



RESEARCH ARTICLE - WASPS

Social Wasps (Vespidae: Polistinae) from Two National Parks of the Caatinga Biome, in Brazil

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Abstract

This work recorded 593 specimens allocated in 11 genera and 23 species of social wasps were collected in Ubajara National Park and Sete Cidades National Park, Caatinga Biome, Northeast of Brazil. *Chartergellus communis* Richards, 1978, *Chartergus globiventris* de Saussure, 1854, *Metapolybia docilis* Richards, 1975, *Polybia paulista* (von Ihering, 1896), *P. rejecta* (Fabricius, 1798), *Protonectarina sylveirae* (de Saussure, 1854) and *Protopolybia exigua* (de Saussure, 1854) are new occurrence records for Ceará state. *Apoica flavissima* van der Vecht, 1898, *Brachygastra augusti* (de Saussure, 1854), *C. globiventris*, *Metapolybia cingulata* (Fabricius, 1804), *Polybia chrysothorax* (Lichtenstein, 1796), *P. paulista*, *P. scutellaris* (White, 1841) and *Protopolybia chartergoides* Gribodo, 1891 are new occurrence records for Piauí state. Eighteen species were collected in the Ubajara National Park, being eight exclusive and fifteen in the Sete Cidades National Park, being five exclusive; ten species were collected in both Parks. *Brachygastra augusti* and *M.docilis* are new records for Caatinga biome.

Introduction

Caatinga is composed of dry forests with trees, shrubs, and herbs; rainfall in the biome is below 1.000 mm and strongly concentrated in a short rainy season followed by a marked dry season of up to 10 months. (Drumond et al., 2002; Leal et al., 2005). This climate may be reflected in adaptive changes in the regional biota, which most probably influences the population dynamics of insects, in particular social wasps (Melo et al., 2015).

Social wasps (Vespidae: Polistinae) play a decisive role in the trophic balance of ecosystems due to their food duplicity, since they act as well as predators and as scavengers of insect larvae and smaller insects (Carpenter & Marques, 2001) and as collectors of nectar and pollen (Sühs et al., 2009). In addition, it is a group with high species richness and populations and very common in several places of the Neotropical region (Carpenter & Marques, 2001). However, information about Vespidae in the Brazilian Northeastern Region is precarious, with few studies and few described

species, due to the conception that the diversity is low in the local ecosystems (Andena & Carpenter, 2014).

As mentioned earlier, there is an erroneous view that arid ecosystems are poor in diversity. This view was perpetrated by Ducke (1907) in his article on Brazilian social wasps in which he quotes: "In the Ceará state, center of the dry region Northeast of Brazil, is very poor Hymenoptera diversity, characterized to the absence of many frequent species throughout the rest of the country". The same autor, "still did not know about the fauna of the Rio Grande do Norte, Paraíba, Pernambuco, Alagoas and Sergipe states, and only supposed it to be a continuation of the fauna of Bahia, probably still impoverished by the absence of species linked to humid climate."

Among the most comprehensive study reporting the social wasps's diversity in Northeastern Brazil, five were developed in Bahia state: one in three ecosystems (Floresta Tropical Atlântica, Restinga and Manguezal) with 21 species (Santos et al., 2007a); two in Caatinga area, with 13 visiting flowers (Aguiar & Santos, 2007) and nine using cactus fruit for food resources (Santos et al., 2007b); one in Cerrado area, 19



wasp species (Santos et al., 2009), and the last one in an area of Campos Rupestres, collecting 11 species visiting flowers (Silva-Pereira & Santos, 2006). Additionally, one study was made in Maranhão state, referring to a Cerrados area, with 31 species, the largest number of species so far recorded from an area in the Northeastern region (Souza et al., 2011), another study was performed in the state of Rio Grande do Norte, with 20 species (Virgínio et al., 2014) and the last in Piauí state with 12 species (Rocha & Silveira, 2014). Andena and Carpenter (2014) compiled information from collections and bibliographies and reported the occurrence of 76 social wasp species from the Brazilian semi-arid region, mainly for Bahia.

Despite these efforts, most of the natural areas belonging to the Caatinga biome have not yet been inventoried. Consequently, here we present information about the social wasp species in two Brazilian National Parks from the Caatinga biome.

Material and Methods

The wasps were obtained during two collecting expeditions to the study areas, from April 18th to 21st of 2012 and February 7th to 13th of 2013 at the Sete Cidades National Park (NP Sete Cidades, Piriapiri municipality, Piauí state - 4°5'57"S, 41°42'34"W) and from April 22st to 25th of 2012 and February 14th to 20th of 2013 at the Ubajara National Park

(NP Ubajara, Ubajara municipality, Ceará state - 3°50'18"S, 40°53'54"W) (Fig 01). Although both parks are included in the Caatinga Biome, the areas sampled within these parks seem to represent islands dominated by Cerrado in Sete Cidades and montane humid forest in PN Ubajara. The two parks are distant by approximately 110 km.

The following wasps traps were used: 6-meter intercept Malaise traps (Gressitt & Gressitt, 1962), suspended intercept traps (Rafael & Gorayeb, 1982), light traps using a white sheet. Guided manual collections were also performed throughout the excursion with entomological nets and active search for wasps's colonies, in addition to the use of the spraying method spraying method with a solution of water, salt and sugar, in a transect of 1000 m (Gomes & Noll, 2010). The collection effort was standardized between the two national parks, with the same number and models of traps, with 11 consecutive days in each park in the two sampling periods.

A better detail of the study area and the methods used, can be found in the study of Takiya et al. (2016).

Wasps were pinned and some were preserved in ethanol, with their colonies, when they were collected. Material collected was divided and deposited in two institutions: Coleção Zoológica do Maranhão, Universidade Estadual do Maranhão, Caxias (CZMA) and Coleção de Invertebrados, Instituto Nacional de Pesquisas da Amazônia, Manaus (INPA).

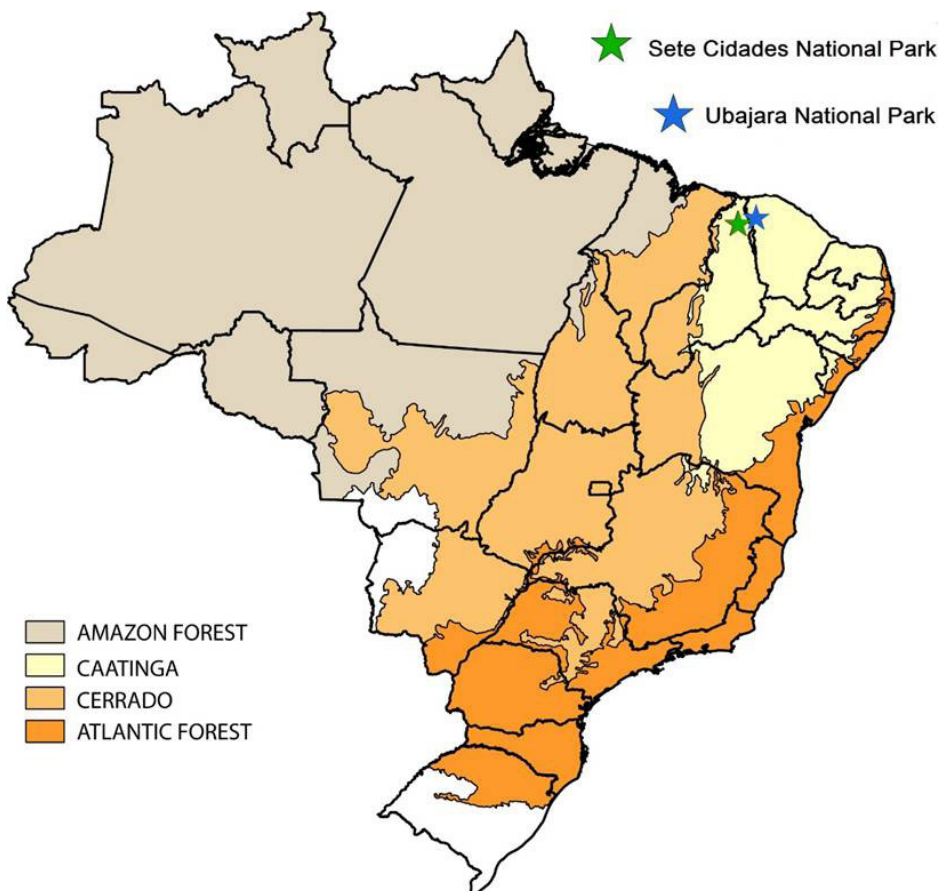


Fig 1. Map of Brazilian states colored by four major phytogeographical domains: Amazon forest, Cerrado, Atlantic forest, and Caatinga; the last one including Sete Cidades (green star) and Ubajara (blue star) National Parks (Figure from Takiya et al., 2016).

Results and Discussion

It was collected 593 specimens allocated in 11 genera and 23 species of Polistinae social wasps. All species are listed in the Table 01, according to the two study areas. 18 species were collected in the Ubajara National Park - eight exclusive and 15 in the Sete Cidades National Park- five exclusive; ten species were collected in both National Parks.

Polybia occidentalis (Olivier, 1792) and *Agelais pallipes* (Olivier, 1792) are the most abundant species and only *P. occidentalis* was collected with all the methods: Malaise, suspended, light trap, spraying trap and nest.

Chartergellus communis Richards, 1978, *Chartergus globiventris* de Saussure, 1854, *Metapolybia docilis* Richards, 1975, *Polybia paulista* (von Ihering, 1896), *P. rejecta* (Fabricius, 1798), *Protonectarina sylveirae* (de Saussure, 1854) and *Protopolybia exigua* (de Saussure, 1854) are new occurrence records for Ceará state. *Apoica flavissima* van

der Vecht, 1898, *Brachygastra augusti* (de Saussure, 1854), *C. globiventris*, *Metapolybia cingulata* (Fabricius, 1804), *Polybia chrysothorax* (Lichtenstein, 1796), *P. paulista*, *P. scutellaris* (White, 1841) and *Protopolybia chartergoides* Gribodo, 1891 are new records for Piauí state. In addition, *Brachygastra augusti* and *Metapolybia docilis* are new records for Caatinga biome.

The use of different methods and traps is an important way to sample wasps richness of an area, since different species generally have varied foraging behaviors. Active search with entomological net using the spraying method was the best way to collect social wasps species in both areas. However the use of indirect methods, like interception and light traps, were important for collecting certain wasps groups; for example, the light trap used for nocturnal foraging wasps (*Apoica*) and some species of *Polybia* and small vespids (*Metapolybia* and *Protopolybia* - smaller than 10 mm) collected with Malaise and suspended traps.

Table 1. Social wasps collected in Sete Cidades National Park (Piauí state) and Ubajara National Park (Ceará state) and methods used for collect each species: (* New record for Caatinga Biome).

Taxa	Method used for collect	NP Ubajara CE	NP Sete Cidades PI
Epiponini			
<i>Agelais pallipes</i> (Olivier, 1792)	Malaise, Spraying, Suspended	51	33
<i>Apoica pallens</i> (Fabricius, 1804)	Light trap	05	-
<i>Apoica flavissima</i> van der Vecht, 1898	Light trap, Malaise	01	55
<i>Brachygastra augusti</i> (de Saussure, 1854)*	Malaise, Nest, Spraying	-	12
<i>Brachygastra lecheguana</i> (Latreille, 1804)	Malaise, Nest, Spraying	01	12
<i>Chartergellus communis</i> Richards, 1978	Nest, Spraying	12	-
<i>Chartergus globiventris</i> de Saussure, 1854	Light trap, Nest, Spraying	01	12
<i>Metapolybia cingulata</i> (Fabricius, 1804)	Malaise, Spraying, Suspended, Nest	-	49
<i>Metapolybia docilis</i> Richards, 1975*	Nest, Spraying	62	-
<i>Polybia chrysothorax</i> (Lichtenstein, 1796)	Light trap, Malaise, Nest, Spraying	10	23
<i>Polybia occidentalis</i> (Olivier, 1792)	Light trap, Malaise, Spraying, Nest, Suspended	30	63
<i>Polybia ignobilis</i> (Haliday, 1836)	Malaise, Spraying	06	05
<i>Polybia paulista</i> (von Ihering, 1896)	Spraying	01	02
<i>Polybia rejecta</i> (Fabricius, 1798)	Malaise, Nest, Spraying, Suspended	06	19
<i>Polybia scutellaris</i> (White, 1841)	Malaise	-	01
<i>Polybia sericea</i> (Olivier, 1791)	Light trap, Spraying	-	10
<i>Polybia</i> sp.1	Spraying	01	-
<i>Protonectarina sylveirae</i> (de Saussure, 1854)	Malaise	02	-
<i>Protopolybia chartergoides</i> Gribodo, 1891	Malaise, Spraying	-	02
<i>Protopolybia exigua</i> (de Saussure, 1854)	Nest, Spraying	13	55
Mischocyttarini			
<i>Mischocyttarus cerberus</i> Ducke, 1898	Nest	26	-
<i>Mischocyttarus cearensis</i> Zikán, 1945	Nest	09	-
Polistini			
<i>Polistes canadensis</i> (Linnaeus, 1758)	Nest	03	-
Total		241	353

One colony of the wasp *P. rejecta* was found associated with the nest of the ant *Azteca* sp. in the Sete Cidades National Park, this association was only registered for the Brazilian Amazon (Somavilla et al., 2013) and in the transition area of the Atlantic Forest and Caatinga in Rio Grande do Norte (Virgínio et al., 2015), probably this association is more common.

A curious fact was the collection of just two *Mischocyttarus* species and one *Polistes* species only in NP Ubajara, close to human constructions. These genera were not collected in PN Sete Cidades, where only Epiponini species were represented. *Polybia*, due to its great species diversity and swarming nests foundation, was the genus with the greatest amount of species in both parks, with eight species reported.

Due to the deficiency of local Vespidae studies, there is insufficient information to attribute “endemic” or “overhanging” conditions to any species collected at this site. Therefore, these species should be considered as insufficiently known or rare in terms of geographic distribution. In fact most of the species recorded are widespread species, but this is common in social wasps, as many species have very widespread distributions, especially Epiponinae. On the other hand, *Polistes* and *Mischocyttarus* could show to have more area-restricted species.

This results highlights the importance of preserving the Caatinga *sensu lato* environment as a way to maintain the diversity of social wasps in this region. They also reinforce the need of more taxonomy-related research with this group of insects, broadening the geographic coverage of samples in order to increase the knowledge on richness and biodiversity of Northeastern Brazil, as well as in poorly known biomes, such as Caatinga and its transition areas with other biomes.

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