

## THE BLACK-GOGGLED TANAGER (*TRICHTHRAUPIS MELANOPS*): AN OCCASIONAL KLEPTOPARASITE IN MIXED-SPECIES BIRD FLOCKS AND ANT SWARMS OF SOUTHEASTERN BRAZIL

Marcos Maldonado-Coelho<sup>1,2</sup> & Renata Durães<sup>1</sup>

Departamento de Biologia Geral, ICB, Universidade Federal de Minas Gerais, Av. Antônio Carlos 6627, 31270-110, Belo Horizonte, Minas Gerais, Brazil.

**Resumo.** – O Tiê-de-topete (*Trichothraupis melanops*): um cleptoparasita ocasional em bandos-mistos de aves e correições de formigas no Sudeste do Brasil. – Cleptoparasitismo é raramente reportado para Passeriformes. Acredita-se que associações intra- e interespecíficas são situações ecológicas que podem favorecer a ocorrência de tal comportamento. Nos neotrópicos, associações de aves em bandos mistos e em torno de correições de formigas são comuns, mas mesmo durante estas associações cleptoparasitismo parece ser raro. O Tiê-de-topete (*Trichothraupis melanops*) é uma espécie frequentemente registrada nestes dois sistemas sociais no Sudeste do Brasil, onde foi observada tentando roubar artrópodes diretamente do bico de outras nove espécies de aves em 15 ocasiões, incluindo um ataque intraespecífico. O voo ágil e o comportamento de forrageio tipo “sallier” apresentado nos bandos-mistos e correições são provavelmente algumas das características que permitem ao Tiê-de-topete roubar presas mesmo de espécies maiores, apesar do fato de que cleptoparasitismo é um comportamento de forrageio infrequente para esta espécie. Algumas das possíveis causas tanto para a ocorrência quanto para a aparente raridade de cleptoparasitismo em associações interespecíficas de aves nas florestas neotropicais são discutidas.

**Abstract.** – Kleptoparasitism rarely has been reported among passerines. One of the ecological situations in which this behavior is believed to be favored is during intra- and interspecific associations. In the Neotropics, assemblies of birds in mixed-species flocks and attending army-ant raids are common, but even in these associations kleptoparasitism seems to be uncommon. The Black-goggled Tanager (*Trichothraupis melanops*) is a species commonly recorded in mixed-species flocks and attending army-ant raids in southeastern Brazil. We observed this species attempting to steal arthropod prey from the bill of nine bird species on 15 occasions, during three years of study, including an intraspecific attack. The flight agility and sallying foraging behavior of the Black-goggled Tanager are probably some of the features that contribute to its ability to steal prey of even larger birds. We discuss some possible causes for both occurrence and apparent rarity of kleptoparasitic behavior in interspecific bird associations in Neotropical forests. *Accepted 5 February 2003.*

**Key words:** Kleptoparasitism, Black-goggled Tanager, *Trichothraupis melanops*, Atlantic forest, Brazil, Mixed-species bird flocks, Ant swarms.

<sup>1</sup>*Current address:* Department of Biology and International Center for Tropical Ecology, University of Missouri-St. Louis, 8001 Natural Bridge Road, St. Louis, Missouri 63121-4499, USA.

<sup>2</sup>*Corresponding author's e-mail:* mmc8v5@studentmail.umsl.edu

## INTRODUCTION

The stealing of food, or kleptoparasitism, has been recorded for a number of bird species, and is particularly common among Falconiformes and Charadriiformes (reviewed in Brockmann & Barnard 1979). In contrast, although most bird species are in the order Passeriformes, the incidence of this behavior seems to be infrequent and sporadic among passerines (but see Kellner & Cooper 1998, Etersson & Howery 2001, Llambías *et al.* 2001). An ecological context that may favor kleptoparasitism is the occurrence of intra- or interspecific associations, because of the concentration of potential hosts in such associations (Brockmann & Barnard 1979). Kleptoparasitism has been recorded in mixed-species flocks in Africa and Asia (Greig-Smith 1978, Herremans & Herremans-Tonnoeyr 1997, Hino 1998, King & Rappole 2001, in press), but is apparently rare among Neotropical species, including those that take part in mixed-species flocks or follow ant swarms, two of the most common social systems in this region (but see Munn 1986, Jullien & Thiollay 1998).

One of the bird species that most frequently forages in mixed-species flocks and follows ant swarms in southeastern Brazilian forests is the Black-goggled Tanager (*Trichothraupis melanops*) (Willis 1986, Willis & Oniki 1992, Rodrigues *et al.* 1994, Maldonado-Coelho & Marini 2000). At some localities in Minas Gerais State, the Black-goggled Tanager has a nuclear role in mixed-species flocks, helping to maintain flock cohesion through frequent vocalizations and conspicuous movements (Maldonado-Coelho 2000, Maldonado-Coelho & Marini 2000). In addition, this species is a flock sentinel, giving alarm calls at the approach of potential predators such as hawk-sized birds and human observers (Maldonado-Coelho pers. observ.).

Here we provide the first reports of klep-

toparasitic behavior by Black-goggled Tanagers while in mixed-species flocks and following ant swarms. We test Brockmann & Barnard's (1979) hypothesis that kleptoparasitism should be more frequent in situations of food shortage by comparing the frequency of this behavior between the dry and rainy seasons. Additionally, since body size has been shown to mediate social dominance in foraging behavior among birds following army-ant raids (Willis & Oniki 1978) and in mixed-species flocks (Alatalo 1981, Alatalo *et al.* 1986, Pierpont 1986, Alatalo & Moreno 1987), we examine whether kleptoparasitic behavior of the Black-goggled Tanager is influenced by host body size. Finally, we discuss some potential ecological causes for the apparent rarity of this behavior in mixed-species flocks in Neotropical forests. Detailed descriptions of mixed-species flocks in our study area are published elsewhere (Maldonado-Coelho & Marini 2000, Maldonado-Coelho & Marini in press).

## METHODS

We conducted this study during rainy (October to January) and dry (May to August) seasons from December 1996 to August 1999 in Atlantic forest fragments at Viçosa (20°50'S, 42°56'W, 650 m a.s.l.) and Belo Horizonte (19°50'S, 43°50'W, 1100 m a.s.l.) Mun., Minas Gerais State, southeastern Brazil. The foraging behavior of the Black-goggled Tanager was recorded in these areas, where flocks (N = 493) and ant swarms (N = 6, *Labidus* sp.) were located and followed along roads and trails in the forest interiors and borders (see details in Maldonado-Coelho 2000, Maldonado-Coelho & Marini 2000). We spent a total of 734 and 609 h following these two types of associations during the rainy and dry seasons, respectively. Once a flock was located, it was followed up to one hour or until lost from sight. Observations at ant

TABLE 1. Records of kleptoparasitism by the Black-goggled Tanager (*Trichothraupis melanops*) in mixed-species bird flocks (ms) and ant swarms (as) during rainy and dry seasons in Atlantic forest of Brazil.

Host species	Number of successful attempts	Number of unsuccessful attempts	Type of social system	Season	Mean body mass (g) $\pm$ SD (N)
Rufous-browed Peppershrike ( <i>Cyclarhis gujanensis</i> )	3	–	ms	dry	28.3 $\pm$ 3.4 (5) <sup>1</sup>
Variable Antshrike ( <i>Thamnophilus caeruleus</i> )	2	1	ms	rainy	20.9 $\pm$ 3.2 (46) <sup>1</sup>
Red-eyed Vireo ( <i>Vireo olivaceus</i> )	2	–	ms	dry	14.3 $\pm$ 1.1 (3) <sup>1</sup>
White-collared Foliage-gleaner ( <i>Anabazenops fuscus</i> )	1	1	ms	rainy	37.8 $\pm$ 2.8 (5) <sup>2</sup>
Sepia-capped Flycatcher ( <i>Leptopogon amaurocephalus</i> )	1	–	ms	dry	11.6 $\pm$ 0.8 (13) <sup>1</sup>
Black-goggled Tanager ( <i>Trichothraupis melanops</i> )	1	–	ms	rainy	22.3 $\pm$ 4.2 (22) <sup>1</sup>
White-shouldered Fire-eye ( <i>Pyriglena leucoptera</i> )	1	–	as	dry	26.1 $\pm$ 1.9 (15) <sup>1</sup>
Red-crowned Ant-Tanager ( <i>Habia rubica</i> )	1	–	as	dry	34.6 $\pm$ 2.0 (15) <sup>2</sup>
Rufous Gnatcatcher ( <i>Conopophaga lineata</i> )	1	–	as	dry	20.6 $\pm$ 3.5 (85) <sup>1</sup>
Total number of observations	13	2			

<sup>1</sup>Data from the authors, gathered mostly in the study areas.

<sup>2</sup>Data provided by R. Ribon (pers. com.).

swarms varied from a few minutes to one hour. In general, a pair of Black-goggled Tanagers was present in each flock and at each ant swarm. We considered a kleptoparasitic attempt to be whenever an individual Black-goggled Tanager attacked another bird of the same or other species that was carrying an insect in the bill. The attempt was considered successful when the prey was seen in the bill of the Black-goggled Tanager after its attack. Even though birds were not banded, observations were recorded in different days and at several forest fragments (N = 7), so we assumed that each kleptoparasitic attempt was carried out by distinct individuals.

## RESULTS

Black-goggled Tanagers were seen stealing

prey from six bird species while associated with mixed-species flocks, and from three different bird species while following ant swarms (Table 1). Fifteen kleptoparasitism attempts, including an intra-specific attack, were observed, of which 86.7% (N = 13) were successful. The number of kleptoparasitic events did not differ statistically between dry (N = 9) and rainy (N = 6) seasons ( $\chi^2 = 0.067$ , df = 1,  $P > 0.05$ ; Yates' correction for continuity). The number of kleptoparasitic attempts was not affected by host size, once that the number of species smaller or larger than the Black-goggled Tanager was similar (Table 1). Thus, kleptoparasitism does not seem to be influenced by size dominance in this species.

The Black-goggled Tanager's usual foraging behavior consists of scanning down and up towards moderately distant foliage while

perched on horizontal twigs. Foraging maneuvers are predominantly sallies (> 90%, N = 266; Maldonado-Coelho unpubl.) of one to several meters to capture arthropods in the air or from the upper and lower leaf surfaces. Kleptoparasitic attempts were all similar: the Black-goggled Tanager watched other flock or ant swarm members carefully, and stole the food directly from their bills. The theft was always on the wing, and occurred immediately after host birds caught an arthropod from a substrate (air, leaves, twigs, or ground). We did not observe any reaction of host individuals to the attacks.

## DISCUSSION

Ecological conditions that could favor the evolution of kleptoparasitism in birds include the following: (1) large concentration of hosts, (2) large quantities of food, (3) high-quality food items, (4) predictable food supply, (5) visible food, and (6) food shortage (Brockmann & Barnard 1979). Of these, conditions 1, 3, 5, and 6 could possibly help to explain the occurrence of kleptoparasitic behavior in the Black-goggled Tanager. In relation to the first condition (large concentration of hosts), several individuals regularly forage together in mixed-species flocks and ant swarms, providing ecological opportunities for food stealing. Even though we do not have information to test the third condition (high-quality food items), it is possible that the Black-goggled Tanager only engages in kleptoparasitism when the prey captured by the host is large enough to compensate the effort of an attack. Although it was not possible to identify all prey items stolen, circumstantial evidence supporting this idea is that two were a large lepidoptera larvae and a cicada. Large prey items are also likely to be more visible (condition 5). In addition, other characteristics that would increase prey visibility and favor kleptoparasitism by this spe-

cies are the wide visual field provided by its flycatcher-like behavior and its central position in mixed-species flocks and ant swarms. In ant swarms, its central position can be related to the absence of dominant bird species in this foraging system in southeastern Brazil, which allows nonprofessional species (e.g., Black-goggled Tanager) to move towards the center of this association (Willis & Oniki 1978). Perching behavior on sites that allow monitoring flockmates seems to favor kleptoparasitism in at least one another species (the Greater Racket-tailed Drongo; King & Rappole in press). Lastly, although some studies show that arthropod biomass in Atlantic forest is largely reduced during the dry season in comparison to the rainy season (e.g., Davis 1945, Develey & Peres 2000), the similar frequency of kleptoparasitic attempts during the dry and the rainy seasons does not seem to support Brockmann & Barnard's (1979) hypothesis that this behavior should be more frequent during periods of food shortage (condition 6). This differs from Herremans & Herremans-Tonnuyer's (1997) observation that kleptoparasitism among Fork-tailed Drongos (*Dicrurus adsimilis*) is more frequent in southern Africa during the coolest and driest periods, than during the wet and hot summer months. However, the number of observations in the present study is small for such a comparison and needs to be interpreted carefully.

An important feature that possibly allows Black-goggled Tanagers to steal food even from larger bodied birds is their flight agility, a characteristic that might be considered a pre-adaptation for kleptoparasitic behavior (see Brockmann & Barnard 1979). Indeed, sallying behavior, characteristic of the Black-goggled Tanager, seems to be a common strategy among kleptoparasite species in mixed-species flocks, both in Neotropical (Munn 1986, Jullien & Thiollay 1998) and Paleotropical (Herremans & Herremans-Ton-

noyer 1997, Hino 1998) regions. Similarly, Munn (1986) suggested that the fast flight of Bluish-slate Antshrike (*Thamnomanes schistogynus*) allows it to steal arthropods flushed or actually captured by other birds in Amazonian mixed-species flocks. Willis (1986) and Willis & Oniki (1992) suggested that Black-goggled Tanager's flight agility allows it to attack larger bird species, e.g., White-shouldered Fire-eye (*Pyriglena leucoptera*), when following army-ant swarms in southern Brazil.

As pointed out above, the aggregation of several individuals in mixed-species flocks and at ant swarms might provide an ecological opportunity favoring the occurrence of kleptoparasitism (Brockman & Barnard 1979). This behavior has been documented in mixed-species flocks in African wooded grasslands, in Madagascar's dry forests, and in Asian dipterocarp forests, where passerine birds of the genus *Dicrurus* were seen several times stealing prey from other flock species (Greig-Smith 1978, Herremans & Herremans-Tonnoeyr 1997, Hino 1998, King & Rappole 2001, in press). On the other hand, although mixed-flocks and ant-swarms are two of the most common types of social systems in Neotropical forests (Willis & Oniki 1978, 1992; Powell 1985), kleptoparasitism seems surprisingly rare in this region. The only records we are aware of besides our study are provided by Munn (1986) and Julien & Thiollay (1998), who report that nuclear species of Amazonian canopy and understory mixed-species flocks (*Lanius* spp. and *Thamnomanes* spp.) steal prey flushed by other flock species by giving false alarm calls to deceive and distract them. Nevertheless, the Black-goggled Tanager's strategy of stealing food directly from the bill of other birds seems to be uncommon among these species (see also Herremans & Herremans-Tonnoeyr 1997).

One of the potential causes of the apparent rarity of kleptoparasitism in Neotropical

forests could be that many flocking and ant-swarm following individuals conceal themselves while handling prey, which makes them less visible to potential parasitic species. In addition, Paulson (1985) highlights the importance of visibility of parasites for kleptoparasitism. He suggests that this behavior is less common in woodlands when compared to more open habitats, although he also acknowledges that this may be due to human observers overlooking such behaviors due to the reduced visibility in these habitats. The fact that most kleptoparasitism records in mixed-species flocks have been done in dry forests and more open habitats is consistent with this hypothesis (Greig-Smith 1978, Herremans & Herremans-Tonnoeyr 1997, Hino 1998, King & Rappole 2001). It would be interesting to objectively test whether kleptoparasitism is more common in mixed-species bird flocks in dry and more open habitats than in humid and more closed forests, or if this apparent trend is only an artifact of survey due to the differences in visibility between these habitats.

It should be stressed that kleptoparasitism seems to be an uncommon behavior for the Black-goggled Tanager, because the frequency of thefts is small in relation to the total number of foraging maneuvers (5.6%,  $N = 266$ ; Maldonado-Coelho unpubl. data). It would be worthy to compare the frequency of kleptoparasitism observed for the Black-goggled Tanager with those recorded for other flocking species across different regions, but unfortunately this is not possible due to the lack of detailed and quantitative information in these studies. However, kleptoparasitism by Black-goggled Tanagers is exceptional in that none of the other species (approx. 90) recorded in flocks and ant swarms in the study areas were recorded engaging in this behavior despite more than 1300 observation hours. It would be interesting to assess whether individual Black-goggled Tanagers across populations

along their geographic range engage in kleptoparasitism, and whether this behavior occurs with the same low frequency observed in the two studied populations, in order to evaluate if this is a stereotypical behavior for this species (*sensu* Sherry 1990). Since the frequency of stealing maneuvers by Black-goggled Tanagers is small, the only apparent cost to other species in associating with them in mixed-species flocks is the occasional loss of prey. Conversely, these species likely benefit from their sentinel behavior (Maldonado-Coelho & Marini 2000).

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