

Associations between birds and social wasps in the Pantanal wetlands

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ABSTRACT: Nesting associations between birds and wasps may increase reproductive success of birds because the stings of these insects serve to protect the offspring against predators. The predation of wasps by birds is known from elsewhere and usually birds feed on the wasps during flight. Here we report on nest associations between birds and social wasps and comments on wasp nest predation by birds in the Brazilian Pantanal wetlands. The study was conducted in the sub-region known as “Pantanal de Poconé”, state of Mato Grosso, Brazil. We recorded seven associations involving four bird species: *Paroaria capitata*, *Myiozetetes similis*, *M. cayannensis* and *Columbina talpacoti*, and four wasp species: *Polybia sericea*, *P. ruficeps xanthops*, *Chartergus globiventris* and *Parachartergus fraternus*. One successful nest of *M. cayannensis* (14.2%) was associated to *P. sericea* wasps. On the other hand, 42.8% of the bird nests were abandoned, and 42.8% were preyed upon. Additionally, a direct event of wasp nest predation was recorded, in which a group of *Melanerpes candidus* attacked a nest of *P. ruficeps xanthops*. Other ten wasp nests were found with marks of predation made by birds. These were nests of *Synoecca surinama* (n = 2), *P. chrysothorax* (n = 2), *P. ruficeps xanthops* (n = 3), *P. sericea* (n = 2) and *P. jurinei* (n = 1), suggesting that social wasps may constitute an additional element in the diet of insectivorous birds. We concluded that: 1) associations with wasps did not prevent predation of bird nests against the variety of predators in the region, and 2) the predation of social wasps by birds can contribute to population control of these social insects in the Pantanal. Further studies may shed additional light on this bird-wasp relationship.

KEY-WORDS: Animal behavior, bird nests, bird-wasp interactions, wasp colonies.

INTRODUCTION

Nest predation is usually the main cause of reproductive failure in birds (Ricklefs 1969; Oniki 1979, Lopes & Marini 2005). One of the strategies used by birds to minimize or avoid predation is the construction of nests near colonies of ants, wasps and bees (Hymenoptera) (Haemig 2001). The social hymenopterans more commonly seen in association with birds are wasps, Vespidae (Hansell 2000). The swarming behavior and the painful stings of wasps protect the birds' offspring against predators (Dejean & Fotso 1995, Brightsmith 2000, Beier & Tungbani 2006, Bologna *et al.* 2007). However, the effectiveness of nest defense is variable among wasp species (Richards 1978, Hansell 2000).

In the Neotropical region, the association between nesting birds and social wasps is prominent for species of *Cacicus* (Icteridae), for which the association with wasps is regarded as an adaptation to avoid nest predation (Feeke 1981, Robinson 1985, Sick 1997, Somavilla *et al.* 2013). On the other hand, wasp predation by birds (Sutton

1939, Gibo 1978, Raw 1997, Sick 1997) is considered a rare event in the neotropics. Birds generally feed on wasps during flight and there are few reports of attacks on wasp nests (Gibo 1978, Henriques & Palma 1998).

Here we describe the nesting associations between birds and social wasps (Hymenoptera: Vespidae) in a North Pantanal region and present our observations on social wasp nest predation by birds to advance further the knowledge on the ecology of interactions between birds and social insects.

METHODS

The Pantanal is the largest seasonally flooded wetland area of the planet and it is located in the center of South America, covering parts of Brazil, Bolivia, Paraguay and Argentina. In Brazil, it is present in the states of Mato Grosso and Mato Grosso do Sul (Silva & Abdon 1998). This study was conducted in Retiro Novo Farm (16°15'12"S, 56°22'12"W), located in the municipality

of Poconé, state of Mato Grosso, Brazil. From 25 August 2011 to 11 April 2012, the vegetation was searched for a total of 1,024 hours of sampling effort in order to seek bird nests (according to Martin & Geupel 1993) in a mosaic covering the forest formations locally known as “cambarazal”, “landizal” and “pombeiral”, and in natural grasslands (see Nunes da Cunha *et al.* 2010). After locating bird nests, we recorded the occurrence of wasp nests in the same plant. Here, we considered an association when both nests were located in the same tree and having between them a distance shorter than 1 m (see Wunderle & Pollock 1985). The distance between the bird and wasp nests and the height of the nests from the ground was obtained with a measurement tape. A sample of wasp individuals was collected using an insect net. The voucher specimens were deposited in the collections of the Museum of Zoology, Universidade Estadual de Feira de Santana (MZFS), Feira de Santana, Bahia, and Zoological Collection of Universidade do Estado de Mato Grosso (CZUNE), Cáceres, Mato Grosso. Bird nests were monitored through brief visits with three-day regular intervals in order to minimize nest disruption. Each nest was accompanied until reproductive success, predation or even desertion (Lopes & Marini 2005, Duca & Marini 2008). We considered as successful a bird's nest in which at least one nestling left the nest. Predated nests were those recorded with contents missing during the monitoring interval (i.e., eggs or nestlings).

RESULTS

We recorded a total of 155 active nests belonging to 37 species of birds, and 308 nests belonging to 14 social wasp species (Almeida *et al.* 2014). However, we found

only seven nesting associations involving four bird species and four species of wasps (Table 1). *Polybia* was the most frequent wasp genus in the seven associations (71.4%).

Bird nests were on average 0.5 ± 0.4 m distant (max = 1.0 m; min = 0.1 m) from wasp nests, and the associations were recorded in cambarazal edges (n = 5) and in natural grasslands (n = 2). Considering bird nests associated with wasps, only one nest (14.2%), belonging to *Myiozetetes cayannensis* associated to *Polybia sericea*, was successful. The loss of brood was caused by nest abandonment (42.8%) when they were still under construction, and predation (42.8%) (Table 1).

In all cases reported here (n = 7), the wasp nests were positioned above the bird nests, which were on average 2.2 ± 1.6 m from the soil (max = 5.9 m; min = 1.1 m), while the wasp nests were on average 2.9 ± 2.0 m from the soil (max = 6.2 m; min = 1.6 m). In six of the seven associations, the wasp nests were well developed, showing a selection by the birds to nest close to social wasp colonies.

In the second half of October 2011, we found two nesting association attempts made by *M. cayannensis* with *Chartergus globiventris* and *Parachartergus fraternus* simultaneously on the same tree. In the first attempt, the bird was building the nest at about 0.1 m from a nest of *P. fraternus* and 1.9 m from a nest of *C. globiventris*. However, the bird nest was abandoned for unknown causes. Ten days later, the bird started building another nest and at similar distances (about 1 m) between the two wasp nests. However, the nest was again abandoned. It is likely that the birds were attacked by wasps when they build their nests close to the wasp nests. This might have occurred because during the construction of the nests the wasps were not approachable. For *Myiozetetes*, there are association records to *Chartergus* (Sick 1997).

TABLE 1: Species of birds and social wasps in nesting associations at Retiro Novo Farm, Pantanal de Poconé, state of Mato Grosso, from August 2011 to April 2012. DN (m): Distance in meters (m) between the nest of the bird and the nest of the wasp; HA (m): Height of bird nests from the ground; HV (m): Height of wasp nests from the ground; Nest fate: AB = abandoned; PR = preyed upon; SU = successful. Asterisk (*) indicates the nest associated with two wasp colonies.

Bird species	Wasp species	DN (m)	HA (m)	HV (m)	Nest plant support	Nest fate
<i>Paroaria capitata</i>	<i>Polybia sericea</i>	1.0	1.6	1.8	<i>Bactris glaucescens</i>	PR
<i>Myiozetetes similis</i> *	<i>Chartergus globiventris</i>	1.0	5.9	6.2	<i>Vochysia divergens</i>	AB
	<i>Parachartergus fraternus</i>	1.0		6.1		
<i>Myiozetetes cayannensis</i>	<i>Polybia ruficeps xanthops</i>	0.1	1.9	1.9	<i>Licania parvifolia</i>	AB
<i>Myiozetetes cayannensis</i>	<i>Parachartergus fraternus</i>	0.2	1.4	1.8	<i>Erythroxylum anguifugum</i>	AB
<i>Myiozetetes cayannensis</i>	<i>Polybia sericea</i>	0.4	2.1	2.1	<i>Cissus spinosa</i>	SU
<i>Myiozetetes cayannensis</i>	<i>Polybia sericea</i>	0.1	1.6	1.8	<i>Vochysia divergens</i>	PR
<i>Columbina talpacoti</i>	<i>Polybia ruficeps xanthops</i>	0.5	1.1	1.6	<i>Vochysia divergens</i>	PR

In the present study, we recorded the association of *M. similis* with *C. globiventris* and *Parachartergus fraternus*; as well as of *M. cayannensis* with *P. ruficeps xanthops*, *P. fraternus* and *P. sericea*. In the 2009 breeding season, at the same area of this study, a nest of *Crotophaga ani* (Cuculidae) was observed in association with wasps (M. M. Evangelista, pers. comm.), as well as a nest of *Sporophila collaris* (Thraupidae) and one of *Arundinicola leucocephala* (Tyrannidae) during the breeding season of 2010 (D. Grangero, pers. comm.).

We observed predation of wasp nests by the White Woodpecker *Melanerpes candidus* (Picidae) on a nest of *P. ruficeps xanthops*. On 26 January 2012, at 14:03, seven individuals of this woodpecker attacked a nest located 1.5 m above the water surface amidst the leaves of *Ludwigia* sp. (Onagraceae). While one White Woodpecker was feeding on larvae in the nest, the others birds were vocalizing perched about 10 m from the nest. Each individual remained for about two minutes in the nest, and after the attack of the birds, we found the wasp nest partially destroyed with part of larvae left. On the same day, at 14:40 h, one *M. candidus*, possibly from the same flock, attacked a nest of *P. sericea* located about 40 m from the preyed nest of *P. ruficeps xanthops*. However, the attacks were discontinued. On 5 April 2012, another nest of *P. sericea* on the edge of a cambarazal was preyed upon by *M. candidus*. We also observed that nests of *Synoeca surinama* (n = 2), *P. chrysothorax* (n = 2), *P. ruficeps xanthops* (n = 3), *P. sericea* (n = 2) and *P. jurinei* (n = 1) had predation marks (pecking) made by birds.

DISCUSSION

Nesting associations between birds and social wasps are not due to chance and there are evidences that the birds select their nesting sites near wasp nests (Dejean & Fotso 1995). Recent records of associations between bird nests and wasp colonies in Brazil indicate that the bird and wasp species involved in this relationship are varied and species-rich (Cazal *et al.* 2009, Somavilla *et al.* 2013, Menezes *et al.* 2014, Sazima & D'Angelo 2015, present paper). Further studies may shed additional light on this bird-wasp relationship and its ecological importance.

Despite our low sample size of bird nests associated with wasps, we can conclude that associations with wasps did not prevent predation of bird nests, and this may be related to the variety of predators in the region (Pinho 2005), such as birds (Clark *et al.* 1983), mammals (Wray & Whitmore 1979) and snakes (Oniki 1979, Navarro *et al.* 1992), which explored different environments and layers of vegetation, besides having different predation strategies. In Costa Rica, nests of *Campylorhynchus rufinucha* (Troglodytidae) associated with *Polybia rejecta*

had a greater reproductive success than non-associated wasps (Joyce 1993). In this latter case, the most important predator was the monkey *Cebus capucinus* (Cebidae).

The reduced number of bird species found in association with wasps in the present study corroborates the data presented by Hansell (2000), who stated that this is a rare event. In addition, we suggest that social wasps could not provide the necessary protection against the variety of nest predators in the Pantanal wetlands.

The use of social wasps by White Woodpecker as food was previously recorded in the Paraná River floodplain, Argentina, where the diet of this bird was basically composed of ants (*Acromyrmex* spp.) and wasps (*Polybia scutellaris*) (Patterer *et al.* 2003). Predation on a *Polybia paulista* nest by *M. candidus* was recorded by Sazima (2014), who pointed out that this bird employed a subtle tactic that minimized and latter prevented wasp attacks. Although this species of woodpecker is well known for attacking wasp nests (Sick 1997), our study presents new information about social wasp species preyed by *M. candidus*.

It seems that a great number of bird species are not adapted to withstand numerous stings during an attack on a wasp nest (Raw 1997). However, there are also records indicating that birds are the main predators of wasp nests (Strassmann 1981). In the present study, nevertheless, we noted that birds, especially *M. candidus*, prey upon nests of very aggressive wasps such as *Polybia sericea*.

Social wasp nests were recorded profusely in our studied area (n = 308) (Almeida *et al.* 2014). Thus, wasps may be an additional element in the diet of insectivorous birds, especially woodpeckers (Picidae), which feed mainly on hymenopterans (Sick 1997). In addition, predation of social wasps by birds can play an important role in population dynamics of this insect group, contributing to population control (Henriques & Palma 1998).

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