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Biodiversity of Insecta in Amazonia: Updating the geographic records of social wasps (Vespidae: Polistinae) in Acre and Rondônia States, Brazil

A Somavilla, RNM de Morais Junior, PCS Barroso, ML Oliveira, JA Rafael

Instituto Nacional de Pesquisas da Amazônia, Coordenação de Biodiversidade, Manaus, Amazonas, Brazil

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Corresponding author
Alexandre Somavilla
https://orcid.org/0000-0002-8174-7418
Instituto Nacional de Pesquisas da Amazônia
Coordenação de Biodiversidade
Av. André Araújo nº 2936
CEP 69067-375, Manaus, Amazonas, Brasil.
E-Mail: alexandresomavilla@gmail.com

Abstract

The Acre and Rondônia states in Brazil are part of the Western Amazon rainforest in Brazil, an area harboring high biodiversity and high degree of endemisms. Nevertheless, there are few studies on diversity of social wasps occurring in both states. This study presents a list of social wasps (Vespidae: Polistinae) collected using three modified *Malaise* trap models: Townes, Gressitt and Gressitt, and suspended traps in two localities in Acre and two in Rondônia states. A total of 60 species were collected, 20 of these species are new distribution records to Acre State. Meanwhile, 54 species were collected in Rondônia State, 15 of which are new collecting records. Some species are not commonly found in collections and lists of species, and some are recorded for the first or second time to Brazil or the Amazon region. Currently there are 114 species (19 genera) for Acre and 116 species (19 genera) for Rondônia. This increase may be an indication that the Polistinae richness is probably higher in the regions studied and that Acre and Rondônia may well contain a number of additional (as yet unrecorded) social wasp species. We also present an update on the geographic records of social wasps' fauna in both states.

Introduction

The Amazon rainforest is the largest biome within the Brazilian territory, covering an area of 4,196.943 Km² (Ministério do Meio Ambiente, 2018). Many areas of Brazil lack the most basic biodiversity studies, particularly in the case of invertebrates. In order to develop any effective conservation proposals, first of all, it is necessary to acquire knowledge of the species that occur in a particular area. For this reason, the thematic network 'Biodiversity of Insects in the Amazon' is the first network among researchers of the Brazilian Amazon in terms of the increase of knowledge and provision of subsidies for the conservation of Amazonian biodiversity, focusing on insects, and to disseminate this knowledge to different sectors of our society (see Somavilla et al., 2020).

The Brazilian Amazon rainforest is one of the greatest biodiversities hotspots in the world, including the greatest diversity of social wasps (Silveira, 2002; Somavilla et al., 2014a; Barbosa et al., 2016; Somavilla et al., 2020). Knowledge on social wasps remains from some few studies carried out in forest fragments. Ducke (1904, 1907) conducted one of the first surveys of wasp fauna in the eastern region of the Brazilian Amazon, mainly in Pará State. Recently, similar works have been carried out in the Brazilian Amazon, such as in Acre State (Morato et al., 2008; Gomes et al., 2018), Amapá State (Silveira et al., 2008; Silveira et al., 2019), Amazonas State (Silveira et al., 2008; Somavilla et al., 2015; Somavilla et al., 2016; Somavilla & Oliveira, 2017; Somavilla et al., 2019; Somavilla et al., 2020), Maranhão State (Somavilla et al., 2014b), Pará State (Silveira, 2002; Silva & Silveira, 2009), Rondônia State (Gomes et al., 2020), and Roraima State (Raw, 1998; Barroso et al., 2017).

Despite the contributions of these works, Somavilla et al. (2014a) stated "there are many sample gaps in the Amazon region and distribution and occurrence studies are necessary for improving upon this prior knowledge". Furthermore, for Acre there are two works on social wasps: one in Serra do Divisor National Park (Morato et al., 2008) and another in three fragments

of the Amazon rainforest, near to the city of Rio Branco (Gomes et al., 2018), in addition to the previous records from Richards (1978) and the Taxonomic Catalog of Fauna of Brazil – CTFB (Hermes et al., 2015), reporting a sum of 94 species for this state. In Rondônia, one recent work has been published by Gomes et al. (2020) with samples from three fragments in northern Rondônia, in addition to the previous records from Richards (1978) and the Taxonomic Catalog of Fauna of Brazil – CTFB (Hermes et al., 2015), reporting 101 species for this state.

Moreover, it is an area close to Peru and Bolivia, regions known for presenting endemic species for different groups of organisms (Brown, 1991; Hoorn et al., 2010), but the diversity of social wasps in this part of the Amazon is poolry known, generating a gap in knowledge about the species occurring in the Western Amazon of Brazil.

In this way, a long term collection of one year was carried out within the network 'Biodiversity of Insects in the Amazon' and we present here the social wasps results of two different areas sampled in Acre and two in Rondônia States. Also, we present updated geographic records of social wasps' fauna in both states.

Material and Methods

Acre State areas

The social wasps were collected in two areas in Acre State: Bujari, Experimental Farm Antimary (09º20'01" S, 68º19'17" W) and Senador Guiomard, Experimental Farm Catuaba (10º04'28" S, 67º37'00" W). The region where the two areas are located is characterized by open forest with the presence of *Gadua* bamboos (locally known as tabocais), and palm trees (Silveira, 2005). The predominant type of soil in the region is latosol and the landscape is slightly hilly (Daly & Silveira, 2008). The average annual temperature varies between 22 and 24º C. Lowest temperatures occur in August (about 12 to 14 ºC) (Mesquita & Paiva, 1995; Mesquita, 1996). Average annual rainfall is 1,944 mm, varying between 1,566 and 2,425 mm. The climate is tropical wet, with well-defined hot/rainy (winter) and hot/dry (summer) seasons. The rainy period occurs from October to April and the driest period from June to August. May and September are transitional months between seasons (Duarte, 2005).

Rondônia State areas

The social wasps were collected in two areas in Rondônia State: Porto Velho, Forest Fragment of Universidade Federal de Rondônia (UNIR) (08º50'15.8" S, 63º56'17.5" W) and Itapuã do Oeste, Floresta Nacional of Jamari (09º15'36" S, 62º54'46" W).

The predominant vegetation in the region are of the dense rainforest and open rainforest types. The predominant type of soil in the region is latosol and the relief is slightly rugged with few depressions, the state is on an average of 240 m in altitude (Schlindwein et al., 2012). The average annual temperature is about 25º C. Average annual rainfall is 2,400 mm, varying between 2,200 and 2,600 mm. The climate is tropical wet, with well-defined hot/rainy (winter) and hot/dry (summer) seasons. The rainy period occurs from November to April and the driest period from June to September. May and October are transitional months between seasons (Fernandes & Guimarães, 2002).

Wasp collection and identification

The wasps were collected in the forest fragments using three modified *Malaise* trap models: 1. Townes (1972) model 2-meter long; 2. Gressitt and Gressitt (1962) model 6-meter long with two collector vials in understory; and 3. suspended trap (Rafael & Gorayeb, 1982) model in the canopy. All of these trap models were distributed in each forest fragment and were active for twelve uninterrupted months, totaling a period of one year between July 2016 and June 2017, and every fifteen days only the collection bottles were replaced.

The Polistinae specimens were sorted and identified at the Hymenoptera Laboratory of the National Institute of Amazonian Research (INPA). The vouchers were deposited into the INPA's Invertebrate Collection and duplicates will be sent to other collections like MNRJ (Museu Nacional do Rio de Janeiro, Brazil, Rio de Janeiro) and MZUSP (Museu de Zoologia da Universidade de São Paulo, Brazil, São Paulo), as recommended by the thematic network 'Biodiversity of Insects in the Amazon'. Specimens were identified using the keys proposed by Richards (1978), Carpenter and Marques (2001), Carpenter (2004), Somavilla and Carpenter (2020) and were compared to previously identified species from the INPA Invertebrate Collection, and some type specimens images from the Natural History Museum (London), Muséum National d'Histoire Naturelle (Paris) and American Museum of Natural History (New York City).

Results

A total of 114 species in 19 genera of social wasps were recorded for Acre; we identified 60 species in our samples, 40 already reported in literature and 20 as new collecting records. There are still other 54 species known from literature not sampled in this study (Richards, 1978; Morato et al., 2008; Gomes et al., 2018; Andena et al., 2019; Somavilla & Andena, 2019; IUNH, 2020) (Table 01). For Rondônia we listed the occurrence of 116 species in 19 genera; we identified 54 species in our samples, 39 already reported in literature and 15 as new records. For this state there are also 61 species from literature, not collected in this study (Richards, 1978; Gomes et al., 2020; IUNH 2020) (Table 1).

About 50% of the species belong to three genera: *Polybia* Lepeletier (35 species), *Mischocyttarus* de Saussure (21 species) and *Agelaia* Lepeletier (18 species). The list also comprises *Polistes* Latreille (13), *Apoica* Lepeletier (09), *Brachygastra* Perty (09), *Protopolybia* Ducke (09), *Parachartergus* R. von Ihering (07), *Chartergellus* Bequaert (06), *Angiopolybia* Araujo (04), *Asteloeca* Raw (03), *Chartergus* Lepeletier (03), *Clypearia* de Saussure (03), *Metapolybia* Ducke (03), *Pseudopolybia* de

Saussure (03), *Synoeca* de Saussure (03), *Leipomeles* Möbius (02), *Charterginus* Fox (01), *Epipona* Latreille (01) and *Nectarinella* Bequaert (01). *Nectarinella* was not registered for Acre and *Asteloeca* for Rondônia. *Protonectarina* Ducke was not registered for both states, and according to da Silva et al. (2018) species of this genus occur widely in the Atlantic rainforest and arboreal Caatinga, being absent in the Amazon region.

From 60 species sampled, 20 represent new records for Acre state: *Agelaia centralis*, *Ag. flavipennis*, *Ag. ornata*, *Apoica albimacula*, *Ap. gelida*, *Ap. pallens*, *Brachygastra bilineolata*, *Chartergellus afoveatus* (first time in Brazil), *C. amazonicus*, *Leipomeles spilogastra*, *Mischocyttarus adolphus*, *Polistes canadensis*, *Polybia belemensis*, *Poly. depressa*, *Poly. ignobilis*, *Poly. micans*, *Poly. occidentalis*, *Poly. singularis*, *Synoeca chalibea* and *S. surinama*.

For Rondônia, the numbers, although smaller, are also noteworthy: from 54 species sampled, about a quarter of them (15) represent new records for Rondônia state: *Agelaia brevistigma*, *Angiopolybia pallens*, *Apoica pallens*, *Chartergellus nigerrimus*, *Leipomeles spilogastra*, *Mischocyttarus drewseni*, *Nectarinella manauara*, *Polistes carnifex*, *Poli. geminatus*, *Poli. pacificus*, *Polybia batesi*, *Poly. minarum*, *Poly. simillima*, *Poly. velutina* and *Protopolybia fuscatus*.

Discussion

For Acre State, Richards (1978) recorded the occurrence of 52 species, of which 29 were not collected in this study. Morato et al. (2008) recorded the occurrence of 20 species in Serra do Divisor National Park and Gomes et al. (2018) recorded the occurrence of 36 species in three areas and just 20 species not collected in our work. The other 20 species are recorded in our samples and are new occurrences for Acre.

For Rondônia State, only the original descriptions and species recorded by Richards (1978) were known. Recently, Gomes et al. (2020) recorded the occurrence of 72 species in three Rondônia areas. Richards (1978) and previous studies recorded the occurrence of 101 species in Rondônia, and 28 species were not collected in this study. The other 15 species are recorded in our study and are new occurrences for Rondônia.

A sampling of a large diversity of Polistinae can be attributed to more than one factor. One of them is the location of the collection areas in the Western Amazon, known for harboring great biodiversity (Brown, 1991; Hoorn et al., 2010). Another factor are the methodology and effort applied. Usually only one method is used to sample social wasps, which can limit the number of species sampled. In our study, we used a set of traps: two different *Malaise* trap models and suspended traps to collect wasps for an uninterrupted year.

Regarding species composition, Silva and Silveira (2009), Somavilla et al. (2014a) and Somavilla et al. (2020) showed that fast inventories were efficient for sampling the most abundant species, recording three genera: *Polybia*, *Mischocyttarus* and *Agelaia*. Herein, we found the same most speciose genera, which constituted about 50% of the species collected. Specimens of *Polybia* have a very active foraging behavior, which facilitates the collection of the specimens by interception flight traps, adding to the fact it is the genus with the largest number of species within Epiponini. *Mischocyttarus* is the genus with the higher number of species within social wasps (around 250), of which more than 120 occur in Brazil, supporting the high diversity in this study (Silveira, 2002).

Agelaia species usually form large colonies with millions of individuals (Zucchi et al., 1995), and, consequently, are more likely to be captured, and probably due to the habits of this genus that presents generalist and opportunistic species in relation to food and resource choices (Silva & Silveira, 2009; Somavilla et al., 2014a) (Silveira, 2002; Somavilla et al., 2014a; Somavilla et al., 2020).

The Amazon region has the highest diversity of Polistinae species (Richards, 1978; Carpenter & Marques, 2001; Silveira, 2002; Barbosa et al., 2016; Somavilla et al., 2020). In the Brazilian Amazon, 20 genera and more than 250 species have been recorded, which represents about two thirds of the Brazilian diversity of social wasps (Silveira, 2002; Hermes et al., 2015; Somavilla & Oliveira, 2017; Somavilla et al., 2020). Nevertheless, this impressive number surely does not yet represent the region's mega diversity, since there were only two studies carried out on Acre state (Morato et al., 2008; Gomes et al., 2018) and only one study in Rondônia state (Gomes et al., 2020). The present study presents new occurrences of 20 social wasp species for Acre and 15 new occurrences for Rondônia. Our findings extend the species distributions and increase the number of species recorded to 114 and 116 species for Acre and Rondônia, respectively.

This increase may be an indication that the richness is probably higher in the regions studied and that Acre and Rondônia may well contain a number of additional (as yet unrecorded) social wasp species. Nevertheless, large gaps still remain in the geographic distribution for many species of social wasps in Brazil, mainly in the Amazon Region, and more comprehensive studies are needed in order to increase the knowledge of wasp species in Acre and Rondônia. In a region of great diversity but also high indexes of deforestation, as Western Amazon, further studies become necessary and urgent.

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Table 1. Species of social wasps from Acre and Rondônia states, listed by Richards (1978), Morato et al. (2008), Gomes et al. (2018), Gomes et al. (2020), web catalog from Natural History Laboratory of the Ibaraki University (IUNH 2020), and in the present work. [1] new distribution record for Acre; [2] new distribution records for Rondônia; * distribution records only in the descriptions of the species. AC=Acre; RO=Rondônia; BUJ=Bujari; SEG=Senador Guiomard; IDO=Itapuã do Oeste; PVH=Porto Velho.

Taxon	Richards (1978)	Morato et al. (2008)	Gomes et al. (2018)	Gomes et al. (2020)	IUNH web catalog (2020)	Present work, Locality collected
Agelaia acreana Silveira & Carpenter, 1996					AC	
Agelaia angulata (Fabricius, 1804)	AC, RO	AC	AC	RO	AC, RO	AC: BUJ, SEG; RO: IDO, PVH
Agelaia baezae (Richards, 1943)			AC			
Agelaia brevistigma (Richards, 1978) [2]			AC			RO: PVH
Agelaia cajennensis (Fabricius, 1798)	AC			RO	AC	AC: SEG
Agelaia centralis (Cameron, 1907) [1]				RO		AC: BUJ, SEG; RO: IDO
Agelaia flavipennis (Ducke, 1905) [1]	RO				RO	AC: SEG
Agelaia fulvofasciata (DeGeer, 1773)	AC, RO	AC	AC	RO	AC, RO	AC: BUJ, SEG; RO: IDO, PVH
Agelaia hamiltoni (Richards, 1978)	AC, RO			RO	AC, RO	AC: SEG
Agelaia lobipleura (Richards, 1978)		AC		RO		
Agelaia melanopyga Cooper, 2000				RO		
Agelaia myrmecophila (Ducke, 1905)		AC	AC	RO		RO: PVH
Agelaia ornata (Ducke, 1905) [1]				RO		AC: BUJ, SEG; RO: IDO, PVH
Agelaia pallidiventris (Richards, 1978)				RO		
Agelaia pallipes (Olivier, 1792)	AC		AC	RO	AC, RO	AC: BUJ, SEG; RO: IDO, PVH
Agelaia pleuralis Cooper, 2000			AC			AC: SEG
Agelaia testacea (Fabricius, 1804)	AC, RO		AC	RO	AC, RO	AC: BUJ, SEG; RO: IDO, PVH
Agelaia timida Cooper, 2000				RO		RO: IDO
Angiopolybia pallens (Lepeletier, 1836) [2]	AC	AC			AC	AC: BUJ, SEG; RO: IDO
Angiopolybia paraensis (Spinola, 1851)	AC, RO	AC		RO	AC, RO	AC: SEG; RO: IDO
Angiopolybia obidensis (Ducke, 1904)			AC			
Angiopolybia zischkai Richard, 1978			AC	RO		
Apoica albimacula (Fabricius, 1804) [1]						AC: BUJ
Apoica ambracarina Pickett, 2003					AC	
Apoica arborea de Saussure, 1854	AC, RO				AC, RO	RO: PVH
Apoica flavissima van der Vecht, 1972	AC, RO				AC, RO	
Apoica gelida van der Vecht, 1972 [1]				RO		AC: BUJ
Apoica pallens (Fabricius, 1804) [1,2]						AC: BUJ, SEG; RO: IDO, PVH
Apoica pallida (Olivier, 1792)	AC, RO				AC, RO	AC: BUJ, SEG; RO: PVH
Apoica strigata Richards, 1978	AC				AC	AC: BUJ
Apoica thoracica du Buysson, 1906	AC, RO				AC, RO	AC: SEG, RO: IDO, PVH
Asteloeca lutea Carpenter, 2004					AC	
Asteloeca traili (Cameron, 1906)	AC				AC	
Asteloeca ujhelyii (Ducke, 1909)					AC	AC: BUJ
Brachygastra albula Richard, 1978	RO	AC		RO	RO	

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Taxon	Richards (1978)	Morato et al. (2008)	Gomes et al. (2018)	Gomes et al. (2020)	IUNH web catalog (2020)	Present work, Locality collected
Brachygastra augusti (de Saussure, 1854)	AC		AC	RO	AC	RO: PVH
Brachygastra bilineolata Spinola, 1841 [1]				RO	RO	AC: BUJ, RO: IDO
Brachygastra cooperi (Richards, 1978)				RO		
Brachygastra lecheguana (Latreille, 1824)		AC		RO	RO	AC: SEG; RO: PVH
Brachygastra moebiana (de Saussure, 1867)	AC	AC			RO	AC: SEG
Brachygastra propodealis Bequaert, 1943			AC		RO	
Brachygastra scutellaris (Fabricius, 1804)	AC, RO			RO	AC, RO	AC: BUJ, RO: IDO
Brachygastra smithii (de Saussure, 1854)	AC				AC	
Chartergellus afoveatus Cooper, 1993 [1]						AC: SEG
Chartergellus amazonicus Richard, 1978 [1]				RO		AC: SEG
Chartergellus communis Richards, 1978				RO		
Chartergellus flavoscutellatus Somavilla, 2019 *						AC: BUJ, SEG
Chartergellus nigerrimus Richards, 1978 [2]	AC				AC	RO: PVH
Chartergellus zonatus (Spinola, 1851)				RO		
Charterginus fulvus Fox, 1898			AC	RO		AC: BUJ; RO: PVH
Chartergus artifex (Christ, 1791)					AC, RO	AC: BUJ, SEG
Chartergus globiventris de Saussure, 1854				RO		
Chartergus metanotalis Richards, 1978	AC				AC	
Clypearia duckei Richards, 1978	AC				AC	
Clypearia nigrior Richards, 1978	AC				AC	AC: BUJ
Clypearia sulcata (de Saussure, 1854)	AC, RO				AC, RO	
Epipona tatua (Cuvier, 1797)	AC, RO				AC, RO	RO: IDO
Leipomeles dorsata (Fabricius, 1804)			AC	RO		AC: BUJ, SEG; RO: IDO
Leipomeles spilogastra (Cameron, 1912) [1,2]						AC: SEG; RO: IDO
Metapolybia acincta Richards, 1978					RO	
Metapolybia cingulata (Fabricius, 1804)	AC				AC	
Metapolybia fraudator Carpenter and Andena, 2019 *						
Mischocyttarus acreanus Silveira, 2006					AC	
Mischocyttarus adolphi Zikán, 1949 [1]						AC: BUJ
Mischocyttarus alfkenii (Ducke, 1904)	AC				AC	
Mischocyttarus artifex Ducke, 1914		AC				
Mischocyttarus carbonarius (de Saussure, 1854)			AC			AC: BUJ
Mischocyttarus drewseni de Saussure, 1857 [2]						RO: IDO
Mischocyttarus duckei (du Buysson, 1908)		AC				
Mischocyttarus flavicans (Fabricius, 1804)			AC	RO		RO: IDO
Mischocyttarus gomesi Silveira, 2013				RO		
Mischocyttarus heliconius Richards, 1941		AC				
Mischocyttarus imitator (Ducke, 1904)					RO	
Mischocyttarus interruptus Richards, 1978				RO		
Mischocyttarus labiatus (Fabricius, 1804)		AC	AC	RO		AC: SEG; RO: PVH
Mischocyttarus lecointei (Ducke, 1904)				RO		

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Taxon	Richards (1978)	Morato et al. (2008)	Gomes et al. (2018)	Gomes et al. (2020)	IUNH web catalog (2020)	Present work, Locality collected
Mischocyttarus metathoracicus (de Saussure, 1854)			AC			
Mischocyttarus prominulus Richards, 1941			AC			
Mischocyttarus rotundicollis (Cameron, 1912)					RO	
Mischocyttarus socialis (de Saussure, 1854)	AC					
Mischocyttarus surinamensis (de Saussure, 1854)	AC		AC		AC, RO	AC: SEG
Mischocyttarus synoecus Richards, 1940			AC			
Mischocyttarus tomentosus Zikán, 1935	AC, RO			RO	AC, RO	RO: PVH
Nectarinella manauara Silveira & Nazareno Jr. 2016 [2]						RO: IDO
Parachartergus colobopterus (Lichtenstein, 1796)	RO				RO	
Parachartergus flavofasciatus (Cameron, 1906)			AC	RO		AC: SEG; RO: IDO
Parachartergus fraternus (Gribodo, 1892)				RO		
Parachartergus lenkoi Richards, 1978				RO		RO: IDO
Parachartergus pseudoapicalis Willink, 1959				RO		
Parachartergus smithii (de Saussure, 1854)				RO		RO: PVH
Parachartergus weyrauchi Willink, 1959	AC				AC, RO	
Polistes bicolor Lepeletier, 1836	AC				AC	
Polistes canadensis (Linnaeus, 1758) [1]				RO		AC: SEG; RO: IDO
Polistes carnifex (Fabricius, 1775) [2]						RO: PVH
Polistes deceptor Schulz, 1905			AC			
Polistes geminatus Fox, 1898 [2]						RO: PVH
Polistes erythrocephalus Latreille, 1813	AC				AC	
Polistes lanio (Fabricius, 1775)	AC, RO				AC	
Polistes occipitalis Ducke, 1904				RO		
Polistes pacificus Fabricius, 1804 [2]			AC			AC: SEG; RO: IDO
Polistes rufiventris Ducke, 1904	RO				RO	
Polistes testaceicolor Bequaert, 1937	AC, RO				AC	RO: IDO
Polistes torresae Silveira, 1996					RO	
Polistes versicolor (Olivier, 1792)	AC				AC	
Polybia affinis du Buysson, 1908	RO				RO	
Polybia batesi Richards, 1978 [2]						RO: IDO
Polybia belemensis Richards, 1970 [1]						AC: SEG
Polybia bifasciata de Saussure, 1854	AC			RO	AC	
Polybia bistriata (Fabricius, 1804)	AC, RO			RO	AC, RO	
Polybia catillifex Möbius, 1856		AC	AC	RO		
Polybia depressa (Ducke, 1905) [1]				RO		AC: BUJ
Polybia diguetana Buysson, 1905				RO		
Polybia dimidiata (Olivier, 1792)	RO		AC	RO	RO	AC: BUJ
Polybia dimorpha Richards, 1978		AC				AC: SEG
Polybia eberhardae Cooper, 1993			AC	RO		
Polybia emaciata Lucas, 1879	AC, RO	AC		RO	AC, RO	AC: BUJ, SEG; RO: IDO, PVH
Polybia furnaria von Ihering, 1904	AC, RO				AC, RO	

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Taxon	Richards (1978)	Morato et al. (2008)	Gomes et al. (2018)	Gomes et al. (2020)	IUNH web catalog (2020)	Present work, Locality collected
Polybia gorytoides Fox, 1898			AC	RO		AC: BUJ, SEG; RO: IDO, PVH
Polybia ignobilis (Haliday, 1836) [1]	RO				RO	AC: SEG
Polybia jurinei de Saussure, 1854	AC, RO		AC	RO	AC, RO	AC: BUJ; RO: PVH
Polybia juruana von Ihering, 1904	AC				AC	AC: BUJ
Polybia liliacea (Fabricius, 1804)	AC, RO		AC	RO	AC, RO	AC: BUJ, SEG; RO: IDO, PVH
Polybia micans Ducke, 1904 [1]				RO		AC: BUJ, SEG; RO: IDO
Polybia minarum Ducke, 1906 [2]						RO: IDO
Polybia occidentalis (Olivier, 1792) [1]	RO				RO	AC: BUJ, SEG; RO: IDO
Polybia parvulina Richards, 1970				RO		
Polybia platycephala Richards, 1951	AC			RO	AC, RO	
Polybia procellosa dubitata Ducke, 1910				RO		
Polybia quadricincta de Saussure, 1854	AC			RO	AC, RO	
Polybia rejecta (Fabricius, 1798)	AC, RO	AC	AC	RO	AC, RO	AC: BUJ, SEG; RO: IDO, PVH
Polybia rufitarsis Ducke, 1904			AC	RO		AC: BUJ, SEG; RO: IDO
Polybia scrobalis Richards, 1970	AC, RO			RO	AC, RO	
Polybia sericea (Olivier, 1792)	RO			RO	RO	RO: IDO
Polybia simillima Smith, 1862 [2]			AC			AC: SEG; RO: IDO
Polybia singularis Ducke, 1909 [1]	RO			RO	RO	AC: BUJ, SEG
Polybia spinifex Richards, 1978					RO	
Polybia striata (Fabricius, 1787)	AC, RO		AC	RO	AC, RO	
Polybia tinctipennis Fox 1898		AC		RO		
Polybia velutina Ducke, 1907 [2]	AC				AC	AC: SEG; RO: IDO
Protopolybia acutiscutis (Cameron, 1906)				RO	RO	
Protopolybia alvarengai Richards, 1978	RO				RO	
Protopolybia amarella Bequaert, 1944	AC				AC	
Protopolybia chartergoides (Gribodo, 1892)	AC, RO	AC		RO	AC, RO	AC: SEG; RO: IDO
Protopolybia emortualis (de Saussure, 1855)					AC	
Protopolybia exigua (de Saussure, 1854)	AC				AC	
Protopolybia fuscatus (Fox, 1898) [2]						RO: IDO
Protopolybia minutissima (Spinola, 1851)	RO				RO	
Protopolybia rotundata Ducke, 1910				RO		
Pseudopolybia compressa (de Saussure, 1854)				RO		
Pseudopolybia difficilis (Ducke, 1905)					RO	
Pseudopolybia vespiceps (de Saussure, 1863)			AC	RO	RO	AC: BUJ; RO: PVH
Synoeca chalibea de Saussure, 1852 [1]				RO		AC: SEG
Synoeca surinama (Linnaeus, 1767) [1]	RO			RO	RO	AC: SEG
Synoeca virginea (Fabricius, 1804)	AC	AC	AC	RO	AC, RO	AC: SEG; RO: IDO, PVH

Authors' Contribution

A Somavilla - species identification, formal analysis and writing
RNM Morais Júnior - species identification, formal analysis and writing
PCS Barroso - species identification, formal analysis and writing
ML Oliveira - Investigation, project administration, funding acquisition and writing
JA Rafael - Investigation, project administration, funding acquisition and writing

References

Andena, S.R., Mateus, S., Nascimento, F.S. & Carpenter, J.M. (2019). Description of a new species of *Metapolybia*, a Neotropical genus of social wasps, from the Amazon Forest. Sociobiology, 66: 377-380. doi: 10.13102/sociobiology.v66i2.3731

Barbosa, B.C., Detoni, M., Maciel, T.T. & Prezoto, F. (2016). Studies of social wasp diversity in Brazil: Over 30 years of research, advancements and priorities. Sociobiology, 63: 858-880. doi: 10.13102/sociobiology.v63i3.1031

Barroso, P.C.S., Somavilla, A. & Boldrini, R. (2017). Updating the geographic records of social wasps (Vespidae: Polistinae) in Roraima state. Sociobiology, 64: 339-346. doi: 10.13102/sociobiology.v64i3.1789

Brown Jr., K.S. (1991). Conservation of Neotropical environments: insects as indicators. In N.M. Collins & J.A. Tomas (Eds.), The conservation of insects and their habitats (pp. 349-404). London: Academic Press.

Carpenter, J.M. (2004). Synonymy of the genus *Marimbonda* Richards, 1978, with *Leipomeles* Mobius, 1856 (Hym.: Vespidae: Polistinae), and a new key to the genera of paper wasps of the new world. American Museum Novitates, 3456: 1-16.

Carpenter, J.M. & Marques, O.M. (2001). Contribuição ao Estudo dos Vespídeos do Brasil (Insecta, Hymenoptera, Vespoidea, Vespidae). Bahia: Universidade Federal da Bahia, Departamento de Fitotecnia, 147 p.

da Silva, M., Noll, F.B. & Morales-Corrêa e Castro, A.C. (2018). Phylogeographic analysis reveals high genetic structure with uniform phenotypes in the paper wasp *Protonectarina sylveirae* (Hymenoptera: Vespidae). Plos One, 1-25. doi: 10.1371/journal.pone.0194424

Daly, D.C. & Silveira, M. (2008). Primeiro catálogo da flora do Acre, Brasil / First catalogue of flora of Acre, Brazil. EDUFAC, Rio Branco, 555 p.

Duarte, A.F. (2005). Variabilidade e tendência das chuvas em Rio Branco, Acre, Brasil. Revista Brasileira de Metereologia, 20: 37-42.

Ducke, A. (1904). Sobre as Vespidas sociaes do Pará. Boletim do Museu Paraense Emílio Goeldi de História Natural, 4: 317-374.

Ducke, A. (1907). Novas contribuições para o conhecimento das Vespas (Vespidae sociales) da Região Neotropical. Boletim do Museu Paraense Emílio Goeldi de História Natural, 5: 152-199.

Fernandes, L.C. & Guimarães, S.C.P. (2002). Atlas geoambiental de Rondônia. 2a ed. Porto Velho: SEDAM, 141 p.

Gomes, B., Knidel, S.V.L., Moraes, H.S. & da Silva, M. (2018). Survey of social wasps (Hymenoptera, Vespidae, Polistinae) in Amazon rainforest fragments in Acre, Brazil. Acta Amazonica, 48: 109-116. doi: 10.1590/1809-4392201700913

Gomes, B., Lima, C.S., Silva, M. & Noll, F.B. (2020). High Number of Species of Social Wasps (Hymenoptera, Vespidae, Polistinae) Corroborates the Great Biodiversity of Western Amazon: a Survey from Rondônia, Brazil. Sociobiology, 67: 112-120. doi: 10.13102/sociobiology.v67i1.4478

Gressitt, J.L. & Gressitt, M.K. (1962). An improved *Malaise* trap. Pacific Insects, 4: 87-90.

Hermes, M.G., Somavilla, A. & Andena, S.R. (2015). Catálogo Taxonômico da Fauna do Brasil: Vespidae. http://fauna.jbrj.gov.br/fauna/faunadobrasil/4895. (acessed date: 25 July, 2020).

Hoorn, C., Wesselingh, F.P., ter Steege, H., Bermudez, M.A., Mora, A., Sevink, J., et al. (2010). Amazonia through time: Andean uplift, climate change, landscape evolution, and biodiversity. Science, 330: 927-931. doi: 10.1126/ science.1194585

IUNH - Natural History Laboratory Ibaraki University. (2020). Checklist and/or Catalog of Social Wasps. http:// http://iunh2.sci.ibaraki.ac.jp/wasp/list. (accessed date: 01 July, 2020).

Mesquita, C.C. (1996). O clima do Estado do Acre. Rio Branco: Secretaria de Estado de Ciência, Tecnologia e Meio Ambiente - SECTMA, 53 p.

Mesquita, C.C. & Paiva, R.A. (1995). Estudos básicos das precipitações do Acre. Rio Branco: Secretaria de Estado de Planejamento, 148 p.

Ministério do Meio Ambiente. (2018). Biomas, Amazônia. http://www.mma.gov.br/biomas/amazonia. (accessed date: 10 October, 2018).

Morato, E.F., Amarante, S.T. & Silveira, O.T. (2008). Avaliação ecológica rápida da fauna de vespas (Hymenoptera, Aculeata) do Parque Nacional da Serra do Divisor, Acre, Brasil. Acta Amazonica, 38: 789-798.

Rafael, J.A. & Gorayeb, I.S. (1982). Tabanidae (Diptera) da Amazônia, I – Uma nova armadilha suspensa e primeiros registros de mutucas de copas de árvores. Acta Amazonica, 12: 232-236.

Raw, A. (1998). Social Wasps (Hymenoptera, Vespidae)

of the Ilha de Maracá. In J.A. Ratter & W. Milliken (Eds.), Maracá. Biodiversity and environment of an Amazonian Rainforest (pp. 307-321). Chichester: John & Sons.

Richards, O.W. (1978). The social wasps of the Americas (excluding the Vespinae). London: British Museum of Natural History, 580 p.

Schlindwein, J.A., Marcolan, A.L., Fioreli-Perira, E.C., Pequeno, P.L.L. & Militão, J.S.T.L. (2012). Solos de Rondônia: Usos e Perspectivas. Revista Brasileira de Ciências da Amazônia, 1: 213-231.

Silva, S.S. & Silveira, O.T. (2009). Vespas sociais (Hymenoptera, Vespidae, Polistinae) de floresta pluvial Amazônica de terra firme em Caxiuanã, Melgaço, Pará. Iheringia, 99: 317-323.

Silveira, M. (2005). A floresta aberta com bambu no sudoeste da Amazônia: Padrões e processos em múltiplas escalas. Rio Branco: EDUFAC, 157p.

Silveira, O.T. (2002). Surveying Neotropical Social Wasps. An Evaluation of Methods in the "Ferreira Penna" Research Station (ECFPn), in Caxiuanã, PA, Brazil (Hymenoptera, Vespidae, Polistinae). Papéis Avulsos de Zoologia, 42: 299-323.

Silveira, O.T., da Costa Neto, S.V. & da Silveira, O.F.M. (2008). Social wasps of two wetland ecosystems in Brazilian Amazonia (Hym., Vespidae, Polistinae). Acta Amazonica, 38: 333-344.

Silveira, O.T., Furtado, N.V.R., Gama, J.M.F., Felizardo, S.P.S. & Santos, I.P.V. (2019). Update to the knowledge of the social wasps of the Brazilian state of Amapá based on the vespid collection of the Amapá Research Institute (IEPA) (Hymenoptera, Vespidae, Polistinae). Zootaxa, 4563: 267-296. doi: 10.11646/zootaxa.4563.2.3

Somavilla, A., Oliveira, M.L. & Silveira, O.T. (2014a). Diversity and aspects of the ecology of social wasps (Vespidae, Polistinae) in Central Amazonian 'terra firme' forest. Revista Brasileira de Entomologia, 58: 349-355. doi: 10.1590/s008 5-56262014005000007.

Somavilla, A., Marques, D.W.A., Barbosa, E.A.S., Pinto Jr, J.S. & Oliveira, M.L. (2014b). Vespas Sociais (Vespidae: Polistinae) em uma Área de Floresta Ombrófila Densa Amazônica no Estado do Maranhão, Brasil. EntomoBrasilis, 7: 183-187. doi: 10.12741/ebrasilis.v7i3.404

Somavilla, A., Andena, S.R. & Oliveira, M.L. (2015). Social Wasps (Hymenoptera: Vespidae: Polistinae) of the Jaú National Park, Amazonas, Brazil. EntomoBrasilis, 8: 45-50. doi: 10.127 41/ebrasilis.v8i1.447

Somavilla, A., Schoeninger, K., Castro, D.G.D., Oliveira, M.L. & Krug, C. (2016). Diversity of wasps (Hymenoptera: Vespidae) in conventional and organic guarana (*Paullinia cupana* var. *sorbilis*) crops in the Brazilian Amazon. Sociobiology, 63: 1051-1057. doi: 10.13102/sociobiology.v63i4.1178

Somavilla, A. & Oliveira, M.L. (2017). Social wasps (Vespidae: Polistinae) from Ducke Reserve, Amazonas, Brazil. Sociobiology, 64: 125-129. doi: 10.13102/sociobiology.v64i1.1215

Somavilla, A. & Andena, S.R. (2019). A New Species of the Swarming Social Wasp *Chartergellus* Bequaert, 1938 (Vespidae: Polistinae: Epiponini) from Acre, Brazil. Sociobiology, 66: 602-605. doi: 10.13102/sociobiology.v66i4.4601

Somavilla, A., Morais Jr. R.N.M. & Rafael, J.A. (2019). Is the social wasp fauna in the tree canopy different from the understory? Study of a particular area in the Brazilian Amazon Rainforest. Sociobiology, 66: 179-185. doi: 10.13102/ sociobiology.v66i1.3568

Somavilla, A., Morais Jr., R.N.M., Oliveira, M.L. & Rafael, J.R. (2020). Biodiversity of Insects in the Amazon: survey of social wasps (Vespidae: Polistinae) in Amazon rainforest areas in Amazonas state, Brazil. Sociobiology, 67: 312-321. doi: 10.13102/sociobiology.v67i2.4061

Somavilla, A. & Carpenter J.M. (2020). Key to the Genera of Social Wasps (Polistinae) Occurring in Neotropical Region. In: Prezoto, F., Nascimento, F.S, Corrêa-Barbosa, B. & Somavilla, A. Neotropical Social Wasps. Springer Nature. doi: 10.1007/978-3-030-53510-0_18

Townes, H. (1972). A light-weight Malaise trap. Entomological News, 83: 239-247.

Zucchi, R., Sakagami, S.F., Noll, F.B., Mechi, M.R., Mateus, S., Baio, M.V. & Shima, S. (1995). *Agelaia vicina*, a swarm-founding polistine with the largest colony size among wasps and bees (Hymenoptera: Vespidae). Journal of New York Entomological Society, 103: 129-137.