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ARTICLE

Bee in the nose: raptors let or let not stingless bees enter their nostrils

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ABSTRACT: Relationships between birds and social insects include birds following ants, birds nesting close to active colonies of wasps or bees, and nesting inside termitaria. A little known relationship between birds and colonial insects is that of stingless bees (Meliponina) entering the nostrils of hawks and owls. Herein I report on a stingless bee entering the nostrils of the Roadside Hawk (*Rupornis magnirostris*), and on avoiding behaviours displayed by the same hawk species and a Burrowing Owl (*Athene cunicularia*) in presence of stingless bees hovering in front of their faces. The bees probably were seeking mucus inside the raptors' nostrils, as already reported for a few birds of prey. Avoiding behaviour seems a novelty in this relationship between raptors and bees. The role stingless bees play in the lives of some bird species remains little known, and merits closer attention by field ornithologists and apidolologist.

KEY-WORDS: *Rupornis magnirostris*, *Athene cunicularia*, Meliponina bees, mucus foraging, avoiding behaviour.

INTRODUCTION

The relationships between birds and social insects include birds that follow ants, birds that nest on branches close to active colonies of wasps or bees, and birds that nest inside active or vacant termitaria (Myers 1935, Willis & Oniki 1978, Brightsmith 2000, Quinn & Ueta 2008, Sazima & D'Angelo 2015. A little known relationship between birds and colonial insects is that of stingless bees (Meliponina) entering the nostrils of hawks and owls to take mucus (Lobato *et al*. 2007). However, this relationship remains little known and I am unaware of any reference on the subject other than the short report by Lobato *et al*. (2007) and a brief mention of this raptor-bee relationship based on claims by indigenous people in Northern Brazil (Santos & Antonini 2008). Therefore, I report herein on a stingless bee entering the nostrils of the Roadside Hawk (*Rupornis magnirostris*), and on avoiding behaviours displayed by the same hawk species and a Burrowing Owl (*Athene cunicularia*) in presence of stingless bees hovering in front of their faces.

METHODS

I recorded two encounters of stingless bees with hawks at an urban recreational park (22°48'42"S, 47°04'26"W, 587 m a.s.l) in Campinas, São Paulo, Southeastern Brazil, on 19 November 2007 and 22 February 2015 at midmorning (8:59 and 9:35 h respectively). Additionally, I recorded an encounter of a stingless bee with an owl at the campus of a local university (22°49'23"S, 47°04'01"W, 620 m a.s.l) in Campinas, on 3 January 2010 at late morning (10:32 h). I observed the birds through a 70-300 mm telephoto lens mounted on a camera from a distance of 2-5 m. I used the "*ad libitum*" and "sequence" observational samplings (Altmann 1974), which are adequate to record rare or fortuitous events. Bee's sizes were estimated by enlarging the digital photos to actual measurements of the raptors' bill length taken from museum specimens (3 adult hawks, 1 young owl) and measuring the total length of the insects with a flexible scale directly on the screen. Digital photos of the hawks and the owl interacting with stingless bees are on file in the Museu de Zoologia, Universidade Estadual de Campinas (ZUEC).

RESULTS

One encounter between an unidentified, small (*ca*. 4 mm) Meliponina bee and an adult Roadside Hawk began with the bee hovering in front and above the cere of the bird (Figure 1a), then landing on the left nostril (Figure 1b) and performing brushing movements with its forelegs to scrape what seemed dry mucus. Afterwards, the bee moved to the right nostril (Figure 1c), where it performed

FIGURE 1. A stingless bee (Meliponina) visits the nostrils of an adult Roadside Hawk (*Rupornis magnirostris*). The bee hovers close to the cere (a) and then alights in the left nostril (b); the bee is now in the right nostril (c), and hovers again near the hawk's head (d).

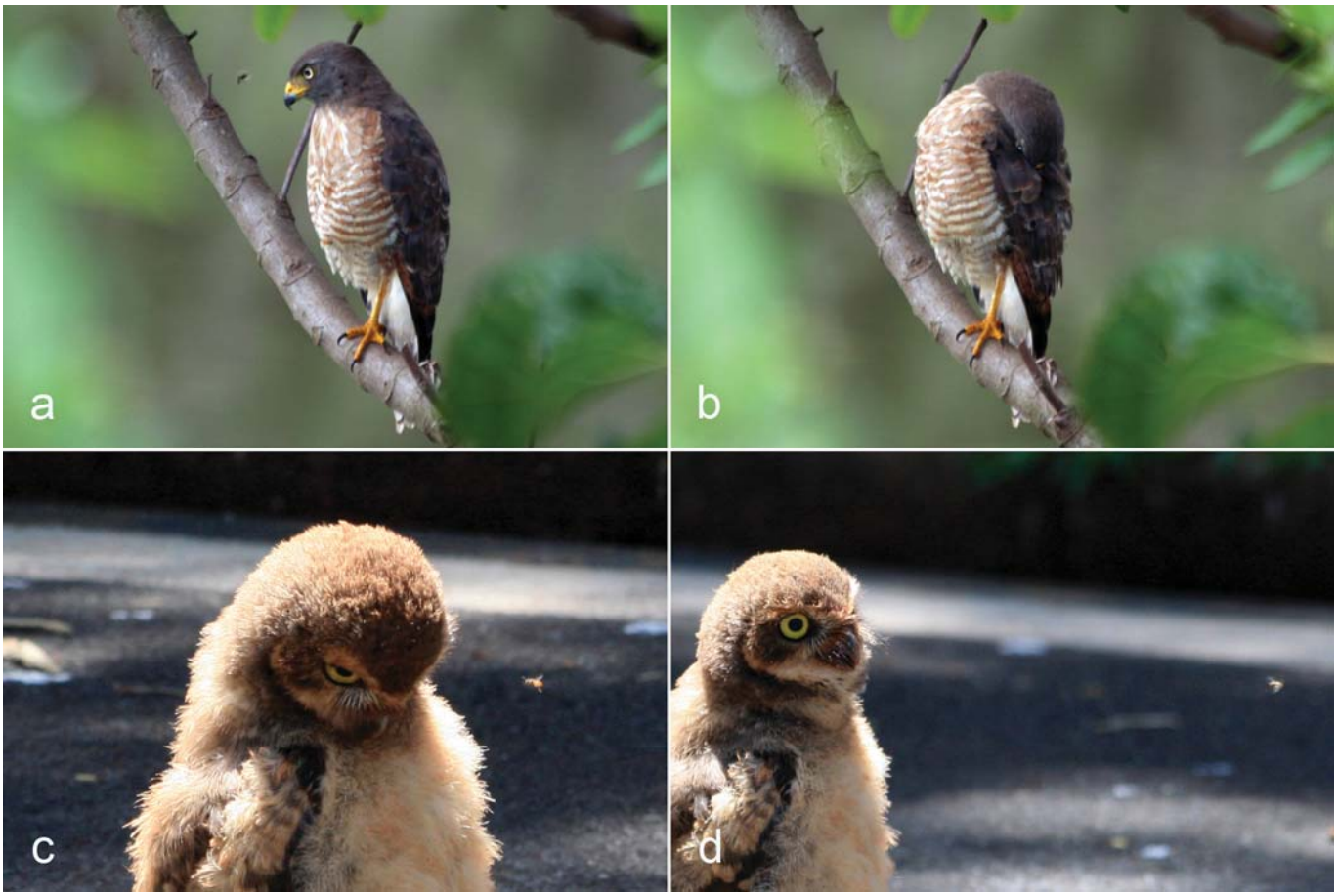

FIGURE 2. Stingless bees (Meliponina) approaching an adult Roadside Hawk (*Rupornis magnisrostris*) and a young Burrowing Owl (*Athene cunicularia*), and the birds' response. Upon noticing the hovering bee (a), the hawk hides most of its bill among the wing coverts (b). The owl watches the bee closely (c), and bill-snaps at the bee, which retreats (d).

similar leg movements. The bee left the nostril and began to hover again near the hawk's head (Figure 1d), but had no opportunity to land because the bird took wing. The interaction lasted *ca*. 1 min.

Another encounter between a larger (*ca*. 10 mm) stingless bee, apparently *Trigona* sp., and an adult Roadside Hawk also began with the bee hovering in front of the bird's head (Figure 2a). Upon noticing the bee, the hawk first lowered its head and then hid most of its bill between the wing coverts (Figure 2b). This behaviour apparently discouraged the bee, which retreated from the proximity of the bird. The interaction lasted *ca*. 1 min.

One encounter between an unidentified, small (*ca*. 5 mm) Meliponina bee and a juvenile Burrowing Owl began with the bee approaching the bird and hovering in front of its head. The bird noticed the bee at once, lowered its head and watched the insect closely (Figure 2c). Then the apparently disturbed owl bill-snapped 2-3 times towards the bee, which retreated (Figure 2d). The interaction lasted *ca*. 30-40 sec.

DISCUSSION

From the three encounters of raptors with stingless bees recorded here, only one adult Roadside Hawk appeared to tolerate, or perhaps even allow, the bee to enter its nostrils and scrap mucus there. Alternatively, instead of letting the bee to enter its nostrils, the hawk could simply be undisturbed with the bee's presence. Since the bird remained in plain view and did not show signs of disturbance due to the observer and two other people standing by, distraction seems an unlikely cause for the hawk's absence of aversive behaviour towards the bee. Whatever the cause, the bee successfully obtained the resource it was seeking and reduced the mucus in the hawk's nostrils. Reduction of secretion in nostrils improve breathing in captive raptors and is viewed as an instance of facultative mutualism between birds of prey and stingless bees (Lobato *et al*. 2007). These authors report on seven species of hawks, including *R. magnirostris*, and two owl species whose nostrils are visited by Meliponina bees to collect mucus as a source of proteins and minerals (Lobato *et al*. 2007). Based on claims of indigenous people in Northern Brazil, Santos & Antonini (2008) mention that a stingless bee species visits the beak and nostrils of captive Harpy Eagle (*Harpia harpyja*) to collect food there. To obtain nutrients or nest material, stingless bees collect the most unusual sources, including carrion, faeces, urine, blood, human sweat, and ashes (Roubik 1982, 1992, Santos & Antonini 2008, IS pers. obs.). Thus, collecting mucus should not come as a surprise for the versatile Meliponina, even if to obtain this material the bees must enter the nostrils of raptors.

The apparent avoidance behaviour displayed by one adult Roadside Hawk (lowering the head and hiding most of the bill) might be related to the larger size of the bee. Although the bee's size would allow it to enter the bird's nostrils, even if partially, its presence there may well be a nuisance to the hawk. Since the hawk was not preening its plumage before or after the bee arrival, its head lowering and hiding the bill was unrelated to this comfort behaviour (Marks *et al*. 1999). The response of the juvenile Burrowing Owl differs from that of the hawk basically by the bird's bill-snapping towards the hovering bee. Similarly, the young owl was not preening its plumage before or after the bee arrival. Bill-snapping (or bill-clapping) is a common response of owls to individual disturbance (Gehlbach 2009), and may partly explain the young bird's reaction towards the bee. Avoidance behaviour seems a novelty in the relationship between raptors and stingless bees (Lobato *et al*. 2007).

In conclusion, it seems that raptors let or let not stingless bees in. The outcome may depend on various circumstances, including the predisposition (or tolerance) of the bird, the bee size relative to the bird, and the apparent disturbance caused by the bee to the bird. The role stingless bees play in the lives of some bird species remains little known, and this relationship ought to be studied both in the field and in captivity (Lobato *et al.* 2007). I suspect that the association of birds and stingless bees is not restricted to raptors, and other bird groups may be involved. Natural history-oriented studies may disclose additional bird species whose nostrils are visited by stingless bees. To detect a tiny bee entering the nostrils of a bird in the field is admittedly a difficult task, but ornithologists and apidologists alike may help to unravel this captivating relationship between birds and bees.

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