four diameters apart) between parapsidal lines, minute and moderately sparse (one to three diameters apart) along posterior border, leaving most of the disc impunctate and shiny; on scutellum fine and moderately sparse (two to four diameters apart) on disc, moderately coarse and very dense under fringe; on metanotum moderately coarse and moderately dense (one or less diameter

Figure 15 - *Exomalopsis gualamba* sp. nov. Paratype ♀ from Rio Hondo, Los Puestos, Tucumán, Argentina (LILLO): A – dorsal view; B – frontal view; C – lateral view.

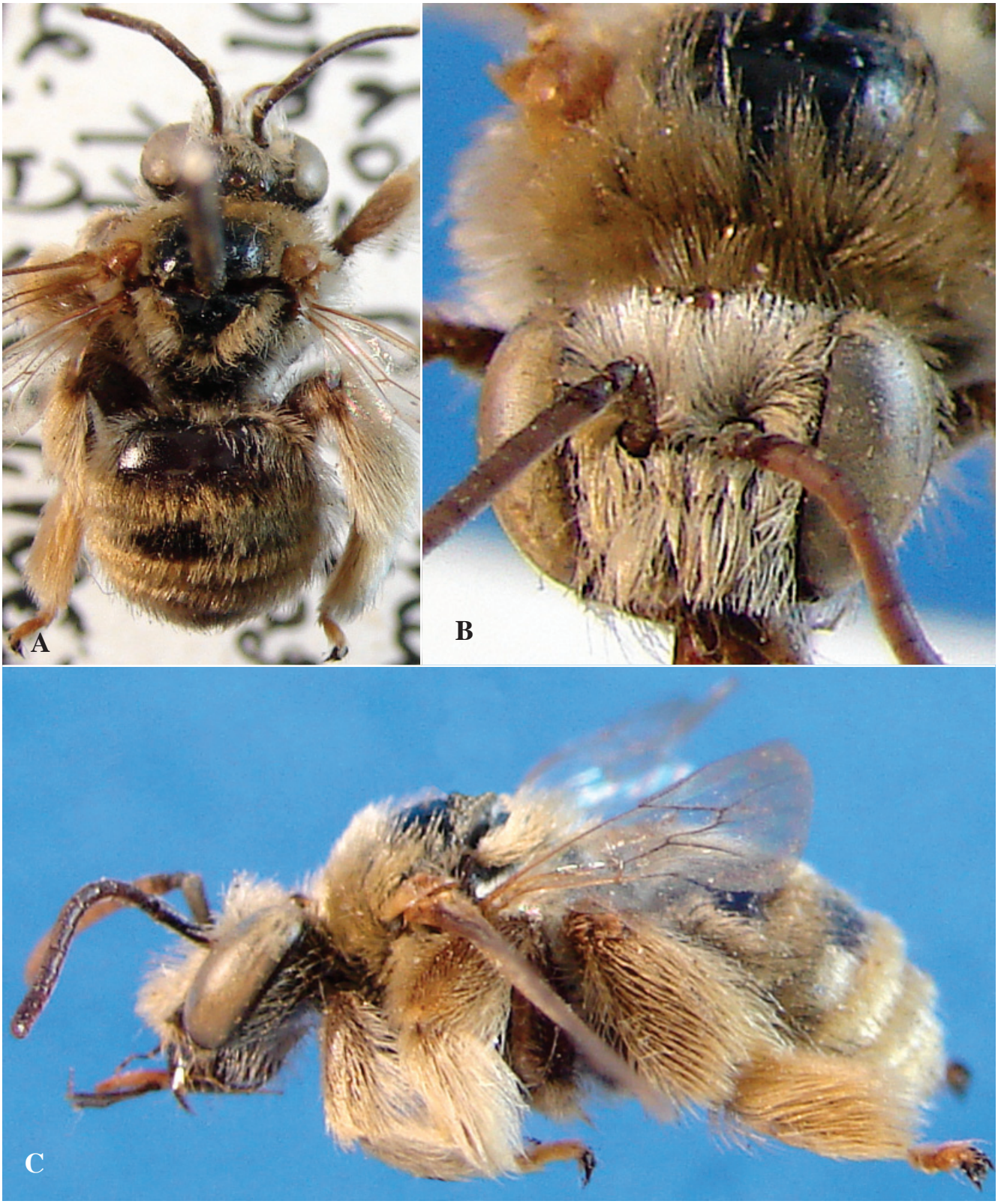

Figure 16 - *Exomalopsis gualamba* sp. nov. Paratype % from La Viña, Salta, Argentina (AMNH): A – dorsal view; B – frontal view; C – lateral view.

apart) on lateralmost areas, very fine and sparse (two to four diameters apart) on midlateral areas and moderately coarse and very dense medially under tuft; on mesepisternum fine and sparse (two or more diameters apart) intermixed with minute sparse punctation (more than two diameters apart) on anterior surface, coarse and very dense on disc; on propodeum moderately coarse and dense (less than one diameter apart) laterally, progressively finer towards middle; on metapostnotum, basally, very fine and dense, impunctate and shiny around propodeal pit; on anterior vertical surface of T1 fine, moderately sparse (one or more diameters apart), very fine and denser near transverse carina; on disc of T1 fine and dense near transverse carina (less than one diameter apart), progressively finer and sparser posteriorly, and leaving midline and a band anterior to premarginal line impunctate; marginal zone of T1 impunctate and shiny, except for lateralmost area; marginal zones of T2 to T4 hidden under tomentum.

Structure – disc of T1 0.45 times as long as marginal zone on midline.

Measurements (mm) ? body length: 7.6; of forewing: 7.2. Length and width of head: 2.07; 3.14. Maximum, inferior and superior distance between eyes: 1.98; 1.59; 1.83. Interocellar and ocello-ocular distances: 0.52; 0.42. Diameter of mid and lateral ocelli: 0.25; 0.22. Length and diameter of scape: 0.89; 0.18. Length of pedicel, 1st, 2nd, 3rd and terminal flagellomeres: 0.16; 0.26; 0.19; 0.20; 0.35. Diameter of 5th flagellomere: 0.19. Length and width of mesoscutum: 2.09; 2.53. Length and width of prestigma: 0.25; 0.12. Length and width of pterostigma: 0.66; 0.27. Length and width of marginal cell: 1.3; 0.65.

Variation – There is extensive variation in pilosity color among females of this species. Some specimens have the postocellar fringe largely black, the hairs covering the fore and mid tibia and the mid basitarsus black and black hairs on the apex of the tibial scopa, posteriorly, and near the apex of basitibial plate. On mesosoma, hairs vary from whitish yellow to ferruginous (as in the holotype) or present different proportions of ferruginous and black hairs; two females from Fortin Toledo, Boquerón, Paraguay, have it completely black, except for the ventralmost part of the mesepisternum, which is always whitish. One specimen from Donadeu (Santiago del Estero) has black hairs mixed with the ferruginous ones on the mesoscutum, just anterior to the impunctate area, and on the scutellar fringe, just posterior to the disc (as in *E. jenseni)* and on the mesepisternum. One specimen from La Vina (Salta) has the postocellar fringe, a band of hairs anterior to the disc of the mesoscutum, the scutellar fringe and many of the hairs laterally on the mesosoma, the metanotal tuft and hairs on the fore and mid tibiae and basitarsi black. The integument on the trochanters and femora of certain specimens is black.

Male

Body color – as in female but basitarsi light ferruginous.

Pubescence – similar to that of female but with black hairs limited to T6.

Punctures – on labrum, very fine, very dense on basal third, sparser around edges (one to four diameters apart), disc impunctate; on clypeus, frons, supraclypeal area and paraocular area, hidden under pilosity; on vertex between lateral ocellus and eye, minute and sparse (one to three diameters apart); on gena very fine and sparse, without minute and dense punctures along posterior margin of eye; on postocellar region fine, moderately sparse (one to two diameters apart); under pronotal collar moderately coarse and dense (half a diameter apart), with no band of minute punctures around impunctate disc; on mesoscutum fine and dense anteriorly near pronotum (half a diameter apart), moderately coarse and moderately sparse between parapsidal lines (one to two diameters apart), area behind parapsidal lines almost impunctate but divided at midline by sparse row of punctures, and delimited posteriorly, near scutellum, by few rows of fine, sparse punctures; on scutellum coarser and sparser than in female, and with two ill-defined lateral impunctate areas; on mesepisternum finer than on female (but still coarse) and moderately dense on disc (one diameter or less apart); on propodeum moderately coarse and moderately dense, more sparse toward middle (one diameter or less apart); on metapostnotum moderately fine and moderately sparse basally, impuctate apically; on disc of T1 fine and very dense adjacent to transverse carina, sparser on mid band of disc, finer near premarginal line; on marginal zone of T1 to T5 very fine and sparser (three diameters apart), hidden under tomentum.

Structure – T1 with transverse carina present. Apex of S8 as shown in Fig.6C.

Measurements (mm) – body length: 7.4; of forewing: 6.3. Length and width of head: 1.90; 2.66. Maximum, inferior and superior distance between eyes: 1.54; 1.27; 1.54. Interocellar and ocello-ocular distances: 0.45; 0.36. Diameter of mid and lateral ocelli: 0.22; 0.19. Length and diameter of scape: 0.70; 0.18. Length of pedicel, 1st, 2nd, 3rd and terminal flagellomeres: 0.16; 0.21; 0.22; 0.22; 0.34. Diameter of 5th flagellomere: 0.19. Length and width of mesoscutum: 1.59; 2.11. Length and width of prestigma: 0.19; 0.11. Length and width of pterostigma: 0.61; 0.26. Length and width of marginal cell: 1.09; 0.55.

Variation – black or brownish black pubescence may occur on the hind tibia around the basitibial plate, in the posterior floccus of the basitarsus, on the marginal zone of T1, the disc of T2 and the apical fimbria of T5. Hairs on the mesosoma may be light yellow instead of ferruginous.

Material examined

Holotype (♀) – ARGENTINA, La Rioja, Illiar; February, 1934; [M.Gomez]. Deposited at the Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Buenos Aires, Argentina.

Paratypes – ARGENTINA: Catamarca – Catamarca, Andalgala; April, 1945 [J.B.Daguerre]; 1 ♀. Catamarca, Pirquitas; March 13, 1958 [R.Golbach]; 1♀. **Cordoba –** Cordoba, La Puerta; March 4, 1971 [M.A.Fritz]; 2 ♀♀. Cordoba, Villa de Soto; January 14, 1984 [R.B.Roberts]; 1 ♂. **Jujuy –** Jujuy, La Esperanza; March 3, 1961 [F.H.Walz]; 1♀. **La Rioja –** La Rioja (no locality, date or collector); 4 ♀♀. La Rioja, Illiar; (no date) [M.Gomez]; 1 ♀. Same locality; February, 1934 [M. Gómez]; 3 ♀♀. La Rioja, Estación Amado; October, 1934 [M. Gomez]; 2 ♀♀. La Rioja, La Rioja; January, 1923 [M. Gomez]; 1 ♀. La Rioja (no locality); March, 1929 [M. Gómez]; 1 ♀. **Salta –** Salta, Urundel; November 22, 1942 [A.Ogloblin]; 1 ♂. Salta, La Vina; March 1992 [Fritz]; 1 ♂. Same locality; July 1992 [Fritz]; 1♀. **Santiago del Estero –** Santiago del Estero, Donadeu (no date or collector); 1 ♀. Santiago del Estero, Termas

del Rio Hondo; April 24, 1951 [A. Ogloblin]; 1 ♀. Same locality and collector; December 09, 1952; 1 ♂. Same locality; November 10, 1951 (no collector); 1 ♂. Santiago del Estero, Campo Gallo; March, 1943 [A. Prosen]; 1 ♀, 1 ♂. Santiago del Estero, 13 km SW of Añatuya, 100m; December 16, 1983 [R. B. Roberts]; 1 ♀. **Tucumán –** Tucumán, Los Puestos (cam. Rio Hondo); April 8, 1967 [Willink & Terán]; 1 ♀. Same locality (Dept: Leales); April 11, 1967 [A. Willink]; 1 ♂. Same locality; April 21, 1967 [A. Willink]; 1 ♂. Tucumán, San Pedro de Colalao, February 2, 1952 [Terán]; 1 ♀. Tucumán (no locality or date) [M. Arnau]; 1 ♀. **Incomplete data –** (No province, date or collector), Chaco de Santiago; 1 ♀. **PARAGUAY: Boquerón –** Ft (Fortin) Toledo, 22º21.471 S; 060º20.463 W; 480ft; February 7, 2007 [E.Willis] 5♀♀. **Concepción –** 12km S. Vallemi; 22°15.327 S 57°42.400 W; 294 ft; February 3, 2007. [E Willis] 1 ♀. Deposited at AMNH, LILLO, MACN, PLATA, PLATO, PARIS, SNOW, SUNJ, UFMG, UFPR, UTAH, YORK.

Known activity period

October – July.

Etymology

Gualamba means large in the language of the Tonocotés, who inhabited part of the range of this species.

***Exomalopsis (Phanomalopsis) perikalles*, sp.nov.**
(Figs. 4B, 5B, 17, 18)

Diagnosis

This species is widespread in southern Brazil, ocorring in Central Brazil in mountain ranges and plateaus above 1000 m. *E. perikalles* is structurally similar to *E. atlantica, E. aureosericea*, and *E. trifasciata*. Its female can be distinguished from *E. atlantica* by its ferruginous tegula (dark in *E. atlantica*), the smooth posterior area of the mesoscutum (in *E. atlantica*, punctate); it can be distinguished from *E. aureosericea* and *E. trifasciata* by the ferruginous pubescence of the mesosoma (pale yellow to black but never ferrugineous in *E. aureosericea* and *E. trifascata*). The male *E. perikalles* can be distinguished from *E. trifasciata* by the apical process of the posterior trochanter (absent in *E. trifascata*); it can be distinguished from *E. atlantica* by the smooth posterior area of mesoscutum without protuberant areas (two protuberances present with fine and dense punctures in *E. atlantica*; and it can be distinguished from *E. aureosericea* by its ferruginous pubescence on mesoscutum (dark brown or blackish on *E. aureosericea*).

Female (holotype)

Body color – black except as follows: second third of mandible, distal half of flagellum dorsally blackish ferruginous; flagellum ventrally except most of first flagellomere, tegula, spurs, strigilis, mid and hind tibiae and femora (except basitibial plate), mediotarsi and distitarsi ferruginous; pterostigma and most wing veins (except C and R) light ferruginous; legs (except distitarsi and mediotarsi) dark brown; veins brownish; apical margin of metasomal sterna yellowish. Wings fuscous with yellowish tint.

Pubescence – creamy white on labrum, around antennal socket, on gena and on occipicium behind postocellar fringe; ferruginous on postocellar fringe, mesoscutum, mesepisternum, and scutellum; light ferruginous on metepisternum, propodeum, anterior vertical surface and disc of T1 and posteriorly on tibial scopa; pale yellow on metapostnotum, anteriorly on scopa and ventrally on mesosoma and on metasomal sterna; bright yellow on tomentose bands of T1-T4; black on clypeus, most of frons, postocellar fringe, apical fringe of T4 and on T5-T6, posteriorly on basitibial scopa and on a longitudinal median band on tibial scopa. Hairs moderately fine and semierect on labrum and clypeus; on frons longer, moderately plumose and semidecumbent; inferiorly on paraocular area moderately long, plumose, dense and decumbent (except a row of erect short hairs in the inner margin of eye); on upper frons, near ocelli, short; on gena, long and semierect, shorter toward eye; on pronotum and mesoscutum moderately long, plumose and semierect; on mesepisternum, scutellar fringe and metanotal tuft long, plumose and erect; on propodeum moderately long, plumose and semidecumbent to semierect, shorter on metapostnotum; an anterior vertical face of T1 moderately plumose and erect; on disc of T1 fine and semidecumbent. Marginal area of T1 and T2-T4 with dense tomentum. Hairs denser and shorter on apex than on base of forewing.

Punctures – medially on labrum fine and very dense (less than one diameter apart from each other) leaving a median longitudinal band smooth, moderately coarse and very sparse on the remaining of clypeus (denser near margins); on anterior half of clypeus moderately coarse and moderately sparse (one to three diameters apart), finer medially, denser on posterior half; on supraclypeal area fine and sparse (two to four diameters apart), denser near antennal socket; on frons moderately dense (one and a half to two diameters apart); between ocelli fine and moderately dense (one to three diameters apart); between eye and lateral ocellus fine to minute and sparse (two diameters or more apart) behind ocellus and on pronotum moderately fine and dense (less than one diameter apart); on disc of mesoscutum coarse and dense (one diameter or less apart), posteriorly with two well defined smooth areas; scutellum mostly smooth, moderately coarse and dense medially and on margins; on metanotum coarse and very dense; on mesepistenum and propodeum coarse and moderately dense, leaving a smooth area around propodeal pit; on metapostnotum coarse and dense, sparser medially; on anterior vertical surface of T1 fine and moderately sparse (one to three diameters apart); on disc of T1 moderately fine and sparse (one and a half to two diameters apart); on marginal area of T1 minute and very sparse.

Structure – labrum trapezoidal with apical margin roundly projected, disc slightly concave with elevated median longitudinal band slightly elevated, lateral parts folded back at right angle to disc; clypeus gently convex, disc plane, apical margin delimited by strongly punctate transverse line; frontal sulcus well-defined; superior margin of eye at same level of vertex of head; vertex, behind eye, not visible above eye, in frontal view; vertex with a discrete protuberance beside lateral ocellus; basitibial plate longer than wide, with apex lengthened; disc of T1 approximately 1/2 of dorsal surface of tergum; hamuli, fourteen per wing.

Measurements (mm) – approximate body length = 9.4; of forewing = 8.1. Length and width of head = 2.31, 3.07.

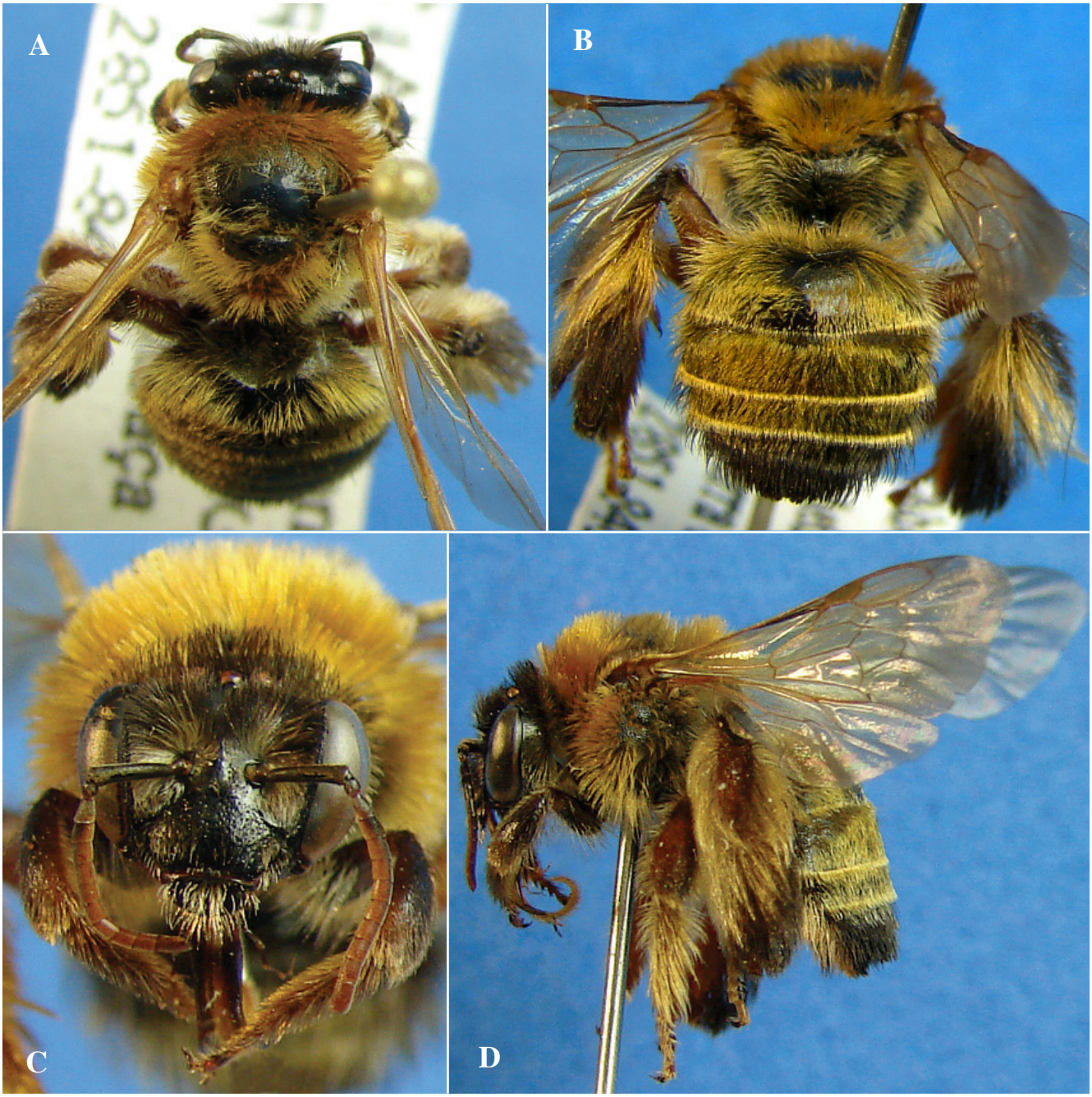

Figure 17 - *Exomalopsis perikalles* sp. nov. Holotype ♀: A – dorsal view of head and mesosoma; B – dorsal view of metasoma; C – frontal view; D – lateral view.

Maximum, inferior and superior distance between eyes = 2.08, 1.73, 1.92. Interocellar and ocellar-ocular distances = 0.54, 0.48. Diameters of mid and lateral ocelli = 0.21, 0.20. Length and diameter of scape = 0.80, 0.17. Length of pedicel, 1st, 2nd, 3rd and terminal flagellomeres = 0.19, 0.23, 0.23, 0.22, 0.40. Diameter of 5th flagellomere = 0.21. Length and width of mesoscutum = 2.00, 2.76. Length and width of prestigma = 0.20, 0.16. Length and width of pterostigma = 0.78, 0.21. Length and width of marginal cell (measured on wing margin) = 1.10, 0.51.

Variation – Hair color frequently lighter, the pre-occipital fringe varying from dark brown to mostly ferruginous or light yellow (with blackish hairs intermixed); the yellow tomentum on metasomal terga becoming pale yellow and the black hairs on T5 becoming brown, light brown or ferruginous. Medial band of

Figure 18 - *Exomalopsis perikalles* sp. n. Paratype ♂ from Itacambira, Minas Gerais, Brazil (UFMG): A – dorsal view of head and mesosoma; B – dorsal view of metasoma; C – frontal view; D – lateral view.

black hairs on tibial scopa (under the basitibial plate) sometimes reduced or absent; sometimes expanding backwards and apicad, forming a posterior dark band continuous to that on basitarsus. Tergal margins sometimes dark brown. T1 often with noticeable transverse depression dividing disc and marginal area of the tergum and without punctures on marginal zone.

Male (Paratype [1174; Brasil: DF; Jardim Botânico; RIPFreitas & GSFreitas; 03/IX/1996]) deposited at UFMG.

Body color – black except as follows: apical margin of clypeus, distal half of mandible blackish ferreuginous; flagellum, marginal area of metasomal sterna, tibiae, femora, basitarsi, mediotarsus, and T7, dark ferruginous; on tegula, pterostigma, wing veins, distitarsi, strigilis and spurs ferruginous; pedicel, coxae and trochanters brown; scape blackish brown; wings slightly fuscous with yellowish tint.

Pubescence – Mostly light ferruginous with a few blackish hairs intermixed on upper paraocular area, preoccipital fringe, mesoscutum and, more abundantly, on abdominal terga; lighter (almost pale yellow) on gena and ventrally on mesosoma. Hairs longer than on females, especially on head. Tomentose bands of T1 absent, on T2-T4 sparse and less apressed than on female.

Punctures – on labrum fine and very sparse near apical margin, denser toward base; on clypeus moderately fine and moderately sparse (one to three diameters apart); on upper frons fine and sparse (two to four diameters apart); on gena moderately fine and moderately sparse (one to three diameters apart); on mesoscutum coarse and dense (less than one diameter apart), extending further posteriorly than on females (exceeding parapsidial lines) and leaving a large posterior impunctate area; on disc of scutellum largely impunctate, moderately coarse and dense posteriorly; on metanotum moderately coarse and dense (less than one diameter apart); on propodeum moderately coarse to coarse and dense (less than one and a half diameters apart); on metapostnotum moderately coarse to coarse and dense, sparser apicad, leaving an impunctate area near propodeal pit; on discs of T1 and T2 moderately coarse and moderately dense (less than two diameters apart), finer toward marginal area.

Structure – labrum almost flat, apical margin with median notch; paraocular carina weaker than on female; area between lateral ocellus and eye much more excavated than on female; transverse carina of T1 present but weak; premarginal line of T1 not depressed; hind trochanters with ventral surface of hind trochanter with an apical triangular expansion directed downward.

Variation – The integument of abdominal terga is black in male specimens from northern Minas Gerais state (Itacambira), while on males from Brasília and Paraná state they are dark ferruginous to blackish brown (except for T7, always ferruginous). The integument of the legs is very light ferruginous, almost yellow, in several males from Paraná state, but in others in the same region, as well as in the ones from Minas Gerais and Brasília, it is dark ferruginous to blackish brown. Males from Itacambira also present blackish hairs on upper paraocular area, on a transverse band across the frons, partially hidden under the longer yellow pilosity in front of it, and on an aterior band of the post ocellar fringe. On mesosoma, blackish hairs are also abundant on the posterior half of the mesoscutum and on the anterior margin and disc of scutellum.

Measurements (mm) – approximate body length = 8.4; of forewing 6.3. Length and width of head = 1.86, 2.48. Maximum, inferior and superior distance between eyes = 1.55, 1.36, 1.55. Interocellar and ocellar-ocular distances = 0.46, 0.38. Diameters of mid and lateral ocelli = 0.19, 0.19. Length and diameter of scape = 0.70, 0.16. Length of pedicel, 1st, 2nd, 3rd and terminal flagellomeres = 0.14, 0.17, 0.30, 0.29, 0.37. Diameter of 5th flagellomere = 0.17. Length and width of mesoscutum = 1.49, 1.84. Length and width of prestigma = 0.23, 0.19. Length and width of pterostigma = 0.64, 0.21. Length and width of marginal cell (measured on wing margin) = 0.85, 0.4.

Material examined

Holotype (♀) **–** Abelhas da Zona Metalúrgica de MG, Serra do Caraça, 2851-8402. Catas Altas MG. BRASIL, 09/01/1999, F.A.Silveira. HOLOTYPUS, *Exomalopsis perikalles* Silveira & Almeida. Deposited at UFMG

Paratypes – BRAZIL: Distrito Federal –BRASIL, Brasilia, Lago Sul, 30-9-976. *Exomalopsis* E. 1; 1 ♀. BRASIL: DF; Jardim Botânico; RIPFreitas & GSFreitas; 01/X/1996; *Cuphea spermacoce*, campo sujo queimado; *Exomalopsis* sp.6, Det. RIPFreitas; 2358 1 ♀. 452; BRASIL: DF; Jardim Botânico; RIPFreitas & GSFreitas; 14/VIII/1996 1 ♀. Numbers 471, 472; BRASIL: DF; Jardim Botânico; RIPFreitas & GSFreitas; 21/VIII/1996 2 ♀♀. Numbers 811, 830; BRASIL: DF; Jardim Botânico; RIPFreitas & GSFreitas; 27/VIII/1996 2 ♀♀. Numbers 1107, 1130, 1131, 1136, 1142, 1144, 1174, 1176, 1182; BRASIL: DF; Jardim Botânico; RIPFreitas & GSFreitas; 03/IX/1996 8 ♀♀, 1 ♂. 1422; BRASIL: DF; Jardim Botânico; RIPFreitas & GSFreitas; 09/IX/1996. *Exomalopsis holotricha*; 1 ♂. Numbers 1437, 1448, 1449, 1460, 1466, 1489; BRASIL: DF; Jardim Botânico; RIPFreitas & GSFreitas; 10/IX/1996 6 ♀♀. Numbers 1662, 1676, 1679, 1692; BRASIL: DF; Jardim Botânico; RIPFreitas & GSFreitas; 17/IX/1996 4 ♀♀. Numbers 2006, 2014, 2015; BRASIL: DF; Jardim Botânico; RIPFreitas & GSFreitas; 24/IX/1996 3 ♀♀. 2017; BRASIL: DF; Jardim Botânico; RIPFreitas & GSFreitas; 10/IX/1996 1 ♀. Numbers 2018, 2021, 2026, 2053, 2064; BRASIL: DF; Jardim Botânico; RIPFreitas & GSFreitas; 24/IX/1996 5 ♀♀. 2349; *Exomalopsis holotricha*; BRASIL: DF; Jardim Botânico; RIPFreitas & GSFreitas; 01/X/1996 1 ♀. Numbers 2360, 2390, 2398; BRASIL: DF; Jardim Botânico; RIPFreitas & GSFreitas; 01/X/1996 3 ♀♀. 3302; BRASIL: DF; Jardim Botânico; RIPFreitas & GSFreitas; 05/XI/1996 1 ♀. **Minas Gerais –** Itacambira MG, BRASIL 11/03/2005, A. A. Azevedo. Abelhas Espinhaço, 10490-30590; 1 ♂. Itacambira MG, BRASIL 01/10/2005, A. A. Azevedo. Abelhas Espinhaço, 10538-30688; 1 ♀. Itacambira MG, BRASIL 01/10/2005, A. A. Azevedo. Abelhas Espinhaço, 10538-30689; 1 ♀. Itacambira MG, BRASIL 30/09/2005, A.. A. Azevedo. Abelhas Espinhaço, 10549-30761; 1 ♀. Itacambira MG, BRASIL 01/10/2005, M. F. Goulart. Abelhas Espinhaço, 10565-30844; 1 ♀. Itacambira MG, BRASIL 01/10/2005, M. F. Goulart. Abelhas Espinhaço, 10566-30856; 1 ♀. Itacambira MG, BRASIL 01/10/2005, C. F. Cardoso. Abelhas Espinhaço, 10573-30911; 1 ♂. Itacambira MG, BRASIL 01/10/2005, C. F. Cardoso. Abelhas Espinhaço, 10573-30913; 1 ♀. Itacambira MG, BRASIL 12/05/2006, A. A. Azevedo. Abelhas Espinhaço, 10725-31536; 1 ♀. Itacambira MG, BRASIL 13/05/2006, Azevedo & Goulart. Abelhas Espinhaço, 10736-31577; 1 ♀.

Paraná – *Megomalopsis holotricha* m., det. J.S.Moure 19?7; Paraná 1.41; M. da . R.Lange – leg. 1♀. COLOMBO – PR, Brasil XI-63, S.LAROCA leg; 1 ♂. Curityba – Paraná, X-1942. *Megomalopsis holotricha* m. Det. J.S.Moure 19?7; 1 ♂. Curitiba – PR, XII-1954, R.Lange leg. 3. 1 ♀. CURITIBA – PR, Brasil, II-IV 65, Mitchell e Laroca; 1 ♀ and 1 ♂. JAQUARAIVA – PARANÁ, BRASIL – 29/01/1974, Pe. Moure leg. DEPTº ZOOL., UF-PARANÁ; 1 ♂. BRAZIL, Paraná: Jaquaraiva, January 29, 1974. J.G. Rozen, F.C.Thompson, J.S.Moure, Collectors; 1 ♀ and 2 ♂♂. DEPTº ZOOL., UF-PARANÁ. BRAZIL, Paraná: Rio Negro, February 7, 1974. J.G.Rozen, R.C.Thompson, Collectors; 1 ♂. TIJUCAS DO SUL – PR, (Rincão) BRASIL 10/2/1974, Pe. Moure leg.; 1 ♀. S.J.PINHAIS – PR, Brasil – II-63, C. ELIAS leg.; 1 ♂. VILA VELHA – PR, Brasil – 16/11/55, Moure & Marinoni; 1 ♂. Vila Velha–PR Brasil, 6-X-65, Michener e Graf; 1 ♀. DEPTº ZOOL., UF-PARANÁ. Vila Velha–PR, Brasil, 9-X-65, Mitchell e Graf; 1 ♀. VILA VELHA–PR Brasil, 19-IX-65, T. B. Mitchell leg; 18 ♀♀. VELHA–PR, Brasil, 6-X-65, Mitchell e Graf; 4 ♀♀. Vila Velha – PR, BRASIL 15/11/1965, Moure e Marinoni; 3♀♀ females.Vila Velha, PR – BRASIL, V.Graf, 2-X-66; 1 ♀. Vila Velha–PR Brasil, 15-X-66, Moure, Marinoni; 2 ♀♀. Vila Velha–PR Brasil, 15-XI-66, Moure e Marinoni; 9 ♀♀. Vila Velha – PR, BRASIL 8/12/967, Moure & Mielke; 2 ♀♀ and 1 ♂. Brasil, Paraná, Parque Estadual de Vila Velha, 25°14'S 49°59'W, 16.iii.2002, G.Melo & R.B.Gonçalves; 1 ♀. Brasil, Paraná, Parque Estadual de Vila Velha, 25°14'S 49°59'W, 3.iii.2002, G.A.R.Melo; 1 ♀. BRAZIL, Paraná: Vila Velha, February 5, 1974. J.G.Rozen, F.C.Thompson; 1 ♀. Paraná, I-41 (unlegible locality), R. Lange - Leg; 1 ♀. **Rio Grande do Sul –** Alegrete, R.S., BR250, Brasil, 29/11/1985, R.Redtke. Col. MCN. F.A.Silveira, Exomalopsini, Relationships; 1 ♂. Alegrete RS, 25/XI/1985, J.R.Cure leg. Sleg(?) 1. Col. MCN. 91.628; 1 ♂. Esteio, XI-1942, R.Gr.Sul; 1 ♂. Esteio, RGS, XI-1942; 1 ♂. **Santa Catarina –** BRASIL, Santa Catarina, Criciúma, Parque Ecológico, 17-III-04, Thiago Souza; 1 ♂. **São Paulo –** Coleção Campos Seabra. São Bernardo do Campo S.P., 23-X-1955 Werner, col. 1 ♀.

Deposited at AMNH, FZRS, JMFC, MACN, MZUSP, UFMG, UFPR and UKANS.

Activity period

September – April.

Etymology

Perikalles is a Greek word meaning very beautiful.

Comments

Among the specimens examined, several (in the collections belonging to UFPR and UNB) were labeled by Moure as *Exomalopsis holotricha,* a *nomen nudum.* No publication containing this name was located. It is interesting to note that Moure associated this species both to *Phanomalopsis* and *Megomalopsis* (= *Exomalopsis s. str.).*

The distribution of *E. perikalles* resembles those of other bees, as shown by Silveira & Cure (1993), which are widespread across the southern states of Brazil (Rio Grande do Sul, Santa Catarina and Paraná) and, in other cases to northern Argentina, being absent in the lowlands of São Paulo state and reapearing, on elevations above 1000 m, on mountain ranges of the state of Minas Gerais and, in this case, on the Brazilian Central Plateau. As pointed by Silveira & Cure (1993), these populations occurring north of the Capricorn Tropic may be relicts of a past widespread distribution under cooler climates, maybe during the Pleistocene.

***Exomalopsis (Phanomalopsis) snowi* Cockerell**
(FigS. 2B, 8D)

Exomalopsis snowi Cockerell, 1906:73; Silveira, 2007:265.
Exomalopsis (Phanomalopsis) grandior Timberlake, 1980:93.
Exomalopsis (Megomalopsis) magna Timberlake,1980:103.
Exomalopsis (Megomalopsis) occipitalis Timberlake, 1980:104.
Exomalopsis (Megomalopsis) tricincta Timberlake, 1980:105.

Female (U.S.A., Texas, Brownsville; June. At SNOW).

Body color – black, except as follows: base of mandible, reddish-ferruginous; antenna, legs, most of anterior vertical surface of T1 and marginal zones of S1 and S2, light brown; strigilis, spurs, tegula, pterostigma and wing veins light ferruginous; wings hyaline with ferruginous reflection, somewhat dusky at apex.

Pubescence – clear white on face, lateral and ventral areas of mesosoma, propodeum, metapostnotum, mid tibia anteriorly, mid basitarsus, anterior vertical surface and disc of T1, lateral area of T2 to T4 and most of tibial and basitarsal scopa; whitish-yellow on post-ocellar fringe, pronotum, mesosocutum, scutellar fringe, metanotal tuft, tomentose bands of T2 to T4 and apical fimbria of T6; brownish black on mid tibia laterally and posteriorly, apex of hind femur, over base of basitibial plate and at apex posteriorly, on posterior floccus of basitibial scopa, and mixed with yellowish hairs on marginal zones of T2 to T4 and on apical fimbria of T5. Hairs on S2 to S5, especially the small ones, hooked; tomentose bands of T2 to T4 not reaching apical margin of terga.

Punctures – on labrum fine and dense laterally at base (one or less diameter apart), sparser toward apex (one or more diameters apart), very dense medially under tuft (much less than half a diameter apart); on clypeus fine, very dense medially (half a diameter apart or less), slightly sparser near lateral and apical margins, intermixed with very fine, moderately sparse (one or more diameters apart) punctures laterally and with minute, moderately dense punctures (one or more diameters apart) along epistomal suture between tentoral pit and eye; on subantennal area and laterally on supraclypeal area very fine and moderately sparse (one or more diameters apart), intermixed with minute moderately sparse punctures; on disc of supraclypeal area minute and very sparse (one to five diameters apart), leaving a median longitudinal stripe impunctate; on paraocular areas under tomentum, minute to very fine and sparse (more than one to five diameters apart); on frons fine (finer than on clypeus) and dense, progressively finer and sparser toward vertex, minute and moderately sparse around ocelli, minute and dense and

intermixed with very fine punctures between ocellus and eye; on gena very fine and moderately sparse (one or more diameters apart) behind, becoming minute near posterior eye margin; on postocellar region fine and moderately sparse (one or more diameters apart); under pronotal collar fine and very dense, with minute punctures intermixed (but not forming distinct band) along border of impunctate disc; on mesoscutum very fine and moderately dense medially near pronotum, becoming moderately coarse on disc and producing a distinct mid longitudinal band of punctures that defines two latero-posterior ill-defined impunctate areas; on disc of scutellum fine and very dense anteriorly and medially, very fine and moderately sparse (one to two diameters apart) laterally and posteriorly; on metanotum, fine and moderately dense (one or more diameters apart) laterally, coarser and very dense under tuft; on mesepisternum moderately coarse and very dense on disc (more so on upper area), progressively finer and sparser posteriorly, fine and moderately sparse intermixed with minute to very fine sparse punctures on anterior surface; on propodeum, fine and dense, progressively finer (but with coarser sparse punctures intermixed) downward and toward middle; on metapostnotum, basally, very fine and dense, sparser toward middle; wide area impunctate and shiny around propodeal pit; on anterior vertical surface of T1 fine and dense (less than to more than one diameter apart); on disc of T1 fine and moderately sparse, denser laterally, barely reaching premarginal line; marginal zone of T1 to T4 very fine, hidden under tomentum basally, sparse and exposed apically.

Structure – Disc of T1 subequal to marginal zone (0.45: 0.55).

Measurements – body length: 9.4; of forewing: 7.9. Length and width of head: 2.28; 3.45. Maximum, inferior and superior distance between eyes: 2.32; 1.93; 2.14. Interocellar and ocello-ocular distances: 0.57; 0.49. Diameter of mid and lateral ocelli: 0.25; 0.23. Length and diameter of scape: 1.01; 0.19. Length of pedicel, 1st, 2nd, 3rd and terminal flagellomeres: 0.21; 0.29; 0.21; 0.21; 0.37. Diameter of 5th flagellomere: 0.20. Length and width of mesoscutum: 2.27; 2.51. Length and width of prestigma: 0.25; 0.13. Length and width of pterostigma: 0.78; 0.29. Length and width of marginal cell: 1.44; 0.63.

Variation – females of this species presents a wide range of variation in the color patterns of the pubescence. Specimens from Texas and Sonora have the hairs on the head, mesosoma and metasomal bands white, with no black hairs on the mesoscutum or the scutellum. Four specimens (out of 12) from Hidalgo County (Texas) have a few black hairs in front of the postocellar fringe. One female from Guanajuato and several from Tamaulipas (these, the type series of *grandior*) are very similar to those in Texas. One female from Culiacan (Sinaloa) is as light as the Texan ones, but has a whole line of black hairs along the front of the postocellar fringe and a few black hairs on the scutellum. Specimens from Morelos (type series of *E. occipitalis*) have the hairs mainly light as in Texan specimens, but some have ferruginous hairs on the mesosoma; all have a black postocellar fringe and black hairs on the mesoscutum and scutellum; some also have some black hairs on the frons and upper paraocular area; their scopa is darker than on the Texan individuals and the apical fringes of their metasoma may be entirely black or black with brownish tips. Females from Jalisco have the pubescence darker than those from Texas (ferruginous on the mesosoma and metasomal bands). Their postocellar fringe is mainly light ferruginous, but has a row of black hairs anteriorly. A single female has a few black hairs on the scutellar fringe. All have the scopa with much more black hair than the Texan specimens. One specimen from Yautepec (Morelos) is very similar to those from Jalisco, but with the postocellar fringe entirely black. Specimens from Zacatecas are very similar to those from Jalisco, perhaps slightly paler.

Some variation also occurs in color of the integument (especially among males, which may be entirely black or with variable amounts of ferruginous on legs and metasomal terga and sterna) and puncture density (on clypeus and disc of T1 in females, for example).

Male (holotype).

Body color – black, except as follows: apical two-thirds of mandible reddish ferruginous; basal third of mandible, labrum, antenna, legs except coxae, tegula, pterostigma and wing veins, anterior vertical surface and disc of T1, metasomal sterna light ferruginous; gena, mesepisternum, coxae, lateral portion of propodeum, dark brown; wings hyaline, their apices lightly fuscous.

Pubescence – mostly creamy-white; white on face, gena, lateral and ventral surfaces of mesosoma, legs (except fuscous posteriorly on hind basitarsus), anterior surface and disc of T1, lateral and ventral areas of metasoma. Tomentose bands on marginal zones of T1 to T5 restricted to stripe along premarginal lines, not reaching apical margin of terga.

Punctures – on labrum very fine, very dense medially at base, sparse laterally and apically; on face hidden under pubescence; on upper frons and vertex between lateral ocellus and eye minute and moderately sparse (one to two diameters apart); on gena fine and moderately sparse (one to two diameters apart), progressively finer anteriorly, minute along eye margin; on postocellar region fine and dense (one diameter apart); on pronotum fine and very dense under collar; on mesoscutum fine and dense, slightly coarser (but still fine) and sparser between and posterior to parapsidal lines (one or more diameters apart), leaving two small ill-defined lateral areas posteriorly impunctate; on scutellum fine (as on mesoscutum) and dense, intermixed with very fine and minute punctures on disc, fine and very dense under fringe; on metanotum fine and dense (less than one to more than one diameter apart) on lateralmost area, minute and very sparse on mid-lateral areas, fine and very dense under tuft; on mesepisternum fine and moderately sparse (one to more than two diameters apart) on disc, denser posteriorly, very fine and sparse intermixed with minute irregularly dense punctures on anterior surface; on propodeum fine and dense laterally, fine and sparse laterally and dense medially on base of metapostnotum (which is weakly reticulate); on T1 very fine and very sparse (five or more diameters apart) on anterior surface, fine and moderately sparse (one to two diameters apart) on disc, very fine along premarginal line and marginal zone, on the latter very sparse (four or more diameters apart); on T2 to T4 fine (coarser on T2 than on T3 and T4) and very dense (half a diameter apart), on discs fine and very sparse on marginal zones.

Structure – transverse carina of T1 not present. Genitalia as in Fig.6D.

Measurements – Body length: 6.2; of forewing: 5.9. Length and width of head: 1.62; 2.53. Maximum, inferior and superior distance between eyes: 1.61; 1.31; 1.58. Interocellar and ocello-ocular distances: 0.42; 0.40. Diameter of mid and lateral ocelli: 0.19; 0.16. Length and diameter of scape: 0.62; 0.16. Length of pedicel, 1st, 2nd, 3rd and terminal flagellomeres: 0.14; 0.16; 0.23; 0.24; 0.34. Diameter of 5th flagellomere: 0.18. Length and width of mesoscutum: 1.35; 1.70. Length and width of prestigma: 0.18; 0.09. Length and width of pterostigma: 0.61; 0.22. Length and width of marginal cell: 1.11; 0.48.

Variation – the integument color is extremely variable among the males of this species. In Texas the darkest specimens still have the scape, the ventral surface of the flagellum, at least part of the legs, first sternum and a stripe along the premarginal line of T1 ferruginous. As one goes southward, the males become progressively darker, but in any location there are always males with some ferruginous areas on the integument. Only rarely does the scape become entirely dark brown or black. Density of punctures is also somewhat variable, especially on the mesoscutum and propodeum, whose impunctate areas can vary in size. The reticulation present on the metapostnotum of the holotype is relatively rare even in the population at the type locality.

Material examined

Holotype (♂) – U.S.A., Texas, Brownsville; June [F.H.Snow]. USNM.

Additional material – A total of 134 specimens (72 ♀♀ and 62 ♂♂) from the following localities. **GUATEMALA:** (Rabinal, San Geronimo). **MEXICO: Guanajuato** (León); **Jalisco** (Chamela, San Juan Lagos, Teocaltiche); **Michoacán**; **Morelos** (Yautepec); **Nuevo León** (Vallecillo); **Oaxaca** (Coyula, El Camaron, Tehuantepec, Matias Romero); **Puebla** (Matamoros, Tehuitzingo); **San Luis Potosí** (El Salto); **Sinaloa** (Culiacan, Villa Unión); **Sonora** (Navajoa); **Taumalipas** (Llera Mesa); **Zacatecas** (Nochistlán). **PANAMA: Canal Zone** (Corozal). **U.S.A.: Texas** (Bentsen, Brownsville, Ft. Sam Houston; Laredo, Lopeno, McAllen, Rio Grande, Southmost). Deposited at AMNH, CUIC, DAVIS, FSCA, NHMLA, SNOW, UCRIV, UFPR and UTAH.

Activity period

April – June in Texas; June – September, November in Mexico; August in Guatemala; February in Panamá.

Comments

Exomalopsis occipitalis, E. grandior, *E. magna* and *E. tricincta* are all known only from their females. Males collected with the female holotype and paratypes of *E. occipitalis*, with the holotype of *E. grandior*, and paratypes of *E. tricincta* (6 altogether) were all assigned to *E. snowi* by Timberlake (1980). No females of the latter are known from those localities. In fact, before describing *E. grandior,* Timberlake (1980:93) noted that "Possibly its male has not been distinguished from *snowi* and may be included in material under that species". Timberlake would have perhaps applied this reasoning to *E. magna, E. occipitalis,* and *E. tricincta*, if he had recognized them as *Phanomalopsis*. Instead, he errouneously assigned them to *Megomalopsis* (= *Exomalopsis s.s.).*

We examined male *Phanomalopsis* from Texas, several states of México, Guatemala and Panamá (see list of localities above) and, except for the variation in color of pubescence and integument (which often occurs intraspecifically in *Exomalopsis*) they are indistinguishable. Their male genitalia and hidden sterna (7 and 8) are also extremely uniform. A close examination of the females convinced us that all names above refer to the same species. What Timberlake (1980) described as different species are actually different stages of a geographic gradient of hair colors, the lightest populations being at the northern end of the distribution (southern Texas, Tamaulipas, Sonora), the darkest at the southern end (Oaxaca).

In Timberlake's (1980) key, *E. magna* is separated from the others by its "Frons very finely punctate and hairless and more minutely and sparsely punctate on each side" (page 80, couplet 12). It is clear, however, that the pubescence on the frons (and also paraocular areas) was just worn off in the holotype. The punctures on the frons of *E. magna*, on the other hand, are just as in the types of *E. grandior, E. occipitalis* and *E. tricincta*. Perhaps Timberlake was misled by the frontal pubescence on these, which somewhat conceals the punctures beneath it. All characters used by Timberlake to distinguish his species are inside the range of variation of local populations. It is noteworthy that the holotype of *E. magna* was collected at the same locality and date as a paratype of *E. grandior*. The type locality for *E. occipitalis* and *E. tricincta* is the same, and two of the paratypes of *E. tricincta* were collected with the holotype and several paratypes of *E. occipitalis.*

Exomalopsis (Phanomalopsis) solitaria Brèthes

Exomalopsis solitaria Brèthes, 1910: 292; Silveira, 2007:266.
Exomalopsis giacomelli Cockerell, 1927:400.

Female (holotype)

Body color – black except as follows: apical half of mandible, apical margin of clypeus, scape and pedicel blackish ferruginous; radial vein ferruginous; flagellum ventrally and tarsi light ferruginous; flagellum dorsally, marginal areas of T1–T3 brown; outer face of legs (except tarsi) and abdominal sterna light brown; basal half of mandibles, wing veins (except R), tegula, pterostigma, spurs, strigilis and apical margins of abdominal terga light yellow. Wings hyaline.

Pubescence – creamy white. On mandible moderately long, fine and semidecumbent to semierect; on clypeus long, densely plumose and semierect; on frons long, plumose and semidecumbent; on postocellar fringe moderately long and semierect; on gena long and semidecumbent; on mesoscutum moderately long, densely plumose and semidecumbent; on mesepisternum long, moderately plumose and semidecumbent; on scutellar fringe moderately long, plumose and semierect; on vertical surface of T1 moderately long and erect; appressed and dense on marginal areas of T2 to T4; on T5, additionally to the apical fringe, and on lateral areas of T1 to T4 long and semidecumbent. Hairs on S2 to S5 hooked. Hairs denser on apex than on base of wings.

Punctures – on clypeus fine and sparse (one to three diameters apart); on frons, between eyes and ocelli, minute and sparse (two to five diameters apart); on gena fine and sparse (one to three diameters apart); on mesoscutum fine and moderately dense anteriorly (one to two diameters apart), sparser toward parapsidal lines, smooth area of mesoscutum extending from posterior half mesoscutum (including parapsidal lines) to margin of scutellum; disc of scutellum smooth and shiny; on posterior margin of scutellum and medially on metanotum coarse and dense (less than one diameter apart), laterally on metanotum sparser; on anterior margin of metapostnotum coarse and dense (one diameter or less apart); on the vertical surface of propodeum minute and sparse (two to four diameters apart); on apical third of metapostnotum, above propodeal pit, impunctate and shiny; on vertical surface of T1 fine and sparse (two to four diameters apart – integument microreticulate basally and medially, smooth near disc); on disc of T1 minute and sparse (two to four diameters apart); coarser on the row of punctures on transverse depressed line of T1; marginal zone of T1 smooth and shiny; on T2 and T3 minute and sparse (two to five diameters apart).

Structure – disc of clypeus almost flat, lateral area folded backwards; vertex gently excavated; superior margin of eye, in frontal view, at the same level of summit of head; pre-occipital carina absent; basitibial plate longer than wide, apex rounded; disc of T1 about 2/5 of dorsal surface of tergum. Ten hamuli on left wing and nine on right wing.

Measurements (mm) – approximate body length = 6.0; of forewing 4.91. Length and width of head = 1.62, 2.23. Maximum, inferior and superior distance between eyes = 1.44, 1.17, 1.25. Interocellar and ocellar-ocular distances = 0.43, 0.22. Diameters of mid and lateral ocelli = 0.18, 0.16. Length and diameter of scape = 0.58, 0.11. Length of pedicel, 1st, 2nd, 3rd and terminal flagellomeres = 0.13, 0.13, 0.13, 0.12, 0.22. Diameter of 5th flagellomere = 0.12. Length and width of mesoscutum = 1.20, 1.58. Length and width of prestigma = 0.17, 0.14. Length and width of pterostigma = 0.68, 0.19. Length and width of marginal cell (measured on wing margin) = 1.07, 0.32.

Male (Depto de Puan, Est. Felipe Sola Buenos Aires. Argentina; I-1951; A.Martines) – UKANS.

Body color – black except as follows: apical half of mandible, femora, trochanters and coxae dark ferruginous; apical margin of clypeus, tibiae and pygidial plate ferruginous; anterior half of mandibles, tarsi and metasomal sterna light ferruginous; wing veins, margins of T1 and T2 yellowish brown; labrum, tegula, pterostigma, spurs and strigilis light yellow; flagellum dorsally and pedicel brown; flagellum ventrally light brown. Wings hyaline.

Pubescence – white. Hairs on labrum moderately long, semierect and moderately plumose; on face longer and denser than on female, completely hiding its surface. Hairs on mesoscutum, legs and metasomal terga longer than on female. Hairs on S2 to S5 not hooked.

Punctures – on labrum moderately coarse and sparse (one to three diameters apart each other); on face hidden by pubescence; on vertex between ocelli moderately coarse and moderately dense (one to two diameters); on vertex between eyes and ocelli minute and sparse (two to five diameters apart); behind ocelli coarse and dense (less than one diameter apart); on gena fine and sparse (two to three diameters apart); on mesoscutum moderately coarse and moderately dense (less than one to two diameters apart), posterior smooth area reaching parapsidial lines; disc of scutellum smooth and shiny; on anterior surface of propodeum coarse and very dense (less than one diameter apart); on vertical surface of propodeum moderately coarse and moderately dense (one to two diameters apart); on metapostnotum moderately coarse and very dense basally, more sparse apicad, leaving an impunctate area above propodeal pit; on vertical surface of T1 moderately fine and sparse (two to four diameters apart); on T1 moderately fine and moderately dense (one to three diameters apart), finer near margin of tergum.

Structure – labrum rectangular, flat, apical margin straight; transverse carina of T1 absent; premarginal line of T1 not depressed. Nine hamuli on left wing and eight on right wing.

Measurements (mm) – approximate body length = 5.1; of forewing 4.1. Length and width of head = 1.44, 1.85. Maximum, inferior and superior distance between eyes = 1.13, 0.89, 1.10. Interocellar and ocellar-ocular distances = 0.35, 0.23. Diameters of mid and lateral ocelli = 0.17, 0.14. Length and diameter of scape = 0.43, 0.11. Length of pedicel, 1st, 2nd, 3rd and terminal flagellomeres = 0.12, 0.12, 0.15, 0.15, 0.21. Diameter of 5th flagellomere = 0.13. Length and width of mesoscutum = 1.02, 1.40. Length and width of prestigma = 0.12, 0.07. Length and width of pterostigma = 0.50, 0.16. Length and width of marginal cell (measured on wing margin) = 0.46, 0.30.

Material examined

Holotype (♀) – "213; *Exomalopsis solitaria* Brèthes; 724; Holotypus". Deposited at the Department of Entomology of the Museo Argentino de Ciencias Naturales, Buenos Aires, Buenos Aires.

Additional material – A total of 906 specimens (250 ♀♀, 656 ♂♂) from **ARGENTINA: Buenos Aires** (Felipe Sola, Sierra De La Ventana, St. Villa Iris, Tornquinet, Tornquist); **Catamarca** (Alijilan, Andalgalá, Colnes, Colpes, Copacabana, El Pucara, Joyango, La Cienega, Quiros, Santa Maria); **Chaco** (Colonia Benitez, Resistência); **Córdoba** (Aguila Blanca, Cordoba (?), Jesus Maria, Quilino, Rio Segundo, Serrezuela); **Entre Ríos** (?) (Parana); **Formosa** (Gran Guardia); **Jujuy** (Caimansito); **La Pampa** (Conhelo, Hucal); **La Rioja** (Alpasinche, Cebolla, Chepes, Chilecito, Famatina, La Rioja, Mascasin, Patquia, San Blas, Sebila, Villa Casana, Villa Unión); **Neuquen**; **Rio Negro** (Conesa, Laborde, Rio Colorado, San Antonio Oeste); **Salta** (Cachi, Cafayate, Coronel Moldes, Metan, Molinos, S. Guemes, Tacuil, Tartagal, Urundel, V. Elordi); **San Juan** (Valle Fertil); **Santa Fé** (Florencia, Zantiri (?)); **Santiago del Estero** (Arroyo las Tinelas, Caspi Corral, Colonia Dora, Depto.Matará – Desvio 511, Donadeu, El Pinto, Frias, Mansupa, Las Termas, Rio Hondo, Termas de Rio Hondo), **Tucumán** (Amaicha, Amaiche del Valle, Amsicha, Cadillal, Los Puestos, Mimilito, V. Padre Monti). **BOLIVIA: Santa Cruz** (Comarapa, Mandeyapecua); **Tarija** (Villa Montes).

Deposited at: AMNH, CUIC, DAVIS, LILLO, MACN, MZHU, NHMLA, NMNH, PARIS, PLATO, UFMG, UFPR, SNOW, SUNJ, UCRIV, UTAH, ZMHU.

Activity period

August – May.

***Exomalopsis (Phanomalopsis) testaceinervis* Brèthes**
(Fig. 8E)

Exomalopsis testaceinervis Brèthes, 1910:293; Silveira, 2007:266.

Female

Body color – black, except as follows: transverse stripe near base of mandible, dark ferruginous; flagellum ventrally, distitarsi of all legs, hind basitarsus, strigilis, spurs, tegula and wing veins, light ferruginous; S1 and legs (except tarsi) blackish-brown; wings hyaline with ferruginous reflection on radial, marginal and submarginal cells of fore wing and radial cell of hind wing.

Pubescence – mostly black; white on ventral surface of mid and hind femora, disc of T1, metasomal sterna and anterior floccus of basitibial scopa; pale yellow on marginal zones of T2 to T4 (but black on sides of T2 to T4 and on apical fimbria of T4). Tomentose bands on marginal zones of T2 to T4 extending to apical margin of terga; hairs on metasomal sterna, fine and straight.

Punctures – on labrum fine, very dense under tuft, sparse (one to two diameters apart) on basilateral areas and disc; on clypeus moderately coarse, moderately dense (less than one to two diameters apart), intermixed with very fine, sparse punctures; on supraclypeal area, fine and dense laterally, intermixed with very fine, sparse punctures (two to three diameters apart) which extend to the disc; on subantennal and paraocular areas hidden under tomentum; on frons fine and dense (one diameter apart or less), becoming minute around ocelli and on vertex between ocellus and eye; on gena fine and sparse, becoming minute and dense towards eye margin; on postocellar region fine and dense (one diameter apart); fine and denser (less than one diameter apart) under pronotal collar, which is separated from impunctate pronotal disc by a band of dense, minute punctures; on mesoscutum very fine and very dense in an anterior band along pronotum, moderately coarse and very dense (less than half a diameter apart) anteriorly on disc, becoming dense (one diameter apart or less) between and posterior to parapsidal lines, and leaving impunctate two ill-defined lateral areas posteriorly; on scutellum fine and dense (one diameter apart or less) and intermixed with very fine punctures anteriorly and on midline, very fine and moderately sparse (one or two punctures apart) laterally on disc, moderately coarse and very dense under fringe; on metanotum fine and moderately dense (one diameter apart or more) on lateralmost area, very fine and dense on midlateral area, moderately coarse and very dense under tuft; on mesepisternum, fine and sparse (one to three diameters apart) and intermixed with minute sparse punctures on anterior surface, coarse and very dense anteriorly on disc, progressively sparser posteriorly; on propodeum, fine and moderately sparse (less than one to two diameters apart), intermixed with very fine, dense punctures under spiracle, fine and very dense on lateralmost area, becoming very fine and dense towards middle, the impunctate shining area of disc limited to a narrow strip around propodeal pit; on anterior vertical surface of T1, fine, moderately dense (one diameter apart or less) medially, denser laterally, finer toward transverse carina; on disc of T1 fine and moderately sparse (one or two diameters apart), denser laterally and leaving the midline and a band anterior to premarginal line impunctate; marginal zone of T1 impunctate and shiny, except for lateralmost area beyond dorsolateral convexity; on marginal zones of T2 to T4 hidden under tomentum.

Structure – Disc of T1 0.45 times as long as whole dorsal surface of tergum on midline.

Measurements (mm) – body length: 8.1; of forewing: 7.2. Length and width of head: 2.24; 3.21. Maximum, inferior and superior distance between eyes: 2.14; 1.17; 1.98. Interocellar and ocello-ocular distances: 0.57; 0.46. Diameter of mid and lateral ocelli: 0.25; 0.24. Length and diameter of scape: 0.94; 0.12. Length of pedicel, 1st, 2nd, 3rd and terminal flagellomeres: 0.17; 0.26; 0.18; 0.20; 0.34. Diameter of 5th flagellomere: 0.20. Length and width of mesoscutum: 2.14; 2.48. Length and width of prestigma: 0.24; 0.11. Length and width of pterostigma: 0.68; 0.26. Length and width of marginal cell: 1.40; 0.65.

Male (holotype)

Body color – black, except as follows: apical three-fourths of mandible, dark ferruginous; flagellum ventrally, distitarsi (missing on hind legs), fore basitarsus, strigilis, spurs, tegula, wing veins and pterostigma, light ferruginous; flagellum dorsally, legs (except distitarsi) and metasomal sterna, brown; wings hyaline with weak ferruginous reflection in the closed cells.

Pubescence – mostly black, except whitish yellow on labrum, clypeus, paraocular area, frons and postocellar fringe (the latter with some black hairs intermixed laterally); white on apex of mid tibia, anteriorly on hind tibia and hind basitarsus, ventrally on mesosoma, laterally on T1 and on metasomal sterna; light yellow on marginal zones of T2 to T4 (very few hairs left on holotype), but black on lateralmost areas and marginal fimbria of T4.

Punctures – on labrum very fine, sparse (one to six diameters apart) on apical two-thirds of disc, dense (one diameter apart) on mid basal third, sparser (two to three diameters apart) laterally; on clypeus, fine and moderately sparse (one to two diameters apart - sparser medially), intermixed with very fine, moderately sparse punctures (one to three diameters apart); on supraclypeal area fine, dense (one diameter apart or less) on upper half and lateral margins, progressively finer and sparser toward disc, apical margin impunctate; on subantennal and paraocular areas hidden under pubescence; on frons and vertex between lateral ocellus and eye, fine, sparse (one to four diameters apart), denser (one to two diameters apart) toward ocelli; on gena fine and sparse (two to three diameters apart) becoming minute and sparse (three or more diameters apart) near eye margin; under pronotal collar fine, dense (one or less diameter apart) medially, progressively sparser laterally; on mesoscutum near pronotum (at least medially), very fine and dense (one diameter apart), on disc, moderately coarse, dense (one or less diameter apart) anteriorly, progressively sparser posteriorly and leaving impunctate two latero-posterior areas; on scutellum moderately coarse and dense (one diameter apart) on disc, coarser and denser under fringe; on metanotum moderately coarse and dense (one diameter apart or less) on lateralmost areas, very fine and sparse (two to four

diameters apart) on mid lateral areas and moderately sparse and very dense (less than half a diameter apart) under tuft; on mesepisternum moderately coarse and dense (one diameter apart or less) on disc, progressively finer and sparser toward anterior surface and posterior area; on propodeum fine and dense laterally (one or less diameters apart), finer medially, impunctate discal area relatively small; on anterior vertical surface of T1 hidden by glue on holotype; on disc of T1 fine and dense (one diameters apart or more); on marginal zone of T1 to T5 fine and dense next to premarginal line, progressively finer and sparser toward margin.

Structure – transverse carina of T1 present. S8 as shown in Fig.6E.

Measurements (mm) – body length: 6.6; of forewing: ?. Length and width of head: 1.83; 2.61. Maximum, inferior and superior distance between eyes: 1.65; 1.31; 1.59. Length and width of labrum: 0.33; 0.85. Length and width of clypeus: 0.62; 0.52. Diameter of antennal socket: 0.18. Interantennal, antennal-ocular and antennal-clypeal distances: 0.42; 0.31. Interocellar and ocello-ocular distances: 0.56; 0.38. Midocellar-occipital and lateral ocellar-occipital distances: 0.08; 0.04. Diameter of mid and lateral ocelli: 0.21; 0.18. Length, frontal and lateral widths of eye: 1.58; 0.65; 0.42. Width of gena: 0.50. Length and diameter of scape: 0.69; 0.17. Length of pedicel, 1st, 2nd, 3rd and terminal flagellomeres: 0.16; 0.17; 0.23; 0.21; 0.34. Diameter of 5th flagellomere: 0.21. Length and width of mesoscutum: 1.57; 2.01. Length of scutellum: 0.57. Width of metasoma: 2.93. Length and width of prestigma: 0.23; 0.10. Length and width of pterostigma: 0.65; 0.25. Length and width of marginal cell: 1.17; 0.59.

Variation – only one male, besides the holotype, has been examined. It agrees well with the type but has its pubescence better preserved. On this male, the marginal zone of T1 (which has no hairs left on the type) is covered by a sparse band of fine, semiappressed pale-yellow hairs; the marginal zones of T2 to T4 are provided with bands of densely branched, semiappressed pale-yellow hairs. The bands on T1 to T4 are terminated before the tergal lateral margins, which are covered with black pubescence. Unlike the type, this specimen has white hairs anteriorly on midbasitarsus and the hairs on the disc of T1 (also lacking on type) are whitish.

Material examined

Holotype (♂) – Argentina, Jujuy. Deposited at the "Museo Argentino de Ciencias Naturales 'Bernardino Rivadavia'", Buenos Aires, Argentina.

Additional material – Three specimens (2 ♀♀ and 1 ♂) from **ARGENTINA: Jujuy** (Monterrico); **Salta** (30 km South of General Güemes, 1000m, General Ballivian). **BOLIVIA: Santa Cruz**.

Deposited at MACN, PLATA, SUNJ.

Activity period

November, January and March.

Comments

See "Comments" for *E. dasypoda*.

Exomalopsis (Phanomalopsis) trifasciata **Brèthes**

Exomalopsis trifasciata Brèthes, 1910:292.
Exomalopsis spegazzinii Brèthes, 1910:290.

Female (holotype)

Body color – black except as follows: margins of T1 and T2 brownish black; abdominal sterna blackish brown; legs internally brown; flagellum ventrally (except the first flagellomere and the basal third of the second flagellomere) light brown; radial and costal veins dark brown; mandibular condyle, apical margin of clypeus, flagellum dorsally (except the two first flagellomeres) and tegula blackish ferruginous; transverse stripe near apex of mandible dark ferruginous; wing veins (except C and R), pterostigma, spurs, distarsi, midtarsi and strigilis light ferruginous. Wings hyaline.

Pubescence – black on gena, preoccipital fringe, pre-episternum, posteriorly on hind basitarsus, T5 and discs of T2 and T3; fuscous on paraocular areas, mesoscutum, mesepisternum and posteriorly on hind tibia; brown, sometimes with black and yellowish hairs intermixed, on tibiae (except scope) and femora (on inner surface lighter than on the outer); light brown on frons, propodeum and ventrally on mesosoma; yellowish on mid and hind tarsi, and fore basitarsus; light yellow on abdominal sterna; creamy white on the anterior band of scopa; whitish on T1 and tomentous of marginal areas of T2 to T4. Hairs missing on clypeus; on supraclypeal area short, fine (predominantly) and semierect; on paraocular areas plumose and dense; on suprantenal area long; on frons short, fine and semierect to erect; on postocellar fringe moderately long fine and erect; on gena moderately long, fine and semidecumbent; on mesoscutum and propodeum moderately long, plumose and semierect; hairs missing on scutellum and on metanotum; on mesepisternum long, fine and semierect; on lateral zones of T1 to T4 long, fine and semierect; appressed and dense on marginal areas of T2 to T4. Hairs denser on apex than on base of wings.

Punctures – on disc of clypeus moderately coarse and dense (one diameter or less apart) progressively sparser toward lateral areas and leaving a median longitudinal smooth band and an apical transverse band sparsely punctate (two to five diameters apart); on supraclypeal area moderately fine and moderately sparse (one to three diameters apart) intermixed with minute punctures; on frons fine and moderately sparse (one to three diameters apart); on vertex, between eyes and ocelli and between the ocelli minute and sparse (three to four diameters apart); behind the ocelli fine and dense (one diameter or less apart); on gena moderately coarse and sparse (one to three diameters apart) becoming finer toward eye; on mesoscutum moderately coarse and dense (less than one diameter apart) on anterior half, progressively sparser (one diameter or less apart) between parapsidial lines, smooth area median and posterior area which do not reach the parapsisdial lines; on disc of scutellum fine and sparse (one to three diameters apart), with a median band of fine and dense punctures, coarse and very dense (less than a diameter apart) posteriorly and laterally; on metanotum, mesepisternum and anterior horizontal surface of propodeum coarse and dense (less than one diameter apart); on posterior vertical surface of propodeum moderately coarse and dense (one diameter or less apart), apical third of metapostnotum, above propodeal pit,

microstriate and reticular; on vertical surface of T1 moderately fine and moderately dense with irregular smooth areas apart, integument microreticulate basally and smooth (among punctures) near disc; on disc of T1 moderately fine and sparse (one to three diameters apart), becoming finer posteriorly; marginal area of T1 smooth; on T2 fine and dense (less than one diameters apart), becoming sparser (two to four diameters apart) close to margin of tergum.

Structure – Labrum almost flat (except for a longitudinal median elevated line) and trapezoidal but with a slight medial projection on its apical margin; superior margin of eyes, in frontal view, at the same level of summit of head; basitibial plate longer than wide, with apex narrowly rounded; disc of T1 about 2/5 of dorsal surface of tergum. Thirteen hamuli on left wing and twelve on right wing.

Measurements (mm) – approximate body length = 7.98; of forewing 7.47. Length and width of head = 2.08, 2.83. Maximum, inferior and superior distance between eyes = 1.89, 1.52, 1.70. Interocellar and ocellar-ocular distances = 0.48, 0.46. Diameters of mid and lateral ocelli = 0.22, 0.20. Length and diameter of scape = 0.82, 0.16. Length of pedicel, 1st, 2nd, 3rd and terminal flagellomeres = 0.18, 0.22, 0.19, 0.20, 0.33. Diameter of 5th flagellomere = 0.18. Length and width of mesoscutum = 1.95, 2.20. Length and width of prestigma = 0.22, 0.19. Length and width of pterostigma = 0.79, 0.25. Length and width of marginal cell (measured on wing margin) = 1.70, 0.51.

Variation – this is a highly polymorphic species, the hair color being especially variable across its range of distribution. Some specimens tend to be mostly lightly colored (tones of creamy white or yellowish), some are predominantly ferruginous in color, some are mostly dark colored, and some a combination. Pubescence of head can be pale yellow, white, fuscous, or ferugineous; pre-occipital fringe varies from completely yellow or ferrugineous to completely black; mesosoma sometimes all blackish, sometimes with mesoscutum and mesepisternum ferrugineous, sometimes pale yellow or even white; scopa can be entirely yellow or yellowish, varying to the point yellow hairs are restricted to apical portion of scopa (which can be the whole posterior portion of basitarsus) and apex of basitibial plate only; apical fringe of terga varies from light brown to blackish. Flagellum dorsally varies from blaskish to ferrugineous, and ventrally it varies from ferrugineous to light ferrugineous; tegula varies from almost completely black to ferrugineous; wings can be slightly duscky, sometimes hyaline with yellowish tint; wing veins vary in color from light yellow to dark brown. Impunctate posterior area on mesoscutum sometimes continuous, sometimes separated medially by a longitudinal median band of punctures.

Male [ARGENTINA; SALTA; Yacochuya; (Cafayate); 12.XII.1973; Col. L.Stange; Ex. flores; Senecio sp.; COLECCION INST. – FUND. M. LILLO; 4000; S. M. TUCUMAN; TUCUMAN – ARGENTINA].

Body color – black except as follows: flagellum ventrally and S5 dark ferruginous; pedicel blackish ferruginous; apical edge of clypeus, veins (except R) and pterostigma brownish ferruginous; tarsi, pygidial plate, transverse median stripe and tip of mandible, coxae and trochanters ferruginous; inner side of tibiae and femora, spurs and strigilis light ferruginous; outer side of tibiae and femora yellowish ferruginous. Wing brownish hyaline.

Pubescence – mostly white; light brown on scutellar fringe and on marginal area of terga. Hairs on labrum and face longer and denser than on female, completely hiding face; hairs on legs and metasomal terga longer than on female.

Punctures – On labrum moderately coarse and dense (less than two diameters apart from each other); on face largely hidden by pubescence; on upper frons and on vertex between ocelli fine and sparse (one to three diameters apart); on vertex, between eye and ocellus minute and sparse (three to five diameters apart); behind ocelli coarse and dense (less than one diameter apart); on gena moderately fine and sparse (one to four diameters apart), finer toward eyes; on mesosoma as in female; on T1 coarse and dense (one or less than one diameter apart); on disc of T2 coarse and dense (less than one diameter apart.)

Structure – labrum rectangular, flat, apical margin straight; transverse carina of T1 present; premarginal line of T1 not depressed. Ten hamuli on left wing and eleven on right wing.

Measurements (mm) – approximate body length = 6.9; of forewing 6.2. Length and width of head = 1.95, 2.35. Maximum, inferior and superior distance between eyes = 1.48, 1.26, 1.50. Interocellar and ocellar-ocular distances = 0.42, 0.37. Diameters of mid and lateral ocelli = 0.23, 0.17. Length and diameter of scape = 0.61, 0.13. Length of pedicel, 1st, 2nd, 3rd and terminal flagellomeres = 0.14, 0.15, 0.26, 0.26, 0.37. Diameter of 5th flagellomere = 0.17. Length and width of mesoscutum = 1.31, 1.79. Length and width of prestigma = 0.18, 0.10. Length and width of pterostigma = 0.66, 0.22. Length and width of marginal cell (measured on wing margin) = 0.84, 0.41.

Material examined

Holotype (♀) **–** "7116; Provincia Salta; *Exomalopsis trifasciata* Brèthes; 723; Holotypus". Deposited at the Department of Entomology of Museo Argentino de Ciencias Naturales, Buenos Aires, Buenos Aires.

Additional material – A total of 231 specimens (133 ♀♀, 98 ♂♂) from [Chiva, Chiva; Juan Mina] **ARGENTINA: Buenos Aires** (Buenos Aires, Felipe Sola, Sierra De La Ventana); **Catamarca** (Alijilam, El Alto); **Córdoba** (Bialet Massé, Cerro Colorado – 13 Km E de Santa Elena, Córdoba, Dique "Los Molinos", El Sauce, La Puerta); **Jujuy** (Huacalera, Monte Rico, "Ruta 9 – S Monumento Trópico Crapicornio 500 m", Tilcara, Tumbaya); **La Pampa** [= Eva Perón] (Cuchillo, Hucal); **La Plata**; **Rio Negro** (Rio Colorado); **Salta** (General Ballivian, Rosario de Lerma, Tacuil, Yacochuya); **Santa Fé** (Carcarana); **Tucumán** (Cadillal, Los Puestos, S.P. Colalao, Tacanas, Tafi Viejo, Tapia, Ticucho). **BOLIVIA:** (Santa Cruz?); **Chuquisaca** (Salanacachi); **Cochabamba** (Chapare, Cochabamba); **Potosí** (Concycidu**). BRAZIL: Paraná** (Curitiba, Jaguariaia, Palmeira, Rio Negro, S.J.Pinhais; Vila Velha); **Rio Grande do Sul** (Alegrete, Esteio, Viamão); **Santa Catarina** (Caçador, Içara, Nova Teutônia).

The specimens belong to the following collections: AMNH, FZRS, LILLO, MACN, PLATA, SNOW, UFPR, UNSM, UTAH.

Activity period

September – May.

Discussion

Silveira (1995b) encountered three equally parsimonious hypotheses for the sister group of *Phanomalopsis* – i) *Exomalopsis s.s.;* ii) *Stilbomalopsis;* and iii) a clade composed of all other subgenera of *Exomalopsis.* The results obtained here support only the second alternative. Characters supporting sister-group relationship between *Phanomalopsis* and *Stilbomalopsis* are: an expanded dorsal surface of the apical process of the male S7 (character 38-2) and a long, slender gonostylus in the male genitalia. Both characters are unique to members of these subgenera. This relationship suggests that a vicariance event led to the speciation of an ancestral species, leading to the origin of the ancestor of *Stilbomalopsis* in Central and North America and the ancestor of *Phanomalopsis* in South America. It seems that that ancestral species and the ancestor of each of its daughter subgenera dwelled in semidesertic areas.

When Silveira (1996) described the female of *E. diminuta,* he stated that it fit in *Phanomalopsis sensu* Michener & Moure (1957) due to its convex vertex and to the presence of the depressed premarginal groove on T1. However, vertices of true *Phanomalopsis,* as currently accepted, are straight in frontal view and gently excavated between lateral ocelli and eye (Silveira, 1995b). Moreover, the premarginal groove of T1, although present in all *Phanomalopsis,* occur also in other lineages of *Exomalopsis* (Silveira, 1995b; this study). Accordingly, one of the results of the present study is the indication that *E. diminuta* actually is not part of *Phanomalopsis* but probably is, with *E.dubia,* part of *Diomalopsis.* Synapomorphies supporting the inclusion of *E. diminuta* and *E. dubia* in *Diomalopsis* are the unevenly-spaced hamuli of the hind wing (character 12-1), the short disc of T1 of female approximately one-third as long as marginal area or less (character 22-2) – a homoplastic synapomorphy for *Diomalopsis,* which does not occur in *Phanomalopsis* but is present also in *E. (Exomalopsis) auropilosa* – and the straight hairs of the apical fringe of T5, in females, with densely plumose hairs (character 27-1). Characters 12-1, 27-1, 33-3, and 39-2 are unique to the clade composed by *E. diminuta, E. dubia* and *Diomalopsis* and were listed by Almeida & Silveira (1999) as synapomorphies of the latter. However, there were problems in coding them. Although the hamuli of all four species involved were unevenly spaced, in *E. diminuta,* the three groups of hamuli that could be distinguished (3-2-3) were more closely spaced than in the other species. To avoid the possibility of preconcivealy "pushing" this species into *Diomalopsis* it was decided to code this character for it as "unknown". The apical fringe of T5 of females of all four species were straight and somewhat dense, although those of *E. dubia* and *E. diminuta* were not quite as long as those of the others. It was not possible to ascertain, however, whether or not their hairs were like those of *E. bicellularis* and *E. alexanderi* – straight with densely plumose apices. For this reason, they were also coded as "unknown" for the two former species.

On the other hand, *E. diminuta* and *E.dubia* do not possess the single unique synapomorphy appearing in the females of *Phanomalopsis:* a gently concave vertex (character 9-1), instead, they retain the plesimorphic convex vertex, which is present also in *Diomalopsis.* Other characters defining *Phanomalopsis* and absent in *E. diminuta* or *E. dubia* all pertain to males which are not known for these species.

It is interesting, thus, that, even with some synapomorphies coded as missing, *E. diminuta* and *E. dubia* consistently appear as part of *Diomalopsis*. Accepting the affiliation of *E. dubia* and *E. diminuta* to this subgenus, however, would require changing its scope, as recently defined by (Almeida & Silveira, 1999) and the front wings with only two marginal cells (character 13-1) would no more be a synapomorphy of *Diomalopsis* but just of a derived pair of its species *(E. bicellularis* and *E. alexanderi).* Discovery of male *E. diminuta* and *E. dubia* would probably help to confidently place them in the classification of *Exomalopsis.* Until then, it seems wiser to leave these species in *incerta sedis* for sake of taxonomic stability.

Silveira (1995b) found *Phanomalopsis* to be the only clade in the genus that could not be sharply separated from the others. He argued that this was due to a few basal species which retain many of the plesiomorphies for the clade. Despite this, the phylogenetic analyses presented here supported the monophyly of *Phanomalopsis,* provided that *E. diminuta* is removed from it.

Monophyly of the subgenus *Phanomalopsis* (minus *E. diminuta)* is mainly supported by male characters: the form of the disc of S7 (character 33-2); the presence of an apical process of S7 with two basilateral lobes (character 34-2), which is shown in Fig. 9 as appearing on the base of the clade formed by *Phanomalopsis* and *Stilbomalopsis*, but changing again to character 34-3 on the *Stilbomalopsis* lineage; the production of the apical process of S8 into two long arms attached to a single base, partially membranous and narrowing gradually (character 39-5); the presence of a lobe under the basal tuft of the apical process of S8 (character 42-1); the apical process of S8 of male long with a lobe separated from disc by strongly constricted stalk (character 49-1); and the acute ventral angle of the lateral process of penis valve (character 51-2). All these characters, however, are changed to other unique characters that are, themselves, synapomorphies for internal clades of the subgenus. The only unique female synapomorphy in the subgenus is the gently excavated vertex (character 9-1), which is convex in all other Exomalopsini, except in *Exomalopsis s.str.,* in which it is deeply excavated. Other characters appear as homoplasies in other Exomalopsini.

There are several strong synapomorphies separating *E. solitaria* from the clade formed by the *aureosericea* species-group + the *jenseni* species-group. They are all features of the male genitalia and hidden sterna. The main synapomorphies for this group are: the basal tuft of the apical process of S8, which is short, restricted to the base of the apical process and separated from the apical tuft (characters 40-2 and 41-1); the mesal and external sinuses in the ventral surface of the penis valve (character 47-1); the subapical microrrugulation on the margin of the ventral internal surface of the penis valve (character 48-1); the short lateral process of the penis valve, and the projection of the dorsal angle of the lateral process of the penis valves, which is directed dorsad (characters 49-2 and 50-2). They are all unique characters of this group but all, except 47-1 and 49-2, change or suffer reversals inside the clade. Other characters supporting this group appear also in other subgenera of *Exomalopsis.*

A single unique synapomorphy supports the *aureosericea* species-group. This is the pockets on the postero-lateral margin of the S8 disc, which are at least partially contained inside the perimeter of the sternal disc (character 43-1). Other characters supporting the clade are homoplastic.

On the other hand, the *jenseni* species-group is well supported by several unique features in both sexes. The labrum of their females is concave, triangular and with no median elevated area (character 3-1); both sexes possess a longitudinal carina on the dorsal surface of the hind trochanter (character 31-1). In the males, there is a marginal flange on the apical half of the disc of S7 (character 37-1); the apical process of S8 is produced into two short, robust, widely separated arms attached to a single base, without a membranous area (character 39-4); and the narrow expansion of the posterior margin of the dorsal bridge of penis valves (character 45-2).

Taxonomic Note

Almeida & Silveira (1999) made a mistake when giving collection dates for the paratypes of *E. (Diomalopsis) alexanderi*. Contrary to what they stated, paratypes were not collected on the same date as the holotype. Correct dates are: for three of them, November 24-27, 1983 (two deposited at the ARS-USDA Bee Biology & Systematics Lab. at Logan, Utah, USA, one at UFMG); for another one (also deposited at Utah), November 28-30, 1983 and, for the last one (deposited at the Snow Entomological Division of the Natural History Museum of the University of Kansas, Lawrence, Kansas, USA), December 1-4, 1983.

Acknowledgements

We would like to thank the institutions that loaned specimens for our study, as well as their curators (listed in the Material and Methods); the University of Kansas Science Bulletin which, through Dr. C. D. Michener, allowed the reproduction of figures originally published in Silveira (1995b) and Roderic B. Martines for the phographs used in several of our figures. T. Griswold made a carefull revision of the manuscript and encouraged us to describe the species we named after him as new. This paper was prepared with the support of the Brazilian council for development of science and technology (CNPq), which granted fellowships to both authors. FAS wishes to thank the late Dr. B. A. Alexander and Dr. C. D. Michener for their support during the elaboration of his Ph. D. thesis, which was the starting point for this article.

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APPENDIX I

Character matrix employed in the cladistic analyses.

TAXA	CHARACTERS				
	1	2	3	4	5
	1234567890123456789012345678901234567890123456789012345678901234567				
A. (Anthophorisca) texana (Friese, 1899)	11001111100000021211031100101000000000260000000003000000				
A. (Isomalopsis) niveata (Friese, 1908)	11020000000?00000103111000100000000?60000000003000002000				
E. (Exomalopsis) fulvofasciata Smith, 1879	00000111211000222201110000001101400000000000000040010102O				
E. (Exomalopsis) auropilosa Spinola, 1853	00010110211000122201020000001101400000200000000040010102O				
E. (Stilbomalopsis) solani Cockerell, 1896	00000101001001111111100222100110013210110000111000000130I0				
E. (Stilbomalopsis) dimidiata Timberlake, 1980	00000101000000111111101221100?10013210110000111000000130I0				
E. (Diomalopsis) bicellularis Michener &Moure, 1957	00010000000110111111102212210?10030000220002110003000020 20				
E. (Diomalopsis) alexanderi Almeida &Silveira, 1999	??01?2000001101?211?2211110010?????????????????????????O				
E. (incertae sedis) diminuta Silveira, 1996	??01??00000?0011??11?2111?0010?????????????????????????O				
E. (incertae sedis) dubia sp. n.	??01??0100010011??11?2111?0010?????????????????????????O				
E. (Phanomalopsis) solitaria Brèthes, 1910	00010100100001000001011111010100222000500121100011200201O				
E. (Phanomalopsis) atlantica Silveira, 1996	00000?10101000222211011010001100211100521101110111221002010				
E. (Phanomalopsis) aureosericea Friese, 1899	00010010101000012220101111000110021110052101110111222012010				
E. (Phanomalopsis) trifasciata Brèthes, 1910	00000001010100011?201*11111001100422100522111101022101211O				
E. (Phanomalopsis) perikalles sp. n.	00000001010100012110101111100110042210052211110111212012110				
E. (Phanomalopsis) jenseni Friese, 1908	00100111101001111111121111101011022211041112120112210120I0				
E. (Phanomalopsis) gualamba sp. n.	00120111101001111111121111101011022211041102120112220121I0				
E. (Phanomalopsis) snowi Cockerell, 1906	00100111101000122201011100010110222110421121301122201211I1				
E. (Phanomalopsis) griswoldi sp.n.	00100011101000122211011111010110222110421121301122201211I1				
E. (Phanomalopsis) dasypoda Strand, 1910	00100111101000?222211111111010110???1?0411?21?01????0???10				
E. (Phanomalopsis) testaceinervis Brèthes, 1910	00100?1101?00?222?111111?10110???1?0421?21?01????0???10				
E. (Phanomalopsis) eremalis sp.n.	00??01???0?001??111112?????????10222110411121201122201201??				

* Coded as a polymorphic (0/1) character.

APPENDIX II

***Exomalopsis dubia* sp.nov.**
(Fig. 19)

Diagnosis

This species, known only from the Brazilian state of Paraná, is similar to *E. diminuta* Silveira, 1996, to which it seems to be related and from which it can be distinguished by the following set of characters: In *E. dubia,* hairs on mesoscutum are all long, wings are hyaline and scopa, on outer surface of tibia, is light-colored. In *E. diminuta,* hairs on mesoscutum are short, felt-like in appearance, with long fine hairs scattered among them, wings are dusky and the scopa, on outer surface of tibia, is dark.

Female (holotype)

Body color – black except as follows: wing veins R and C dark brown; flagellum ventrally, wing veins (except R and C), tegula brown; basitarsi ferruginous; pterostigma yellowish with darker edges.

Pubescence – pale yellow, except: whitish on tomentose bands of T1 – T4 and on propodeum and mesepisternum; fringes of T5 and T6 light brown with blackish apices; blackish on apex of basitibial plate; yellow frontally on basitarsi. Labrum with two parallel longitudinal median rows of hairs; on clypeus sparse and semi-erect; laterally on supraclypeal area and on frons denser, shorter and sparser toward ocelli; on vertex sparse; pre-occipital fringe; on mesoscutum moderately long and plumose, regularly distributed; on disc of scutellum short; on scutellar and metanotal fringes and on mesepisternum long and plumose; on metepisternum moderately short and erect; on propodeum mostly short and semidecumbent to decumbent; on metapostnotum absent; on anterior surface of T1 and on the sides of metasoma plumose, moderately long and semierect; on T1 – T4 short, decumbent, and densely plumose, completely covering the visible areas of T3 and T4 but leaving a glabrous small median area on T2, and being restricted to the sides of T1; on T5 and T6 forming fringe composed by long, poorly branched hairs in addition to special hairs (straight, with densely plumose apices).

Punctures – on clypeus moderately fine and moderately sparse (one to three diameters apart from each other), leaving a smooth median longitudinal band and forming a submarginal transverse discontinuous line of densely arranged punctures; on supraclypeal area finer and sparser medially, becoming denser near antennal socket (less than one diameter apart); on frons minute and sparse (more than two diameters apart); denser on vertex, especially near eye margin; fine and moderately sparse between median and lateral occeli; moderately fine and dense (less than one to two diameters apart) behind ocelli; on mesoscutum moderately fine and moderately dense (one to three diameters apart), slightly sparser posteriorly but not leaving impunctate spaces; on disc of scutellum sine and very sparse (more than three diameters), denser in a longitudinal median band and toward margins; on metanotum coarse, oblique, and very dense (less than one diameter apart); basally on propodeum fine and moderately sparse (one and a half to four diameters apart), leaving a smooth median longitudinal band; metapostnotum smooth and shiny; on mesepisternum moderately coarse to coarse and dense (less than one to five diameters apart); T1 mostly impunctate, except for a row of fine and very sparse punctures that delimits the marginal area from the disc of T1, and for the densely punctuated lateral areas; on T2 fine and sparse, becoming denser laterad amd leaving a smooth median area near the apical margin; on T2 - T6 hidden by pubescence.

Structure – clypeus gently convex, disc flat, apical margin delimited by a strongly punctate transverse line; frontal sulcus well-defined; superior margin of eye slightly below vertex of head; vertex slightly below lateral ocellus; vertex between eye and lateral ocellus not excavated; basitibial plate longer than wide, with apex rounded; disc of T1 approximately 1/3 of dorsal surface of tergum; hamuli, eight per wing, unevenly distributed.

Measurements (mm) – approximate body length = 6.3; of forewing 5.04. Length and width of head = 1.56, 2.02. Maximum, inferior and superior distance between eyes = 133, 1.09, 1.20. Interocellar and ocellar-ocular distances = 0.39, 0.26. Diameters of mid and lateral ocelli = 0.18, 0.15. Length and diameter of scape = 0.56, 0.12. Length of pedicel, 1st, 2nd, 3rd and terminal flagellomeres = 0.14, 0.15, 0.13, 0.14, 0.25. Diameter of 5th flagellomere = 0.13. Length and width of mesoscutum = 1.17, 1.41.Length and width of prestigma = 0.17, 0.11. Length and width of pterostigma = 0.62, 0.21. Length and width of marginal cell (measured on wing margin) = 0.75, 0.35.

Male (Unknown).

Material examined

Holotype (♀) – Brasil, Paraná, Parque Estadual de Vila Velha, 25°14'S 49°59'W, 3.iii.2001. G.A.R.Melo. Deposited at UFPR.

Paratypes – Brasil, Paraná, Parque Estadual de Vila Velha, 25 14'S 49 59'W, 28.iii.2004. G. Melo & R. Gonçalves (3 ♀♀), with the following additional labels – PEVV\2825, PEVV\ 2570 and PEVV\2590; Brasil, Paraná, Parque Estadual de Vila Velha, 25 14'S 49 59'W, 28.ii.2004, G. Melo & R. Gonçalves (4 ♀♀) with the following additional labels – PEVV\2229, PEVV\2235, PEVV\2236 and PEVV\2237. All deposited at UFPR, except one, at UFMG. Collected on flowers of *Eryngium junceum* Cham. & Schlecht and of an unidentified Asteraceae.

Activity period

February – March.

Etymology

Dubia is a Latin word for doubtful. This is a reference to its uncertain position among the subgenera of *Exomalopsis.*

Figure 19 - *Exomalopsis dubia* sp. n. Holotype ♀: A – dorsal view of head and mesosoma; B – dorsal view of metasoma; C – frontal view; D – lateral view.