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NEST ASSOCIATES AND COLONY TREES OF THE RED-RUMPED CACIQUE (*CACICUS HAEMORRHOUS*, ICTERIDAE)

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Aves e árvores associadas às colônias do Guaxe (*Cacicus haemorrhous*, Icteridae).

Key words: *Cacicus haemorrhous*, *Pachyramphus*, Red-rumped Cacique, Atlantic forest, Brazil, protective nest association.

INTRODUCTION

Nest predation is one of the most important causes of nesting failure in birds (Martin 1995, Duca & Marini 2008). To protect their nests against predators, birds adopt an impressive array of strategies. For example, protective nesting associations or the exploitation of nest defense behavior of another aggressive species are widespread among birds. In a recent review, Quinn & Ueta (2008) identified 92 protected associate species in nine avian orders all over the world, but suspected that many more associations remain to be discovered, especially in the tropics. Passerine birds are among the most common 'protected' species, while Charadriiformes and Falconiformes, together with several wasp species, belong to the most common 'protective' species (Quinn & Ueta 2008).

Coloniality is another well-known anti-predator strategy adopted by birds (Lack 1968). However, coloniality has its drawbacks because it is not equally effective against all potential predators, and the aggregation of many individuals and nests in a restricted area may attract the attention of predators (Wittenberg & Hunt 1985). As a consequence, it is not uncommon for colonial birds to adopt additional protective strategies, such as the selection of safe sites to establish their colonies. Colonial nesting icterids (Icteridae) of the neotropical forests are good examples. Their colonies may congregate dozens of nests and usually attract a variety of predators, from snakes to birds and monkeys (Robinson 1985, Duca & Marini 2004). In the Peruvian Amazon, colonies of Yellow-rumped Caciques (*Cacicus cela*) placed in lake islands or near wasp nests are relatively safe from predators (Robinson 1985). Similarly, at Parque

Estadual do Rio Doce, aproximately 800 km north of the study site, Duca & Marini (2008) found that colonies of Red-rumped Caciques (*Cacicus haemorrhous*) established in swamp areas presented higher nest survival than colonies in forest or in lake margins.

Here I report on the nesting associations involving Crested and Chestnut-crowned Becards (*Pachyramphus validus* and *P. castaneus*, respectively) and colonies of Red-rumped Caciques in an Atlantic forest reserve in southeastern Brazil. Surprisingly, a nesting association in which both protected and protective species are passerines is not common in nature. Only four out of 64 studies surveyed by Quinn & Ueta (2008) reported such a combination. I also explore the possibility that Red-rumped Caciques select a particular tree species to establish their colonies. The protection offered by such trees against predators and the possible existence of learned traditions (i.e., culture *sensu* Laland & Janik 2006) in the selection of nesting sites by Red-rumped Caciques are discussed.

Red-rumped Cacique is a colonial nesting icterid occurring in forested habitats of the Amazon and in the Atlantic Forest in southeastern Brazil, northern Argentina, and eastern Paraguay (Jaramillo & Burke 1999). Three races are recognized: *haemorrhous* in the Guianas, northern Brazil, southeastern Venezuela, and eastern Colombia, *pachyramphus* in the Amazon basin of Brazil and along its southern tributaries, and *affinis* in southeastern Brazil, northern Argentina, and eastern Paraguay (Jaramillo & Burke 1999). Colonies of Red-rumped Caciques are established in the same trees year after year. At each breeding season, new pouch-like nests are constructed, while old nests gradually decay. Colonies may be located close to wasp nests, and they may also form mixed colonies with other icterids, such as Yellow-rumped Cacique and oropendolas (*Psarocolius* spp.) (Feekes 1981, Jaramillo & Burke 1999).

METHODS

I searched for colonies of Red-rumped Caciques from 1993 to 2000 during regular visits made to Parque Estadual Intervales (PEI), more specifically to the Carmo Research Station located at 700 m a.s.l.. PEI is a 490 km^2 reserve that forms, with adjacent reserves, one of the largest blocks of well preserved Atlantic forest in southeastern Brazil. Extensive areas of old-growth forest (*sensu* Clark 1996) surround the study site. The vegetation is composed of Atlantic rain forest (*sensu* Morellato & Haddad 2000), with trees reaching up to 30 m, and patches of second growth vegetation near human settlements and along the margins of dirt roads. A dry-cold season occurs from April to August (winter), and a wet-hot season from September to March. The annual mean temperature is c. 17ºC (range 4–38°C), the annual precipitation is 1600 mm per year.

Colonies were monitored from September to January, which corresponds to the period during which they were active (Pizo pers. observ.). At each colony we recorded the tree species, tree height (visually estimated) and diameter at breast height (DBH), the number of active cacique nests, and the presence of nest associates. I visually estimated the distance from the nests of associate species to the nearest active cacique nest.

RESULTS

I found seven cacique colonies, six of which were established in *Piptadenia gonoacantha* (Leguminosae, Mimosoideae) trees ranging from 8 to 17 m height (12.5–67.8 cm DBH). The other tree species, with only three cacique nests, could not be identified.

Each colony had from two to 21 active cacique nests. All but two of the colonies had associated nests of either Crested or Chestnut-crowned Becards; two of them had both

at the same time. The two colonies with no nest associated were the smallest ones, with only two and three active cacique nests. The largest of the colonies was monitored during four years; in all of them the colony had nests of at least one of the associate species. The becards differed in the location of their nests within the crown of the colony tree, but maintained an apparently safe distance from the nearest active cacique nest. Nests of Crested Becards were more at the centre of the crown, 5.4 ± 2.8 m (range 2–10 m, n = 5) from the nearest cacique nest, while Chestnut-crowned Becards placed their nests at the extremities of the crown, 6.0 ± 2.2 m (range 4–10 m, n = 5) from the cacique nest. The greatest distances from cacique nests were recorded for nests placed in trees situated by the side of the colony tree (one record for each of the associated species). In total I found five nests of each becard species associated with cacique colonies, and only two nests of each species away from such colonies.

I did not observe any agonistic interactions involving caciques and the nest associates, but extensive observations were not made. In one colony with nests of the two becard species, however, I saw Crested Becards robbing nest material from the nest of Chestnut-crowned Becards.

DISCUSSION

Protective nesting associations have already been recorded for tyrant flycatchers, more commonly involving wasp nests, but associations with cacique species as reported here have also been observed elsewhere. Five out of seven cacique colonies at Rio Doce had associated nests of tyrant-flycatchers (Great Kiskadee *Pitangus sulphuratus*, White-throated Kingbird *Tyrannus albogularis*, Streaked Flycatcher *Myiodynastes maculatus*, and Piratic Flycatcher *Legatus leucophaius*; Duca & Marini 2004). Streaked Flycatcher and, to a lesser extent, Great Kiskadees are common birds at the study site (Vielliard & Silva 2001) but were not observed nesting in association with cacique colonies. On the other hand, Crested and Chestnut-crowned Becards occur at Rio Doce (Augusto Alves, pers. com. 2008) but were not recorded nesting at cacique colonies (Duca & Marini 2004).

Although attracting a variety of nest predators, cacique species adopt a series of anti-predator behaviors that are apparently effective in driving nesting predators away from their colonies (Feekes 1981, Robinson 1985). Therefore, cacique colonies may constitute a relatively safe nesting site for other nesting birds, which makes me believe that the becards acted primarily as protected species while caciques were the protective species. Such a distinction may not be so straightforward, however, because tyrant flycatchers are known to act as protective species for a variety of bird species (Skutch 1997). Duca & Marini (2004), for instance, observed a White-throated Kingbird attacking a hawk in a cacique colony, thus defending its own nest, and indirectly the cacique nests. Protective nest associations, however, are not always beneficial, but may involve costs for both protected and protective species. The most common cost for protected species is predation upon adults and eggs by the protective species (Quinn & Ueta 2008). I did not observe the caciques harassing the becards, but my observations on the birds' behavior were not extensive. The only cost I observed involved the two protected species in the form of piracy of nesting material, a kind of cost not mentioned by Quinn & Ueta (2008) in their review.

Regarding the selection of colony trees, the observations available indicate great geographical variability. At the Manaus region, *C. h. pachyramphus* choose *Peltogyne* trees (Leguminosae, Faboideae) to establish their colonies, supposedly because the slender,

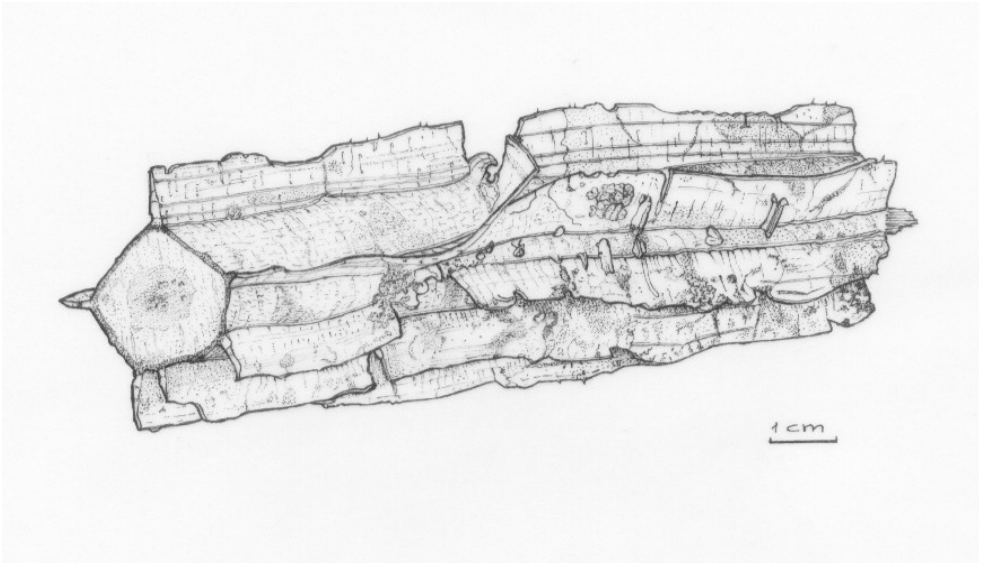

FIG. 1. A section of a branch of *Piptadenia gonoacantha* showing the conspicuous blade-like crests with tiny spines growing lengthwise along the branch.

smooth trunk of such trees deter predators (Oniki & Willis 1983). Based on 30 nest trees of *C. h. haemorrhous* surveyed in Suriname, Feekes (1981) found that birds are not selective in relation to the nesting trees. Similar result was found for the Rio Doce population where the seven colonies of *C. h. affinis* monitored were established in six different tree species (Duca & Marini 2004). At PEI, however, I believe that birds actively choose *Piptadenia* trees to establish their colonies. Although the abundance of *Piptadenia* in relation to other tree species is unavailable for the study area, I do not think that this is an especially common tree. For instance, Nascimento (1994) found no *Piptadenia* in ten 7.5x11.25 m plots set 8 km from the study site. *Piptadenia* have small spines bore in blade-like crests that grow lengthwise along the young trunk and branches (Fig. 1). This feature might act to prevent the access of potential nest predators to cacique nests, but I have seen capuchin monkeys walking along and toucans perched on *Piptadenia* branches with no apparent annoyance. No observation is available regarding the use of *Piptadenia* trees by snakes, another potential predator of cacique colonies. Therefore, the protection (if any) offered by *Piptadenia* trees against potential nest predators of cacique colonies is still unclear.

The geographical variability noted above in the selection of a particular tree species for the establishment of colonies, both among and within cacique subspecies, offers an opportunity to investigate the role played by culture as a driver of such selection. Even though the selection of colony trees may be governed by ecological (e.g., the putative protection against predators) or genetic drivers (possibly leading to differences among subspecies), this did not preclude the occurrence of learned traditions determining not only the selection of colony trees itself, but also the tree features selected (Laland & Janik 2006).

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