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Notes on the nest of the social wasp *Pseudopolybia langi* (Hym., Vespidae, Polistinae)

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ABSTRACT

Detailed descriptions of the architecture of *Pseudopolybia langi* nests are presented for the first time. Structural variations in the arrangements of nest parts are described and compared with features observed in other species of *Pseudopolybia* and other epiponine genera.

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Introduction

The subfamily Polistinae is known for the great diversity and beauty of its nest architecture (Richards, 1971; Wenzel, 1991, 1993, 1998). Some genera, such as *Polistes* and *Mischocyttarus*, usually have small nests with simple structures and unenveloped single combs, often with less than a hundred cells. The nests of several species of epiponine genera, however, may be quite large, with hundreds to thousands of cells in several combs, and are usually covered by an envelope (Carpenter, 1991; Jeanne, 1975, 1991; Richards, 1978).

Pseudopolybia von Dalla Torre 1894 is a wasp genus of the tribe Epiponini that is normally found in forested areas, with four species distributed from Nicaragua to southern Brazil (Richards and Richards, 1951; Richards, 1978). It is distinguished by the third segment of the labial palpi bearing a short, stout, curved bristle near its apex, and the number of palpal segments being six maxillary and four labial (Richards, 1978; Andena et al., 2007). The nests of most species in the genus are oval to spherical arboreal objects, presenting a pale yellow to brown envelope composed of laminate or imbricate sheets (much like those of vespine species), with a simple entry; each comb is attached to the comb above by vertically positioned pedicels. Comb diameters gradually decrease from the first comb to the last (Jeanne, 1975; Andena et al., 2007). Details

of such distinctive architectures can be observed in the Fig. 4E in this paper showing a nest of *P. difficilis* (Ducke 1905), which is also representative of the internal structure of the nests of *P. vespiceps* (Saussure 1864) and *P. compressa* (Saussure 1854). Other images of nests of these species may be found in Ducke (1914, p. 318), and Richards (1978, p. 4). In the papers by Wenzel (1993, 1998) about vespine nest architecture, information on the genus *Pseudopolybia* was only based on features observed in the above three species (i.e. envelope laminate; combs round or oval, secondary combs suspended from those above by central pedicel; cocoon caps simple; entrance simple at lowest point).

Pseudopolybia langi Bequaert, 1944 differs from its congeners in several aspects, being a much smaller wasp (6–8 mm long versus 13–15 mm in other species), and with a more elongated body. It has been recorded for the Guyanas, Ecuador, and Brazil. In the latter country, it is known from the states of Amapá and Amazonas in areas covered by relatively undisturbed “terra-firme” rainforest. Due to the relative rarity of *P. langi*, its nests were unknown to Bequaert (1944) and even to Richards (1978), only being mentioned (but not described) in a paper by Dejean et al. (1998) in association with palm trees of the genus *Astrocaryum*. Later, one of us (OTS) encountered a fully developed (although damaged) nest in Amapá State (IEPA collection; not found in recent visits by the authors). A photograph of this specimen was used by Andena (2007; thesis) to prepare a brief description that was used in a phylogenetic analysis published by Andena et al. (2007). We recently collected a new well-preserved nest specimen in Amapá State (MPEG collection) which better demonstrates both external and internal aspects of

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E-mail: orlando@museu-goeldi.br (O.T. Silveira).<https://doi.org/10.1016/j.rbe.2018.02.002>0085-5626/© 2018 Sociedade Brasileira de Entomologia. Published by Elsevier Editora Ltda. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

the architecture of the species – making it relevant to present a full description of the nest architecture of *P. langi* and analyze some observed variations in terms of *Pseudopolybia* nest architecture as well as some other epiponine genera.

Methods

Specimens examined

The nests used here as references for the description of nest architecture of *P. langi* were both encountered in areas covered by ombrophilous “terra-firme” rain forest in the following localities in Brazil:

Specimen #1: Amapá. Laranjal do Jari, RESEX Cajari, comunidade Marinho (00°34'44"S/52°13'16"W), 01/ix/2001, O.T. Silveira (IEPA collection; not found in recent visits by the authors). The nest was brought to OTS by a boy who found it in an orchard tree (probably Annonaceae). It had been transported in a plastic bag and showed some damage caused by crushing. Photographs were taken just a few hours after receiving the specimen. The nest was removed from the plastic bag, the envelope carefully detached, and the broken and loose combs were set apart from the remaining nest elements still affixed to the substrate leaf (see Fig. 1). This nest was not

reexamined recently, and our present comments are based on OTS's knowledge and memory of the specimen in 2001, as well as available photographs.

Specimen #2: Amapá. Ferreira Gomes, Floresta Nacional do Amapá (FLONA Amapá; 0°58'03.36"N/51°38'19.09"W), 08/iii/2016, Felizardo S.P.S. & Santos I.P. (MPEG). The nest was located along a trail in the Amapá plot of the PPBio biodiversity research program. It was found in a relatively dry area, approximately 2 km from the Araguari River, and at least 500 meters distant from any other smaller water course. The nest was in a young tree of the family Annonaceae (2.5 m tall) with small leaves, and was attached to two of the leaves, approximately 2 m above the ground. The entire nest was collected in a plastic bag (together with wasps present at the moment, numbering about 40 individuals). The brood in the nest cells consisted only of eggs and small to medium-sized larvae. Due to the fragility of the envelope, some deformation occurred around the entrance, but this did not prejudice the observation of its original form.

Information concerning a third nest specimen was also used for comparative purposes. It consists of a fragmented nest in the collection of the American Museum of Natural History (AMNH; Amazonas, 03/x/1991; catalog 910310-1). A photograph is available on the internet at <http://research.amnh.org/iz/hymenoptera/collection/display.php?sid=401491>.

Measurements

Measurements of the FLONA-Amapá specimen were made using a pachymeter. Nests available only from photographs were measured indirectly using ImageJ software (<https://imagej.nih.gov/ij/>), based on scale information available in the photographs (a ruler in the case of the IEPA – Cajari nest; cell size in the case of the AMNH specimen). Measurements were obtained (when possible) of: combs (major and minor diameters and height), cell dimensions, pedicel lengths, the envelopes, and associated substrate leaves.

Comparative analysis of the evolution of *P. langi* nest features

To compare some of the architectural features of *P. langi* with those of other epiponine taxa within a phylogenetic framework, we performed the parsimonious optimization of these nest characters with the program Winclada (Nixon, 2002) on a phylogenetic tree for the Polistinae adapted from a tree published by Wenzel and Carpenter (1994) based on morphological adult and larval characters, as well as on nest characteristics. Character states were generally coded according to the phylogenetic study by Wenzel (1993). In the adapted tree showed in Fig. 5 (for Epiponini only), *Occipitalia* and *Synocoides* are omitted, since they have been synonymized to *Clypearia* and *Polybia*, respectively (see Carpenter et al., 1996, 2000). For its distinctive nest architecture, *Marimbonda* is maintained and represented in the tree as sister-group of *Leipomeles* (see Carpenter, 2004); *P. langi* is added to the tree as sister-group of other *Pseudopolybia* species, according to Andena et al. (2007).

Results

The FLONA-Amapá nest was used as a primary reference, as it was collected undamaged and its original shape was well-preserved. The envelope is a small inverted flask-shaped structure, fixed laterally to two small leaves (1.7 cm wide, 6.5 cm long) (Fig. 2A, B); the combs are in a vertical series, connected to each other by short vertical pedicels, and connected laterally to the substrate leaves by equally short lateral pedicels, except for the downmost smaller developing comb (Fig. 3A).

Combs: The nest has four combs (the last one very small, apparently having just been initiated) of the same color as the envelope,



Fig. 1. Nest of *P. langi* from RESEX Cajari; scale: 2 cm.

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