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On the dumping ground genus *Scotaena* Klug, 1810 (Hymenoptera, Tiphiidae, Thynninae): Phylogeny, Taxonomy, and Geographic Distribution.

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RESUMO

Thynninae é a subfamília mais diversa de Tiphiidae (Hymenoptera, Aculeata) e está presente nas regiões Neotropical e Australásica. É dividida atualmente em quatro tribos, das quais Scotaenini compreende sete gêneros exclusivamente neotropicais. Porém, uma análise cladística recente não recuperou a monofilia do grupo, assim como de *Scotaena*, Klug, o gênero-tipo da tribo. As 15 espécies atualmente reconhecidas de *Scotaena* passaram por diversas alterações de status taxonômico desde que foram descritas, sem nenhum suporte cladístico. Através do levantamento de caracteres morfológicos de espécimes fixados do sexo masculino, uma análise cladística foi realizada a fim de se testar a monofilia do gênero. A análise retornou uma única árvore sobe pesagem igual de caracteres, na qual o gênero aparece parafilético e dividido em vários clados. A partir desses resultados, três novas combinações são propostas: *Eucyrtothynnus rosenbergi* comb. n. (=*Scotaena rosenbergi*), *Glottynoides genisei* comb. n. (=*Scotaena genisei*), e *Ornepetes clypearis* comb. n. (=*Scotaena clypearis*). Duas espécies são definidas como *incertae sedis*: *Scotaena brunnea* inc. sed. e *Scotaena pallida* inc. sed. Três gêneros são descritos e suas espécies-tipo redescritas: *Kaysara* Carnimeo 2017 gen. n., *Pseudoscotaena* Carnimeo, 2017 gen. n., e *Pampathynnus* Carnimeo, 2017 gen. n. E cinco novas espécies são descritas: *Scotaena reversa* Carnimeo, 2017 sp. n.; *Kaysara laterolata* Carnimeo, 2017 sp. n., *Kaysara apiciconcava* Carnimeo, 2017 sp. n., *Kaysara marginoplicata* Carnimeo, 2017 sp. n., e *Kaysara levicrenata* Carnimeo, 2017 sp. n. Além disso, uma chave de identificação e mapas de distribuição geográfica das espécies estudadas são apresentados. O gênero *Scotaena* é agora composto por quatro espécies: *S. trifasciata*, *S. horni*, *S. vetusta*, e *S reversa*. Esses resultados, além de contribuirem para um melhor entendimento do gênero, irá facilitar estudos futuros em *Scotaena* e Thynninae da América do Sul como um todo.

Palavras-chave

Neotropical wasps; *Kaysara; Pseudoscotaena; Pampathynnus; Scotaena reversa; Kaysara laterolata; Kaysara apiciconcava; Kaysara marginoplicata; Kaysara levicrenata;*

ABSTRACT

Thynninae is the most diverse subfamily of Tiphiidae (Hymenoptera, Aculeata) and is distributed in the Neotropical and Australasian regions. It is subdivided into four tribes, among which Scotaenini comprises seven exclusively Neotropical genera. A recent cladistic analysis of Scotaenini did not indicate this clade as a monophyletic group, and suggested that *Scotaena* Klug, the type-genus of Scotaenini, is not monophyletic either. The 15 species of *Scotaena* have passed through several taxonomic changes since they were described, without any cladistic analysis to support them. Through the characterization of morphological structures of fixed male specimens, a cladistic analysis was carried out to unravel which species really belong to *Scotaena*. The analysis returned a single tree under equal weighting, in which the genus was shown to be paraphyletic and divided in several clades. Based on these results, three new combinations are proposed: *Eucyrtothynnus rosenbergi* (Turner, 1910) **comb. n.** (=*Scotaena rosenbergi*), *Glottynoides genisei* Kimsey, 1991 **comb. n.** (=*Scotaena genisei*), and *Ornepetes clypearis* Durán-Moya, 1941 **comb. n.** (=*Scotaena clypearis*). Two species are left as *incertae sedis*: *Scotaena brunnea* (Fox, 1898) **inc. sed.** and *Scotaena pallida* (Fox, 1898) **inc. sed.**. Three new genera are described, and their respective type species redescribed: *Kaysara* Carnimeo **gen. n.**, *Pseudoscotaena* Carnimeo **gen. n.**, and *Pampathynnus* Carnimeo **gen. n.**. Five new species are described: *Scotaena reversa* Carnimeo **sp. n.**; *Kaysara laterolata* Carnimeo **sp. n.**, *Kaysara apiciconcava* Carnimeo **sp. n.**, *Kaysara marginoplicata* Carnimeo **sp. n.**, and *Kaysara levicrenata* Carnimeo **sp. n.**. Additionally, an identification key and geographical distribution maps are provided for the studied species. *Scotaena* is now restricted to comprise four species: *S. trifasciata* Klug, 1810; *S. horni* (Turner, 1927); *S. vetusta* Turner, 1909; and *S reversa* Carnimeo. These results, besides contributing to a better understanding of the group, will make further studies more feasible for *Scotaena* and the entire South-American Thynninae.

Key words

Neotropical wasps; *Kaysara*; *Pseudoscotaena*; *Pampathynnus*; *Scotaena reversa*; *Kaysara laterolata*; *Kaysara apiciconcava*; *Kaysara marginoplicata*; *Kaysara levicrenata*;

Sumário

Introduction

Tiphiidae encompasses about 2,000 described species in 120 genera in the world (Kimsey, 2006). While the Brazilian fauna includes at least 19 genera and 120 species. (Rafael et al, 2012). The family is divided in seven subfamilies (Anthoboscinae, Brachycistidinae, Methochinae, Myzininae, Thynninae, Tiphiinae and Diamminae) of which Thynninae is the largest one regarding genera and species number (Kimsey, 1991a). Being for a long time considered a distinct family, "Thynnidae", created for the genus *Thynnus* Fabricius, 1775 (Turner, 1910a). The subfamily occurs in South America and Australasia (Kimsey & Brown, 1993), but it is still poorly studied in both regions, mainly because of the scarcity of information regarding its taxonomy and systematics (Kimsey, 1992). Thynninae wasps presents strong sexual dimorphism, with winged male and ant-like wingless female (Kimsey 1991a), what difficult identification and male-female association. The entire Tiphiidae family is defined as ectoparasitoid of Scarabaeoidea (Coleptera) larvae, although there are records of Cerambycidae, Cicindelidae (Coleoptera), and Gryllotalpidae (Orthoptera) parasitized by tiphiids (Brothers & Finnamore, 1995; Kimsey & Brothers, 2006; Kimsey, 2006) - what shows how the biology of the group is still unclear.

The subfamily is divided into four tribes: Rhagigasterini, Elaphropterini, Thynnini and Scotaenini (Kimsey, 2004b). Elaphropterini and Scotaenini has exclusively Neotropical genera, Thynnini encompasses the Australasian ones, while Rhagigasterini is present in both regions (Kimsey, 2004b). Scotaenini was proposed by Kimsey (1992) to assemble seven South-American genera: *Scotaena* Klug, 1810 (type genus of the tribe); *Rostrynnus* Genise, 1991; *Parelaphroptera* Turner, 1910; *Anodontyra* Westwood, 1835; *Glottynus* Genise, 1991; *Ornepetes* Guérrin-Méneville, 1838, and *Pseudelaphroptera* Ashmead, 1903, but recent studies based on morphological data did not recover the monophyly of Scotaenini (Justino, 2013). The taxonomy of the South-American species of Thynninae, just like several other Neotropical groups of insects, is still poorly known and need to be revised (Genise & Kimsey, 1991). Several genera, especially *Elaphroptera* Guérin-Méneville, 1838 and *Scotaena*, were considered dumping grounds because they are composed by species that do not fit in other genera (Genise & Kimsey, 1991). Most studies concerning Thynninae were done isolated, resulting in a multiplicity of names for most of the collected species, rather than a coherent organization of the genera (Kimsey, 1992).

Scotaena was described by Klug (1810) for the species *Scotaena trifasciata*. Most of the species currently known for the genus were described for other genera. The last species included in *Scotaena* was *S. genisei*, described by Kimsey (1991a). The same author was responsible for several studies on the South-American Thynninae and represent the main reference for this group currently. In Kimsey (2004a), several new combinations are proposed for *Scotaena* and other genera, and a list of all the species included in *Scotaena* is presented for the first time: *S. brunnea* (Fox, 1898); *S. clypearis* (Durán-Moya, 1941); *S. decora* (Smith, 1859); *S. duckei* Turner, 1909; *S. fastuosa* (Smith, 1879); *S. flavovariegata* (Smith, 1879); *S. genisei* (Kimsey, 1991 in Genise & Kimsey 1991); *S. horni* (Turner, 1927); *S. pallida* (Fox, 1898); *S. polistoides* Turner, 1910b; *S. pubescens* (Klug, 1840); *S. trifasciata* Klug, 1810; *S. vetusta* Turner 1909; and *S. vigilii* (Bréthes, 1910). Besides that, two species described in *Scotaena* were transferred to other genera (Kimsey, 1991): *Scotaena impressiceps* to *Upa impressiceps* (Turner, 1910b); *Scotaena turbulenta* for *Merithynnus turbulentus* (Turner, 1910a). Thus, 15 species are currently recognized for the genus (Kimsey, 2004a), and besides the several synonymizations and changes in the taxonomic status of its species, the same study that showed Scotaenini to be non-monophyletic indicated *Scotaena* as a paraphyletic group either (Justino, 2013). This result indicates that the genus has taxonomic problems, needing to be revised under a cladistic perspective.

Furthermore, species level identification keys of South-American Thynninae fauna are available only for the genera revised by Kimsey: *Aelurus* Westwood, 1844 (Kimsey, 1991b), *Elaphroptera* (Genise & Kimsey, 1993), *Merithynnus* Kimsey, 1991 (Kimsey, 2005), and *Upa* Kimsey, 1991 (Kimsey, 1996). Identification of *Scotaena* through species description is barely possible, once its descriptions vary too much in terms of complexity and diagnostic characters. Most of them rely on colouration features, being therefore very few conclusive to the species identification. The taxonomic impediment suffered by *Scotaena* make it difficult to use the collected species in other researches, what results in a rich amount of material deposited and unutilized. Brazilian and international collections have deposited material available, but identified only at the generic level. This is a recurrent scenario in most groups of Tiphiidae. Therefore, this research had as objectives a cladistic analysis of the *Scotaena*, in order to test its monophyly. An identification key to the species, and distribution maps of their known geographical range are also provided.

Material and Methods

The phylogenetic analysis was done under cladistic approach, using external morphology characters from male individuals. Those were circumscribed by examining fixed specimens under a stereomicroscope Leica MZ 16. Due to the strong sexual dimorphism present in Thynninae and the scarcity of female individuals available, it is common that studies among this subfamily are performed only based on male specimens. Of the 15 known species of the genus, just seven (*Scotaena clypearis*, *S. duckei*, *S. genisei*, *S. polistoides*, *S. rosenbergi*, *S. vetusta*, and *S. vigilii*) have male and female individuals described, while six (*S. decora*, *S. fastuosa*, *S. flavovariegata*, *S. horni*, *S. pubescens*, and *S. trifasciata*) were described only for male, and two (*S. brunnea* and *S. pallida*) only based on female individuals. Thereby, *S. brunnea* and *S. pallida*, known only by its holotype and with no male associated, were not included in this study analysis. Thus, 13 species were used as ingroups, an asterisk (*) indicate the species where the primary type was analysed: *S. clypearis**; *S. decora**; *S; duckei**; *S. fastuosa**; *S. flavovariegata**; *S. genisei*; *S. horni**; *S. polistoides**; *S. pubescens**; *S. rosenbergi**; *S. trifasciata* (generotype of *Scotaena*)*; *S. vetusta**; *S. vigilii**. On the material examined, some morphological variants were found between the individuals of *S. flavovariegata* (five variants) and *S. vetusta* (two variants) analysed. These variants were added as terminals to the phylogenetic analysis (referred as *flavovariegata*1-5 and *vetusta*1 and 2) in order to confirm and support if they represent new species.

The 13 species used as outgroups were chosen to comprehend the genera closely related to *Scotaena*, representing "Scotaenini", and the more distantly related, representing the other South-American Thynninae tribes: Rhagigasterini and Elaphropterini. The more closely related species analysed were: *Anodontyra haarupi* (Turner, 1911); *Anodontyra tricolor* Westwood, 1835; *Ornepetes albonotata* André, 1904; *Parelaphroptera rollei* (Turner, 1908); *Parelaphroptera flavomaculata* (André, 1904); *Pseudelaphroptera chilensis* Saussure, 1867; *Pseudelaphroptera transandina* Turner, 1929; and *Rostrynnus tarsatus* (Klug, 1840). The more distantly related species analysed were: *Aelurus gayi* (Spinola, 1851) and *Aelurus nasutus* Klug, 1840 (Rhagiasterini); *Elaphroptera arcuata* Turner, 1908; *Elaphroptera scoliaeformis* (Haliday, 1836); and *Eucyrtothynnus avidus* (Turner, 1908) (Elaphropterini). Thereby, with 18 species on the ingroup and 13 species on the outrgroup, the analysis performed encompassed 31 terminal taxa.

The examined material was borrowed from the following curators and institutions: AMNH - American Museum of Natural History, New York, USA (Dr. J. M. Carpenter); BMC - Borhart Museum of Entomology, Davis, USA (Dr. S. L. Heydon); CEMT - Setor de Entomologia da Coleção Zoológica, Instituto de Biociências, Universidade Federal de Mato Grosso, Cuiabá, Brazil (Dr. F. Z. Vaz-de-Mello); CESC - Coleção Entomológica da Universidade de Santa Cruz do Sul, Santa Cruz do Sul, Brazil (Dr. A. Kohler); DZUP - Coleção Entomológica Pe. Jesus Santiago Moure, Departamento de Zoologia da Universidade Federal do Paraná, Curitiba, Brazil (Dr. G. Melo); DZSJRP – Coleção de Hymenoptera do Departamento de Zoologia do Instituto de Biociências, Letras e Ciências Exatas - UNESP, São José do Rio Preto, Brazil (Dr. F. B. Noll); INPA - Coleção de Invertebrados do Instituto Nacional de Pesquisas da Amazônia, Manaus, Brazil (Dr. M. Oliveira); MACN - Museo Argentino de Ciencias Naturales, Buenos Aires, Argentina (Dr. A. R. Alsina); MfN - Museum für Naturkunde Berlin, Berlin, Germany (Dr. F. Koch); MZUSP - Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil (Dr. C. Brandão); NHM - Natural History Museum, London, United Kingdon (Dr. G. Broad); SDEI - Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany (Dr. A. Taeger); UFES - Coleção Entomológica da Universidade Federal do Espírito Santo, Vitória, Brazil (Dr. M. Tavares); UFRJ - Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil (Dr. R.F. Monteiro).

The character matrix (Appendix I) was created and edited in Winclada 1.99 (Nixon, 2015). All characters were treated as non-addictive. Non-applicable states in contingent and unseen characters were coded as '–' and '?', respectively. Some characters present more than two states (12, 22, 24, 25, 35, 36, 58, 59, 62, 66, 71 and 72), but binary and contingent approach were preferred to character polarization. The analyses were performed under equal weighting and carried out in TNT (Goloboff et al, 2008), using the New Technology search scheme and the following algorithms: Sectorial Search (RSS, CSS and XSS); Ratchet (100 interactions and perturbation phase set to 8 for up-weighting and down-weighting); Drift (100 cycles); and Tree Fusing (10 rounds). Bremer index was calculated to branch support measures also in TNT, with search constraints set to 100 times. Terminology for morphological structures followed: Bréthes (1910), Genise & Kimsey (1991a, 1993), Kimsey (1991a, 1992, 2004), (Klug, 1810, 1840), Smith (1859, 1879), Turner (1909, 1910a, b); as it is indicated after each character description in the character list (Appendix II). Characters and structures without citation were circumscribed here for the first time. Colouration characters were completely avoided

since they can vary intra-specifically and suffer alterations by conservation processes. Turner (1927) already attempted to this issue on his *S. honi* description: "The yellow markings on the variety referred to above have almost entirely disappeared, colour in this and allied genera, being very variable in some species, cannot be relied on for specific distinctions."

Most of the characters' images were acquired with a Leica MZ 16 stereomicroscope, coupled to a Leica DFC 295 digital camera, through software Leica Application Suite (Heerbrugg, St. Gallen, Switzerland), with the aid of a scalable and modular dome illumination system (Kawada & Buffington, 2016). The pictures of the species, when not with the equipment indicated above, were taken with a Canon SLR EOS 5DSR with 65 mm macro lens mounted on a copy stand with an automated Z-stepper (NHM). Stacking and aligning were performed using Helicon Focus 6.7.1 (Kozub et al, 2000). Final retouching of the pictures was made using Adobe Photoshop 13.0 (San Jose, CA, USA), and the distribution maps through QGIS 2.18.2 (QGIS Development Team, 2017).

Results and discussion

Cladistic analysis

The matrix was constructed with 75 characters of external morphology: 26 from head structures, 28 from mesosoma (including wings and legs), and 21 from metasoma. The complete matrix is presented in Appendix I. The characters are cited in the text followed by its number and state (ex: 54:1), and are listed in the Appendix II. The analysis under equal weighting returned a single most-parsimonious tree (Fig. 1). Total of rearrangements examined was 19,710,724, and the best score retained was length 140 (CI = 65; RI = 86).

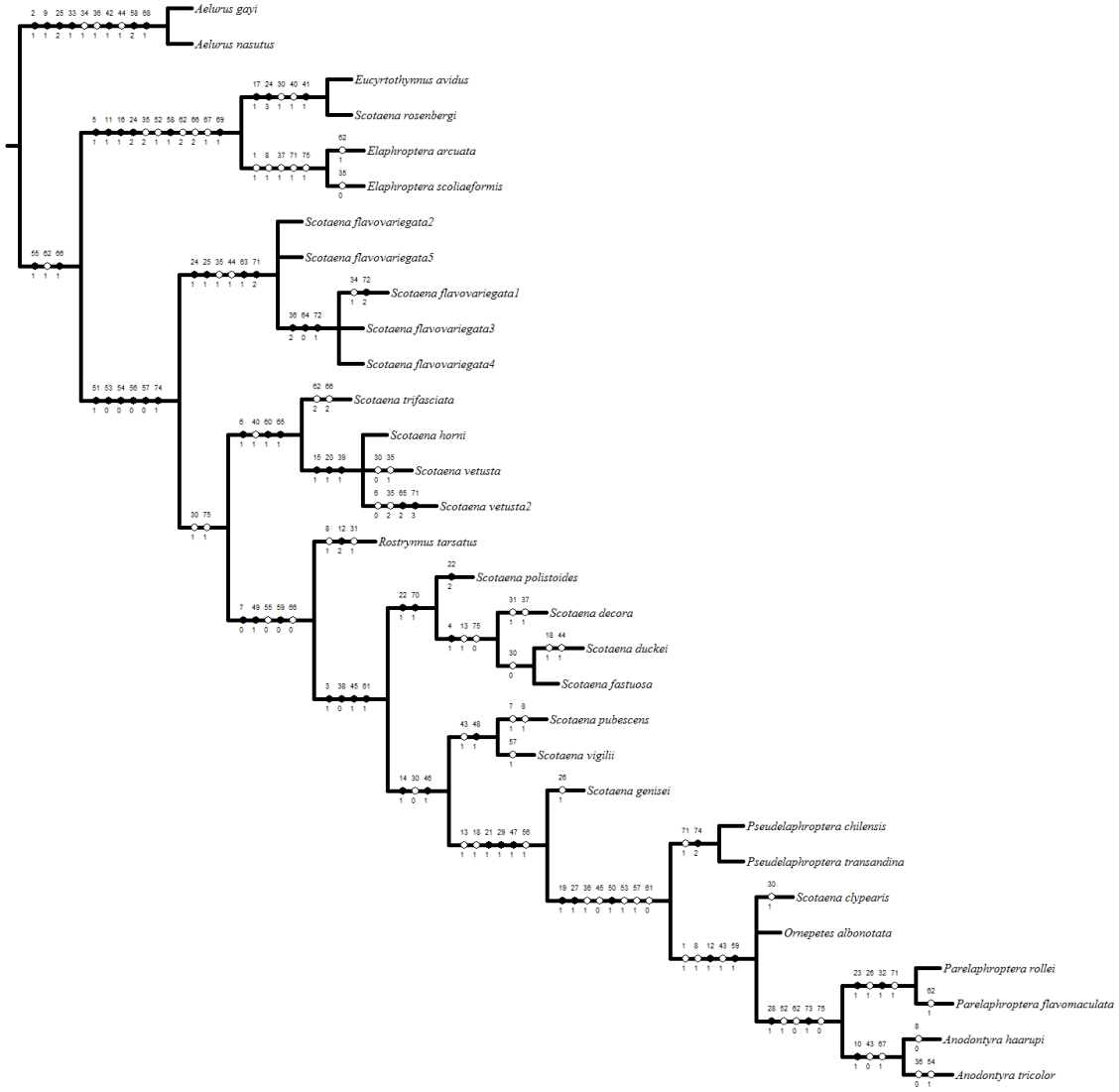


Fig. 1. Single most parsimonious tree resulted under equal weighting showing unambiguous changes. Black circles indicate unequivocal synapomorphies and white circles indicate homoplastic synapomorphies (L=139; CI=65; RI=86).

According to most parsimonious hypothesis, *Scotaena* is paraphyletic in relation to *Rostrynnus*, *Pseudelaphroptera*, *Ornepetes*, *Parelaphroptera*, and *Anodontyra* (Fig. 1), with three ingroup species appearing more related to the outgroups, and four clades being formed by *Scotaena* species (Figs 1, 2). *S. rosenbergi* shows up as sister taxon of *Eucyrtothynnus avidus*, a species that belongs to Elaphropterini. This relationship is supported in the analysis by three unequivocal and two homoplastic synapomorphies, respectively: medial clypeal projection soft and broad (17:1), margin of the subapical mandibular teeth squared (24:3), anterior margin of the pronotum as broad as the posterior margin (30:1), lateral surface of the propodeum striated (40:1), and petiolar grooves

reaching more than half the propodeum extension (41:1). Besides that, several morphological characteristics of *Eucyrtothynnus* can be found in the *S. rosenbergi* lectotype. *Scotaena genisei* appears as sister taxon of an outgroup formed mainly by other "Scotaenini" genera: (((*Pseudelaphroptera* + ((*Ornepetes, Scotaena clypearis* + (*Parelaphroptera* + *Anodontyra*))). Three unequivocal synapomorphies support this relationship: lateral margins of clypeus basis with slight depression (21:1), pronotum dorsally long and only slightly constricted (29: 1), and forecoxae squared and very flat (47:1). Three homoplastic synapomorphies support it as well: clypeal central notch forming two small and soft teeth (13:1), basal region of the clypeus bulging (18:1), and first metasomal tergite with longitudinal sulcus reaching less than half the extension of the tergite (56:1). *Scotaena clypearis* showed up in a politomy with the outgroups: (*Ornepetes albonotata* + (*Parelaphroptera* + *Anodontyra*)). With two unequivocal and three homoplastic synapomorphies supporting it, respectively: clypeal central notch slight not forming teeth (12:1), epipygium rounded, constricted and slightly ending towards the apex (59:1), supra antennal projections without supra antennal plates (1:1), presence of an elevated tubercle between the supra antennal projections (8:1), and propodeum with dorsal transversal striae (43:1).

The first of the four clades (Fig. 2, orange clade) was formed by *Scotaena flavovariegata* and its four other variants (Fig. 1). Four unequivocal synapomorphies support this group: margin of the subapical mandibular teeth trapezoid (24:1), maxillary palpi IV and V 1,5x longer than III (25:1), tuft of hairs on the first metasomal sternite (63:1), and hypopygium margin enlarged (71:2). Also the two following homoplastic synapomorphies: scutellum dorsal surface slightly raised with subtriangular surface in dorsal view (35:1) and, propodeum almost smooth (44:1). In addition, three unequivocal synapomorphies were found to more closely relate *S. flavovariegata*1, 3 and 4: mesopleural transversal sulcus strong and thin (36:2), absence of medial elevation on the tuft spot (64:1), and hypopygium with subquadrate margin, not laterally enlarged (72:1). The formation of smaller monophyletic unities as lineages of *Scotaena* must be taxonomically recognized, so the description of new genera is required for each clade formed by *Scotaena* species.

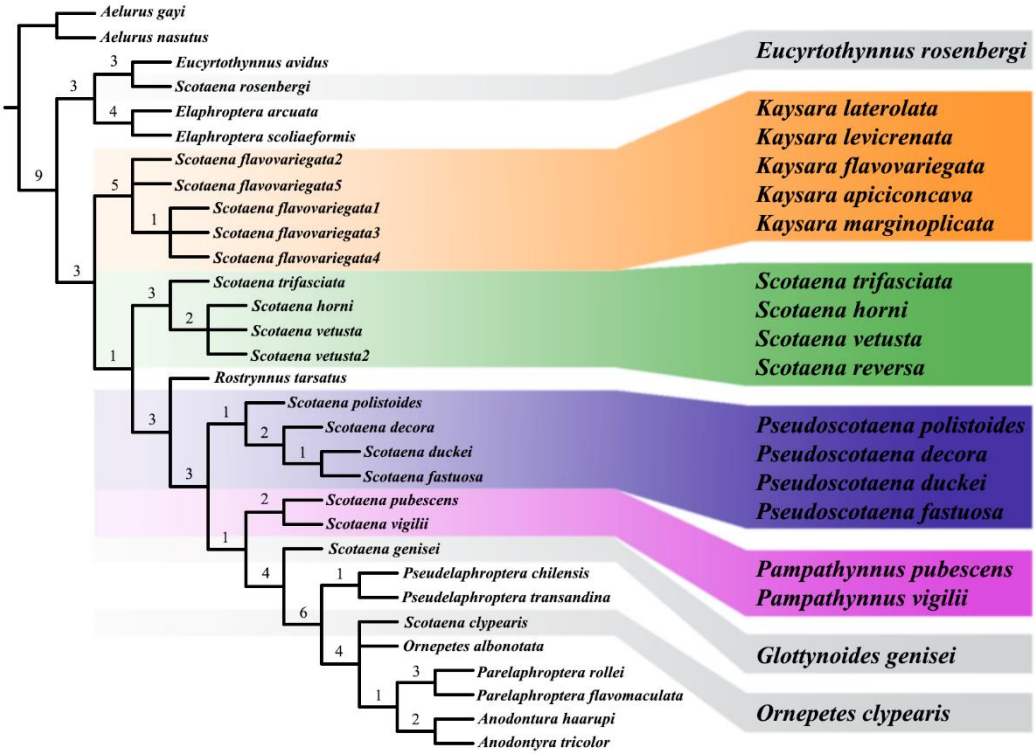


Fig. 2. On the left, single resulting cladogram under equal weighting, showing the paraphyly of Scotaena. Numbers above branches indicate the Bremmer support. The different colours highlight the generic clades formed by the analysis. Orange clade: S. flavovariegata group; Green clade: S. trifasciata group; Blue clade: S. decora group; Purple clade: S. pubescens group. Grey highlight indicate the species that might return to its previous taxonomic status. On the right, list of the updated taxonomic status of the ingroup species analysed.

The second clade consists in the *Scotaena sensu stricto* group (Fig. 2, green clade). Where the species *S. trifasciata*, *S horni*, *S. vetusta* and *S. vetusta2* share three unequivocal and one homoplastic synapomorphies, respectively (Fig. 1): margin of the supra antennal plate carinate (6:1), two lateral carinas raised by the rugosities of the epipygium (60:1), mesepisternal suture raised apically (65:1,2), and lateral surface of the propodeum striated (40:1). Besides that, three unequivocal synapomorphies were found to relate *S. horni*, *S. vetusta*, and *S. vetusta2*: clypeal central notch emargination with the same depth or deeper than its sublateral margins (15:1), longitudinal line on the medial region of the clypeus (20:1), and dorsal surface of the propodeum with dense and coalescent punctuations (39:1).

Scotaena polistoides, *S. decora*, *S. duckei*, and *S. fastuosa* formed a clade (Fig. 2, blue clade) supported by two synapomorphies (Fig. 1): basolateral margins of the clypeus

angulated (22:1), and presence of a hypopygium subtriangular, with narrower basis (70:1). *S. decora*, *S. duckei* and *S. fastuosa* was shown to be more related, sharing one unequivocal and two homoplastic synapomorphies, respectively: apex of the supra antennal plates approximated to each other (4:1), hypopygium ventral surface without longitudinal elevated line (75:1), and clypeal apex with small and soft teeth (13:1). *S. fastuosa* and *S. duckei* share one synapomorphy: anterior margin of the pronotum narrower than the posterior margin (30:0).

The last clade is formed by *S. pubescens* and *S. vigilii* (Fig. 2, purple clade), supported by two synapomorphies, one unequivocal and one homoplastic, respectively: forecoxae with longitudinal depression along the ventral surface (48:1), and propodeum with dorsal transversal striae (43:1).

Since all the resulting clades of the analysis present high Bremer support (Fig. 2), and unequivocal synapomorphies were found for all of them (Fig. 1), this might be sufficient for the designation of new generic concepts for the species that encompasses the clades. This kind of result is expected for neglected groups like Thynninae since, besides its diversity and poor taxonomic situation, very few revisions and phylogenetic analysis has been done until now. The approach of creating new genera in order to try to establish a systematic classification of Thynninae was pointed out by Turner (1910a): "… I have found that it is almost impossible to define larger genera with anything like sufficient accuracy, and I consider that in the future the tendency will be towards the creation of more genera rather than towards sinking those already proposed."

Taxonomy

The phylogenetic results showed that *Scotaena* really consists on a dumping ground group, once its species spread throughout the cladogram topology (Fig. 1). Some of these issues should be solved simply by taxonomic alterations, and others by description of new genera.

The genus has presented 15 species since Kimsey's 2004 work, the last one to deal with *Scotaena* until now. But, after our results, it became clear that the genus delimitation must change. Three species must be reallocated to its original conception, so the following new combinations are proposed: *Eucyrtothynnus rosenbergi* **comb. n.** (=*Scotaena rosenbergi*), *Glottynoides genisei* **comb. n.** (=*Scotaena genisei*), and *Ornepetes clypearis* **comb. n.** (=*Scotaena clypearis*). Two species must be left as *incertae sedis*: *Scotaena*

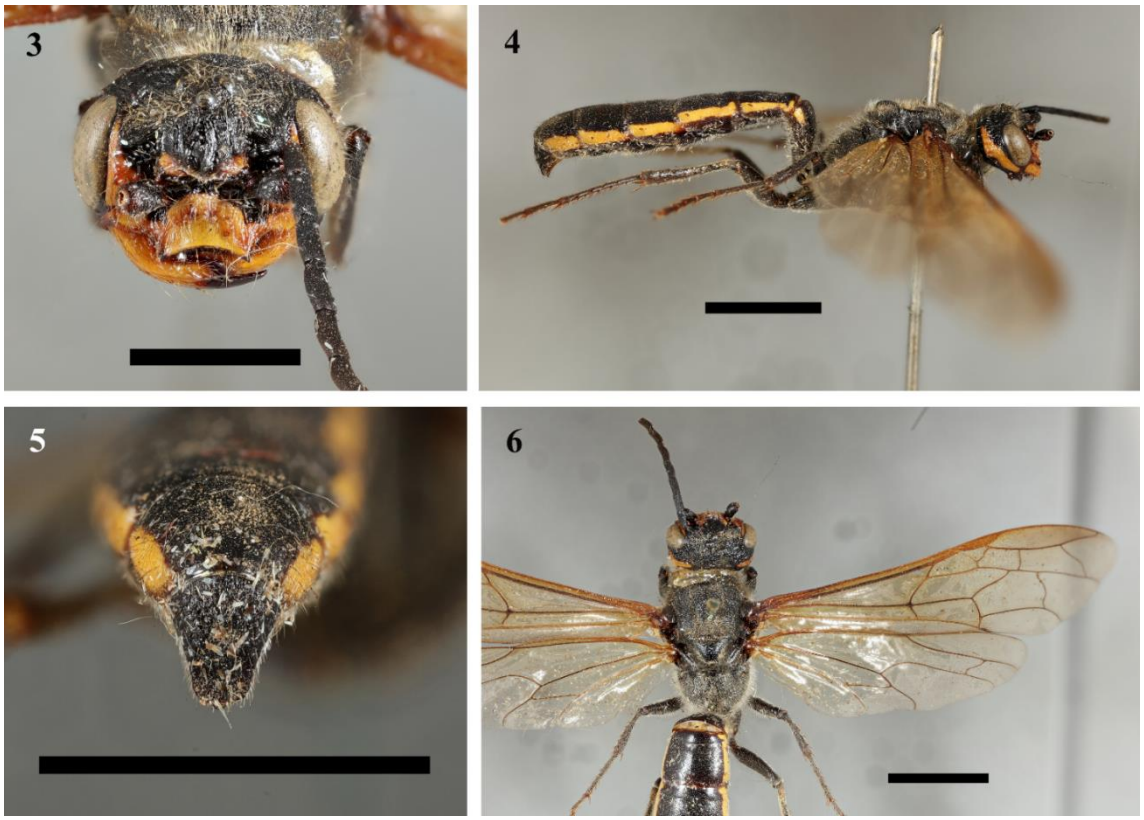
brunnea **inc. sed.** and *Scotaena pallida* **inc. sed.**. Three new genera are proposed for the resulting groups of species that do not belong to *Scotaena*: *Kaysara* Carnimeo **gen. n.**, *Pseudoscotaena* Carnimeo **gen. n.**, and *Pampathynnus* Carnimeo **gen. n.**. Besides that, five new species were described: *Scotaena reversa* Carnimeo **sp. n.**; *Kaysara laterolata* Carnimeo **sp. n.**, *Kaysara apiciconcava* Carnimeo **sp. n.**, *Kaysara marginoplicata* Carnimeo **sp. n.**, and *Kaysara levicrenata* Carnimeo **sp. n.**. Thus, *Scotaena* now presents four species: *S. trifasciata*, *S. horni*, *S. vetusta*, and *S reversa*. Redescriptions were performed for the generotype species.

Scotaena brunnea (Fox, 1898) **inc. sed.** and *S. pallida* (Fox, 1898) **inc. sed.**

These two species were originally described by Fox (1989) for female individuals only. Their holotypes are deposited at the Hymenoptera collection of the Carnegie Museum of Natural History (Pittsburgh, USA). None of them are associated with males, and also there is a possibility of the specimens actually be the female of an already described species of *Scotaena*, or of the new genera forward described herein. Thereby, due to its uncertain position, leaving these two specimens into *incertae sedis* must be the more correct approach to follow at this moment.

Eucyrtothynnus rosenbergi (Turner, 1910) (=*Scotaena rosenbergi*) **comb. n.**

The species was originally described by Turner (1910b) for *Elaphroptera*, even though the type specimen carries a label made by Turner in which it is designated for *Eucyrtothynnus* Turner, 1910. So, Kimsey & Brown (1993) proposed a lectotype designation for the species, placing it in *Eucyrtothynnus*. But after that the species was transferred to *Scotaena* through new combination (Kimsey, 2004a). On the analysis performed, the species appears as a sister taxon of *Eucyrtothynnus avidus* (Figs 1, 2), what corroborate the placement of the species into this genus. Also, the examination of the lectotype (Figs 3-6) make it clear that this species belongs and must be placed back to the *Eucyrtothynnus*, once it presents the genus diagnostic features described by Turner (1910b).



Figs 3-6: *Eucyrtothynnus rosenbergi*, lectotype male. 3, Frontal head; 4, Lateral habitus; 5, Epipygium; 6, Mesosoma dorsal. Scale bar = 5mm.

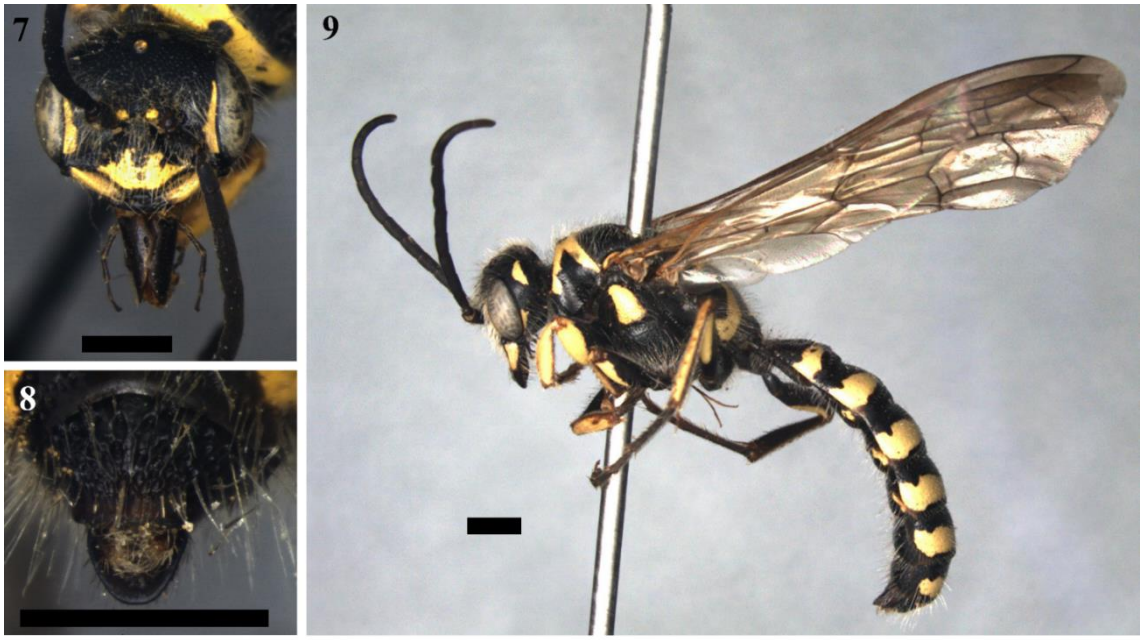
Glottynoides genisei Kimsey, 1991 (=*Scotaena genisei*) **comb. n.**

Kimsey raised the genus *Glottynoides* to uphold *Glottynoides genisei*, a species with distinctive modifications on the male tongue (Genise & Kimsey, 1991). In Kimsey's 2004a work, the author states *Glottynoides* as a junior synonym of *Scotaena*, asserting that the difference between these genera are only in specific level. The analysis results showed that this species is more related to the group: (((*Pseudelaphroptera* + ((*Ornepetes, Scotaena clypearis* + (*Parelaphroptera* + *Anodontyra*))); than to other *Scotaena* species (Figs 1, 2). So, to resolve this taxonomic issue, the genus *Glottynoides* must be re-established for the species *Glottynoides genisei* (Figs 7-9).

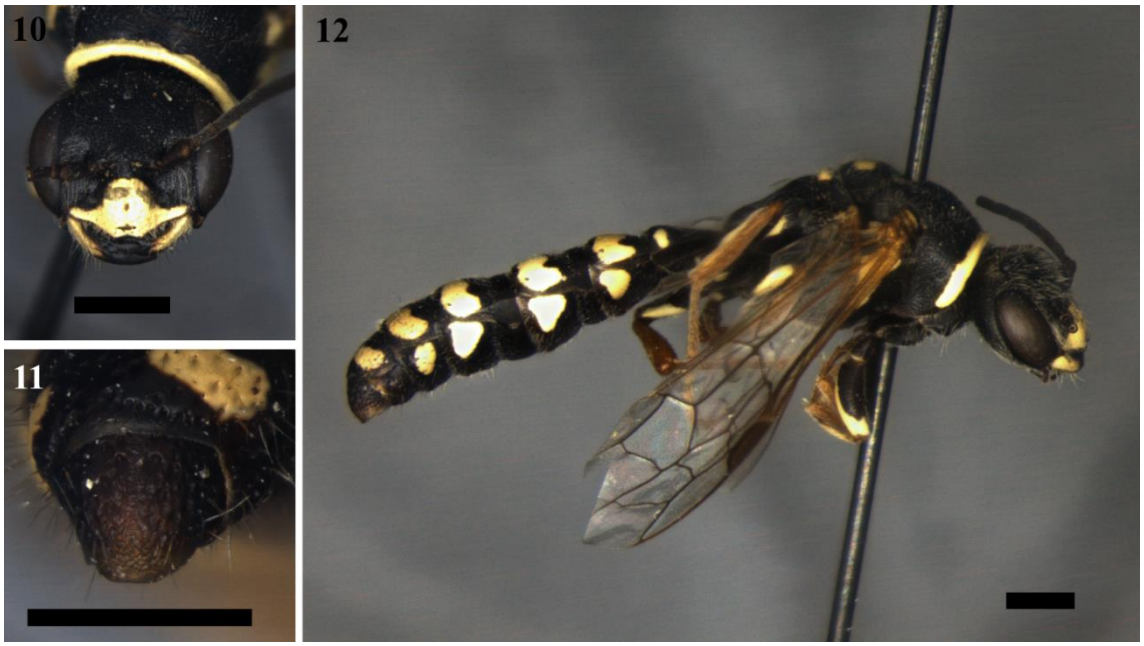
Ornepetes clypearis Durán-Moya, 1941 (=*Scotaena clypearis*) **comb. n.**

This species was described by Durán-Moya (1941) for *Ornepetes* and posteriorly transferred to *Scotaena* through a new combination proposed by Kimsey (2004a). In the analysis results, this species appears to be more related to *Ornepetes*, *Parelaphroptera*, and *Anodontyra* (Figs 1, 2). The politomy formed by (*S. clypearis, Ornepetes albonotata* + (*Parelaphroptera* + *Anodontyra*)) is well supported, and despite the absence of full

resolution for this branch, the first step for solving this relationship must be returning *S. clypearis* (Fig. 10-12) to *Ornepetes*, since this species do not belong to *Scotaena*.



Figs 7-9: *Glottynoides genisei*, male. 7, Frontal head; 8, Epipygium; 9, Lateral habitus. Scale bar = 1mm.



Figs 10-12: *Ornepetes clypearis*, lectotype male. 10, Frontal head; 11, Epipygium; 12, Lateral habitus. Scale bar = 1mm.

***Scotaena* Klug, 1810**

Generotype: *Scotaena trifasciata* Klug, 1810

Male description

Head: Antennal sockets under supra antennal projections, with well-developed supra antennal plate on the medial apex, the margins strongly carinate (except in *S. reversa*). A short longitudinal line between the anterior ocelli and the supra antennal projection, reaching the middle of the supra antennal plates in *S. trifasciata*; Clypeus apical margin with central notch with depth of about 1/2 to 1/4 of clypeus length, the notch is deeper in *S. horni* and *S. vetusta*. Two acute teeth are formed towards down by the notch, longer in *S. horni* and *S. vetusta*. A longitudinal line is present, more or less raised, on the medial region of the clypeus (except in *S. trifasciata*). Basal region of the clypeus convex, depressed on the basolateral margins. Laterals of the apical margins concave. Mandible bidentate, the apical tooth long and acute, the subapical short and rounded. Basal region of the mandible triangular shaped. Maxillary palpi with palpomeres about the same size, the IIIrd often shorter and broader (unknown in *S. trifasciata*); Antennae filiform, with 11 flagelomeres, the apical ones slightly arcuate (unknown in *S. trifasciata*).

Mesosoma: Pronotum constricted in the middle, forming elevations anterior and posteriorly in lateral view. Anterior margin carinated and narrower than the posterior; Fore wing with nervure 2m-cu received by beyond about 1/5 of the base of the submarginal cell; Mesoscutum subquadrate in dorsal view, with dorsal surface convex. A pair of longitudinal submedial sutures, and a pair of longitudinal carina laterally, culminating in a transversal posterior carina; Scutellum surface rounded, medially raised dorsally in *S. reversa*. Delimited anteriorly by a deep transversal suture, and the posterior margin rounded. Latero-posterior margins with borders enlarged towards the axilla; Metanotum short with two sublateral fossae; Mesopleural transversal sulcus wide and diffuse; Metapleuron triangular in lateral view; Propodeum with convex dorsal surface. Apex of the propodeum with two longitudinal petiolar grooves reaching less than half its extension. Dorsal surface of the propodeum with dense and coalescent punctuations (except in *S. trifasciata*); Mesepisternal lamellae triangular, narrow and acute, with the apex slightly rounded. Except in *S. trifasciata*, where the lamellae are short and subquadrate; Mesepisternal suture slightly raised at the apex, more strongly raised in *S. reversa*; A pair of longitudinal sutures on the ventral surface of the mesepistenum; Forecoxae with ventral surface slightly convex, the inner margin straighter and the outer

more sinuous curved. Hindcoxae with longitudinal carina on the dorsal surface; Posterior margins of the mid and hindtibiae with row of projections or serrations, more conspicuous on hindtibiae. With short carina on the external basis of the tibia. Hindfemoral-hindtibial joint lobes asymmetrical with inner lobe longest and both thickened posteriorly;

Metasoma: Metasoma with constrictions between the segments, mainly in lateral view; First metasomal tergite with length longer than its apical breadth in *S. vetusta* and *S. reversa*, and with length as long as its breadth in *S. trifasciata* and *S. horni*. The longitudinal sulcus reaching more than half the segment extension; Apical margins of tergites I-VI with transversal smooth fasciae, preceded by a transversal row of setae horizontally arranged; Epipygium oval, tapering towards the apex and feebly constricted before the apical margin. With lateral carinas raised by the epipygium rugosities; Hypopygium subquadrate, with longitudinal line feebly raised in the middle of the hypopygium surface, touching the apical margin (unknown in *S. trifasciata*);

Colouration: Body predominantly black or variegated with yellow markings.

Included species: *Scotaena trifasciata, S. horni, S. reversa, S. vetusta*.

Distribution: The genus is recorded for southeast Paraguay, northeast Argentina, and mainly on the Brazilian Atlantic Forest: Bahia state, southeast of Minas Gerais, west of Santa Catarina, and on the Atlantic coast of São Paulo and Rio de Janeiro.

Discussion: The diagnostic features presented by Klug on the original description of *Scotaena* rely completely on colouration, while the morphologic characters utilized in the identification keys for the South-American genera are not exclusive to *Scotaena*. Therefore, one of the main results of this work was to redescribe the genus and provide synapomorphyc features to define it.

***Scotaena trifasciata* Klug, 1810**

(Figs 13-16, 90, 96, 99)

Scotaena trifasciata Klug, 1810: 40. *Holotype*, ♂, BRAZIL: Bahia, date unknown (*Hoffmannsegg*) (MfN).

Thynnus trifasciatus Klug, 1840: 32-33; Smith, 1859: 49.

Scotaena trifasciata Dalla-Torre, 1897: 117; Turner, 1908a: 253; Turner, 1910a: 19; Kimsey, 1992: 134; Kimsey, 2004a: 511.

Male redescription

Structure: A longitudinal line between the anterior ocelli and the supra antennal plates; Clypeus central notch with depth of about 1/4 of clypeus length; Wings hyaline,

ferruginous on the anterior margins, stigma, and on the apex of the forewing, covering the marginal cell and the submarginal II and III. The region between the first and second cubital cell slightly ferruginous; Mesepisternal lamellae short and subquadrate, with mesepisternal suture feebly raised at the apex; First metasomal tergite length as long as its breadth; Epipygium rugose, with deep punctuations and transversal striae sculptured towards the apex, converging subapically.

Colouration: Body dark brown variegated with yellow markings. Two small and diffuse spots on the supra antennal plates apex. The apical half of the clypeus, except the margins. The mandibles, except for the apex and margins. The anterior pronotal margin, reaching the laterals. Small spots on the mesopleuron anteriorly. The tegulae and a spot on the middle of the mesoscutum. A transversal fascia on the middle of the scutellum, and two diffuse spots on the antero-lateral margins. The central region of the metanotum and its antero-lateral margins. A pair of rounded spots on the propodeal dorsal surface. The inner surface of the femora. Transversal fasciae subapically on the tergites I-III.

Female: Unknown.

Distribution: known only for the type records.

Discussion: There are four specimens listed as *Scotaena trifasciata* on MfN collection, but only one of them (the holotype) has the correct identification, the other three are actually *S. pubescens*. The species description presented by Klug (1810) regards almost exclusively on colouration features, for this reason a redescription was presented on this work. Due to the age of the specimen some parts are missing, like the mouthparts, the antennae, and the tip of the hypopygium, that is broken. Thus, in order to try to preserve the only *S. trifasciata* specimen available, the genital capsule was not extracted for further description. The species was described as *Scotaena* but Klug himself (1840) therefore referred to it as *Thynnus trifasciatus*. This designation was followed only by Smith (1859), while other authors continued to use *Scotaena trifasciata*.

Figs 13-16: *Scotaena trifasciata*, holotype male. 13, Frontal head; 14, Epipygium; 15, Dorsal habitus; 16, Lateral habitus. Scale bar = 1mm.

***Scotaena horni* (Turner, 1927)**

(Figs 17-20, 93, 95, 102)

Spilothynnus horni Turner, 1927: 449. *Holotype*, ♂, PARAGUAY: Villarrica, x/1923 (*Eberswalde*) (SDEI). *Paratypes*, same locality: 1 ♂, x/1923 (*Eberswalde*) (SDEI); 2 ♂, xii/1923 (*Meyer*) (NHM).

Scotaena horni Kimsey, 1992: 134; Kimsey, 2004a: 511.

Female: unknown.

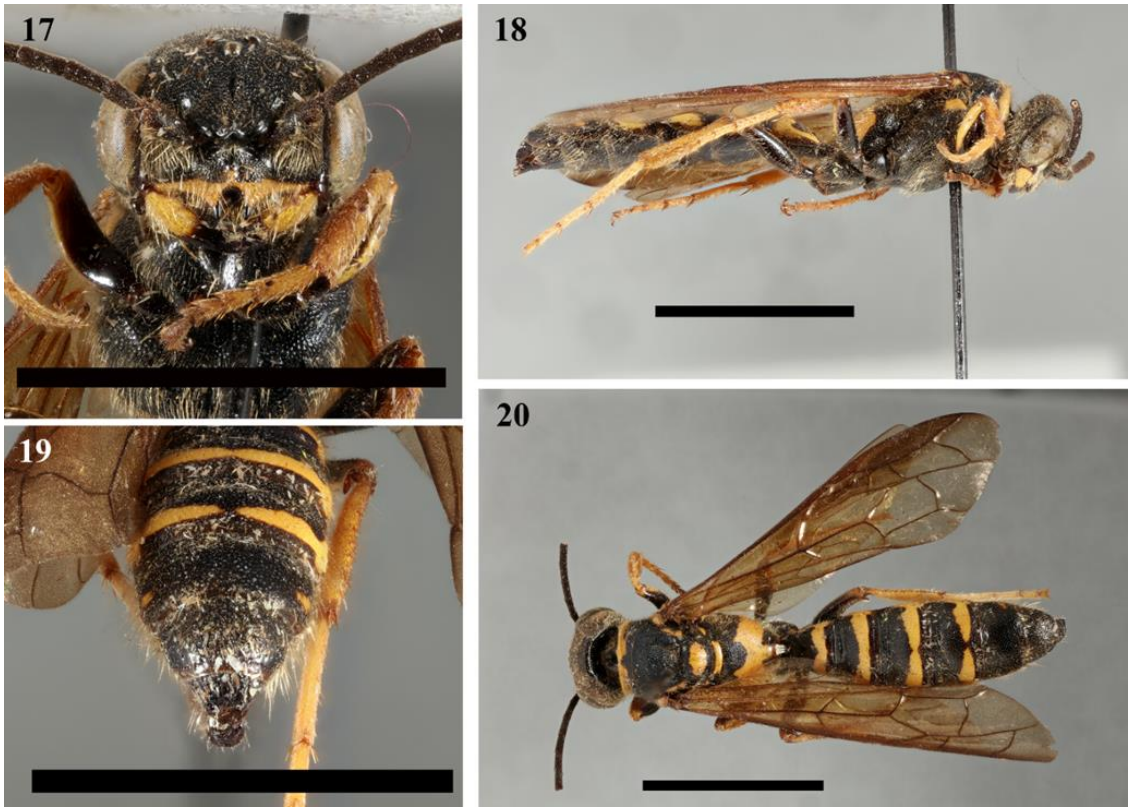
Distribution: known only for the type records.

***Scotaena vetusta* Turner, 1909**

(Figs 21-26, 92, 94, 97, 101, 103, 104)

Scotaena vetusta Turner, 1909: 340-341. BRAZIL: Barbacena, Minas Gerais, November, 4 ♂ 1 (NHM); Turner, 1910a: 19; Kimsey, 1992: 134; Kimsey & Brown, 1993: 325. Lectotype designation: Barbacena, Minas Gerais, BRAZIL, 1♂. Paralectotype: same locality, 1 ♂1 ♀ (NHM); Kimsey, 2004a: 511.

Distribution: Barbacena, Minas Gerais, Brazil (NHM), Passo dos Índios, Santa Catarina, Brazil (NHM), and Colonia Vitoria, Missiones, Argentina (AMNH).



Figs 17-20: *Scotaena horni*, paratype male. 17, Frontal head; 18, Lateral habitus; 19, Epipygium; 20, Dorsal habitus. Scale bar = 5mm.

***Scotaena reversa* Carnimeo, sp. n.**

(Figs 27-32, 91, 98, 100, 105)

Holotype, ♂, BRAZIL: Serra da Bocaina, São José do Barreiro, São Paulo, /11/xi/1964 (*Kovacs*) (AMNH). *Paratype*, BRAZIL: 3♂, Parque Nacional da Serra dos Órgãos, Rio de Janeiro, 04/i/2014 - 01/ii/2014 (*R.F. Monteiro and eq. col.*); 1♂ Parque Nacional do Itatiaia, Rio de Janeiro, 27/ii/2014 (*R.F. Monteiro and eq. col.*) (UFRJ).

Male description

Structure: Supra antennal plate with slightly carinate margins. A slight elevation between the plates; Clypeal apical emargination as deep as its sublateral margins. Base of clypeal emargination subtriangular, what origins a slight longitudinal bevel raised on the medial region of the clypeus; Wings hyaline, ferruginous on the anterior margins, stigma, and marginal cell. The anterior half of the forewing slightly castaneus; Scutellum

raised and pointed at the top; Dorsal surface of the propodeum with dense and coalescent punctuations, laterals striated at the base; Mesepisternal suture strongly raised apically, the lamellae narrow and acute; First metasomal tergite longer than wide. Smooth transversal fasciae on apical margins of tergites almost absent, very short and covered by a dense row of setae; Epipygium sides rugose by elongate punctuations, smooth centrally; Hypopygium subquadrate, rounded laterally;

Genital capsule: Dorsal surface of the basal ring more than 2x longer than its ventral surface. With a longitudinal line medially in dorsal view; Gonocoxite tapering towards the apex, with more than half the gonostylus extension. The apex rounded and almost contiguous, slightly separated medially, with a longitudinal line dorsally; Aedeagus longer than the gonocoxite and shortest than the gonostylus. Expanded laterally in two longitudinal lamellae, curved ventrally and with a small apical lobe; Gonostylus slightly wider at the basis, narrowing medially and broadening again before the apex. With golden pubescence on the half apical region. The apex slightly rounded, triangularly curved ventrally.

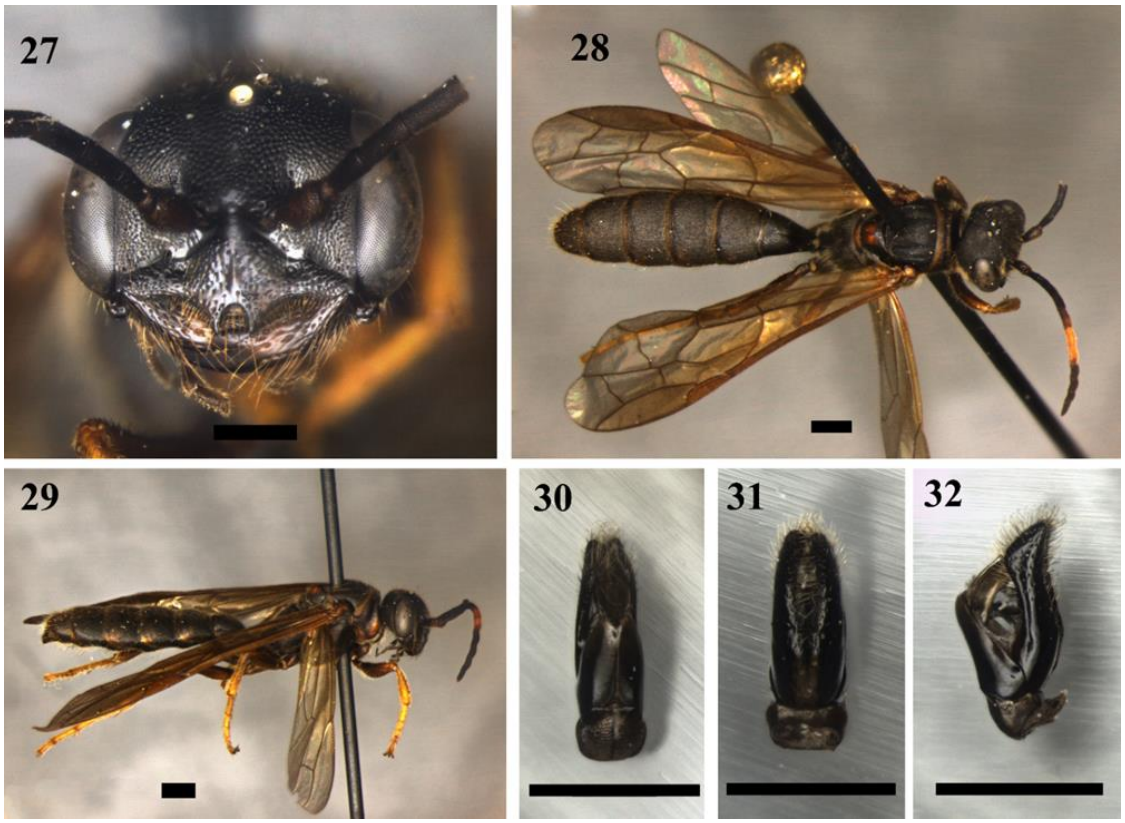
Colouration: body predominantly black, except for the following castaneus markings: flagellomeres V-VII. A large spot on the scutellum dorsal surface. The metanotum centrally. The legs except for the outer surface of the femora. Diffuse spots on the sternites II-IV.

Female: unknown.

Etymology: In Latin *reversus* means “returned”, referring to the lack of the strong carina on the margins of the supra antennal plate, which is a diagnostic character of the *Scotaena* but seems to be reverted in this species.

Distribution: known only for the type records.

Figs 21-26: *Scotaena vetusta*, lectotype male. Body: 21, Frontal head; 22, Dorsal habitus; 23, Lateral habitus. Scale bar = 5mm. Genital capsule: 24, Dorsal view; 25, Ventral view; 26, Lateral view. Scale bar = 0,5mm.



Figs 27-32: *Scotaena reversa*, holotype male. 27, Frontal head; 28, Dorsal habitus; 29,

Lateral habitus; Genital capsule: 30, Dorsal view; 31, Ventral view; 32, Lateral view. Scale bar = 1mm.

***Kaysara* Carnimeo gen. n.**

Generotype: *Kaysara flavovariegata* (Smith, 1879)

Male description

Head: Antennal sockets under supra antennal projections, with well-developed subtriangularly margined supra antennal plate on the medial apex; Clypeus apical margin with central notch with depth of about 1/4, swallower on *K. levicrenata*, with about 1/6 of clypeus length, forming two acute teeth towards down. Basal region of the clypeus convex, depressed on the basolateral margins. Laterals of the apical margins concave. Mandible bidentate, the apical tooth long and acute, the subapical short, trapezoid, with the outer margin longer than the inner margin. Basal region of the mandible triangular shaped. Maxillary palpi IV and V about 1,5x longer than III, that is broader than the others; Antennae filiform, with 11 flagelomeres, the apical ones slightly arcuate.

Mesosoma: Pronotum constricted in the middle, forming elevations anterior and posteriorly in lateral view. Anterior margin carinated and narrower than the posterior; Fore wing with nervure 2m-cu received by beyond about 1/4 of the base of the submarginal cell; Mesoscutum subquadrate in dorsal view, with dorsal surface slightly convex. A pair of longitudinal submedial sutures, and a pair of longitudinal carina laterally, culminating in a transversal posterior carina; Scutellum dorsally slightly raised with subtriangular surface. Delimited anteriorly by a deep transversal suture, and the posterior margin rounded. Latero-posterior margins with borders enlarged towards the axilla; Metanotum short with two sublateral fossae; Mesopleural transversal sulcus well-marked, wide or thin; Metapleuron triangular in lateral view; Propodeum with convex dorsal surface. Apex of the propodeum with two longitudinal petiolar grooves reaching less than half its extension. Propodeal surface almost smooth; Mesepisternal lamellae triangular, narrow and acute, with the apex slightly rounded; A pair of longitudinal sutures on the ventral surface of the mesepistenum; Forecoxae with ventral surface slightly convex, the inner margin straighter and the outer more sinuous curved. Hindcoxae with longitudinal carina on the dorsal surface; Posterior margins of the mid and hindtibiae with row of projections or serrations, more conspicuous on hindtibiae. With short carina on the external basis of the tibia. Hindfemoral-hindtibial joint lobes asymmetrical with inner lobe longest and thickened posteriorly;

Metasoma: Metasoma with constrictions between the segments, mainly in lateral view; First metasomal tergite with length longer than its apical breadth. With a longitudinal sulcus reaching more than half the segment extension. Spiracles slightly raised. Dorsal surface of the tergite I with a rectangular longitudinal slight depression; Apical margins of tergites I-VI with transversal smooth fasciae, preceded by a transversal row of setae horizontally arranged; Epipygium oval, tapering towards the apex and feebly constricted before the apical margin; First metasomal sternite with tuft of hairs emerging medially on the ventral surface. A medial elevation might or might not occur on the point where the tuft emerges; Hypopygium subquadrate, with apical margin enlarged in different ways: lateral rounded enlargement, acute and subapical enlargement or with subquadrate margin;

Colouration: Body predominantly black or much variegated with yellow markings.

Female: Unknown.

Etymology: *Ka'aysara* is a Tupi word used to refer to the traditional people that inhabit the South and South-eastern coast of Brazil, the same regions where the species of this genus are recorded.

Included species: *Kaysara flavovariegata, K. laterolata, K. apiciconcava, K. marginoplicata*, and *K. levicrenata*.

Distribution: Brazilian Atlantic Rainforest: Found in the states of Espírito Santo, Paraná, Rio de Janeiro, Santa Catarina, and São Paulo. All locality data provided for the new species correspond to new records for the genus.

Discussion: The tuft of hairs was absent in some of the specimens studied. This could happen often because it seems that the tuft might fall of due to the conservation processes.

***Kaysara flavovariegata* (Smith, 1879)**

(Figs 33-38, 108, 116, 118)

Thynnus flavovariegatus Smith, 1879: 170. *Holotype*, ♂, AUSTRÁLIA: (erroneous locality) date unknown (NHM).

Scotaena flavovariegata Turner, 1908b: 253.

Spilothynnus flavovariegatus Turner, 1910a: 19.

Scotaena flavovariegata Kimsey, 1992: 134; Kimsey, 2004a: 511 nov. comb.

Male redescription

Structure: Mesopleural transversal sulcus thin and well-marked; Forewings hyaline, castaneus on the anterior margins, stigma, and on a big spot at the apex, covering the marginal cell and the submarginal II and III; Epipygium with deep and broad punctuations and several longitudinal striae converging towards the apex and forming a subapical transversal carina; First sternite with tuft of hairs growing medially on the ventral surface, not emerging from an elevation; Hypopygium subquadrate, with apical margin enlarged in two acute and sublateral teeth, with a deep concave emargination between them;

Genital capsule: Dorsal surface of the basal ring almost 2x longer than its ventral surface, mostly on its apical margin. With a longitudinal line medially in dorsal view; Gonocoxite narrow, tapering towards the apex, with 3/4 the gonostylus extension, slightly depressed basally. The apex rounded. Slightly curved ventrally in lateral view; Slender digitus of the volsella visible in ventral view. The acute cuspis appears externalized between the gonostylus and the gonocoxite; Aedeagus with narrow lamellae, as long as the gonostylus, with a small rounded lobe apically; Gonostylus subtriangular, tapering towards rounded apex. With golden pubescence on the half apical region.

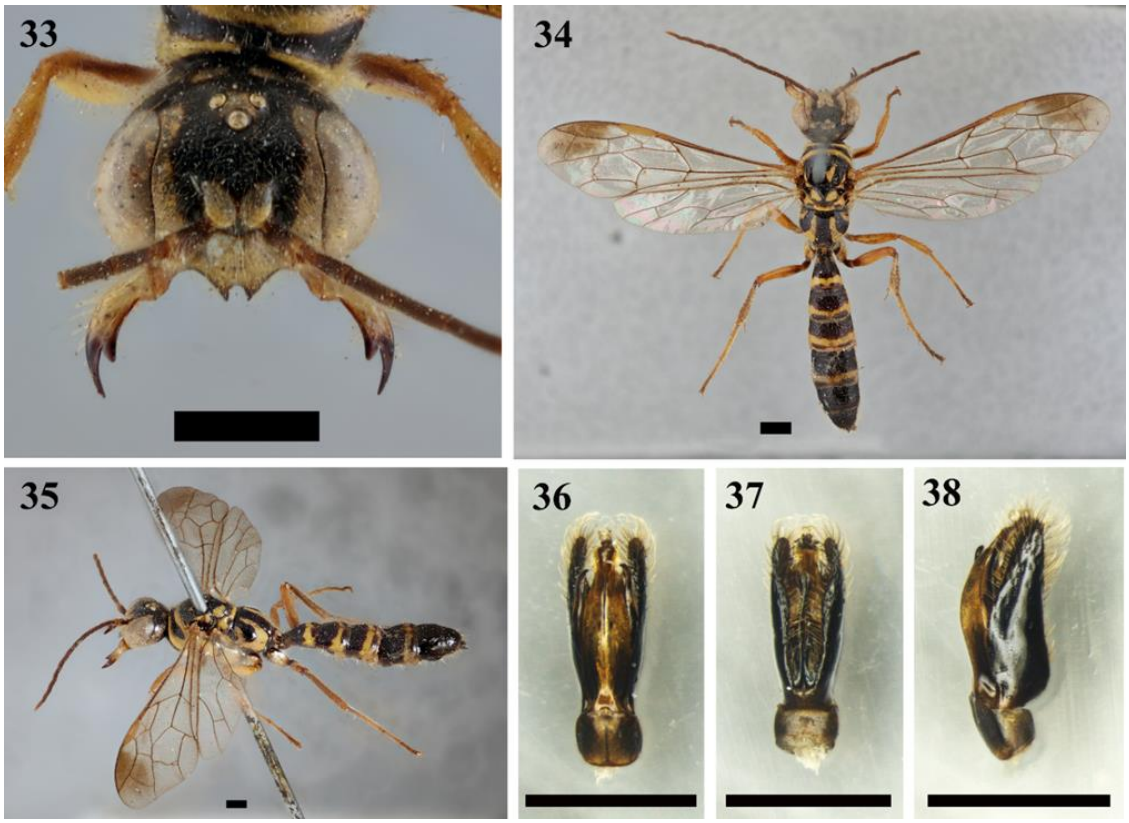
Colouration: Body black with several yellow markings. Clypeus except for the basal and apical margins. Mandibles with dark margins and teeth. Frontal lobes, except for a line between them. Internal surface of the scape and tip of the apical flagellomere. Apex of the internal surface of the flagellomeres brightening towards the apical one, that is almost entirely fuscous. Bands contouring the frontal margin of the eyes, from the clypeus margin to the posterior ocelli. And the genal margin of the eyes narrowing towards the vertex. A pair of oval spots on the vertex. A spot covering the space between the ocelli. The anterior margin of the neck. The anterior margin of the pronotum, interrupted dorsally and stretching to the lateral margin, where is broadened and fused to the fasciae of the posterior margin. Prosternum with a pair of diffuse spots. Mesepisternal lamellae and tegulae yellow. A pair of triangular spots on the mesoscutum surface and oval spots on the scutellum. Lateral spots reaching from the mesoscutum to the scutellum anterior margin. The metanotum except for the fossae. Eliptical spot on the metapleuron. Propodeum with a pair of large spots ‘u’ shaped and a minimal one before the petiolar socket. Mesopleuron except for the transversal sulcus and margins. Legs except for the castaneus trochanter, tibiae and tarsi. A pair of lateral spots on the first metasomal tergite, stretching trough the lateral and converging on a submarginal transversal posterior

fasciae. Trasversal fasciae before the apex of tergite I-IV, broader on the lateral and narrowing towards the dorsal surface. Sternite I with a triangular spot medially. Broad transversal fasciae on the sternite II-IV.

Female: unknown.

Distribution: Nova Teutônia, Santa Catarina, Brazil (NHM), and Parque Estadual da Serra do Mar, Núcleo Picinguaba, Ubatuba, São Paulo, Brazil (MZUSP, DZSJRP).

Discussion: The forewing of the holotype presents the recurrent vein ramified on its junction with the cubital vein. The ramification is wider on the left wing and narrower on the right one. This probably represents a morphological aberrancy on the individual. The two specimens from MZUSP had lost the tuft of hair of the first metasomal sternite. According to Turner (1908b), the locality data informed on the type's label of *S. flavovariegata* and *S. fastuosa* are erroneous: "I have omitted from the list of Australian species two which I am convinced have been described as Australian by mistake, and are almost certainly South American." This was confirmed by the current records found for these species.



Figs 33-38: *Kaysara flavovariegata*, holotype male. 33, Frontal head; 34, Dorsal habitus; 35, Lateral habitus; Genital capsule: 36, Dorsal view; 37, Ventral view; 38, Lateral view. Scale bar = 1mm.

***Kaysara laterolata* Carnimeo sp. n.**

(Figs 39-43, 107, 111, 113, 117)

Holotype, ♂, BRAZIL: Nova Teutônia, Santa Catarina, 10/iii/1936 (*F. Plaumann*) (NHM). *Paratype*, BRAZIL: 1♂, Mananciais da Serra do Mar, Piraquara, Paraná, 06/xii/2007 (*J. A. Rafael*) (INPA).

Male description

Structure: Supra antennal plates separated medially, with a depressed circular point centrally above it; Mesopleural transversal sulcus broad and well-marked; Forewings hyaline, ferruginous on the anterior margins, and stigma. The marginal cell feebly darker than the rest of the wing; Epipygium with deep lateral and sublateral punctuations, with dorsal-apical surface smooth. The sublateral punctures slightly stretched forming raised rugosities; First metasomal sternite with tuft of hairs growing medially on the ventral surface, emerging from a slight elevation; Hypopygium subquadrate, with rounded margin broadly enlarged laterally and apically. The apical border with a slight central invagination and two tiny extensions up folded;

Genital capsule: Basal ring long, with its dorsal surface longer on its apical margin. With a longitudinal line medially in dorsal view; Gonocoxite slightly tapering towards the apex, with less than 3/4 the gonostylus extension, strongly depressed basally. The apex rounded and separated, feebly curved ventrally in lateral view; Aedeagus lamellate, with about 4/5 the gonostylus extension, with a small rounded lobe apically; Gonostylus subquadrate, feebly tapering towards the slightly rounded apex. With golden pubescence on the half apical region.

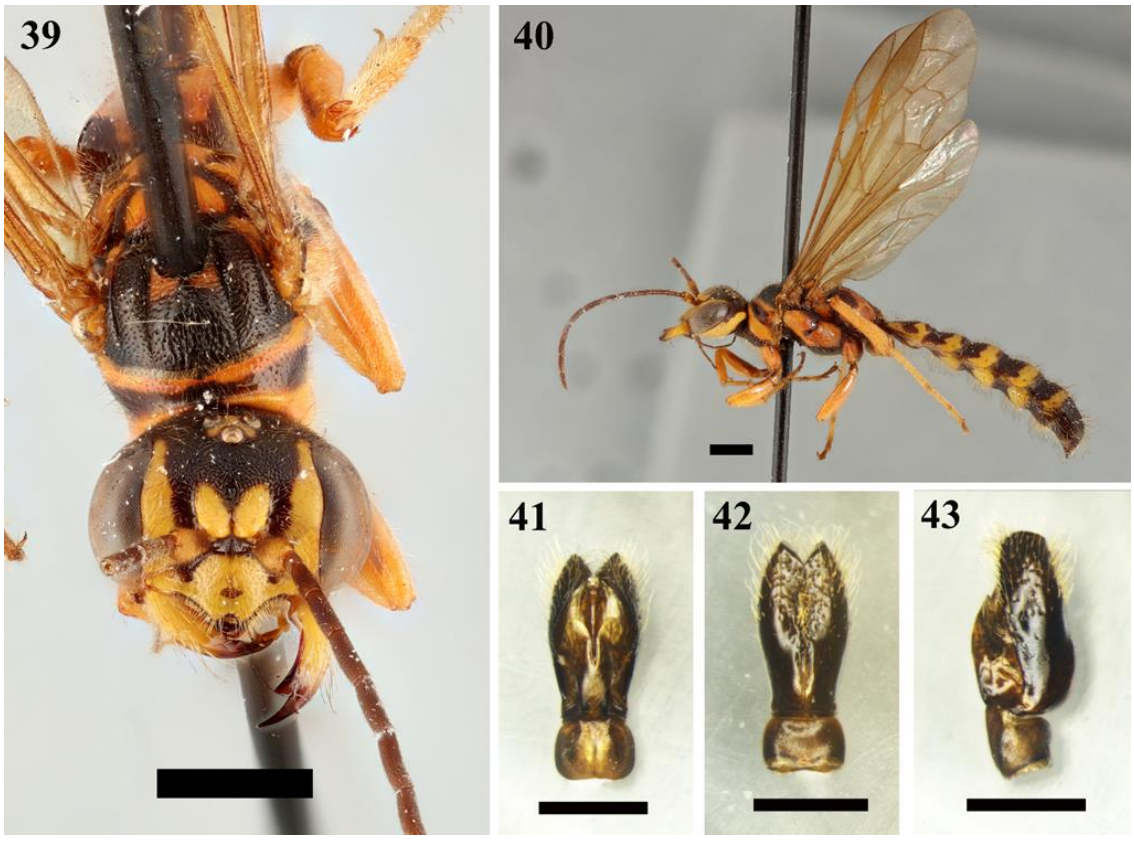
Colouration: Body black with several yellow markings. Clypeus except for the basal and apical margins. Mandibles with dark margins and teeth. Supra antennal plates, except for a line between them. Scape can be almost entirely yellow or just with diffuse spots on the ventral surface. Bands contouring the frontal margin of the eyes, from the clypeus margin to the anterior ocelli. And the genal margin of the eyes narrowing towards the vertex. A spot covering the space between the ocelli. The anterior margin of the neck. The anterior margin of the pronotum, interrupted dorsally and stretching to the lateral margin, where is broadened and almost or not fused to the fasciae of the posterior margin. Mesepisternal lamellae and tegulae yellow. A pair of diffuse impressions on the mesoscutum surface. Two oval spots on the middle of the scutellum, and two smaller ones on the antero-lateral margin. The metanotum except for the fossae. The metapleuron almost completely yellow. Propodeum with a pair of large spots ‘u’ shaped and a small

one before the petiolar socket. Mesopleuron except for the transversal sulcus and margins. Legs except for the castaneus tarsi and dark diffuse spots on the trochanter and dorsal surface of the femora. The lateral of the tergite I, stretching and converging on a submarginal transversal posterior fasciae. Trasversal fasciae before the apex of tergite I-V, broader on the lateral and narrowing towards the dorsal surface. Sternite I with a circular diffuse spot medially, with a pair of smaller ones aside it. Broad transversal fasciae on the sternite II-IV.

Female: unknown.

Etymology: From Latin, *latera* – "sides", "lateral"; and *latus* – "broad", "wide'. Referring to the margin of the hypopygium, that is enlarged and broad laterally.

Distribution: known only for the type records.



Figs 39-43: *Kaysara laterolata*, holotype male. Body: 39, Frontal head; 40, Lateral habitus; Scale bar = 1mm. Genital capsule: 41, Dorsal view; 42, Ventral view; 43, Lateral view. Scale bar = 0,5mm.

***Kaysara apiciconcava* Carnimeo sp. n.**

(Figs 44-49, 112, 114, 120)

Scotaena sp. (Azevedo et al, 2015)

Holotype, ♂, BRAZIL: Faz. Usina Paineiras, Itapemirim, Espírito Santo, 19-26/xii/2010 (*M. T. Tavares*) (UFES).

Male description

Structure: Supra antennal plates separated medially by a smooth longitudinal line; Mesopleural transversal sulcus thin and well-marked, with the basis turning up towards the mesopleural spiracle; Forewings hyaline, ferruginous on the anterior margins, and stigma. The marginal cell castaneus; First metasomal tergite with laterals slightly convex in dorsal view, spiracles not raised, and dorsal surface with longitudinal rounded depression; Epipygium with deep and stretched punctuations raised sublaterally; First metasomal sternite with tuft of hairs emerging from a very slight elevation. The insertion of the tuft 'v' shaped; Hypopygium subquadrate, with straight lateral margins expanding towards the apex. The apical margin convex and curved in posterior view;

Genital capsule: Basal ring long, with its dorsal surface longer on its apical margin. Slightly depressed sublaterally, with a longitudinal line medially in dorsal view; Gonocoxite strongly tapering towards the apex in lateral view, with less than 3/4 the gonostylus extension. Strongly depressed basally and on before the ventral margin, forming a round dorsal surface. The apex almost contiguous, feebly separated; Aedeagus lamellate, almost as long as the gonostylus, with a small rounded lobe apically. Strongly curved ventrally; Gonostylus subquadrate, slightly tapering towards the slightly rounded apex, with the sub-basal region strongly constricted. With golden pubescence on the half apical region margins.

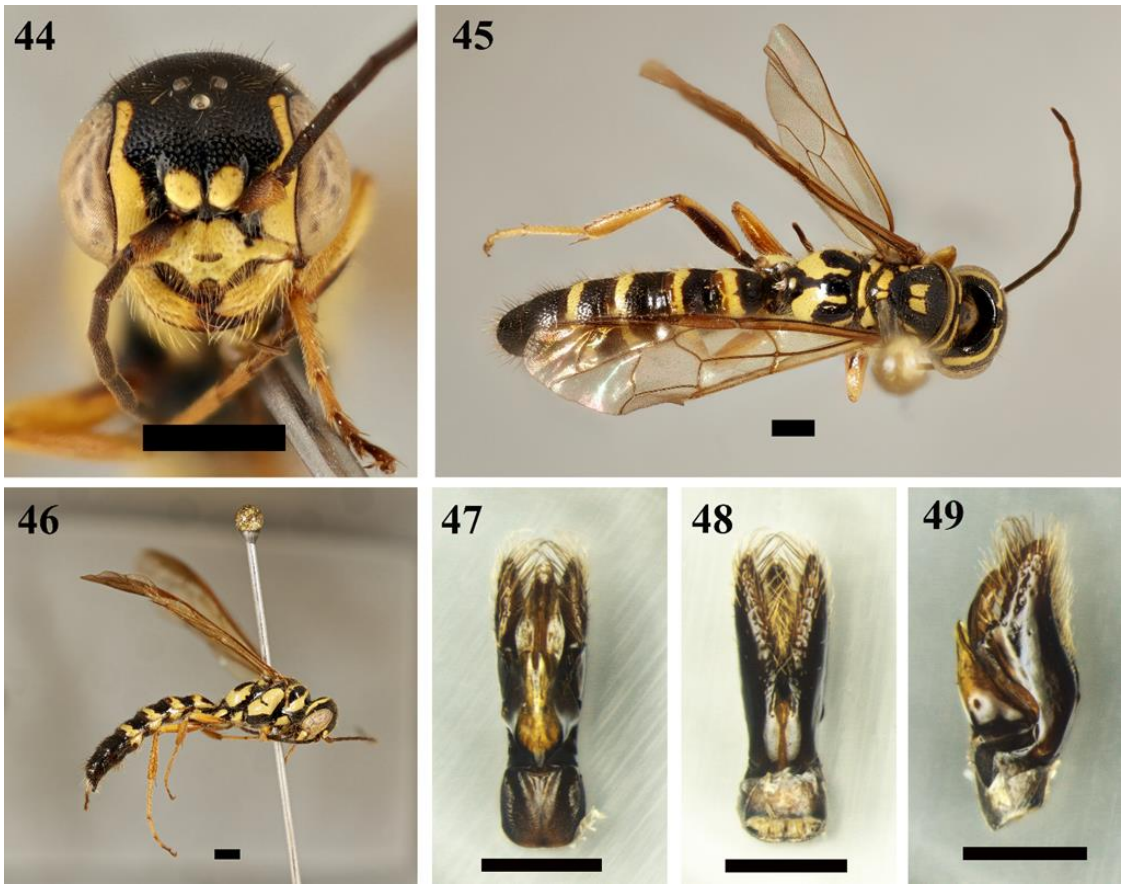
Colouration: Body black with several yellow markings. Clypeus except for the basal and apical margins. Mandibles with dark margins and teeth. Supra antennal plates, except for a line between them. Internal surface of the scape. Orange tyloids on the flagelomeres VI-XI. Bands contouring the frontal margin of the eyes, from the clypeus margin to the posterior ocelli, narrowing from the supra antennal plates. Bands also on the genal surface, not touching the eye margin, narrowing towards the vertex. The two bands almost touching each other at the vertex. The anterior margin of the neck. The anterior margin of the pronotum, interrupted dorsally and stretching to the lateral margin, where is broadened and fused to the fasciae of the posterior margin. Mesepisternal lamellae and tegulae yellow. A pair of trapezoid spots on the mesoscutum surface and rectangular spots on the scutellum. Lateral spots reaching from the mesoscutum to the scutellum anterior margin. The metanotum except for the fossae. Propodeum with a pair

of large spots ‘u’ shaped and a small one before the petiolar socket. Mesopleuron except for the transversal sulcus and margins. Legs except for the dark castaneus trochanter, inner margin of femora, and apical tarsi. The lateral of the tergite I, stretching and converging on a submarginal transversal posterior fasciae. Transversal fasciae before the apex of tergite I-IV, broader on the lateral margins. Apical half of the sternite I. Broad transversal fasciae on the sternite II-IV, almost interrupted medially on II and III and completely on IV.

Female: unknown.

Etymology: From Latin, *apice* – “apex”; and *concava* – “concave”. Referring to the apical margin of the hypopygium, that is concave in posterior view.

Distribution: known only for the type record.



Figs 44-49: *Kaysara apiciconcava*, holotype male. Body: 44, Frontal head; 45, Dorsal habitus; 46, Lateral habitus; Scale bar = 1mm. Genital capsule: 47, Dorsal view; 48, Ventral view; 49, Lateral view. Scale bar = 0,5mm.

***Kaysara marginoplicata* Carnimeo sp. n.**

(Figs 50-55, 106, 110, 115, 121)

Holotype, ♂, BRAZIL: Parque Nacional do Caparaó – Posto Santa Maria, Ibitirama, Espírito Santo, 10-14/iii/2006 (*R. Kawada*) (UFES). *Paratype*, BRAZIL: 1 ♂, Ribeirão Grande, São Paulo, 21/i/2011 (*N.W. Perioto*) (DZSJRP).

Male description

Structure: Mesopleural transversal sulcus thin and well-marked, broadening towards the dorsal margin of the mesopleuron. Forewings hyaline, ferruginous on the anterior margins, and stigma. The marginal cell castaneus; Epipygium with deep and well-marked punctuations, feebly stretched sublateraly, and the subapical surface centrally smooth; First metasomal sternite without tuft of hairs; Hypopygium subquadrate, the apical margin with apico-lateral extensions up folded, forming a rounded notch centrally.

Genital capsule: Basal ring long, with its dorsal surface longer on its apical margin. With a longitudinal line medially in dorsal view; Gonocoxite tapering towards the apex in lateral view, with about 3/4 the gonostylus extension. Strongly depressed basally, with concave ventral margin. The apex thin and rounded, slightly separated; Aedeagus feebly lamellate, as long as the gonostylus, with a rounded lobe apically; Gonostylus slender, feebly tapering towards the rounded apex. With golden pubescence on the half apical region margins.

Colouration: Body black with several yellow markings. Clypeus except for the basal and apical margins. Mandibles with dark margins and teeth. Supra antennal plates, except for a minimum line between them. Internal surface of the scape and tip of the apical flagelomere. Yellow or ferruginous tyloids on the flagelomeres VI-XI. Bands contouring the frontal margin of the eyes, from the clypeus margin to the posterior ocelli. And the genal margin of the eyes narrowing towards the vertex. With or without a pair of spots on the vertex. The anterior margin of the neck. The anterior margin of the pronotum, interrupted dorsally and stretching to the lateral margin, where is broadened and almost fused to the fasciae of the posterior margin. Prosternum with or without diffuse spots. Tegulae yellow. Mesepisternal lamellae yellow or not. A pair of triangular spots on the mesoscutum surface and oval spots on the scutellum. Lateral spots reaching from the mesoscutum to the scutellum anterior margin. The metanotum except for the fossae. The metapleuron almost completely yellow. Propodeum with a pair of large spots ‘u’ shaped and a small one before the petiolar socket. Mesopleuron except for the transversal sulcus

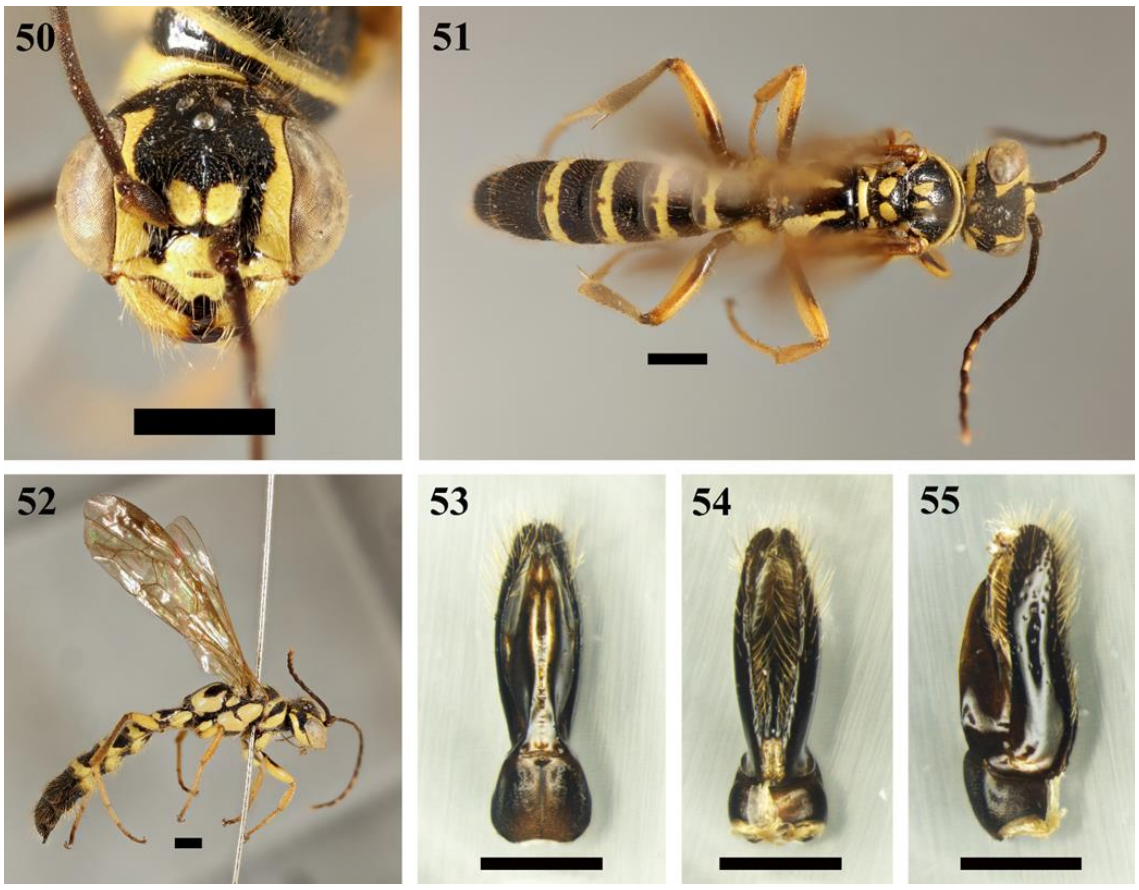
and margins. Legs except for the castaneus hindtibia and hindtarsi, trochanter, basis of the femora, and brown tarsal claw. The lateral of the tergite I, stretching and converging on a submarginal transversal posterior fasciae. Trasversal fasciae before the apex of tergite I-IV, broader on the lateral surface, sometimes broadly interrupted. Sternite I almost entirely or diffusely yellow. Broad transversal fasciae on the sternite II-IV almost or broadly interrupted.

Female: unknown.

Etymology: From Latin, *margines* – "margins"; and *plicata* – "folded". Referring to the apico-lateral margins of the hypopygium, that is folded up in posterior view.

Distribution: known only for the type records.

Discussion: None of the three individuals analysed had the tuft of hairs on the first metasomal sternite.



Figs 50-55: *Kaysara marginoplicata*, holotype male. Body: 50, Frontal head; 51, Dorsal habitus; 52, Lateral habitus; Scale bar = 1mm. Genital capsule: 53, Dorsal view; 54, Ventral view; 55, Lateral view. Scale bar = 0,5mm.

***Kaysara levicrenata* Carnimeo sp. n.**

(Figs 56-61, 109, 119)

Holotype, ♂, BRAZIL: Parque Nacional do Itatiaia, Rio de Janeiro, 12/ii/2015 (*R.F. Monteiro and eq. col.*) (UFRJ). *Paratypes*, BRAZIL: 33 ♂, Parque Nacional da Serra dos Órgãos, Rio de Janeiro, 04/i/2014-10/iv/2014, (*R.F. Monteiro and eq. col.*) (UFRJ).

Male description

Structure: Central clypeal notch shallower, with depth of about 1/6 of clypeus length. Basal region of the clypeus more convex than in the other species; Mesopleural transversal sulcus wide and well-marked; Forewings hyaline, ferruginous on the anterior margins, and stigma. The marginal cell castaneus; Epipygium with deep well marked punctuations, except for the central surface smooth. Subapical surface slightly triangular; Tuft of hairs emerging from a medial elevation; Hypopygium subquadrate, apical margin slightly notched. Apico-lateral margins with tiny acute extensions up folded.

Genital capsule: Dorsal surface of the basal ring more than 2x longer than its ventral surface. Depressed sublateraly with a longitudinal line medially in dorsal view; Gonocoxite with 3/4 the gonostylus extension, strongly depressed basally. The apex subquadrate, feebly separated medially, with acute lateral spines. Basal region broad, narrower since the middle and curved ventrally in lateral view; Aedeagus lamellate, as long as the gonocoxite, with a small rounded lobe apically; Gonostylus subquadrate, feebly narrower before the apex, with acute lateral spine on its ventral margin. With golden pubescence on the half apical region.

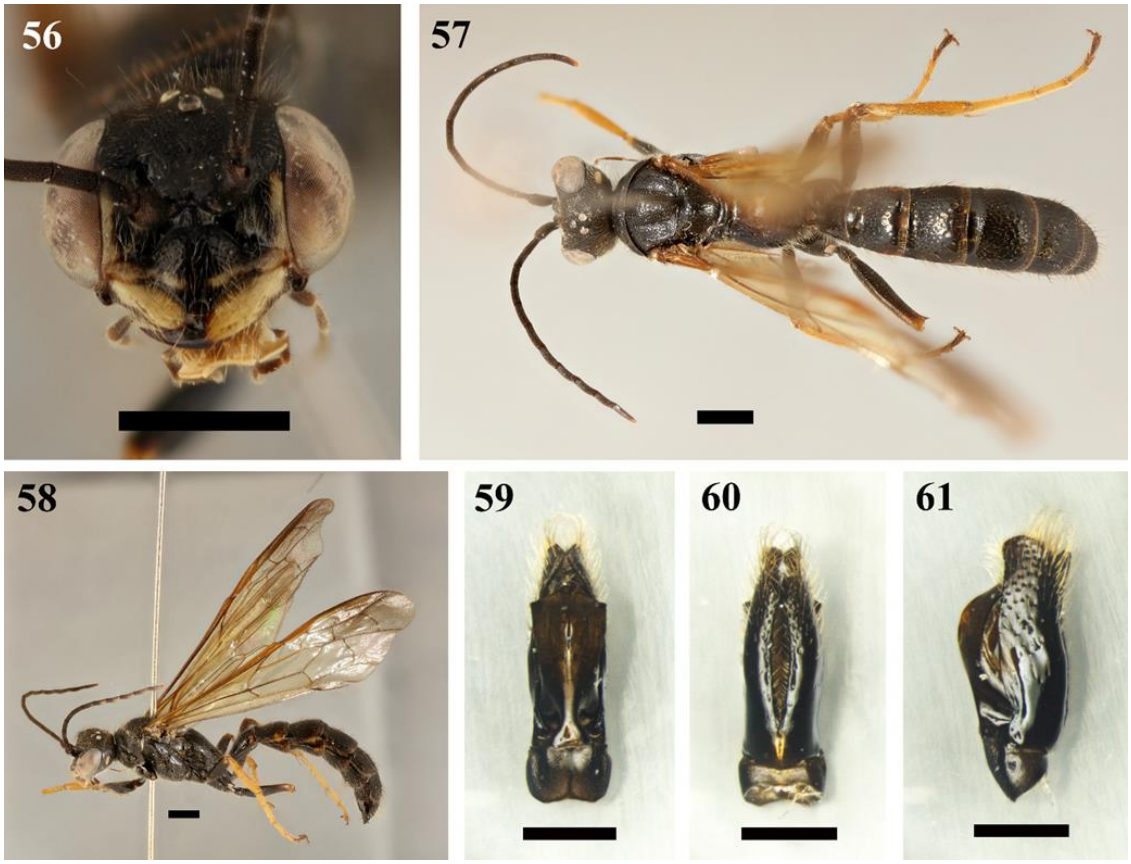
Colouration: Body varies from predominantly black to several yellow markings. Clypeus completely yellow, much variegated, or almost completely black. Mandibles with dark margins and teeth. Supra antennal plates with rounded spots or completely black. Yellow or ferruginous tyloids on the flagelomeres VI-XI and tip of the XI. Bands contouring the frontal margin of the eyes, from the clypeus margin to above the supra antennal projections. Rounded spots on the gena. Tibiae and tarsi, darker on the apical tarsomeres. Ventral surface of the forecoxae, completely yellow or predominantly black. Inner margin of the forefemur marked or completely black. Mesosoma completely black or with the following markings: pronotum with or without marginal fasciae, the anterior interrupted in the middle, and posterior thinner; broad and diffuse spots on the mesopleuron; large spots on the lateral of the propodeum; two rounded spots on the metanotum. Apico-lateral margins of tergites I-IV with rounded or diffuse spots, or

predominantly black. Sternites I-IV with transversal fasciae interrupted in the middle, or predominantly black.

Female: unknown.

Etymology: From Latin, *levis* – "slight", "smooth"; and *crena* – "notch", "incision". Referring to the clypeal notch shallower than the other species.

Distribution: Parque Nacional do Itatiaia and Parque Nacional da Serra dos Órgãos, Rio de Janeiro, Brazil (UFRJ).



Figs 56-61: *Kaysara levicrenata*, holotype male. Body: 56, Frontal head; 57, Dorsal habitus; 58, Lateral habitus; Scale bar = 1mm. Genital capsule: 59, Dorsal view; 60, Ventral view; 61, Lateral view. Scale bar = 0,5mm.

***Pseudoscotaena* Carnimeo gen. n.**

Generotype: *Scotaena decora* (Smith, 1859)

Male description

Head: Antennal sockets under supra antennal projections, with rounded margined supra antennal plate on the medial apex. The apex of the supra antennal plate more or less

approximated to each other; Clypeus apical margin mostly with shallow central notch, medium in *P. polistoides*. With depth from about 1/4 to 1/8 of clypeus length. The teeth formed laterally to the notch generally soft and slightly to the sides, but acute towards down in *P. polistoides*. Basal region of the clypeus convex, more bulging in *P. duckei*, and depressed on the basolateral margins. Basolateral margins angulated, but slightly rounded in *P. polistoides*. Laterals of the apical margins concave; Mandible bidentate, the apical tooth long and acute, the subapical short and rounded. Basal region of the mandible triangular shaped; Maxillary palpi with palpomeres about the same size, the IIIrd often shorter and broader; Antennae filiform, with 11 flagelomeres, the apical ones slightly arcuate.

Mesosoma: Pronotum constricted in the middle, forming elevations anterior and posteriorly in lateral view. Anterior margin carinate and narrower than the posterior; Fore wing with nervure 2m-cu received by beyond about 1/4 of the base of the submarginal cell; Forewings hyaline, ferruginous on the anterior margins, and stigma. The marginal cell darker than the rest of the wing, feebly in *P. duckei*; Mesoscutum subquadrate in dorsal view, with dorsal surface slightly convex. A pair of longitudinal submedial sutures, and a pair of longitudinal carina laterally, culminating in a transversal posterior carina; Scutellum dorsally convex with rounded surface. Delimited anteriorly by a deep transversal suture, and the posterior margin rounded. Latero-posterior margins with borders enlarged towards the axilla; Metanotum short with two sublateral fossae; Mesopleural transversal sulcus wide and diffuse; Metapleuron triangular in lateral view; Propodeum concavity obliquus posteriorly. Apex of the propodeum with two petiolar grooves laterally to the petiolar socket; Mesepisternal lamellae short and rounded; A pair of longitudinal sutures on the ventral surface of the mesepistenum; Forecoxae with ventral surface very slightly convex, almost flattened, with the inner margin straight and the outer broader and curved; Hindcoxae with longitudinal carina on the dorsal surface; Posterior margins of the mid and hindtibiae with row of projections or serrations, more conspicuous on hindtibiae. With short carina on the external basis of the tibia; Hindfemoral-hindtibial joint lobes asymmetrical with inner lobe slightly longest and thickened posteriorly;

Metasoma: Metasoma with constrictions between the segments, mainly in lateral view; First metasomal tergite with length shorter than its apical breadth. With a longitudinal sulcus reaching more than half the segment extension. Spiracles strongly raised in *P. polistoides*; Apical margins of tergites I-VI with transversal smooth fasciae, preceded by a transversal row of setae horizontally arranged; Epipygium oval, strongly

constricted before the apical margin, with flared apical border; Hypopygium with subtriangular margin, apically rounded and with narrower basis.

Colouration: Body black and variegated with yellow markings.

Female: Unknown for *P. decora* and *P. fastuosa*, described for *P. duckei* and *P. polistoides*.

Etymology: This genus contains the two most common species of what was believed to be the *Scotaena* genus (e.g. *P. decora* and *P. polistoides*). Therefore, referring to it as the *Pseudoscotaena* might be appropriate once it differs and associates these two genera through its taxonomic history.

Included species: *Pseudoscotaena decora*, *P. duckei*, *P. fastuosa*, and *P. polistoides*.

Distribution: Records in Brazil for the states of: Amazonas, Ceará, Mato Grosso, Minas Gerais, Pará, Piauí, Paraná, Rio de Janeiro, and São Paulo; Bolivia; Colombia; Paraguay, Peru; and Uruguay.

Discussion: The spiracles of the first metasomal tergite can vary in *P. polistoides*. They are strongly raised most of times, but it was found some specimens of this species with the spiracle just slightly raised.

***Pseudoscotaena decora* (Smith, 1859)**

(Figs 62-67, 122, 128, 135, 136, 138)

Thynnus decorus Smith, 1859: 51-52. *Holotype*, ♂, BRAZIL: Santarém, Pará, date unknown (NHM).

Elaphroptera decora Fox, 1898: 72.

Scotaena decora Turner, 1910a: 19; Kimsey, 1992: 134; Kimsey, 2004a: 511.

Male Redescription:

Structure: Apex of the supra antennal plate approximated to each other; Clypeus apical margin with shallow central notch, with depth from about 1/7 of the clypeus length. The teeth formed laterally to the notch soft and slightly to the sides; Anterior margin of the pronotum almost as wide as the posterior, enlarged in dorsal view; Propodeum obliquus posteriorly, the surface flattened dorsally, largely rounded laterally; Hindcoxae with longitudinal carina forming a keel on the dorsal surface; First tergite spiracles feebly raised; Epipygium with well-marked, deep and stretched punctuations that origins longitudinal striae that converge towards the border of the epipygium.

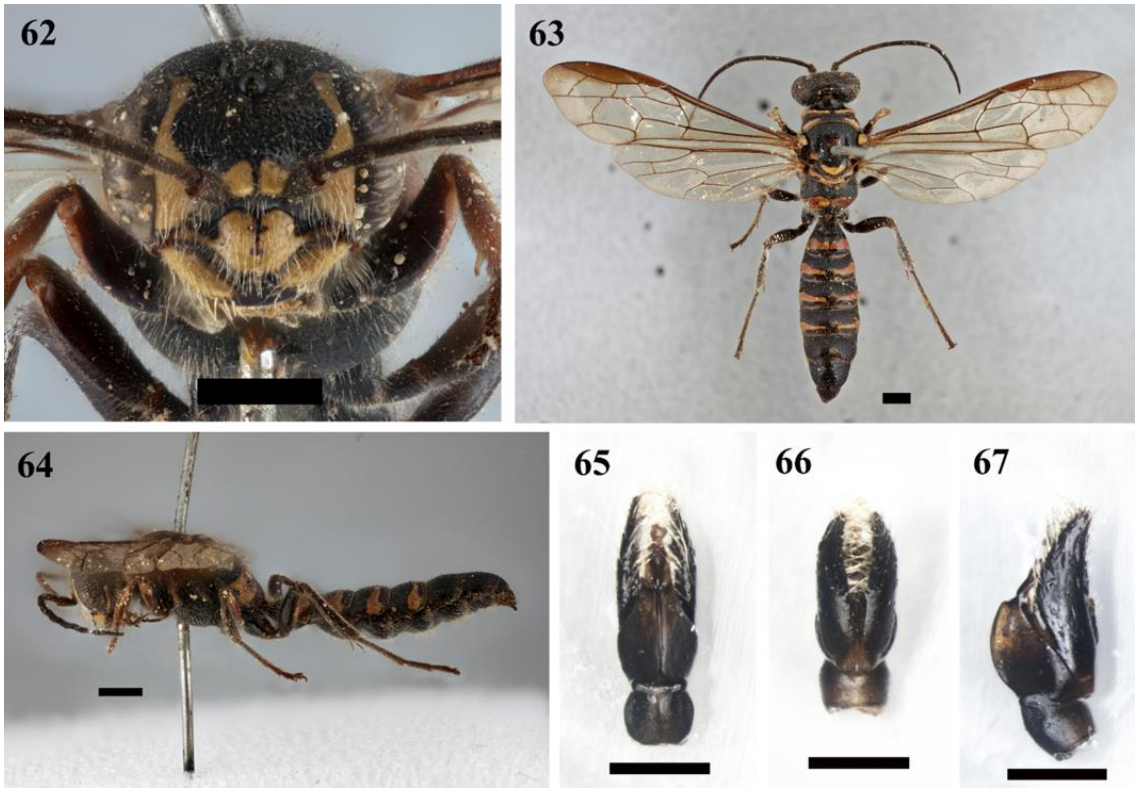
Genital capsule: Basal ring long, with its dorsal surface longer on its apical margin. Depressed sublaterally, and constricted apically. With two rounded tubercles sublaterally and a longitudinal line medially in dorsal view; Gonocoxite broad with its basal region wider than the basal ring. Strongly tapering towards the apex and with convex surface dorsally in lateral view. With about half the gonostylus extension, the apex of the dorsal surface contiguous and two subapical acute teeth; Aedeagus lamellate, longer than the gonocoxite and shortest than the gonostylus. Slightly curved to the ventral surface, with a rounded lobe apically; Gonostylus slender, slightly tapering towards the almost acute apex. With pale golden pubescence on the half apical region margins.

Colouration: Body black and variegated with yellow markings. Clypeus except for the basal and apical margins, and a cross-like spot centrally; Mandibles with dark margins and teeth; Supra antennal plates, except for a line between them; Bands contouring the frontal margin of the eyes, from the clypeus margin to the posterior ocelli. And the genal margin of the eyes narrowing towards the vertex. A pair of diffuse spots on the vertex; The anterior margin of the pronotum, interrupted dorsally and stretching to the lateral margin. A pair of short fasciae dorso-laterally on the posterior margin of the pronotum; The tegulae yellow and a square spot on the mesoscutum surface. A ‘c’ shaped spot medially on the scutellum, and a pair of smaller ones antero-laterally. The metanotum except for the fossae; Propodeum with a pair of large spots narrowing dorsally and almost touching each other medially; Stretched spots on the anterior region of the mesopleuron; Inner surface of the femora and outer of the hindtibiae; Transversal fasciae subapically on the tergites I-IV, broader on the lateral and narrowing towards the dorsal surface, II-IV interrupted medially.

Female: unknown.

Distribution: Villavicencio, Meta, Colombia; Tame, Arauca, Colombia; Tingo Maria, Huanuco, Peru (NHM). Rio Mamore aprox. 10km E San Antonio, Beni, Bolivia (AMNH). Barcelos, AM, Brazil; Rio Aracá, AM, Brazil (INPA). Chapada dos Guimarães - Esc. Buriti, MT, Brazil (CEMT). Fazenda Itaquerê, Nova Europa, SP, Brazil (MZUSP). Planalto, SP, Brazil; Pindorama, SP, Brazil; Taquaritinga, SP, Brazil; União Paulista, SP, Brazil; Matão, SP, Brazil; Sales, SP, Brazil; Vicentinópolis, SP, Brazil; Votuporanga, SP, Brazil; Palestina, SP, Brazil; Magda, SP, Brazil; Novo Horizonte, SP, Brazil; Barretos, SP, Brazil (DZSJRP).

Discussion: Though very similar to *P. fastuosa*, these species can be distinguished by the presence of longitudinal striae on the epipygium of *P. decora* and the longer and thinner hypopygium apex of *P. fastuosa*.



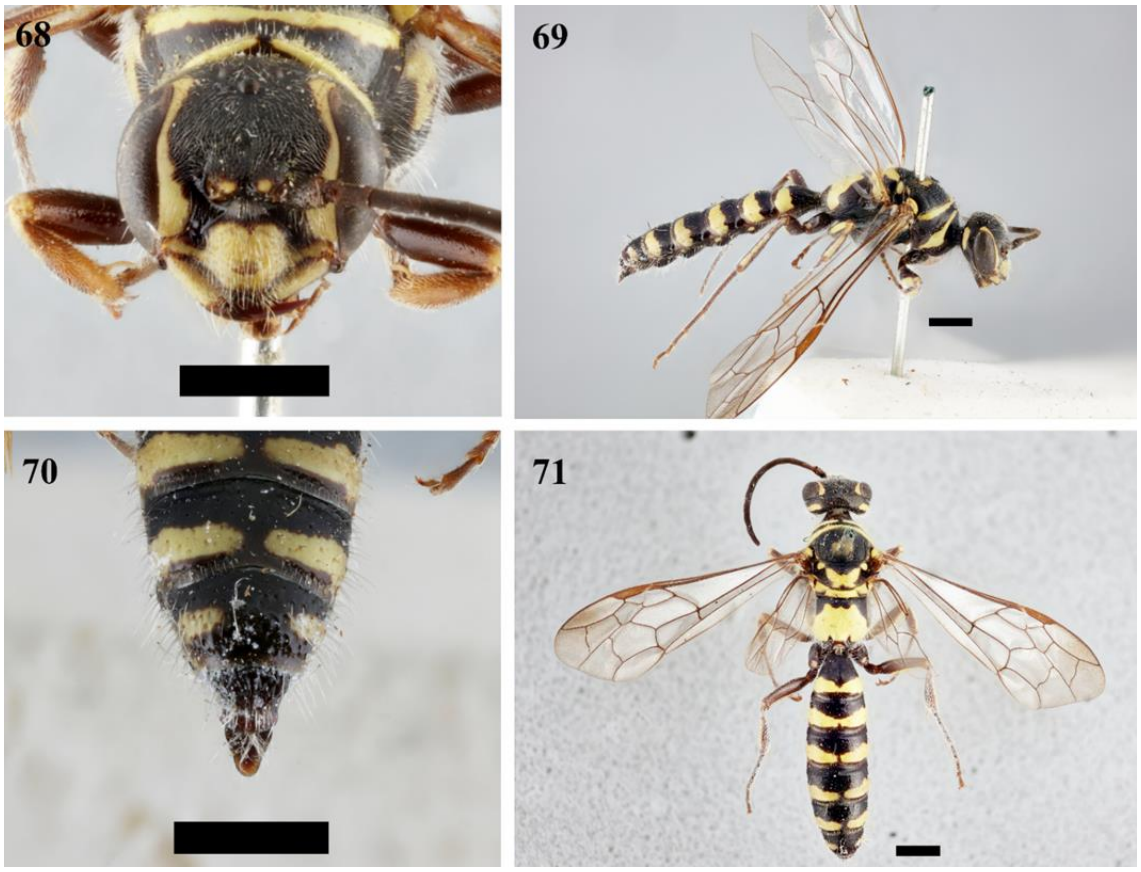
Figs 62-67: *Pseudoscotaena decora*, holotype male. Body: 62, Frontal head; 63, Dorsal habitus; 64, Lateral habitus; Scale bar = 1mm. Genital capsule: 65, Dorsal view; 66, Ventral view; 67, Lateral view. Scale bar = 0,5mm.

***Pseudoscotaena duckei* (Turner, 1909)**

(Figs 68-71, 124, 134)

Scotaena duckei Turner, 1909: 341-342. BRAZIL: Caridade, Ceará, 3 ♂ and 3 ♀, 29/iv/1909 (NHM). Turner, 1910a: 19. Kimsey, 1992: 134. Kimsey & Brown, 1993: 320. *Lectotype* desig., ♂, BRAZIL: Caridade, Ceará 29/iv/1909 (NHM). *Paralectotypes*: 1 ♂ and 2 ♀; Caridade, Ceará, 29/iv/1909-02/v/1909 (NHM). Kimsey, 2004a: 511.

Distribution: known only for the type records.



Figs 68-71: *Pseudoscotaena duckei*, holotype male. 68, Frontal head; 69, Lateral habitus; 70, Epipygium; 71, Dorsal habitus. Scale bar = 1mm.

***Pseudoscotaena fastuosa* (Smith, 1879)**

(Figs 72-75, 123, 131, 137, 139)

Thynnus fastuosus Smith, 1879: 170-171. *Holotype*, ♂, AUSTRALIA: (locality erroneous) date unknown (NHM).

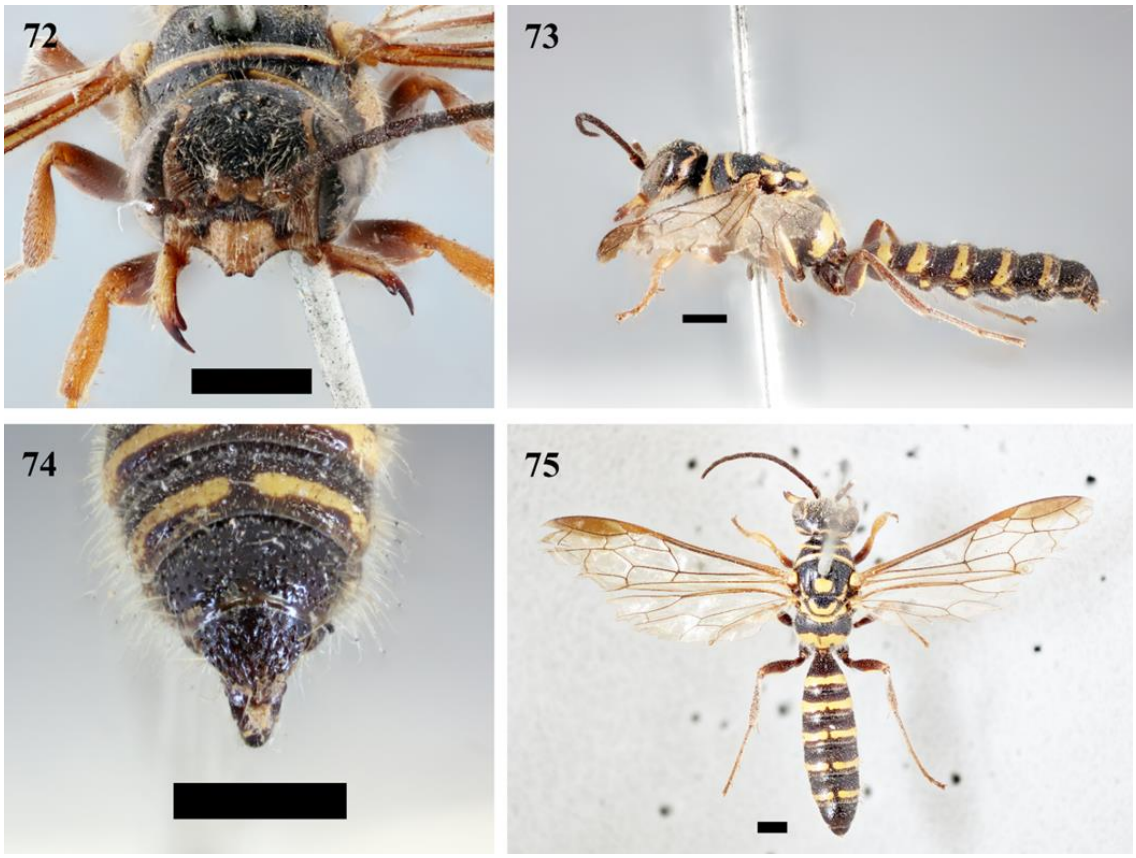
Scotaena fastuosa Turner, 1908b: 253.

Spilothynnus fastuosus Turner, 1910a: 19.

Scotaena fastuosa Kimsey, 2004a: 511.

Female: unknown.

Distribution: Chulumani, La Paz, Bolivia (NHM). Serra das Confusões, Piauí, Brazil (UFES).



Figs 72-75: *Pseudoscotaena fastuosa*, holotype male. 72, Frontal head; 73, Lateral habitus; 74, Epipygium; 75, Dorsal habitus. Scale bar = 1mm.

***Pseudoscotaena polistoides* (Turner, 1910b)**

(Figs 76-79, 125, 130)

Scotaena polistoides (*Thynnus polistoides*, Burmeister) Turner, 1910b: 182-183. BRAZIL: Paraná, 1♂ and 1♀ in copula, december (*Burmeister*) (MfN, NHM); PARAGUAY: Asunción, 6 ♂ (*Anisits*) (MfN, NHM); San Bernardino, 1 ♂ and 1 ♀ (*Fiebrig*) (MfN, NHM). Kimsey, 1992: 134. Kimsey & Brown, 1993: 323, *Lectotype* design, ♂, PARAGUAY: Asunción (NHM); Paralectotypes: Asunción and San Bernardino, Paraguay, 2 ♂ and 2 ♀ (MfN, NHM). Kimsey, 2004a: 511.

Distribution: Paraná, Brazil (NHM, MfN, MACN). Asunción, Paraguay (NHM, MfN). San Bernardino, Paraguay (NHM, MfN). Villa Monte, Bolivia; Uruguai (MfN). Paraguay (AMNH). Fazenda Rio Grande, Cajuru, São Paulo, Brazil; Parque Estadual de Vila Velha, Paraná, Brazil; 12km SE from Jaíba, Minas Gerais, Brazil; Estação Ecológica de Jataí, Luís Antônia, São Paulo, Brazil; Macaé, Rio de Janeiro, Brazil (DZUP). Salgadeira, Cuiabá, Mato Grosso, Brazil (CEMT). Fazenda Floresta, Três Lagoas, Mato

Grosso, Brazil (MZUSP). Macaubal, São Paulo, Brazil; Magda, São Paulo, Brazil; Planalto, São Paulo, Brazil (DZSJRP).

Discussion: The type specimen was labelled by Burmeister as *Thynnus polistoides*, but no description was done for it. So Turner (1910b) described the species for *Scotaena*, carrying *polistoides* as a manuscript name.

Figs 76-79: *Pseudoscotaena polistoides*, holotype male. 76, Frontal head; 77, Lateral habitus; 78, Epipygium; 79, Dorsal habitus. Scale bar = 1mm.

***Pampathynnus* Carnimeo gen. n.**

Generotype: *Scotaena pubescens* (Klug, 1840)

Male description

Head: Antennal sockets under supra antennal projections, with feebly developed rounded margined supra antennal plate on the medial apex. The apex of the supra antennal plate separated to each other by a distance bigger than the width of one plate side. The middle of the plate with a tubercle (in *P. pubescens*) or raised on a slight longitudinal line centrally (in *P. vigilii*); Clypeus apical margin with medium central notch, with depth from about 1/3 to 1/4 of clypeus length. The teeth formed laterally to the notch is thin and

acute towards down. Basal region of the clypeus convex and depressed on the basolateral margins. Basolateral margins diagonals. Laterals of the apical margins concave; Mandible bidentate, the apical tooth long and acute, the subapical short and rounded. Basal region of the mandible triangular shaped, slightly flattened; Maxillary palpi with palpomeres about the same size, the IIIrd often shorter and broader; Antennae filiform, with 11 flagelomeres, the apical ones slightly arcuate. Abundant pale silver pubescence on the whole body, thinner in *P. vigilii*.

Mesosoma: Pronotum slightly constricted in the middle, forming a small elevation anteriorly and a larger on posteriorly, in lateral view. Anterior margin carinated and narrower than the posterior; Fore wing with nervure 2m-cu received by beyond about 1/4 of the base of the submarginal cell; Forewings hyaline, ferruginous on the anterior margins, and stigma. The marginal cell darker than the rest of the wing; Mesoscutum subquadrate in dorsal view, with dorsal surface slightly convex. A pair of longitudinal submedial sutures, and a pair of longitudinal carina laterally, culminating in a transversal posterior carina; Scutellum dorsally convex with rounded surface. Delimited anteriorly by a deep transversal suture, and the posterior margin rounded. Latero-posterior margins with borders enlarged towards the axilla; Metanotum short with two sublateral fossae; Mesopleural transversal sulcus strongly marked; Metapleuron triangular in lateral view; Propodeum concavity obliquus posteriorly, widely rounded laterally. Often with transversal striae dorsally. Apex of the propodeum with two petiolar grooves laterally to the petiolar socket; A pair of longitudinal sutures on the ventral surface of the mesepistenum; Forecoxae with ventral surface flattened, with the inner margin straight and the outer broader and rounded in *P. vigilii* or diagonal, subtriangular in *P. pubescens*; Slightly depressed longitudinally on the ventral surface. Hindcoxae with longitudinal carina on the dorsal surface; Posterior margins of the mid and hindtibiae with row of projections or serrations, more conspicuous on hindtibiae. With short carina on the external basis of the tibia; Hindfemoral-hindtibial joint lobes asymmetrical with inner lobe slightly longest and thickened posteriorly;

Metasoma: Metasoma with constrictions between the segments, mainly in lateral view; First metasomal tergite with length approximately as long as its apical breadth. With a longitudinal sulcus reaching more than half the segment extension. Spiracles slightly raised; Apical margins of tergites I-VI with transversal smooth fasciae, preceded by a transversal row of setae horizontally arranged; Sternite I with subapical surface slightly raised in two lateral lobes, slightly depressed longitudinally between the lobes in

P. vigilii; Epipygium oval, constricted before the apical margin, with flared apical border. Strongly and deeply punctuated; Hypopygium subquadrate with rounded margin.

Colouration: Body predominantly black, with a few yellow markings, mostly on the metasoma.

Etymology: From the Quechuan, the family language of the South American indigenous people Quechua, *pampa* means "plain" and was adopted to refer to the South American lowlands. The name fits with both facts: the synapomorphy supporting the genus is the flattened ventral surface of the forecoxae, and the distribution known for its species is to the Pampean region. And *thynnus* is a commonly used ending word on the Thynninae genera.

Included species: *Pampathynnus pubescens and P. vigilii*.

Distribution: South of Brazil (MfN). Montevideo, Uruguay (NHM). Alta Gracia, Cordoba, Argentina (MACN). Rio Grande, Rio Grande do Sul, Brazil (CESC). 9km E from Araranguá, Santa Catarina, Brazil (DZUP).

Discussion: The two species included species can be easily distinguished by a set of features present in *P. pubescens* and absent in *P. vigilii*: strong transversal striae on the dorsal surface of the propodeum, raised inner margin of the forecoxae and abundance of thick body pubescence.

***Pampathynnus pubescens* (Klug, 1840)**

(Figs 80-85, 126, 129, 132, 140)

Thynnus pubescens Klug, 1840: 31. *Holotype*, ♂, BRAZIL: South of Brazil, date unknown (*Sello*) (MfN). Dalla-Torre, 1897: 103. Smith, 1859: 49.

Scotaena pubescens Turner, 1910a: 19. Kimsey, 1992: 134. Kimsey, 2004a: 511.

Male redescription

Structure: Front with an elevate tubercle present in the middle between the supra antennal plates; Propodeum with strong transversal striae dorsally and with long pubescence; Forecoxae subtriangular, flattened, with the outer lateral margin enlarged and covered with long and thick pubescence. Inner margin raised anteriorly; Hindfemoral-hindtibial joint lobes both slightly thickened posteriorly; Epipygium strongly and deeply punctuated forming raised rugosities, a central longitudinal one almost reaching the apical margin;

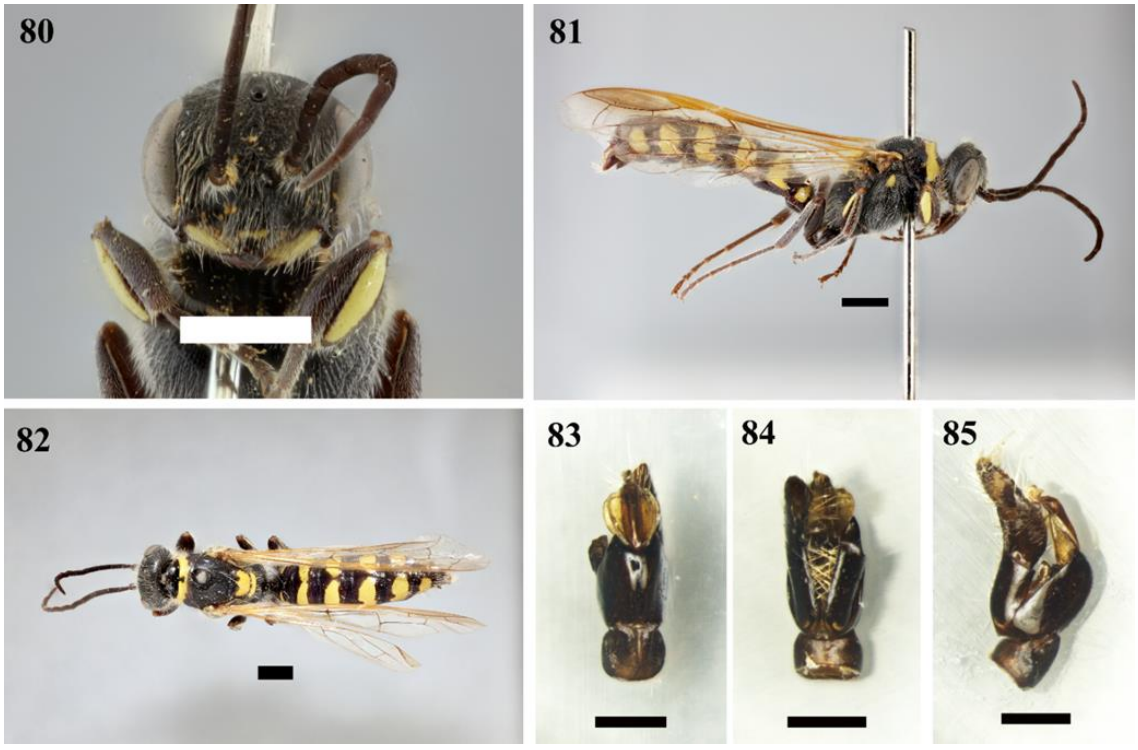
Genital capsule: Basal ring with its dorsal surface longer on its apical margin. Slightly depressed sublaterally before the apex, with a longitudinal line medially in dorsal

view; Gonocoxite broad, with its basal region almost wider than the basal ring. With about half the gonostylus extension. The apex contiguous, with soft teeth sublaterally; Aedeagus lamellate, with about 3/4 the gonostylus extension. Apex curved ventrally, with a small rounded lobe apically and curved dorsally; Gonostylus slender, slightly tapering towards the slightly rounded apex. Strongly curved ventrally, with the medial region strongly constricted. With golden pubescence on the half apical region margins.

Colouration: Body predominantly black, with a few yellow markings. Mandibles except for the apex and basis. Clypeus black with a short fascia centrally, before the apical margin. Large fasciae on the anterior margin of the pronotum, not fully interrupted in the middle. The tegulae and a small rounded spot on the mesopleuron anteriorly. Scutellum with large tridentate spot medially and the metanotum almost entirely. Yellow spots on the inner surface of the fore and midfemur. Transversal fasciae on tergites I-VI, broadly interrupted on last one, slightly or not interrupted on the others. Small rounded spots on the sternites II-V laterally.

Female: unknown.

Distribution: South of Brazil (MfN). Carrasco and Montevideo, Uruguay (NHM).



Figs 80-85: *Pampathynnus pubescens*, male. Body: 80, Frontal head; 81, Lateral habitus; 82, Dorsal habitus; Scale bar = 1mm. Genital capsule: 83, Dorsal view; 84, Ventral view; 85, Lateral view. Scale bar = 0,5mm.

***Pampathynnus vigilii* (Brèthes, 1910)**

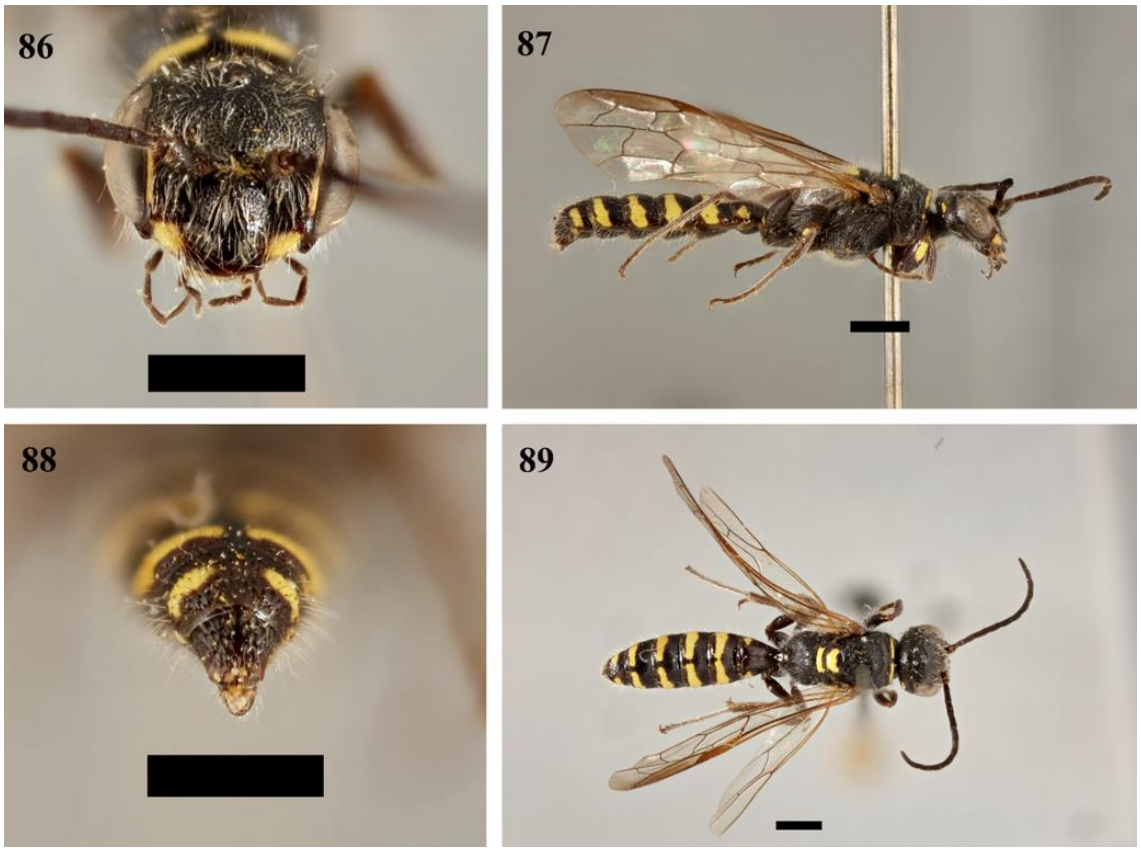
(Figs 86-89, 127, 133, 141)

Elaphroptera vigilii Brèthes, 1910: 217-218. *Holotype*, ♂, ARGENTINA: Alta Garcia, Cordoba, date unknown (*Vigil*) (MACN). *Paratypes*, ARGENTINA: same locality, 1 ♂ and 1 ♀ (MACN).

Scotaena vigilii Kimsey, 2004a: 511.

Distribution: Alta Garcia, Cordoba, Argentina (MACN). Rio Grande, Rio Grande do Sul, Brazil (CESC). Nine km E from Araranguá, Santa Catarina, Brazil (DZUP).

Discussion: Although this species has been described based on male and female individuals, the author makes a caveat after the description: "Es con duda que atribuo á la misma especie los dos sexos que aquí describo". So, further analysis must be made to confirm the identity of the females of *P. vigilii*.



Figs 86-89: *Pampathynnus vigilii*, male. 86, Frontal head; 87, Lateral habitus; 88, Epipygium; 89, Dorsal habitus. Scale bar = 1mm.

Identification key

The pictorial key presented provide generic and specific level identification for male individuals of the genera: *Scotaena, Kaysara, Pseudoscotaena,* and *Pampathynnus.*

1 Supra antennal plates with carinate external margin (Figs 13, 17, 21, 90, 92, 93) (less carinate in *S. reversa*) (Fig. 27, 91); Two lateral carinas raised by the epipygium rugosities (Figs 94, 95); Mesepisternal suture slightly raised apically (Figs 14, 19, 96, 97) (strongly raised in *S. reversa*) (Fig. 98) ……...…...…...……. *Scotaena* Klug …….. 2

- Supra antennal plates without carinate external margin (Figs 3, 7, 10, 33, 44, 50, 56, 62, 68, 72, 76, 80, 86); Epipygium variable, smooth or rugose (Figs 5, 8, 11, 70, 74, 78, 88, 116, 117, 136, 137); Mesepisternal suture not raised apically ……..... 5

2 Clypeus apical margin with central notch with depth of about 1/4 of clypeus length, swallower than its sublateral margins (Fig. 90); Dorsal surface of the propodeum with not-coalescent punctuations (Fig. 99); Mesepisternal lamellae short and subquadrate (Fig. 96) ..... *S. trifasciata* Klug

- Clypeus apical margin with central notch with depth of about 1/2 to 1/3 of clypeus length, as deep (Fig. 91) or deeper (Figs 92, 93) than its sublateral margins; Dorsal surface of the propodeum with dense and coalescent punctuations (Figs 100, 101); Mesepisternal lamellae triangular, narrow and acute, with the apex slightly rounded (Figs 97, 98) 3

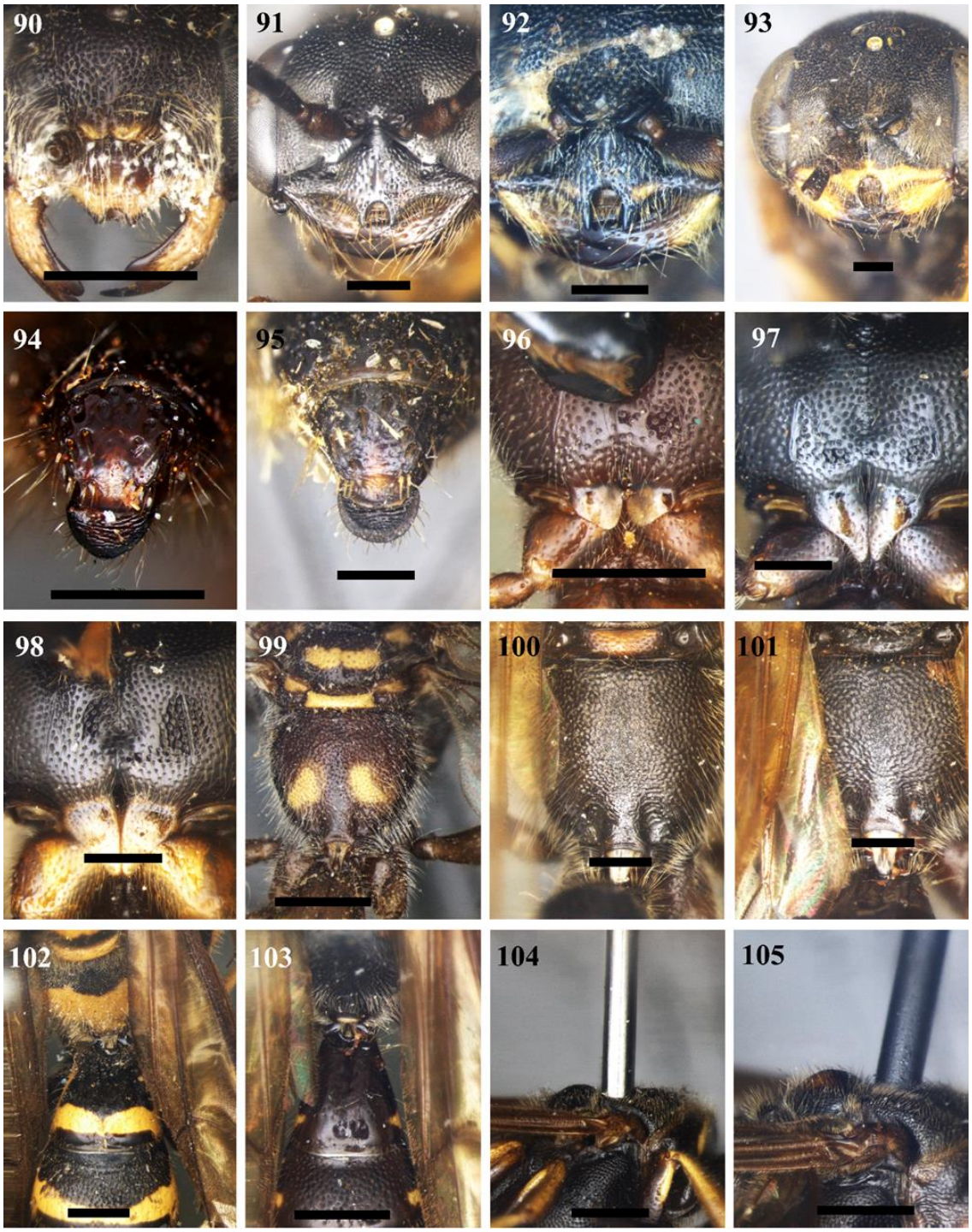
3 First metasomal tergite with length as long as its breadth (Fig. 102) ……...……... *S. horni* (Turner)

- First metasomal tergite with length longer than its apical breadth (Fig. 103) 4

4 Scutellum dorsal surface rounded, feebly raised medially (Fig. 104); Mesepisternal suture slightly raised at the apex (Fig. 97); Clypeus apical margin with deep central notch with depth of about 1/2 of clypeus length (Fig. 92); Supra antennal plates with carinate external margin (Fig. 92) …….……...…….. *S. vetusta* Turner

- Scutellum dorsal surface raised and pointed medially (Fig. 105); Mesepisternal suture strongly raised at the apex (Fig. 98); Clypeus apical margin with central notch with depth of about 1/3 of clypeus length (Fig. 91); Supra antennal plates with feebly carinate external (Fig. 91) ..... *S. reversa* Carnimeo

5 Mandible subapical teeth short, trapezoid, with the outer margin longer than the inner margin (Figs 33, 39, 106); Maxillary palpi IV and V about 1,5x longer than III (Fig. 107); Sternite I with a tuft of hairs medially (Figs 111, 112, 114), sometimes lost (Fig. 110); Hypopygium with apical margin enlarged in different ways (Figs 118-121) ……. *Kaysara* Carnimeo …….. 6



Figs 90-105: *Scotaena* characters. 90, 96, 99: *S. trifasciata*, 91, 98, 100, 105 *S. reversa*; 92, 94, 97, 101, 103, 104: *S. vetusta*; 93, 95, 102: *S. horni*. Scale bar = 1mm.

- Mandible subapical teeth short and rounded (Figs 72, 90, 123); Maxillary palpi IV and V about the same size as the III (Figs 7, 86); Sternite I without tuft of hairs medially; Hypopygium subtriangular or subquadrate, with simple rounded margin (Figs 128, 129, 138, 139) ……..... 10

6 Forewings with a big dark spot at the apex (Fig. 108); Epipygium with deep and broad punctuations and several longitudinal striae converging towards the apex and forming a subapical transversal carina (Fig. 116); Hypopygium with apical margin enlarged in two acute and sublateral teeth, with a deep concave emargination between them (Fig. 118) ..... *K. flavovariegata* (Smith)

- Forewings without dark spot, the apex, mainly in the marginal cell, slightly darker than the rest of the wing (Figs 40, 45, 52, 58); Epipygium without striae and subapical transversal carina (Fig. 117); Hypopygium without subapical acute teeth with deep concave emargination (Figs 119, 120, 121) …….....……..….... 7

7 Central clypeal notch shallower than in the other species, with depth of about 1/6 of clypeus length (Fig. 109); Hypopygium with apical margin slightly notched and apico-lateral margins with tiny acute extensions up folded (Fig. 119); Body predominantly black with a few yellow markings (Figs 57, 58) ……..…….. *K. levicrenata* Carnimeo

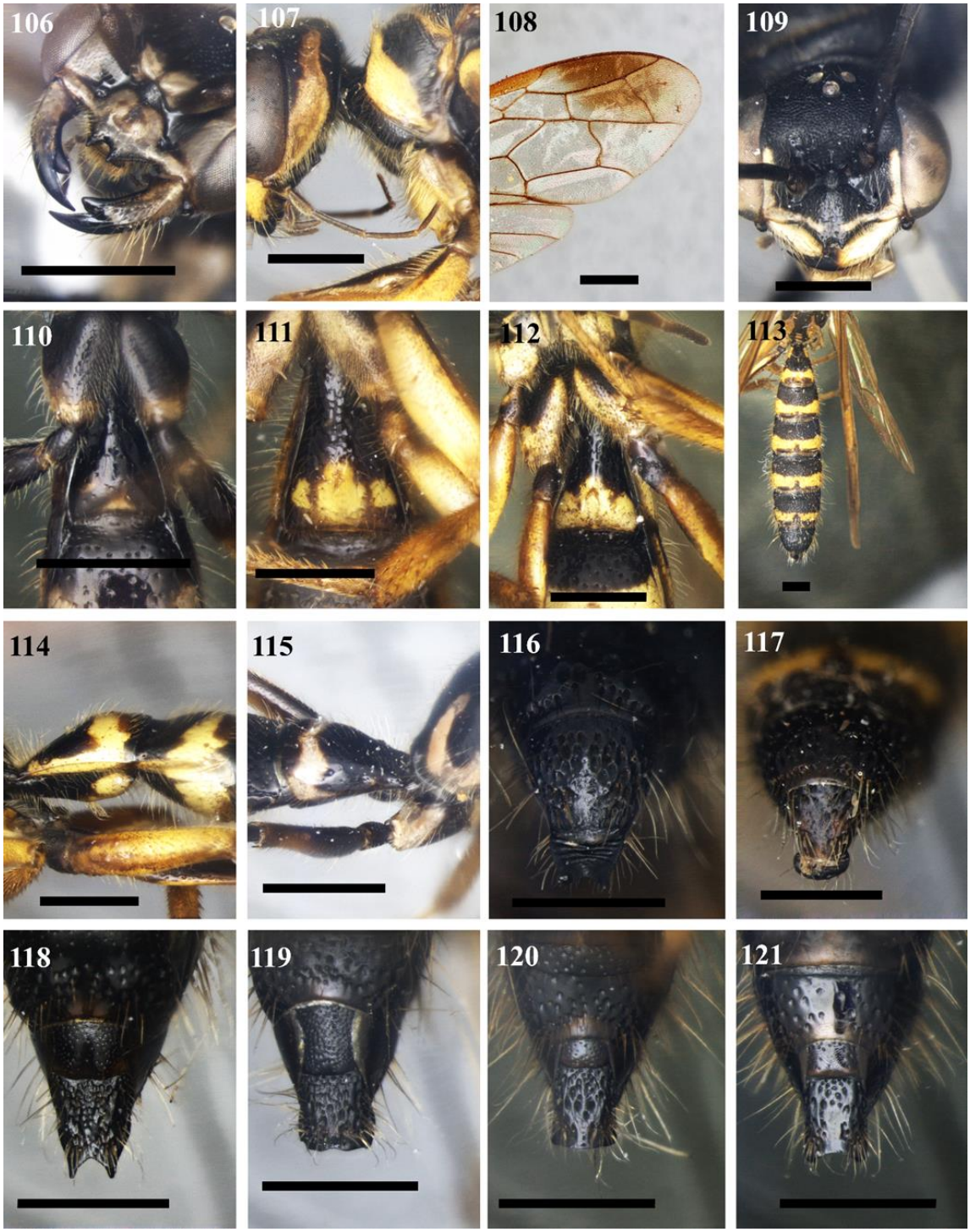
- Clypeal notch with depth of about 1/4 of clypeus length (Figs 33, 39, 44, 50); Hypopygium with subquadrate (Figs 120, 121) or rounded (Fig. 117) apical margin; Body much variegated with yellow markings (Figs 34, 40, 45, 51) 8

8 Hypopygium with rounded margin broadly enlarged laterally and apically. The apical border with a slight central invagination and two tiny extensions up folded (Fig. 117); Transversal fasciae before the apex of metasomal tergites I-V (Fig. 40, 113) ……..….. *K. laterolata* Carnimeo

- Hypopygium not broadly rounded enlarged laterally and apically (Figs 118-121); Transversal fasciae before the apex of metasomal tergites I-IV (Figs 34, 35, 45, 46, 51, 52) ……..…….. 9

9 First metasomal sternite with tuft of hairs emerging from a very slight elevation (Fig. 114). The insertion of the tuft with an inverted ‘v’ shaped (Fig. 112); Hypopygium with straight lateral margins expanding towards the apex (Fig. 120). The apical margin convex and curved in posterior view ……..…….……...….. *K. apiciconcava* Carnimeo

- Tuft of hairs absent in all the studied specimens (Figs 110, 115); Hypopygium apical margin with apico-lateral extensions up folded, forming a rounded notch centrally (Fig. 121) ……..……...….. *K. marginoplicata* Carnimeo



Figs 106-121: *Kaysara* characters. 106, 110, 115, 121: *K. marginoplicata*; 107, 111, 113, 117: *K. laterolata*; 108, 116, 118: *K. flavovariegata*; 109, 119: *K. levicrenata*; 112, 114, 120: *K. apiciconcava*. Scale bar = 1mm.

10 Supra antennal plates contiguous or separated to each other by a distance smaller than the width of one plate side (Figs 122-125); Basolateral margins of the clypeus angulated (Figs 122-124) or slightly rounded (in *P. polistoides*) (Fig. 125); Hypopygium with subtriangular margin, apically rounded and with narrower basis (Fig. 128); Propodeum with large yellow spots (Figs 130, 131) ..... *Pseudoscotaena* Carnimeo …….. 11
- Supra antennal plates feebly developed separated to each other by a distance bigger than the width of one plate side (Figs 126, 127); Basolateral margins of the clypeus diagonals (Figs 126, 127); Hypopygium subquadrate with rounded margin (Fig. 129); Propodeum without yellow markings (Figs 132, 133) …. ……..... *Pampathynnus* Carnimeo …….. 14

11 Basolateral margins of the clypeus slightly rounded (Fig. 125); Clypeus central notch with depth of about 1/4 of clypeus length and apex with acute teeth (Fig. 125); Tergite I with the spiracles usually strongly raised, but it can be slightly raised in some individuals (Fig. 130) ……..……...……..…..... *P. polistoides* (Turner)
- Basolateral margins of the clypeus angulated (Figs 122-124); Clypeus central notch with depth of about 1/6 of clypeus length and apex with soft rounded teeth (Figs 122-124); Tergite I with the spiracles feebly or not raised (Fig. 131) 12

12 Basal region of the clypeus convex and bulging (Fig. 124); Marginal cell feebly darker than the rest of the wing (Fig. 134) ……..…….……..... *P. duckei* (Turner)
- Basal region of the clypeus convex and not bulging (Figs 122, 123, 125); Marginal cell darker than the rest of the wing (Fig. 135) ……..……..……..... 13

13 Epipygium with well-marked, deep and stretched punctuations that origins longitudinal striae that converge towards the border of the epipygium (Fig. 136); Hypopygium subtriangular with short and rounded apex (Fig. 138) ..... *P. decora* (Smith)
- Epipygium with deep stretched punctuations and smooth central surface (Fig. 137); Hypopygium subtriangular with long and thin apex, slightly rounded (Fig. 139) ……..... *P. fastuosa* (Smith)

14 Propodeum with strong transversal striae dorsally and long silver pubescence (Fig. 132); A small tubercle between the supra antennal plates (Fig. 126); Forecoxae triangularly enlarged on the outer margin, inner margin raised anteriorly (Fig. 140) ……..... *P. pubescens* (Klug)

- Propodeum with feeble transversal striae (Fig. 133); Region between the supra antennal plates slightly longitudinally raised (Fig. 127); Forecoxae without inner margin raised (Fig. 141) ..... *P. vigilii* (Brèthes)

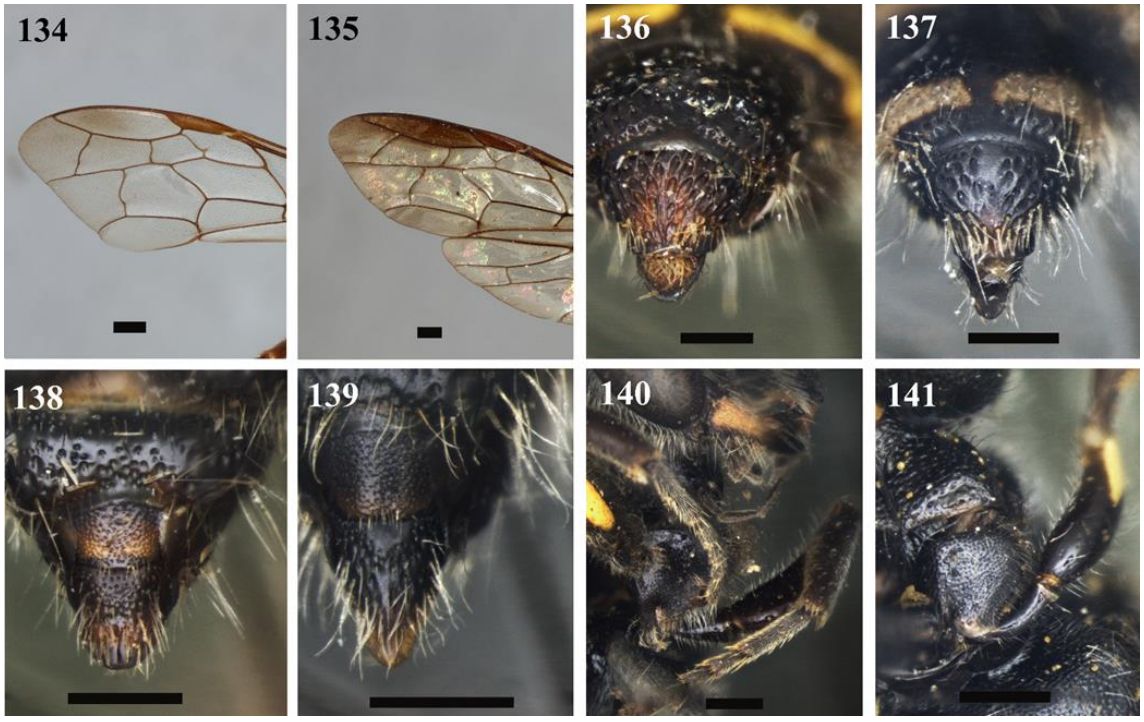
Figs 122-133: *Pseudoscotaena* and *Pampathynnus* characters. 122, 128: *Pseudoscotaena decora*; 124: *P. duckei*; 123, 131: *P. fastuosa*; 125, 130: *P. polistoides*. 126, 129, 132: *Pampathynnus pubescens*; 127, 133: *P. vigilii*. Scale bar = 1mm.

Distribution

The records of the genera and species analysed when plotted in geographic distribution maps showed different patterns for the studied groups (Fig. 142).

The four *Scotaena* species appears with an Atlantic Rainforest distribution, with records from Bahia to Santa Catarina states in Brazil, as well as east Paraguay and Argentina (Fig. 143B). The only record of *S. trifasciata* is from Bahia state, Brazil. This is not an accurate data, since the state is large and formed by several physiognomies. However, as seen for the genus *Upa* Kimsey, 1991 (Kimsey, 1996), which has similar

distribution to *Scotaena*, the record probably belongs to southern Bahia. Since this region, known as Bahia Costal Forests, is part of the Brazilian Atlantic Rainforest (Araújo et al, 1998), where other *Scotaena* species are registered. *S. vetusta* has records in the Brazilian states of Minas Gerais, Rio de Janeiro, São Paulo, and Santa Catarina, and Missiones province, Argentina. Most of them are close to the eastern coast of the continent. *S. reversa* was first registered in eastern São Paulo and then Rio de Janeiro, Brazil. *S. horni* was only recorded until now in Villarrica, Paraguay, being the *Scotaena* species found more distant to the eastern South American coast.



Figs 134-141: *Pseudoscotaena* and *Pampathynnus* characters. 134: *Pseudoscotaena duckei*; 135, 136, 138: *P. decora*; 137, 139: *P. fastuosa*. 140: *Pampathynnus pubescens*; 141: *P. vigilii*. Scale bar = 0,5mm.

Kaysara have a similar distribution with *Scotaena*, apparently occurring even more restrict to the Brazilian Atlantic Rainforest (Fig. 143C). The known records for the species are restricted to Brazil, from the states of Espírito Santo, Rio de Janeiro, São Paulo, Paraná, and Santa Catarina. The generotype *Kaysara flavovariegata* was recorded for the first time in Nova Teutônia, Santa Catarina, and recently in Picinguaba, a natural reserve of São Paulo state shore. *K. laterolata* has its first record also for Nova Teutônia, being registered afterwards in Piraquara, Paraná. *K. apiciconcava* was only recorded in

Itapemirim, close to the shore of Espírito Santo state. *K. marginoplicata* was registered in Ibitirama, Espírito Santo, Ribeirão Grande, São Paulo, and in the Parque Nacional da Serra dos Órgãos, Rio de Janeiro state. The last discovered species, *K. levicrenata*, was found in the Serra dos Órgãos and Parque Nacional do Itatiaia, Rio de Janeiro.

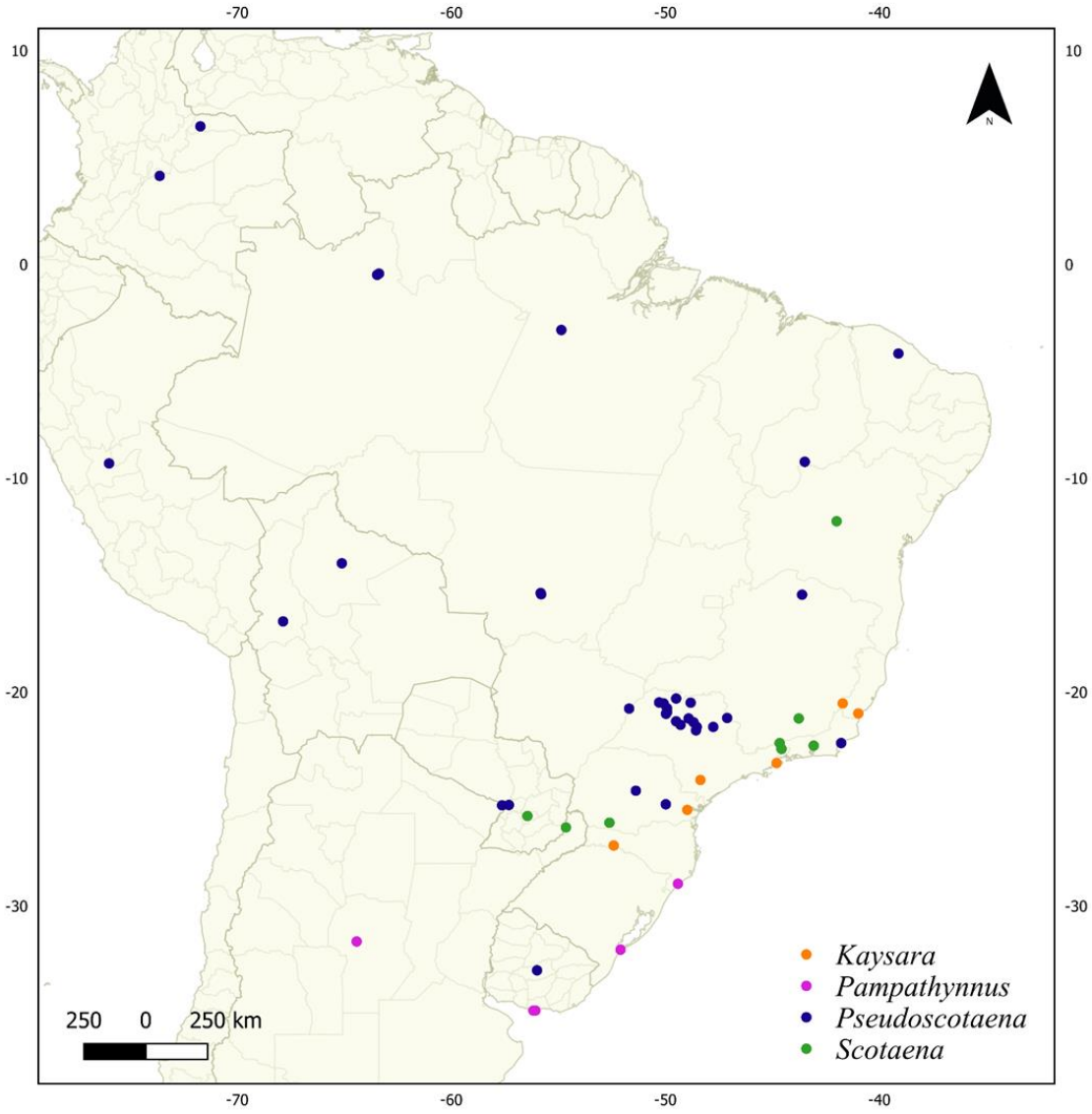


Fig. 142: Geographic distribution map of the studied genera: *Scotaena* (green circles), *Kaysara* (orange circles), *Pseudoscotaena* (blue circles), and *Pampathynnus* (purple circles).

Unlike the two other genera, *Pseudoscotaena* has shown a wide distribution, with records from Colombia, Bolivia, Peru, Brazil, Paraguay and Uruguay (Fig. 143A). *P. decora*, the generotype and most widely distribute species, was registered northernmost in Villavicencio, Colombia and southernmost in Nova Europa, São Paulo state, Brazil.

This species was the most frequently recorded, what indicates that it may be an abundant Thynninae species. *Merithynnus* and *Aelurus* were the only Thynninae genera recorded from Colombia (Kimsey, 2005). Therefore, the records here presented for *P. decora* in Tame and Villavicencio represent an expansion on the distribution known for the species, as well as an addition to the known Thynninae Colombian fauna. *P. duckei* has a single and almost isolated record until now, in Caridade, Ceará state, north-eastern Brazil. *P. fastuosa* was registered in Chulumani, Bolivia, and Serra das Confusões, Piauí, Brazil, western and eastern South America. The distributional gap formed between these two localities may indicate scarce sampling of this species in the regions in-between, as well as difficult to properly identify Thynninae species. *P. polistoides* was registered in Brazil, Paraguay and Uruguay, being the southernmost distributed species of this genus. The several records of *P. decora* and *P. polistoides* for the São Paulo state are result of the thematic project BIOTA-FAPESP (<http://www.biota.org.br/>). Those results show that sampling of these groups is still poor, and that collect and identification efforts can easily expand the known distribution of Thynninae genera.

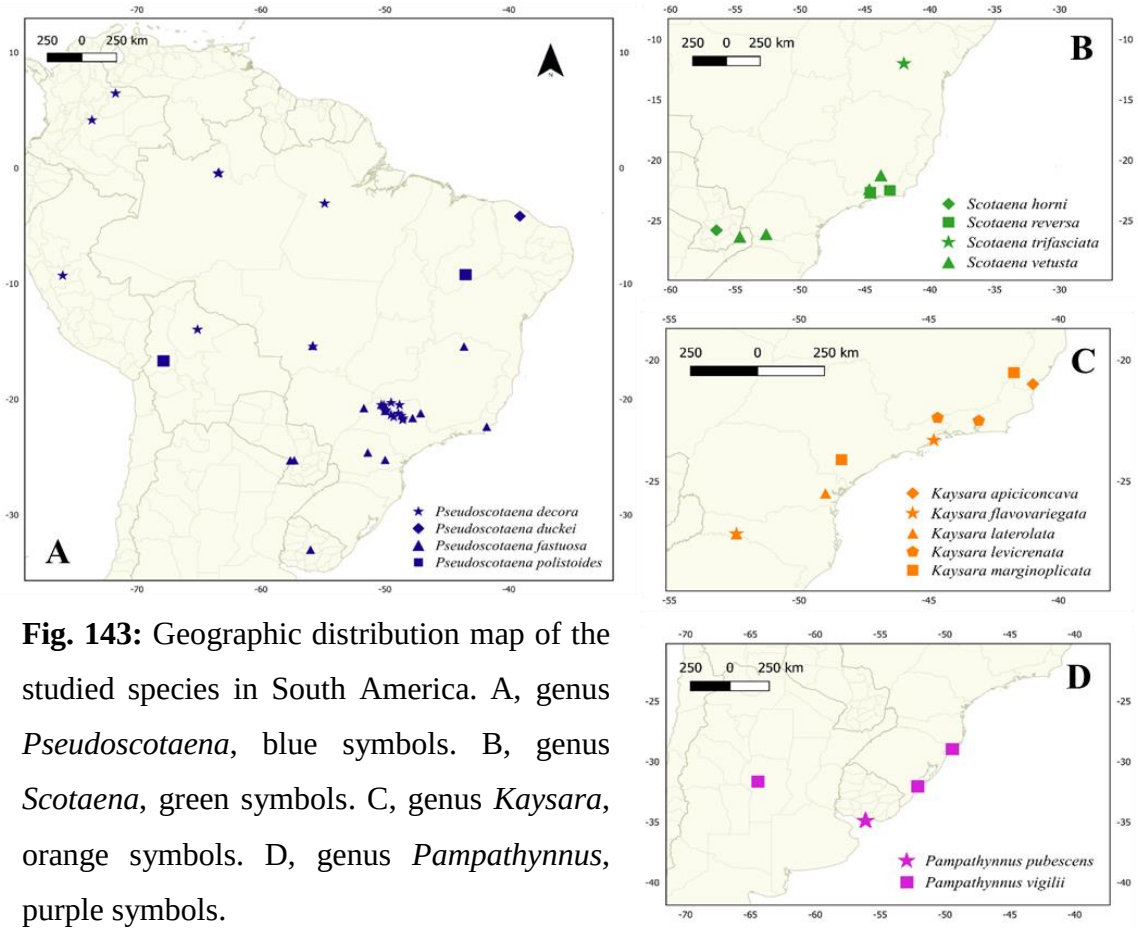


Fig. 143: Geographic distribution map of the studied species in South America. A, genus *Pseudoscotaena*, blue symbols. B, genus *Scotaena*, green symbols. C, genus *Kaysara*, orange symbols. D, genus *Pampathynnus*, purple symbols.

Pampathynnus seems to be more restricted to the southern South America, in the Pampean region: Argentina, Uruguay and south of Brazil (Fig. 143D). *P. pubescens*, generotype of the genus, was originally registered in South Brazil, without any specific locality mentioned. So, in this case, the record was not included in the map due to its uncertainty, and the only known locality for this species is Montevideo, Uruguay. *P. vigilli*, first recoded in Alta Garcia de Cordoba, Argentina, has more current registers from Brazil in Ribeirão Grande, Rio Grande do Sul state and Araranguá, Santa Catarina state.

Concluding remarks

This study was the second to use a phylogenetic approach to make an attempt to delimitate a South-American Thynninae genus, since the only other genus analysed was *Aelurus* (Kimsey, 1991). Through the analysis it was possible to confirm that *Scotaena* really was a dumping ground. The feasibility of the cladistic analysis of *Scotaena* relied on the external morphology, since the paucity of preserved specimens strongly restricts the availability of material for destructive methods of analysis. This is a common issue for several neglected groups of Neotropical insects that, besides being rarely found in nature, remains unnoticed and unidentified in entomological collections. Often due to the absence of bibliography and specialists, both typical causes and consequences of the taxonomic impediment suffered by these groups. Thereat, exploring the morphology of the Thynninae is a prior effort once its systematics and taxonomy need to be lapidated and improved, and also revised for several genera. The fundamental results demanded to be produced are identification keys on species level, in order to improve sampling of material and formation of specialists.

The major efforts on the South-American genera of Thynninae has being done mainly by Turner (1908a, b, 1909, 1910a, b, 1927) and Kimsey (1991a, b, 1992, 1996, 2004a, b, 2005; Genise & Kimsey, 1991, 1993; Kimsey & Brown, 1993; Kimsey & Brothers, 2006), and is being resumed by Justino (2013a, b, 2016) more recently. Willing to continue their endeavour, the present study could unravel the taxonomy of *Scotaena* and improve the number of Thynninae genera (from 19 to 22) and species (from at least 120 to 125) present in Brazil. These results point out the necessity of further studies and the possibility of new taxa yet to be discovered for this group of Neotropical wasps.

Acknowledgements

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Appendix SI – Character matrix.

	Characters																																																																									
Terminals	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Aelurus gayi	0	1	-	-	-	-	-	0	1	-	-	-	-	-	-	0	-	0	-	0	0	0	0	0	2	0	0	0	?	0	0	0	1	1	0	1	0	1	0	0	0	1	0	1	0	-	-	0	0	0	0	0	1	1	0	1	1	2	-	0	0	0	0	-	0	0	0	1	-	-	-	-	-	-	0
Aelurus nasutus	0	1	-	-	-	-	-	0	1	-	-	-	-	-	-	0	-	0	-	0	0	0	0	0	2	0	0	0	?	0	0	0	1	1	0	1	0	1	0	0	0	1	0	1	0	-	-	0	0	0	0	0	1	1	0	1	1	2	-	0	0	0	0	-	0	0	0	1	-	-	-	-	-	-	0
Anodontyra haarupi	1	-	-	-	-	-	-	0	0	1	-	-	-	-	-	0	-	1	1	0	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	-	-	0	1	1	-	1	1	0	0	1	1	0	1	0	0	0	0	-	0	0	1	0	0	0	0	-	1	-	0
Anodontyra tricolor	1	-	-	-	-	-	-	1	0	1	-	-	-	-	-	0	-	1	1	0	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-	0	1	1	-	1	1	1	0	1	1	0	1	0	0	0	0	-	0	0	1	0	0	0	0	-	1	-	0
Elaphroptera arcuata	1	-	-	-	-	-	-	1	0	0	1	-	-	-	-	1	0	-	-	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	0	1	1	0	0	0	0	0	0	0	-	-	0	0	0	0	1	1	1	1	1	1	1	-	0	0	1	0	-	0	2	1	0	1	-	1	-	-	0	1
Elaphroptera scoliaeformis	1	-	-	-	-	-	-	1	0	0	1	-	-	-	-	1	0	-	-	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	-	-	0	0	0	0	1	1	1	1	1	1	1	-	0	0	2	0	-	0	2	1	0	1	-	1	-	-	0	1
Eucyrtothynnus avidus	0	0	0	-	1	-	1	0	0	0	1	-	-	-	-	1	1	-	-	0	0	0	0	3	0	0	0	0	0	1	0	0	0	0	2	0	0	1	0	1	1	0	0	0	0	-	-	0	0	0	0	1	1	1	1	1	1	1	-	0	0	2	0	-	0	2	1	0	1	-	0	-	0	-	0
Parelaphroptera rollei	1	-	-	-	-	-	0	1	0	0	0	1	-	-	-	0	-	1	1	0	1	0	1	0	0	1	1	1	1	0	0	1	-	0	0	1	0	0	0	0	0	0	1	0	0	-	-	0	1	1	-	1	1	0	0	1	1	0	1	0	0	0	0	-	0	0	0	0	0	0	1	-	-	1	0
Parelaphroptera flavomaculata	1	-	-	-	-	-	0	1	0	0	0	1	-	-	-	0	-	1	1	0	1	0	1	0	0	1	1	1	1	0	0	1	-	0	0	1	0	0	0	0	0	0	1	0	0	-	-	0	1	1	-	1	1	0	0	1	1	0	1	0	0	1	0	-	0	0	0	0	0	0	1	-	-	1	0
Scotaena clypearis	1	-	-	-	-	-	-	1	0	0	0	1	-	-	-	0	-	1	1	0	1	0	0	0	0	0	1	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	-	-	0	1	1	-	0	1	0	0	1	1	0	1	0	0	1	0	-	0	0	0	?	?	?	?	-	?	?	?
Scotaena decora	0	0	1	1	0	0	0	0	0	0	0	0	1	0	-	0	-	0	-	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	-	0	1	0	1	0	0	0	0	0	0	0	0	0	1	1	0	-	0	0	0	0	0	1	0	-	0	-	0
Scotaena duckei	0	0	1	1	0	0	0	0	0	0	0	0	1	0	-	0	-	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	-	0	1	0	1	0	0	0	0	0	0	0	0	0	1	1	0	-	0	0	0	0	0	1	0	-	0	-	0
Scotaena fastuosa	0	0	1	1	0	0	0	0	0	0	0	0	1	0	-	0	-	0	-	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	-	0	1	0	1	0	0	0	0	0	0	0	0	0	1	1	0	-	0	0	0	0	0	1	0	-	0	-	0
Scotaena flavovariegata1	0	0	0	-	0	0	1	0	0	0	0	0	0	-	0	0	-	0	-	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	2	0	1	0	0	0	0	0	1	0	-	-	0	0	0	1	0	0	0	1	0	0	0	2	0	0	1	1	0	0	1	0	0	0	0	2	2	-	-	0
Scotaena flavovariegata2	0	0	0	-	0	0	1	0	0	0	0	0	0	-	0	0	-	0	-	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	-	-	0	0	0	1	0	0	0	1	0	0	0	2	0	0	1	1	1	0	1	0	0	0	0	2	0	-	-	0
Scotaena flavovariegata3	0	0	0	-	0	0	1	0	0	0	0	0	0	-	0	0	-	0	-	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	2	0	1	0	0	0	0	0	1	0	-	-	0	0	0	1	0	0	0	1	0	0	0	2	0	0	1	1	0	0	1	0	0	0	0	2	1	-	-	0
Scotaena flavovariegata4	0	0	0	-	0	0	1	0	0	0	0	0	0	-	0	0	-	0	-	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	2	0	1	0	0	0	0	0	1	0	-	-	0	0	0	1	0	0	0	1	0	0	0	2	0	0	1	1	1	0	1	0	0	0	0	2	1	-	-	0
Scotaena flavovariegata5	0	0	0	-	0	0	1	0	0	0	0	0	0	-	0	0	-	0	-	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	-	-	0	0	0	1	0	0	0	1	0	0	0	2	0	0	1	1	0	0	1	0	0	0	0	2	0	-	-	0
Scotaena genisei	0	0	1	0	0	0	0	0	0	0	0	0	1	1	-	0	-	1	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	0	1	0	0	0	0	1	0	0	0	0	1	1	0	-	0	0	0	0	0	0	0	-	0	-	1
Scotaena horni	0	0	0	-	0	1	1	0	0	0	0	0	0	-	1	0	-	0	-	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	-	-	0	0	0	1	0	0	0	1	0	0	0	2	1	0	1	0	-	1	1	0	0	0	0	0	-	0	-	1
Scotaena polistoides	0	0	1	0	0	0	0	0	0	0	0	0	0	-	0	0	-	0	-	0	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	-	0	1	0	1	0	0	0	0	0	0	0	0	0	1	1	0	-	0	0	0	0	0	1	0	-	0	-	1
Scotaena pubescens	0	0	1	0	0	0	1	1	0	0	0	0	0	-	0	0	-	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	1	1	0	-	0	0	0	0	0	0	0	-	0	-	1
Scotaena rosenbergi	0	0	0	-	1	-	1	0	0	0	1	-	-	-	-	1	1	-	-	0	0	0	0	3	0	0	0	0	0	1	0	0	0	0	2	0	0	1	0	1	1	0	0	0	0	-	-	0	0	0	0	1	1	1	1	?	?	1	-	0	0	2	0	-	0	2	1	0	1	-	0	-	0	-	0
Scotaena trifasciata	0	0	0	-	0	1	1	0	0	0	0	0	0	-	0	0	-	0	-	0	0	0	0	0	?	?	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	-	-	0	0	0	1	0	0	0	1	0	0	0	2	1	0	2	0	-	1	2	0	0	0	0	?	-	?	?	1
Scotaena vetusta	0	0	0	-	0	1	1	0	0	0	0	0	0	-	1	0	-	0	-	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	?	0	0	0	0	0	-	-	0	0	0	1	0	0	0	1	0	0	0	2	1	0	1	0	-	1	1	0	0	0	0	0	-	0	-	1
Scotaena vetusta2	0	0	0	-	0	0	1	0	0	0	0	0	0	-	1	0	-	0	-	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	1	1	1	0	0	0	0	0	-	-	0	0	0	1	0	0	0	1	0	0	0	2	1	0	1	0	-	2	1	0	0	0	0	3	-	0	-	1
Scotaena vigilii	0	0	1	0	0	0	0	0	0	0	0	0	0	-	0	0	-	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	1	0	1	0	0	0	0	0	1	0	0	0	1	1	0	-	0	0	0	0	0	0	0	-	0	-	1
Rostrynnus tarsatus	0	0	0	-	0	0	0	1	0	0	0	2	-	-	-	0	-	0	-	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	-	-	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	-	0	0	0	0	0	0	0	-	0	-	1
Pseudelaphroptera chilensis	0	0	1	0	0	0	-	0	0	0	0	0	1	1	-	0	-	1	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	-	-	0	1	1	-	0	?	0	0	1	1	0	0	0	0	1	0	-	0	0	?	0	0	0	1	-	-	2	1
Pseudelaphroptera transandina	0	0	1	0	0	0	-	0	0	0	0	0	1	1	-	0	-	1	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	?	0	1	0	0	0	?	0	0	0	0	0	-	-	0	1	1	-	0	?	0	0	1	1	0	0	0	0	1	0	-	0	0	?	0	0	0	1	-	-	2	1
Ornepetes albonotata	1	-	-	-	-	-	-	1	0	0	0	1	-	-	-	0	-	1	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	?	0	0	-	-	0	1	1	-	0	1	0	0	?	1	0	1	0	0	1	0	-	0	0	0	0	0	0	0	-	0	-	1

Innaplicable states are indicated as ‘-’ and unknown states as ‘?’.

Appendix SII – List of the morphological characters that compound the analysis' matrix.

1. Supra-antennal projections (Turner, 1927) with supra-antennal plate extending between the antennal sockets. (Turner, 1909) (Turner, 1927) (Genise and Kimsey, 1991): present (0) or absent (1);
2. If supra-antennal plate present: forming horizontally produced lobes (1) or with the plates pointing down towards the antennal socket (0). Contingent to state 0 of character 1;
3. If supra-antennal plate pointing down towards the antennal socket: the plate is well-developed (0) or not strongly developed (1) (Turner, 1909). Contingent to state 0 of character 2;
4. If supra-antennal plate not strongly developed: the apex of the plate is distant (0) or approximated (1) to each other. Contingent to state 1 of character 3;
5. Margin of the supra-antennal plate: square (1) or rounded (0). Contingent to state 0 of character 1;
6. If margin of the supra-antennal plate rounded, the external margin carinate: present (1) (Turner, 1909) absent (0). Contingent to state 0 of character 5;
7. Supra-antennal projections with whole basal region elevated (0) or just the plate projected (1);
8. Elevated tubercle between the supra-antennal projections: present (1) or absent (0);
9. Clypeus apical margin slightly bilobated (1) (Kimsey, 1991), or with central notch (slight or deep) (0) (Turner, 1909) (Kimsey, 1992, 2004);
10. If clypeus margin with central notch: notch is almost straight (1) (Kimsey, 2004) or slight/deep (0) (Turner, 1910b) (Kimsey, 2004). Contingent to state 0 of character 9;
11. If clypeus margin with central notch (slight or deep): notch is narrow (0) (Turner, 1910b) or broad (1) (Genise & Kimsey 1993) (Kimsey, 2004). Contingent to state 0 of character 9;
12. If clypeus central notch narrow: notch slight (1) (Turner, 1909), deep enough to form two teeth (rounded or acute) (0) (Smith, 1879) (Klug, 1840) (Bréthes, 1910), or elongated towards the apex (2) (Kimsey, 2004). Contingent to state 0 of character 11;
13. If clypeal central notch deep enough to form two teeth: acute and towards down (0) (Turner, 1909) (Turner, 1927) (Turner, 1910b) or small and soft teeth (1). Contingent to state 0 of character 12;

14. If clypeal central notch with teeth soft and small: teeth towards down (1) or slightly to the sides (0). Contingent to state 1 of character 13;
15. If clypeal central notch with teeth acute and towards down: the emargination has half the depth of the sublateral margins of the clypeus (0) or the same depth or deeper (1) (Turner, 1927). Contingent to state 0 of character 13;
16. Medial clypeal projection: absent (0) or present (1) (Genise & Kimsey 1993);
17. If medial clypeal projection present: pointed and nose-like (0) or soft and broad (1). Contingent to state 1 of character 16;
18. If medial clypeal projection absent: basal region of the clypeus somewhat bulging (1) (Kimsey, 1992) or simply convex (0). Contingent to state 0 of character 16;
19. If basal region of clypeus bulging: medium (0) or strongly (1). Contingent to state 1 of character 18;
20. Longitudinal line on the medial region of the clypeus: present (1) or absent (0);
21. Lateral margins of clypeus basis: with well-marked depression (0) or slight depression (1);
22. Basolateral margins of the clypeus: angulated (1), diagonal (0) or rounded (2);
23. Basal region of the mandible triangular shaped: present (0) or absent (1);
24. Margin of the subapical mandibular teeth: rounded margin (0), trapezoid (1) or subtriangular (2) or squared (3) (Turner, 1910);
25. Maxillary palpus IV and V about 1,5x longer than III (1), more than 2x longer (2), or approximately of the same size (0);
26. Maxillary palpus III wider and broader than the others: present (0) or absent (1);
27. Constriction in the middle of the pronotum (Turner, 1909, 1910b) in lateral view, forming elevation anteriorly and posteriorly: present (0) or absent (1);
28. Pronotum with transverse carina on the anterior margin: present (0) (Turner, 1909, 1910b) (Bréthes, 1910) or absent (1) (Kimsey, 2004);
29. Pronotum dorsally: short and with evident constriction (0) or longest and only slightly constricted (1);
30. Anterior margin of the pronotum: narrower than the posterior margin (0) or equal (1);
31. Sides of the anterior margin of the pronotum enlarged in dorsal view: present (1) or absent (0);
32. Forewing with second recurrent vein (2m-cu) aligned to the second transcubital vein (2r-m) (Kimsey, 1992, 2004): present (1) or absent (0);

33. If second recurrent vein not aligned: received by beyond about 3/4 (0) (Turner, 1909, 1927) or 1/2 (1) of the basis of the submarginal cell. Contingent to state 0 of character 32;
34. Metapleuron striated (0) or not (1);
35. Scutellum dorsal surface: convex slightly flattened (0) (Bréthes, 1910), slightly raised with subtriangular surface in dorsal view (1) (Turner, 1909), or raised and pointed (2) (Genise & Kimsey 1993);
36. Mesopleural transversal sulcus: absent/inconspicuous (1), strong and broad (0), or strong and thin (2);
37. Lateral depression that follows towards the metapostnotal spiracle: broad and well-marked with carinae (1) or simply presented as a narrow line (0);
38. Propodeum concavity in dorsal view: rounded convex (1) (Turner, 1909) or obliquus posteriorly (0) (Turner, 1910b);
39. Dorsal surface of the propodeum with dense and coalescent punctuations: present (1) or absent (0);
40. Lateral surface of the propodeum striated: present (1) or absent (0);
41. Extensions of the petiolar grooves: reaching half or more of the propodeum extension (1) or reaching less than half (0);
42. Propodeum shape: globular (1) or with evident constriction towards the apex (0);
43. Propodeum with dorsal transversal striae: present (1) or absent (0);
44. Propodeum punctuation: almost smooth (1) (Turner, 1909) or with evident punctures (0);
45. Ventral surface of the forecoxae: flattened (1) or convex (0);
46. If ventral surface of the forecoxae flattened, with outer lateral margin enlarged: present (1) or absent (0). Contingent to state 1 of character 45;
47. If ventral surface of forecoxae with outer lateral margin enlarged, forecoxae squared and very flat: present (1) or absent (0). Contingent to state 1 of character 46;
48. Forecoxae with longitudinal depression along the ventral surface: present (1) or absent (0);
49. Forecoxae with longitudinal carina: slight (0) or with keel (1);
50. Hindfemoral-hindtibial joint lobes asymmetrical with inner lobe longest: present (0) or absent (1) (Kimsey, 1992);
51. If lobes asymmetrical, inner lobe with flattened posterior surface present (1) (Kimsey, 1992) or absent (0). Contingent to state 0 of character 50;

52. Hindtibia with distinct row of projections or serrations along posterior margin: present (0) or absent (1) (Kimsey, 2004);
53. Short carina on the external base of the Hindtibiae: present (0) or absent (1);
54. Metasomal segments constricted in lateral view: present (0) (Smith, 1859) (Turner, 1909) (Bréthes, 1910) or absent (1);
55. Length of the first metasomal tergite: smaller (0) or longer (1) than its apical breadth (Turner, 1909) (Turner, 1927);
56. First metasomal tergite with longitudinal sulcus: reaching more than half (0) (Turner, 1909, 1910b) or less than half the extension of the tergite (1);
57. First metasomal tergite with rectangular depression: present (0) or absent (1);
58. Epipygium shape: rounded toward the apex (0) (Genise and Kimsey, 1991) (Kimsey, 1992) (Kimsey, 2004), flattened dorsally and truncate apically (1) (Kimsey, 1992) (Kimsey, 2004), or subtriangular, evenly and smoothly rounded with apical lamellae (2) (Kimsey, 1992);
59. If epipygium rounded and constricted: with well-marked constriction before the apex (0), slightly ending towards the apex (1) or with almost truncated apex (2). Contingent to state 0 of character 58;
60. Two lateral carinas raised by the rugosities of the epipygium: present (1) or absent (0);
61. Epipygium with a longitudinal line on the apex: present (1) or absent (0);
62. Texture of the epipygium: with well-defined punctuations (0), with rugose/elongate punctuations (1) (Smith, 1859) (Turner, 1909) (Bréthes, 1910), or with longitudinal striae (2);
63. Tuft of hairs or at least an impression of it on the first metasomal sternite: absent (0) or present (1);
64. If first metasomal sternite with tuft or impression, with a medial elevation on the tuft spot: present (0) or absent (1). Contingent to state 1 of character 63;
65. Mesepisternal suture: not raised (0), slightly raised (1), or strongly raised (2);
66. Shape of the mesepisternal lamellae: long and acute (1), medium and rounded (0), or short and subquadrate (2);
67. Sulcus between the mesepisternal lamellae and the mesepisternum: present (1) or absent (0);
68. Apical margin of the hypopygium with spines: present (1) (Kimsey, 1992) (Kimsey, 2004) or absent (0) (Kimsey, 2004);

69. If apical margin of the hypopygium without spines: hypopygium narrow and long (1) (Turner, 1910a) or more short and wide (0) (Turner, 1909, 1910b). Contingent to state 0 of character 68;
70. If hypopygium short and wide: hypopygium subquadrate (0) or subtriangular with narrower basis (1) (Turner, 1927). Contingent to state 0 of character 69;
71. If hypopygium without spines: apical margin entire (0), with teeth (1), (Kimsey, 1992), enlarged (2), or indented (3). Contingent to state 0 of character 68;
72. If hypopygium with enlarged apical margin: with lateral rounded enlargement (0), acute and subapical enlargement (2), or subquadrate margin (1). Contingent to state 2 of character 71;
73. If hypopygium with entire apical margin: rounded/subtriangular (0) (Bréthes, 1910) or subquadrate (1) (Kimsey, 2004). Contingent to state 0 of character 71;
74. If apical margins of the hypopygium with teeth: tree teeth with the medial one long and acute (1) (Kimsey, 2004) or one short and rounded teeth (0) (Genise & Kimsey 1993) or tree rounded teeth of the same size (2) (Kimsey, 2004) . Contingent to state 1 of character 71;
75. Hypopygium ventral surface with longitudinal elevated line: present (1) or absent (0);