



SHORT NOTE

Social wasps (Vespidae: Polistinae) from an Amazon rainforest fragment: Ducke Reserve

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Abstract

Social wasps are common elements in Neotropics, although even elementary data about this taxon in the Amazon region is partially unknown. Therefore the purpose of this work was to increase the knowledge of social wasp fauna at the Ducke Reserve, Amazonas. One hundred and three species belonging to nineteen genera were recorded. The richest genera were *Polybia* (28 species), *Agelaia* (12) and *Mischocyttarus* (12). Seventy species were collected in active search, 42 species using *Malaise* trap, 25 in suspended trap, 20 in attractive trap and nine in light trap. Ducke Reserve has one of the highest number of Polistinae wasps in reserves or parks in the Neotropic region.

The Polistinae social wasps comprise 26 genera and 958 species, and Brazilian social wasps fauna include the richest in the world, with 321 species (Carpenter & Marques, 2001). Species in this subfamily belong to three tribes: Mischocyttarini (*Mischocyttarus*, with 117 species in Brazil), Polistini (*Polistes*, with 38 species in Brazil), and Epiponini (20 genera, 166 species in Brazil) (Carpenter, 2004; Pickett & Carpenter, 2010).

For the Brazilian Amazonian rainforest, 20 genera and more than 200 species were recorded, representing about 70% of the Brazilian fauna of social wasps (Silveira, 2002). Recently, some works have been carried out in the Brazilian Amazon, as follow: Maracá Ecological Station, Roraima State with 36 species (Raw, 1998), Caxiuanã Reserve, Pará State with 79 and 65 species, respectively (Silveira, 2002; Silva & Silveira, 2009), Serra do Divisor National Park, Acre State with 20 species (Morato et al., 2008), Lakes of Amapá State with 31 species (Silveira et al., 2008), Mamirauá and Alvarães Reserve, Amazonas State with 46 and 42 species,

respectively (Silveira et al., 2008), Gurupi Biological Reserve with 38 species (Somavilla et al., 2014), Jaú National Park with 49 species (Somavilla et al., 2015) and Embrapa-Manaus with 52 species (Somavilla et al., 2016).

Despite the constant efforts in studies about social wasps conducted in Brazil, little is known regarding the diversity and distribution of these in the Amazon region. Thus, this work aims to expand knowledge about the species of social wasps in Ducke Reserve, Manaus, Amazonas, Brazil.

The Ducke Reserve comprising an area of approximately 100 km² of “terra firme” rainforest near Manaus city, Amazonas, Brazil (02°55’ to 03°01’ S and 59°53’ to 59°59.5’ W) (Baccaro et al., 2008). The climate is humid tropical, with mean annual relative humidity of about 80% and mean annual precipitation of 1,750-2,500 mm and mean annual temperature is 26°C. Vegetation is lowland tropical rainforest, with fairly closed canopy and shady understory, characterized by the abundance of palm trees (Ribeiro et al., 1999; Costa et al., 2008).



We analyze all the wasps deposited at the Zoological Collection of Invertebrates at the Instituto Nacional de Pesquisas da Amazônia (INPA) in Manaus, Brazil. These wasps were collected anteriorly to the development period of this paper. Identification of the specimens followed the keys proposed by Richards (1978) and reference Collections.

Wasps were collected with Entomological net in the understory (active search); additionally, *Malaise* traps (Townes model); Suspended trap on the heights of 1.5m; 10m; 15m; 20m; 30m and 45m (Rafael & Gorayeb model); Light traps (a white sheet attached to a white light); Meat attractive trap (*Rattus norvegicus* Berkenhoid, 1769) and Fruit attractive trap (banana).

We identified 103 social wasp species, in 19 genera (Table 1). About 50% of the collected species belong to three genera: *Polybia* Lepeletier (28 species), *Agelaia* Ducke (12 species), and *Mischocyttarus* de Saussure (12 species). Only *Asteloecca* Raw and *Protonectarina* Ducke were not collected in the Ducke Reserve.

The scope of this inventory is similar to the Silveira (2002) in the Ferreira Penna Scientific Station, in Caxiuanã, Pará, that the author collected 79 species in 18 genera in intensive work active search and different traps in an area predominantly constituted of primary forests. The similarity of results obtained in Ducke Reserve and Caxiuanã surprising, considering the proximity of Ducke with the city of Manaus, unlike the preservation condition which is that of Caxiuanã, fully isolated from any human action.

Many species of social wasps have preferences for particular types of habitat, in this way, the ambiguous character of the Ducke Reserve may have influenced the high species richness. For the part North of the reserve consists of preserved sites with high forest and closed canopy favoring the collection of taxa such as *Chartergellus*, *Charterginus*, *Chartergus*, *Clypearia*, *Epipona*, *Leipomeles* and *Nectarinella* and some species of *Mischocyttarus*, *Polybia*, *Agelaia* and *Angiopolybia* which usually occur in more preserved sites.

The part South of the Reserve, with areas close to urban areas, most affected by human activities, having more open spaces and even degraded, favoring the collection of some species that are more tolerant to these types of environments and support such conditions, as *Agelaia pallipes*, *Polybia rejecta*, *P. chrysothorax*, *P. sericea*. These species are hardly collected in closed vegetation environments creating a network with low light. A few are common in built-up areas as *Polistes*, *Metapolybia*, some *Mischocyttarus*' species and *Polybia occidentalis*.

Comparing to the different techniques used in the wasps collect, we considered active search the most efficient method for collecting Vespidae, was collected in active search 70 species, 42 species using Malaise trap, 25 using suspended trap, 20 attractive trap and only nine species using light trap.

This study corroborates the results of Silva and Silveira (2009) and Somavilla et al. (2014), who considered active

search the most efficient method for collecting Vespidae, mainly close to the forest ground and in the understory; in this study, we collected 70 species in active search in Ducke Reserve. But the addition of different collection methods is an important tool for sampling of the richness of social wasps in an area, as in general the species have a varied foraging behavior. Forty-two species were collected using *Malaise* trap, demonstrating the efficiency of this method for this taxon. In fast inventories, the use of such a trap can be a good way to sample this hornet's group, mainly those that tend to forage in the forest understory. However, the use of *Malaise* trap as the only way of sampling for social wasps may underestimate the real number of species, mainly of *Polistes* and *Mischocyttarus* in a particular area (Silveira, 2002).

Twenty-five species were collected using suspended interception traps, confirming that for the Amazon, where the canopy forest is high, this technique is one of the most efficient to collect social wasps. *Apoica* does its foraging at night, reducing the possibility of being captured during the day by active search. In this study, seven *Apoica* species were only captured in light traps. Still, for twenty species belonging mainly to *Agelaia* and *Polybia* the attractive trap was efficient; however, the use attractive traps as the only way for collecting social wasps may underestimate the real number of *Polistes*, *Mischocyttarus* and some Epiponini taxa.

In surveys conducted in the Amazon rainforest, wasp's diversity is generally higher than other biomes, but in Ducke Reserve, exceeds these indices, with 103 species. In Amazonas state, the closest diversity number (only 50% of this value) was found in Embrapa, and for others states of Amazon region, the closest diversity (about 75% of this value) in Caxiuanã, Pará. However, this difference can make up the sampling effort of several years in Ducke Reserve. Adding the new occurrences, together with the material already registered by Somavilla et al. (2014), it is suggested that the Ducke Reserve has one of the highest number of social wasps' species (Polistinae) in reserves or parks in the Neotropical region.

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Table 1. Species of social wasps collected at Ducke Reserve, Amazonas, Brazil, as well as the method used to capture the species. Active (active search with entomological net); Malaise (*Malaise* trap); Suspended (suspended trap); Light (light trap); Meat (attractive meat trap); Fruit (attractive fruit trap):

Taxa	Active	Malaise	Suspended	Light	Meat	Fruit
Polistinae						
Epiponini						
<i>Agelaia acreana</i> Silveira & Carpenter, 1995			X			
<i>Agelaia angulata</i> (Fabricius, 1804)	X	X			X	
<i>Agelaia cajennensis</i> Fabricius, 1798	X	X	X		X	
<i>Agelaia centralis</i> (Cameron, 1907)	X					
<i>Agelaia constructor</i> (de Saussure, 1854)	X	X			X	X
<i>Agelaia fulvofasciata</i> (DeGeer, 1773)	X	X	X		X	X
<i>Agelaia hamiltoni</i> Richards, 1978		X				
<i>Agelaia myrmecophila</i> (Ducke, 1905)	X	X				
<i>Agelaia ornata</i> (Ducke, 1905)	X					
<i>Agelaia pallidiventris</i> Richards, 1978	X					
<i>Agelaia pallipes</i> (Olivier, 1791)	X	X			X	X
<i>Agelaia testacea</i> (Fabricius, 1804)	X	X	X		X	X
<i>Angiopolybia obidensis</i> (Ducke, 1904)	X	X			X	
<i>Angiopolybia pallens</i> (Lepelletier, 1836)	X	X	X	X		

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Taxa	Active	Malaise	Suspended	Light	Meat	Fruit
Epiponini						
<i>Angiopolybia paraensis</i> (Spinola, 1851)	X	X			X	
<i>Apoica albimacula</i> (Fabricius, 1804)	X			X		
<i>Apoica arborea</i> de Saussure, 1854	X			X	X	
<i>Apoica gelida</i> Van der Vecht, 1973				X		
<i>Apoica pallens</i> (Fabricius, 1804)	X			X	X	
<i>Apoica pallida</i> (Olivier, 1791)				X		
<i>Apoica strigata</i> Richards, 1978				X		
<i>Apoica thoracica</i> Du Buysson, 1906	X		X	X	X	X
<i>Brachygastra billineolata</i> Spinola, 1841		X				
<i>Brachygastra scutellaris</i> (Fabricius, 1804)			X			
<i>Chartergellus amazonicus</i> Richards, 1978	X		X			X
<i>Chartergellus jeannei</i> Andena & Soleman, 2015	X					
<i>Charterginus fulvus</i> Fox, 1898	X					
<i>Chartergus chartarius</i> (Olivier, 1791)		X				
<i>Clypearia apicipennis</i> (Spinola, 1851)	X					
<i>Clypearia duckei</i> Richards, 1978		X				
<i>Clypearia sulcata</i> (de Saussure, 1854)	X	X	X			X
<i>Epipona tatua</i> (Cuvier, 1797)	X					
<i>Leipomeles dorsata</i> (Fabricius, 1804)	X					
<i>Leipomeles pussila</i> (Ducke, 1904)						
<i>Leipomeles spilogastra</i> Cameron, 1912		X	X			
<i>Metapolybia nigra</i> Richards, 1978		X	X			
<i>Metapolybia rufata</i> Richards, 1978			X			
<i>Metapolybia unilineata</i> (R. Von Ihering, 1904)			X			
<i>Nectarinella manauara</i> Silveira & Nazareno Jr, 2016		X				
<i>Parachartergus fasciipennis</i> Ducke, 1905	X					
<i>Parachartergus fraternus</i> (Gribodo, 1892)		X	X		X	X
<i>Parachartergus griseus</i> (Fox, 1898)		X				
<i>Parachartergus richardsi</i> Willink, 1951	X		X			
<i>Parachartergus smithii</i> de Saussure, 1854		X				
<i>Polybia belemensis</i> Richards, 1970	X		X			X
<i>Polybia bicyttarella</i> Richards, 1951	X					
<i>Polybia bifasciata</i> de Saussure, 1854			X			
<i>Polybia bistrriata</i> (Fabricius, 1804)	X	X	X			
<i>Polybia chrysothorax</i> (Lichtenstein, 1796)	X					
<i>Polybia depressa</i> (Ducke, 1905)	X		X			
<i>Polybia dimidiata</i> (Olivier, 1791)	X	X				X
<i>Polybia dimorpha</i> Richards, 1978	X	X				
<i>Polybia emaciata</i> Lucas, 1879		X				
<i>Polybia fastidiosuscula</i> de Saussure, 1854	X					
<i>Polybia gorytoides</i> Fox, 1898		X				
<i>Polybia ignobilis</i> (Haliday, 1836)	X					
<i>Polybia jurinei</i> de Saussure, 1854	X	X				X
<i>Polybia liliacea</i> (Fabricius, 1804)	X	X				
<i>Polybia occidentalis</i> (Olivier, 1791)	X	X				

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Taxa	Active	Malaise	Suspended	Light	Meat	Fruit
Epiponini						
<i>Polybia signata</i> Ducke, 1905		X				
<i>Polybia singularis</i> Ducke, 1905	X					
<i>Polybia striata</i> (Fabricius, 1787)	X					
<i>Polybia tinctipennis</i> Fox, 1898		X				
<i>Polybia velutina</i> Ducke, 1905	X					
<i>Protopolybia bituberculata</i> Silveira & Carpenter, 1995	X					
<i>Protopolybia chartergoides</i> Gribodo, 1891	X	X				
<i>Protopolybia duckeianus</i> Richards, 1978		X				
<i>Protopolybia emortualis</i> (de Saussure, 1855)		X				
<i>Protopolybia holoxantha</i> (Ducke, 1904)		X				
<i>Protopolybia minutissima</i> (Spinola, 1851)		X				
<i>Protopolybia rugulosa</i> Ducke, 1907		X				
<i>Protopolybia sedula</i> (de Saussure, 1854)	X					
<i>Pseudopolybia compressa</i> (de Saussure, 1854)	X					
<i>Pseudopolybia langi</i> Bequaert, 1944		X				
<i>Pseudopolybia vespiceps</i> (de Saussure, 1863)	X					
<i>Synoeca surinama</i> (Linnaeus, 1767)	X		X			X
<i>Synoeca virginea</i> (Fabricius, 1804)	X	X	X			
Mischocyttarini						
<i>Mischocyttarus atramentarius</i> Zikan, 1949	X					
<i>Mischocyttarus collaris</i> (Ducke, 1904)						
<i>Mischocyttarus flavicans</i> (Fabricius, 1804)	X					
<i>Mischocyttarus imitator</i> (Ducke, 1904)			X			X
<i>Mischocyttarus labiatus</i> (Fabricius, 1804)	X					
<i>Mischocyttarus lecointei</i> (Ducke, 1904)	X					
<i>Mischocyttarus metathoracicus</i> (de Saussure, 1854)	X					
<i>Mischocyttarus prominulus</i> Richards, 1941	X					
<i>Mischocyttarus rotundicollis</i> (Cameron, 1912)	X					
<i>Mischocyttarus surinamensis</i> (de Saussure)	X					
<i>Mischocyttarus synoecus</i> Richards, 1940		X				
<i>Mischocyttarus helliconius</i> group	X					
Polistini						
<i>Polistes canadensis</i> (Linnaeus, 1758)	X					
<i>Polistes geminatus</i> Fox, 1898		X				
<i>Polistes goeldi</i> Ducke, 1904	X					
<i>Polistes pacificus</i> Fabricius, 1804	X					
<i>Polistes testaceicolor</i> Bequaert, 1798	X					
<i>Polistes versicolor</i> Olivier, 1792	X					

