Synopsis of New World Sigalphinae (Hymenoptera, Braconidae) with the Description of Two New Species and a Key to Genera

Michael J. Sharkey  
*University of Kentucky,* msharkey@uky.edu

Angélica Maria Penteado-Dias  
*Universidade Federal de São Carlos, Brazil*

M. Alex Smith  
*University of Guelph, Canada*

Winnie Hallwachs  
*University of Pennsylvania*

Daniel Janzen  
*University of Pennsylvania*

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

Follow this and additional works at: https://uknowledge.uky.edu/entomology_facpub

Part of the Entomology Commons

Repository Citation

Sharkey, Michael J.; Penteado-Dias, Angélica Maria; Smith, M. Alex; Hallwachs, Winnie; and Janzen, Daniel, "Synopsis of New World Sigalphinae (Hymenoptera, Braconidae) with the Description of Two New Species and a Key to Genera" (2019). *Entomology Faculty Publications.* 190.  
https://uknowledge.uky.edu/entomology_facpub/190

This Article is brought to you for free and open access by the Entomology at UKnowledge. It has been accepted for inclusion in Entomology Faculty Publications by an authorized administrator of UKnowledge. For more information, please contact UKnowledge@lsv.uky.edu.
Synopsis of New World Sigalphinae (Hymenoptera, Braconidae) with the Description of Two New Species and a Key to Genera

Notes/Citation Information

Copyright Michael J. Sharkey et al.

This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Digital Object Identifier (DOI)
https://doi.org/10.3897/jhr.68.30131

This article is available at UKnowledge: https://uknowledge.uky.edu/entomology_facpub/190
Synopsis of New World Sigalphinae (Hymenoptera, Braconidae) with the description of two new species and a key to genera

Michael J. Sharkey¹, Angélica Maria Penteado-Dias², M. Alex Smith³, Winnie Hallwachs⁴, Daniel Janzen⁴

¹ Department of Entomology, University of Kentucky, Lexington, KY 40546-0091, ON N1G 2W1, USA
² Universidade Federal de São Carlos, Departamento de Ecologia e Biologia Evolutiva, Rodovia Washington Luiz, km 235, CEP 13 565-905 – São Carlos, SP, Brazil
³ Department of Integrative Biology, University of Guelph, Guelph, ON N1G 2W1, Canada
⁴ Department of Biology, University of Pennsylvania, Philadelphia, PA 19104-6018, USA

Corresponding author: Michael J. Sharkey (msharkey@uky.edu)

Abstract
We describe and illustrate Paphanus paloi sp. n., first generic record for Brazil, and Minanga patriciamadrigalae, first generic record for Costa Rica. We present illustrated keys for the New World genera of Sigalphinae, and the New World species of Paphanus and Minanga. Minanga patriciamadrigalae sp. n. was reared from caterpillars of Chloropteryx nordicariaDHJ01 (Geometridae).

Keywords
Neotropical, taxonomy, Costa Rica, Brazil, Minanga, Paphanus

Introduction
Though rarely collected, members of Sigalphinae Blanchard, 1845 are worldwide in distribution (van Achterberg 1985; Iqbal and Austin 2002; Sharkey 2004; Tan et al. 2010; Sharkey and Braet 2012; Braet 2014). The subfamily includes eight genera
(Acampsis Wesmael, 1835; Aposigalphus van Achterberg & Austin, 1992; Malasigalphus van Achterberg & Austin, 1992; Minanga Cameron, 1906; Notosigalphus van Achterberg & Austin, 1992; Paphanus van Achterberg & Riedel, 2009; Pselaphanus Szépligeti, 1902; and Sigalphus Latreille, 1802) with fewer than 50 described species, all of which are presumably koinobiont endoparasitoids of Lepidoptera larvae (Yu et al. 2016).

Shaw and Quicke (2000) presented a detailed description of the biology and immature stages of Acampsis alternipes (Nees). Their major findings include the following. Eggs are placed in host ganglia; early instars are attacked; the first parasitoid instar is polypodiform; and the final instar larvae feed externally on the host.

Sigalphus bicolor is reported as a gregarious, multivoltine parasitoid of Acronicta clarescens Cuenée (Noctuidae); first instar larvae are parasitized, and parasitoid cocoons are spun within the host cocoon (Cushman 1913). Sigalphus romeroi Sharkey from Costa Rica and S. irrorator (Fabricius) from the Palearctic are solitary endoparasitoids of Noctuidae (Sharkey and Janzen 1995) that cut a pupal chamber into rotten wood, in which the parasitoid spins its cocoon that looks much like that of Minanga (Fig. 3B). Yu et al. (2016) list all host records for members of Sigalphinae taken from the literature. Some of these may be erroneous from the source. Here we elucidate the biology of a species of Minanga for the first time.

Methods

Morphological terms

Metasomal median tergites are abbreviated as follows, T1 = metasomal median tergite 1, T2 = metasomal median tergite 2. T2–3 = metasomal median syntergite 2+3. Morphological terms used can be found in the Hymenoptera Anatomy Ontology (HAO) (Yoder et al. 2010). To find definitions for any structure search for the term at http://glossary.hymao.org.

Museum acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCBU</td>
<td>Collection of the Departamento de Ecologia e Biologia Evolutiva, Universidade Federal de São Carlos, São Carlos, SP, Brazil.</td>
</tr>
<tr>
<td>NHMUK</td>
<td>The Natural History Museum, London, UK;</td>
</tr>
<tr>
<td>HNHM</td>
<td>Hungarian Natural History Museum, Budapest, Hungary.</td>
</tr>
<tr>
<td>NBCN</td>
<td>Naturalis Biodiversity Center, Leiden, The Netherlands.</td>
</tr>
<tr>
<td>HIC</td>
<td>The Hymenoptera Institute, 116 Franklin Ave., Redlands, California 92373, USA.</td>
</tr>
<tr>
<td>EMUS</td>
<td>The Entomological Museum of Utah State University, Logan, Utah, USA.</td>
</tr>
</tbody>
</table>
**Synopsis of New World Sigalphinae...**

**Taxonomy**

**Key to new world genera of Sigalphinae**

1. **A.** Metasomal terga 1–3 forming carapace covering entire metasoma, tergum 4 not visible dorsally ................................................................. 2

   **B.** Metasomal terga 1–3 not forming carapace covering entire metasoma, tergum 4 visible dorsally ................................................................. 4

2. **A** Joint between terga 1 and 2 fused, not articulating. **AA.** Head with a pair of horns posterior to lateral ocelli or posterior to genae..........................

   ................................................................................................. *Minanga Cameron, 1906*

   **B.** Joint between terga 1 and 2 articulating, not fused. **BB.** Head lacking horns ................................................................................................. 3

3. **A.** Third tergum curved ventrad such that it is visible in posterior view .......

   ........................................................................................................... *Sigalphus Latreille, 1802*

   **B.** Third tergum not curved ventrad, comparatively flat and not visible in posterior view ................................................................. *Acampsis Wesmael, 1835*
A. Median tergite 1 much longer than wide; third median tergite completely sculptured.................................................................*Paphanus*

B. Median tergite 1 almost as long as wide; third median tergite smooth in the posterior half......................................................*Pselaphanus* Szépligeti, 1902

**Paphanus van Achterberg & Riedel, 2009**

Van Achterberg and Riedel (2009) proposed the genus *Paphanus* (Sigalphinae: Pselaphanini) and described one species, *P. drechseli* van Achterberg & Riedel, 2009, from Paraguay. Subsequently, *P. priscillae* Braet, 2014 was described from French Guiana. Studying the material collected in the Northwest of São Paulo State, Brazil, we found many specimens of a third species of *Paphanus*. This is the first record of the genus in Brazil. The biology of members of *Paphanus* is unknown, although they can be presumed to be koinobiont endoparasitoids of lepidopteran larvae.

**Key to species of the genus Paphanus van Achterberg**

1 A. Fore wing lacking an infuscate apex (Image modified from van Achterberg and Riedel 2009) .......................................................................................................................... *P. drechseli*

B. Fore wing with a distinctly infuscate apex (Image modified from Braet, 2014) .......................................................................................................................... 2

A

B
2  A. maxillary palpi entirely black. (Image modified from Braet 2014) ..........

.............................................................................................................. P. priscillae
– B. Maxillary palpi mostly yellow......................................................... P. paloi sp.n.

\[Image\]

\textit{Paphanus paloi} Penteado-Dias, sp. n.

\texttt{http://zoobank.org/E17B3A96-C6FD-41D1-A444-F9BB538A0C2A}

\texttt{Fig. 1A–F}

\textbf{Diagnosis.} Lengths: body 10.0 mm, fore wing 9.3 mm. The following characters separate this species from \textit{P. drechseli} van Achterberg & Riedel, 2009: fore wing membrane yellowish, infuscate apically, not infuscate near veins and hind wing yellowish with vein 1-M sinuous. The following characters separate this species from \textit{P. priscillae} Braet, 2014: hind coxa yellowish with darkened patch, 1-cu-a of fore wing postfurcal, scutellum not protruding in lateral view and length of first tergite more than 1.8 times the apical width. The following characters separate this species from both \textit{P. drechseli} and \textit{P. priscillae}: face largely rugulose, notauli crenulate.

\textbf{Male.} Unknown

\textbf{Hosts.} Unknown.


\textbf{Etymology.} Named in memoriam of our friend, Haroldo Palo Jr., for his work as a photographer and naturalist.
Figure 1. *Paphanus paloi*: A Lateral habitus B Dorsal habitus C Lateral habitus D Dorsal head and mesosoma E Anterior head F Dorsal metasoma.
**Minanga Cameron, 1906**

Minanga includes 11 species. Three species, including the species proposed here, are found in the New World, whilst the remaining are in the Oriental and Afrotropical realms. Before this account, no hosts or life-history information were known for members of the genus.

**Key to New World species of Minanga**

1  
A. Horns of head directed dorsally and situated directly posterior to lateral ocelli. AA. Fore wing entirely infuscate ..............................................................2  
– B. Horns of head directed posteriorly and situated on lateral occiput. BB. Fore wing yellow basally, infuscate apically....................Minanga angelus

2  
A. Metasoma completely reddish-orange.........................Minanga achterbergi  
– B. Metasoma melanic apically....................Minanga patriciamadrigalae sp. n.

**Minanga patriciamadrigalae** Sharkey, sp.n.  
http://zoobank.org/74324E0B-7051-4E8F-A76A-FFED7F67BE64  
Figs 2 A–F, 3B

**Diagnosis (male and female).** Similar to M. achterbergi but easily separated with the following character states and those in the key. Anterolateral areas of metasomal carapace: smooth in M. achterbergi, rugose in M. patriciamadrigalae. Medial longitudinal carinae of propodeum: absent in M. achterbergi, present in M. patriciamadrigalae. Number of depressions in scutellar sulcus: two in M. achterbergi, four in M. patriciamadrigalae. Medial longitudinal carinae of T2: absent in M. achterbergi, present in M. patriciamadrigalae. Body length: 5.2 mm. M. achterbergi, 7.5 mm. M. patriciamadrigalae. Metapleuron color: orange in M. achterbergi, melanic in M. patriciamadrigalae.

**Host/Biology.** There are hundreds of species of thin “green twig” species of Geometridae in Area de Conservación Guanacaste (Janzen and Hallwachs 2016), and
Figure 2. *Minanga patriciamadrigalae*, holotype male  
A Lateral habitus  
B Anterodorsal view of head  
C Dorsal head and mesosoma  
D Dorsal scutellum, propodeum, and metasoma  
E Wings  
F Ventral metasoma.

the host of *M. patriciamadrigalae* (15-SRNP-70988-DHJ727460.jpg) is one of them.  
As is the case with many of this life form of geometrid caterpillar, its cocoon is merely  
a flap of lightly-silked green leaf; the larva of *M. patriciamadrigalae* emerges from the  
prepupal caterpillar in this flimsy cocoon and spins its own rust-colored ovoid tough
Figure 3. **A** Chloropteryx nordicariaDHJ01, host caterpillar of Minanga patriciamadrigalae  **B** Cocoon of Minanga patriciamadrigalae.

cocoon inside the geometrid’s cocoon (Fig. 3B). The duration of the wasp cocoon in its rain forest habitat is about 15 days. The host Chloropteryx nordicariaDHJ01 feeds on just one species of herbaceous vine Asclepiadaceae (Blepharodendron mucronatum). There have been 7 rearings of wild-caught caterpillars over two years, 2 of which had been parasitized. What have been identified as Chloropteryx nordicaria (Schaus, 1901), based on their very similar morphological appearance, are in fact two species as demonstrated by their very different DNA barcodes; Chloropteryx nordicariaDHJ02 has only been taken with light traps in the same forest and to date the caterpillar has not been located.

Since adults of both species of “Chloropteryx nordicaria” occur in ACG early secondary succession, moist rain forest at mid-elevations, year-round, it is not surprising that the caterpillars have been found in May, July and October. Both species are probably multivoltine, as are likely their parasitoids as well.

**Etymology.** Minanga patriciamadrigalae is named for Sra. Patricia Madrigal Cordero, Vice-Ministra of the Ministerio de Ambiente y Energía (MINAE) of Costa Rica, in recognition of her facilitation of the mutualism between Area de Conservación Guanacaste of MINAE and the Instituto Costarricense de Electricidad (ICE) in 2019–2020.
Material Examined. Holotype male, Costa Rica, Area de Conservación Guanacaste, Guanacaste, Sector Pitilla, Coneja, 415 m., latitude: 11.01525, longitude: -85.3977, Dinia Martinez, reared from a caterpillar of Chloropteryx nordicariaDHJ01 (Geometridae) (Fig. 3A) feeding on Blepharodon mucronatum (Asclepiadaceae), host collection date = 14.vii.2016, host prepupal on 07/19/2016, parasitoid eclosion date = 9.viii.2016, parasitoid voucher = DHJPAR0059699, from deceased caterpillar voucher 16-SRNP-71035 (EMUS). Paratype female, same data as holotype except: eclosion date is 08/09/2016 and caterpillar was prepupal on 22.vii.2016, parasitoid voucher = DHJPAR0059700, from caterpillar voucher 16-SRNP-71036 (HIC).

Acknowledgements

We are grateful to CAPES (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior), CNPq (Conselho Nacional de Desenvolvimento Científico e Tecnológico) and FAPESP (Fundação de Amparo a Pesquisa do Estado de São Paulo) for financial support; to Kees van Achterberg for sending the image of the holotype of P. drecseli and to Luciana Bueno dos Reis Fernandes who processed the pictures of P. paloi; and to the parataxonomists of Area de Conservación Guanacaste (ACG) who have found and reared thousands more parasitoids from ACG caterpillars as part of their inventory financed by both the Guanacaste Dry Forest Conservation Fund (www.gdfcf.org) and ACG (Janzen and Hallwachs 2016).

References


