

## AVIAN PREDATION ON INDIVIDUAL NEOTROPICAL SOCIAL WASPS (HYMENOPTERA, VESPIDAE) OUTSIDE THEIR NESTS

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### INTRODUCTION

Social wasps are common in the Neotropics and their readiness to sting is all too well known. Nonetheless, birds, bats and capuchin monkeys have been reported to attack the nests (Schubart *et al.* 1965, Jeanne 1970, Terborgh 1983). Despite the commonness of both the wasps and their predators, there are few reports of predation on individual wasps away from their nests. Furthermore, those records which exist are questionable because they are based on the remains in regurgitated pellets (Fry 1972) and in gut contents (Schubart *et al.* 1965) rather than on observation of the attack. This indirect evidence leaves some doubt about whether the birds had attacked the wasps inside or away from the nest. The only certain means of knowing where a particular species of bird attacked a wasp is by direct observation, but this method involves a major restriction which is the reliable identification of both the wasp and the bird.

The paucity of information about attacks on wasps outside their nests raises questions about how frequent such predation might be and the species of birds and wasps involved. In order to provide some evidence on these questions, my record of birds' attacks on the wasps are presented here.

### STUDY AREAS AND METHODS

The observations reported here are of attacks on individual wasps which were hunting and foraging. They have been accumulated during some 2,000 hours in the field over a period of 16 years (1976 to 1993). All were made in central Brazil where many species of social wasps and insectivorous birds are found.

Brasilia is located near the region's centre and more than 300 species of birds, many of them insectivorous, have been recorded in the Federal District of Brasília; an area 5,000 km<sup>2</sup> (Antas & Cavalcanti 1988), while, to date I have collected 62 species of social wasps there.

Data were collected at numerous sites around Brasilia and also around the towns of Goiânia and Goiás in Goiás State, and Xavantina in Mato Grosso State which lie, respectively 180 km, 240 km and 480 km south-west and west of Brasilia, and near Patos de Minas in Minas Gerais State which is 380 km to the south of Brasilia. Observations were made in various natural habitats and suburban gardens. The natural vegetation of much of central Brazil is cerrado which ranges from herbaceous savannas to semideciduous forests with ribbons of evergreen forest along the courses of streams (Eiten 1972).

The names of the birds follow Schauensee (1966). The species were identified with the help of the volumes of Schauensee & Phelps (1978), Dunning (1982), Sick (1984) and Antas & Cavalcanti (1988) and the instruction of colleagues. The names of the wasps follow Richards (1978) and Carpenter & Day (1988).

The relatively small number of reliable identifications of social wasps captured by birds (30 of 65) was a result of doubts over identification in the field due to the extreme similarity in appearance of numerous species of wasps. The first stage in the process of identification is knowing which species to expect in a locality. With this knowledge, in many instances a group of visually similar species was identified easily, but sometimes difficulty arose in determining

the actual species of the group which a bird had caught. The flight and appearance of most species of social wasps is relatively characteristic and identification was considered reliable (to my satisfaction) only when the insect had been seen in flight before it was captured by the bird.

## RESULTS

Predation on the wasps outside the nest was observed on 65 occasions, giving an average of only one sighting every 30 field hours. In addition, once a small flycatcher (a species of *Myiarchus*) was stung in the mouth or throat by an unidentified, black wasp (possibly *Polybia ignobilis* or *Epipona tatua*) and the insect escaped.

On 30 occasions both the wasp and the predator were identified (Table 1). The recorded attacks involved 16 species of birds and 18 of wasps. In all the instances that birds attacked wasps the predator caught a live prey and swallowed it. Four of the flycatchers (three of *Tyrannus* and *Gubernetes yetapa*), the two orioles (Icteridae) and the oven-bird (*Furnarius rufus*) spent 10 to 35 s beating each prey on a branch or on the ground and examining it before swallowing, while the Great Kiskadee (*Pitangus sulphuratus*), Burrowing Owl (*Speotyto cunicularia*), Smooth-billed Ani (*Crotophaga ani*), Rufous-tailed Jacamar (*Galbula ruficauda*) and White-eared Puffbird (*Nystalus chacuru*) spent 2 to 5 s

TABLE 1. Records from central Brazil of 30 attacks of 16 species of birds on individuals of 18 species of social wasps outside their nests.

Predator	Wasp species	Locality	Number of observations
<i>Piaya cayana</i> , Cuculidae	<i>Polistes erythrocephalus</i>	Goias GO	
<i>Piaya cayana</i> , Cuculidae	<i>Polybia striata</i>	Goias GO	
<i>Piaya cayana</i> , Cuculidae	<i>Agelaia flavipennis</i>	Goias GO	
<i>Crotophaga ani</i> , Cuculidae	<i>Polistes erythrocephalus</i>	Brasilia DF	
<i>Crotophaga ani</i> , Cuculidae	<i>Polistes versicolor</i>	Brasilia DF	
<i>Guira guira</i> , Cuculidae	<i>Polybia occidentalis</i>	Brasilia DF	
<i>Speotyto cunicularia</i> , Strigidae	<i>Polistes satan</i>	Brasilia DF	
<i>Momotus momota</i> , Momotidae	<i>Brachygastra moebiana</i>	Goias GO	
<i>Galbula ruficauda</i> , Galbulidae	<i>Polybia ignobilis</i>	Goias GO	
<i>Galbula ruficauda</i> , Galbulidae	<i>Polybia quadricincta</i>	Goias GO	
<i>Galbula ruficauda</i> , Galbulidae	<i>Polybia fastidiosuscula</i>	Goias GO	2
<i>Galbula ruficauda</i> , Galbulidae	<i>Epipona tatua</i>	Goias GO	1
<i>Galbula ruficauda</i> , Galbulidae	<i>Agelaia vicina</i>	Goias GO	4
<i>Galbula ruficauda</i> , Galbulidae	<i>Agelaia multipicta</i>	Goias GO	1
<i>Nystalus chacuru</i> , Bucconidae	<i>Polybia ruficeps</i>	Xavantina MT	
<i>Nystalus chacuru</i> , Bucconidae	<i>Chartergus globiventris</i>	Goias GO	
<i>Colaptes campestris</i> , Picidae	<i>Polistes lanio</i>	Brasilia DF	
<i>Colaptes campestris</i> , Picidae	<i>Polybia occidentalis</i>	Brasilia DF	
<i>Furnarius rufus</i> , Furnariidae	<i>Polybia occidentalis</i>	Goias GO	
<i>Furnarius rufus</i> , Furnariidae	<i>Metapolybia cingulata</i>	Goias GO	
<i>Gubernetes yetapa</i> , Tyrannidae	<i>Synoecca surinama</i>	Patos de Minas MG	
<i>Pitangus sulphuratus</i> , Tyrannidae	<i>Polybia occidentalis</i>	Brasilia DF	
<i>Tyrannus melancholicus</i> , Tyrannidae	<i>Polybia occidentalis</i>	Brasilia DF	
<i>Tyrannus melancholicus</i> , Tyrannidae	<i>Polybia fastidiosuscula</i>	Patos de Minas MG	
<i>Tyrannus albogularis</i> , Tyrannidae	<i>Polybia ruficeps</i>	Xavantina MT	
<i>Tyrannus savana</i> , Tyrannidae	<i>Polybia occidentalis</i>	Brasilia DF	
<i>Tyrannus savana</i> , Tyrannidae	<i>Polybia ruficeps</i>	Brasilia DF	
<i>Gnorimopsar chopi</i> , Icteridae	<i>Polybia occidentalis</i>	Goias GO	
<i>Icterus icterus</i> , Icteridae	<i>Polybia occidentalis</i>	Goias GO	
<i>Icterus icterus</i> , Icteridae	<i>Polybia ignobilis</i>	Goias GO	

beating the prey on a branch. In contrast, the kestrel (*Falco sparverius*), Blue-crowned Motmot (*Momotus momota*), two species of woodpeckers (Picidae), two of the cuckoos (*Piaya cayana* and *Guira guira*) and sometimes the rufous-tailed jacamar and white-eared puffbird appeared to have no difficulty in swallowing the wasps immediately they captured them.

At least one species, the Squirrel Cuckoo (*Piaya cayana*) eats other venomous insects in addition to hunting social wasps. On one occasion a squirrel cuckoo hunted systematically through guava trees from which it gleaned and ate more than a dozen larvae of the notorious arctiid moth *Eupseudosoma involutum* (Sepp). The venom of this caterpillar is so strong that if its hairs touch the skin of an adult person the pain is severe and often the person suffers from delirium for several hours.

In addition to the observations on predation on individual wasps outside the nest, two attacks were recorded on nests. Once a kestrel (*Falco sparverius*) opened a nest of *Polybia occidentalis* near the town of Goiânia, and a lined woodpecker (*Dryocopus lineatus*) discovered and opened a nest of *Metapolybia cingulata* which was attached to the trunk of a tree near the town of Goiás. On each occasion, the bird ate some adult wasps and much of the brood while many wasps flew about and seemed to have no means of defending the colony.

The only other occasions observed of wasps being attacked by predators were two unidentified species of robber-flies (Asilidae) which pounced on adult wasps which had alighted on a leaf or a flower and immediately sank the sharp proboscis into the victim's body. The wasps included four individuals of *Polybia ignobilis* and one of *Synoeca surinama*. In addition to the direct observations of predators capturing wasps, on two occasions the remains of night wasps, *Apoica pallens* were discovered in the pellets of Burrowing Owls (*Speotyto cunicularia*).

## DISCUSSION

Two aspects of the above observations are worthy of comment. Firstly, predation by birds on Neotropical social wasps is considered to be uncommon. Secondly, there appears to be a greater number of species of birds which occa-

sionally take social wasps which are away from their nests than those which attack a colony.

Very few attacks were seen in relation to the large numbers of wasps and birds which were encountered during many hours in the field. Furthermore, the wasps which were seen to be attacked are among the more common species of the region (though records of this nature might be expected). Most previous reports of social wasps outside the nest being the prey of birds have been based on the questionable evidence of items that the birds had ingested (Fry 1972, Schubart *et al.* 1965).

Possibly the scarcity of attacks is due to the ability of social wasps to defend themselves so that relatively few species of birds are able to ingest them. Similarly there seem to be few avian attacks on caterpillars of the family Arctiidae (which includes the Ctenuchinae). Many species of moths of this family sequester alkaloids from their host plants which results in the caterpillar being impalatable to potential predators (Watson 1975). An additional variable to be considered in gaining an understanding of avian predation on noxious insects is the ability of individual birds to learn how to process a prey item prior to ingestion. Such behaviour results in big differences in the species of insects taken — even among individuals of a particular species of bird. Sometimes a bird learns to recognize particular types of insects and is able to manipulate the prey so as to avoid the insect's defense system (Brown & Vasconcelos 1976). A bird can also learn to recognize a particular sex of an insect species. For example, one White-throated Kingbird (*Tyrannus albogularis*) caught and ate numerous ♂ of the solitary bee (*Epicharis melanoxantha* Moure), but was never seen to capture a ♀ though the males have a faster, erratic flight (Raw 1992, in press).

Despite their ability and willingness to defend their nests, sometimes the colonies of wasps are preyed on. My two records of attacks on their nests confirm published reports of attacks by raptors and woodpeckers. The Red-throated Caracara (*Daptrius americanus*) (Skutch 1959, Sick 1984: 219) and the Grey-headed Kite (*Leptodon cayanensis*) (Sick 1984: 219) are reported to be specialist predators on the colonies of social wasps and take the brood, but I have not seen them take wasps in central Brazil. In São Paulo

State the White Woodpecker (*Leuconerpes candidus*) opens nests of *Polybia* species to eat the brood (Hempel 1949).

With my observations a total of six species have been reported to attack the colonies of Neotropical social wasps, while 16 species have been observed taking wasps outside the nest. These findings raise the question that, if a bird is able to ingest a social wasp then why does it not attack the wasp's nest? One possibility is that there might be a few specialist predators which are adapted to withstand the numerous stings which a bird might sustain during an attack on a nest, whereas a greater number of species might withstand an occasional sting when taking individual wasps as a part of the diet. At present it is not possible to answer the question because it is not known how much the bias in the available data is a result of the lack of observers capable of identifying both the birds and the wasps. Nonetheless, it is easier to discover an attack on a nest than one on a lone insect which is hunting or foraging so it is doubtful that the lack of information is due, simply to a lack of observation.

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