Key to the Nests of Brazilian Epiponini Wasps
(Vespidae: Polistinae)

by

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ABSTRACT

Brazil possesses the richest diversity of Epiponini wasps in the world. However, field identification of genera of these wasps, based on morphological features, is difficult without optical equipment. Therefore, this work presents a key to the Brazilian Epiponini genera based on the structural features of the nests.

Key words: Hymenoptera, field identification, nest structure.

INTRODUCTION

Polistinae wasps are found throughout South America. Brazil occupies a large extension of this region and its various ecosystems contain the richest diversity of these insects. Brazilian species of Polistinae are classified into three tribes: Polistini, Mischocyttarini, and Epiponini. Species of Epiponini are among the most widespread wasps in South America, comprising 20 genera and 148 species described up to now (Table 1) (Richards 1978, Raw 1985, Carpenter et al. 1996, Mateus & Noll 1997, Carpenter & Marques 2001).

Epiponini wasps build nests with wood pulp, plant fibers, and plant hairs that are chewed and mixed with water and, in some cases, with glandular secretions resulting in a carton-like material. Nevertheless, inorganic particles may also be added to the nest and, in some species, mud is the main building material used for the construction of their nests. Due to the various types and shapes of social wasps’ nests, some classifications based on the architectural features of the nests had been proposed. Until now, the classification proposed by Richards & Richards (1951) is the most widely accepted. It is mainly based on the presence of peduncles or pedicels supporting the combs and on whether or not the initiation of the nests is sessile. Thus, the Epiponini wasps build astelocyttarus nests in which there is a single comb attached directly to the substrate (Fig. 1K). Stelocyttarus nests have

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combs attached by a pedicel. (Fig. 1D). While phragmocytthus nests have sessile combs on the previous envelope (Fig. 1L). However, some species may begin building their nests with a stelocyttarus comb and later add phragmocytthus combs (Fig. 1A) (Richards 1978, Wenzel 1991).

Social insects constitute an ecologically dominant group that is very rich in species (Chapman & Bourke 2001). Hymenoptera is a vital component of all terrestrial ecosystems and the Epiponini wasps have both an important role in the natural regulation of phytophagous insects (La Salle & Gauld 1993) and an outstanding potential as environmental bioindicators. However, field identification may be tedious and difficult to achieve without any kind of optical equipment. Thus, we have elaborated a key based on nest architecture for the Brazilian genera of Epiponini wasps that provides an easy field identification of either occupied or uninhabited nests of these insects.

MATERIALS AND METHODS

The nests examined are deposited in the collection of the

<table>
<thead>
<tr>
<th>Major (s) architectural feature (s) of the nest</th>
<th>Genus</th>
<th>Number of species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agelaia</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Angiopolybia</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Parachartergus</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Pseudopolybia</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Leipomeles</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Protopolybia</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Chartergillus</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Clypearia</td>
<td>7</td>
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</tr>
<tr>
<td>Asteloeca</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Nectarinella</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Marimbonda</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Metapolybia</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Synoeca</td>
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</tr>
<tr>
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<tr>
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<td></td>
</tr>
<tr>
<td>Chartergus</td>
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</tr>
<tr>
<td>Epipona</td>
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</tr>
<tr>
<td>Protonectarina</td>
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<tr>
<td>Polybia</td>
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<td></td>
</tr>
<tr>
<td>Brachygastra</td>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Major architectural features of nests of Brazilian Epiponini wasps.
Departamento de Zoologia, Universidade Estadual Paulista, Rio Claro – São Paulo State, Brazil – and in two personal collections of the authors. The collections included nests of 17 genera described in scientific literature. For the identification of the genera we used the classification proposed by Carpenter et al. (1996), Mateus & Noll (1997), and Carpenter et al. (2000), compiled in the key to the genera of Carpenter & Marques (2001). However, for the analysis of the nests of Asteloeca, Nectarinella, and Charterginus we used the descriptions made by Raw (1985), Mateus & Noll (1997), and Richards (1978), respectively. The basic characters used in nest identification were: 1) the location of the nest, 2) the presence or absence of an envelope, 3) the method of comb suspension, 4) the carton’s texture, 5) the position of the entrance to the nest and 6) the cell diameter. The size of the nest can be a useful criterion, however, this feature may not be representative in young colonies. For some genera, the key will allow the identification without the need of collecting the nest, however, for other genera, it will be necessary to collect the nest and open it carefully in order to examine the method of suspension of the first comb. For this purpose we recommend the use of a sharp knife, cutting the nest longitudinally.

**KEY TO THE NESTS**

1. Exposed nests ................................................................. 2
   — Subterranean nest or constructed in cavities .................. 5
2. Nest built with mud (Fig. 1L) ........................................ Polybia\(^a\)
   — Nest built with plant material and glandular secretions. Inorganic particles can be present in the envelope ....................... 3
3. Enveloped nest ............................................................... 4
   — Nest without envelope. A single circular or oval comb. (Fig. 1I) .... Apoica
4. Nest with a single sessile comb ......................................... 7
   — All the combs hanging by pedicels or at least with sessile initiation ................................................................. 11
5. Enveloped nest. First comb hanging by a pedicel. Lower combs built over the envelope of the adjacent upper ones. (Fig. 1B ..... Polybia\(^b\)
   — Nest with or without envelope. First comb sessile or with pedicel. Lower combs built differently........................................ 6
6. There is a series of parallel combs and each comb is fastened to the walls of the cavity and to one another by a number of pedicels. (Fig. 1C) ......................................................... Agelaia

\(^a\)Polybia (Pedothoeca) and P. (Furnariana).
\(^b\)Polybia (Trichinothorax).
Fig. 1. Diagrams of the nests of some Epiponini wasps found in Brazil. A. *Protopolybia sedula*; B. *Polybia* (Trichinothorax) *ignobilis*; C. *Agelaia pallipes*; D. *Parachartergus fraternus*; E. *Leipomeles sp*; F. *Epipona tatu*; G. *Angiopolybia pallens*; H. *Pseudopolybia sp*. 
—Nest consists of a single comb built horizontally and suspended by one or more pedicels. (Fig. 1A).................................Protopolybia 7. Nest entrance at the lower half of the envelope.........................8 — Nest entrance at the upper half or middle portion of the envelope ................................................................. 9 8. Substrate surrounding the nest entrance with small droplets of

*Nectarinella xavantinensis* is the second known species in the genus and the first described from Brazil (Mateus & Noll, 1997).
sticky substance. Cells 3.5 - 3.7 mm wide......................*Nectarinella*
— Substrate surrounding the nest entrance without droplets of sticky substance. Cells 1.8 mm wide...........................................*Marimbonda*
9. Envelope forms eaves that extend laterally. Envelope with transparent windows made of some secretion. (Fig. 1J)..................*Metapolybia*
— Envelope does not form eaves..................................................10
10. Some areas of the envelope shows added particles of bark and other plant materials. Envelope with transparent windows made of some secretion. Entrance positioned below the middle of the nest ........
.................................................................................................... *Clypearia* and *Asteloeca*
— Envelope without transparent windows. Sometimes with cells built on the walls of the envelope.................................................*Synoeca*
11. Envelope reaching or covering the substrate.................................12
— Envelope does not reach the substrate............................................17
12. Comb (s) supported by one or more pedicels .............................13
— First comb sessile or suspended by a broad sheet-like pedicel. When lower combs are present, they are built over the envelope of the upper ones .............................................................................19
13. A lateral pedicel supports each comb. (Fig. 1D) ....................
.........................................................................................*Parachartergus* and *Chartergellus*
— Combs supported by an approximately central pedicel..................14
14. Beneath the envelope there are a number of separated combs, each supported by a single pedicel from the substrate. Entrance located laterally. (Fig. 1E) .................................................................*Leipomeles*
— Lower combs hang from the upper ones supported by a pedicel ..
.................................................................................................15
15. Combs form spirals.................................................................*Agelaia*
— Combs built differently................................................................16
16. First and lower combs supported by a single central pedicel. Envelope has more than one layer. (Fig. 1H) ............*Pseudopolybia*
— First combs supported by more than one pedicel. Simple envelope. In some species, the nest entrance is located at the lower portion of a tube-like projection of the envelope. (Fig. 1G).................*Angiopolybia*
17. Combs with pedicels. In some cases, an expansion of the nest occurs by the construction of combs over the envelope of the upper combs..........................................................*Protopolybia*

*Some species of Metapolybia* can build nests horizontally in urban structures (personal observations of the authors).

*The genera Clypearia and Occipitalia* are synonymized (Carpenter et al. 1996).

*Asteloeca traili* is the only known species of the genus. It is found in the Amazon basin (Raw 1985).

*Agelaia flavipennis* is the only known species in Brazil of the genus to construct aerial nests (Richards 1978).
— Combs with a narrow sessile initiation.................................18
18. Nest entrance located at the floor of the combs through an opening
between the envelope and the substrate. Nest often star-shaped...

— Different nest entrance. When lower combs are present, they are
built over the envelope of the upper ones ...................... Polybia
19. Nest built to include the substrate in the combs. (Fig. 1N)........Polybia
— Nest built differently from above.................................................20
20. Rigid nest with a hard and fibrous envelope.........................21
— Nest with a soft and friable envelope............................................22
21. Nest with a flattened or conical bottom. The entrance is located at
the center of the nest and through the combs. (Fig. 1M)........Chartergus
— Nest bottom with one side always projected more than the other. The
entrance is located on the less projected portion of the nest. (Fig. 1F)
22. Early combs hemispherical, later combs flattened. Nest with sessile
initiation or with a broad pedicel. (Fig. 1K)........Protonectarina
— Early combs flattened..........................................Brachygastra and Polybia

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REFERENCES

Occipitalia Richards 1978, with Clypearia de Saussure 1854 (Hymenoptera:
do Brasil (Insecta, Hymenoptera, Vespoidea, Vespidae). Série: Publicações
digitais, versão 1.0. Universidade Federal da Bahia. Brasil.
Chapman, R.E & A.F.G. Bourke 2001. The influence of sociality on the
on the diversity of other organisms. In: Hymenoptera and Biodiversity. J.

Polybia (Myrapetra) bistriata.
Polybia (Cylindroeca) dimidiata.
Protonectarina sylveirae is the only known species of the genus. (Richards 1978).