



A REVIEW OF ANTI-PREDATOR DISTRACTION DISPLAYS BY BIRDS OF THE FAMILY CONOPHAGIDAE, WITH THE FIRST PHOTOGRAPHIC DOCUMENTATION FOR THE RUFIOUS GNATEATER (*CONOPHAGA LINEATA*)

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Abstract · Neotropical forest birds in the family Conopophagidae are known to perform anti-predator distraction displays, but such behaviors are seldom mentioned in studies of reproduction. To address this knowledge gap, we compiled published information on the anti-predator displays of species in the family. We found 13 studies that punctually report this behavior, all for species in the genus *Conopophaga*. In addition, we provide a new record of an adult male Rufous Gnateater (*Conopophaga lineata*) performing such a behavior in a natural area located near the city of São Paulo in southeastern Brazil. This bird was observed performing the “broken-wing” display, seemingly intending to protect a fledgling. While apparently common in *Conopophaga*, there have been no specific studies addressing anti-predator distraction displays of Neotropical forest birds.

Resumo · Uma revisão do comportamento de distração anti-predador das aves da família Conopophagidae, com a primeira documentação fotográfica para o chupa-dente (*Conopophaga lineata*)

O comportamento de distração anti-predador é conhecido para as aves neotropicais da família Conopophagidae e raramente mencionado em estudos de reprodução. Para melhorar essa lacuna, compilamos dados publicados sobre as espécies da família. Encontramos 13 estudos que relatam pontualmente esse comportamento em espécies do gênero *Conopophaga*. Além disso, relatamos um registro de campo para um macho adulto do chupa-dente (*Conopophaga lineata*), em uma área natural localizada próximo à cidade de São Paulo, sudeste do Brasil. Este pássaro foi observado fazendo uma exibição de “asa quebrada” aparentemente com a intenção de proteger um filhote. Embora aparentemente comum em *Conopophaga*, não há estudos específicos que abordem as exibições de distração anti-predadores de pássaros de florestas neotropicais.

Key words: Atlantic forest · Behavior · Natural history

INTRODUCTION

Anti-predator distraction displays are defensive behaviors observed in various groups of birds, intended to protect the nest or offspring (Armstrong 1954, Barrows 2001). Several types of distraction behaviors are known for birds, including the “broken-wing” display. This display is performed by adults of a variety of species, mainly in the families Charadriidae and Scolopacidae, which simulate having “broken wings” by dragging them on the ground (Deane 1944, Gochfeld 1984). This behavior is also known for the genus *Conopophaga*, comprising nine small insectivorous species of the Neotropical family Conopophagidae (gnateaters; Humphreys & Ruxton 2020), although most of the species are poorly studied in this regard (Whitney 2003, Winkler et al. 2021). In a review of gnateaters, Greeney (2018) mentions “distraction” and “injury feigning” displays for five species (*Conopophaga melanops*, *C. aurita*, *C. peruviana*, *C. lineata*, and *C. castaneiceps*), while the Birds of the World data platform cites this behavior for only two species in the family (*C. lineata* and *C. aurita*; Winkler et al. 2021). Terms used to refer to anti-predator distraction behaviors of species of this family include “broken-wing”, “bird flapping wings” or “injured bird.”

To better describe anti-predator distraction displays exhibited by species in the family Conopophagidae, we compiled original records of such displays in the literature and present additional observations of a “broken-wing” display performed by an adult Rufous Gnateater (*Conopophaga lineata*) in southeastern Brazil. We also include color photographic documentation of the fledgling's juvenile plumage since there are few descriptions of juvenile plumage in gnateaters (e.g., Willis et al. 1983; Greeney 2018), with only one previously published black-and-white picture.



Figure 1. Geographical location of Ilha dos Eucaliptos, Southeast Brazil. Source: Google Earth (image Landsat /Copernicus 2015).



Figure 2. Ilha dos Eucaliptos, in the central part of the Guarapiranga reservoir, São Paulo, SP. Photo: Fabio Schunck.

METHODS

Literature review. Searches were carried out through Web of Science, Scopus, and Google digital databases (accessed to 2020) using the following combinations of keywords in Portuguese and English: “broken-wing display”, “avian distraction displays”, “reproduction”, “behavior”, “Gnateater”, “*Conopophaga*”, “*Antpitta*”, “*Pittasoma*”, and “Conopophagidae.” A manual search of original works not available in digital media, but accessible in scientific libraries, was also performed for species of *Conopophaga* occurring in Brazil. The

online ornithological data platforms WikiAves (<https://wikiaves.com.br>) and eBird (<https://ebird.org>) were also consulted (July 2020).

Field data. Field data was collected between December 2017 and June 2019 on Ilha dos Eucaliptos (23°44′2.94″S, 46°44′1.55″W; 739 m a.s.l.), a 32 ha island in the Guarapiranga reservoir, south of the city of São Paulo in southeastern Brazil (Figure 1). The island was designated as a park (Parque Ilha dos Eucaliptos) in 1999, but legal implementation never occurred, leaving it as a permanent protection area. The is-

Table 1. Data available in the literature on “anti-predator distraction” displays for the genus *Conopophaga*. Asterisks indicate that the information is probably a repetition of the original work.

Type of behavior	Species	Locality /country	Date	Author
Injured bird	Black-cheeked Gnateater	Not informed (possibly Rio de Janeiro, Brazil)	Not informed	Sick 1964
Injured bird	Family Formicariidae (which included the current family Conopophagidae)	Not informed	Not informed	Sick 1985*
Injured bird	Chestnut-belted Gnateater	Amazonas, Brazil	February 8, 1974	Willis 1985
Flapping wings	Chestnut-crowned Gnateater	Rio Anchicayá Valley, Colombia	1972 and 1973	Hilty 1975
Flapping wings	Rufous Gnateater	São Paulo, Brazil	Winter of 1976; Summer of 1977-1978	Willis et al. 1983
Broken-wing	Rufous Gnateater	Rio Grande do Sul, Brazil	December 20, 1974	Belton 1985
Broken-wing	Rufous Gnateater	Rio Grande do Sul, Brazil	not informed	Belton 1994* <i>in</i> Marini et al. 2007
Broken-wing	Rufous Gnateater	Minas Gerais, Brazil	1995 to 2000	Marini et al. 2007
Broken-wing	Black-cheeked Gnateater	Paraná, Brazil	October 28, 1986	Straube 1989
Broken-wing	Black-cheeked Gnateater	Rio de Janeiro, Brazil	October 2009 to August 2013	Stenzel & Souza 2014
Broken-wing	Ash-throated Gnateater	Madre de Dios, Peru	November 29, 2000	Hillman & Hogan 2002
Broken-wing	Chestnut-belted Gnateater	Amazonas, Brazil	December 8, 2010	Leite et al. 2012
Not informed	Ash-throated Gnateater	Not informed (possibly Peru)	Not informed	Greeney 2018

**Figure 3.** Male Rufous Gnateater performing the “broken-wing anti-predator distraction” display. Sequence of images: 1, 2, 3 and 4. Photos: Fabio Schunck.

land is mostly covered by native forest remnants of Atlantic forest in middle and advanced stages of succession, as well as a small eucalyptus plantation that occupies about one-fourth of its area (Figure 2). Observations were made in native forest with a 18–20 m high canopy, some isolated and emerging eucalyptus, and a dense understory of shrubs, vines and fallen branches.

Field observations were made of the anti-predator distraction display exhibited by an adult *C. lineata vulgaris*, a species that occurs in southern Brazil and adjacent Paraguay, Argentina, and Uruguay. It is widespread in the state of São Paulo, where it is common in Atlantic forests (Sick 1997, Willis & Oniki 2003). This is a small species (11 cm) that dwells in

the understory, where it feeds on small invertebrates (Willis et al. 1983).

RESULTS AND DISCUSSION

A total of 13 studies, published since 1964, were found to report anti-predator distraction displays for species of Conopophagidae, all of them in the genus *Conopophaga*: the Rufous Gnateater (*C. lineata*), the Black-cheeked Gnateater (*C. melanops*), the Chestnut-belted Gnateater (*C. aurita*), the Ash-throated Gnateater (*C. peruviana*), and the Chestnut-crowned Gnateater (*C. castaneiceps*), the last of which does not occur in Brazil (Piacentini et al. 2015). Two of the



Figure 4. Young Rufous Gnateater with juvenile plumage. Photos: Fabio Schunck.



Figure 5. Male Rufous Gnateater with a spider (Anyphanidae) in its beak. Photo: Fabio Schunck.

sources, Sick (1985) and Belton (1994), repeat the information in Sick (1964) and Belton (1985) respectively (Table 1, Appendix 1). No additional references were found in WikiAves or eBird.

The distraction displays were grouped into three categories: (1) “broken-wing” (six records), (2) “bird flapping wings” (two records), and (3) “injured bird” (two records). The “broken-wing” display was mentioned for the Rufous Gnateater, Black-cheeked Gnateater, Ash-throated Gnateater and the Chestnut-belted Gnateater. Bird “flapping wings” was mentioned for the Chestnut-crowned Gnateater and the Rufous Gnateater, while “injured bird” was reported

for the Black-cheeked Gnateater and the Chestnut-belted Gnateater (Table 1, Appendix 1). The only existing photographic documentation of an anti-predator distraction display for the family Conopophagidae was the “broken-wing” display for the Chestnut-belted Gnateater by Leite et al. (2012).

On 6 January 2018 at around 08:30 h, a male Rufous Gnateater making alarm calls close to the ground (short calls and hisses) drew the attention of researchers. The bird then jumped to the ground, vocalizing and exhibiting a distraction behavior by quickly flapping its wings as it moved away from the observers (Figure 3). This behavior lasted for about five

minutes and only ended when the researchers moved away (about 5 m) from a fledgling sitting on a fallen tree trunk, about 2 m from the displaying male (Figure 4). The adult then foraged about 1 m off the ground, took a small spider (Anyphnidae) and fed it to the young (Figure 5). The observations lasted about 30 minutes, during which time a female was never seen. Although the Rufous Gnateater is common in the island, the distraction display was only observed once during almost two years of monthly field studies. The fledgling could not be further observed as it soon hid among the vegetation.

This review represents a comprehensive set of the original information available on the anti-predator distraction display of species of *Conopophaga*, and it highlights the absence of data for some species. The 11 original reports found in the literature complement the information presented by Greeney (2018), supporting that this behavior, having been first recorded in 1964, is typical of species in the genus *Conopophaga*. Information on anti-predator distraction displays is lacking for four species of *Conopophaga*: the Ceara Gnateater (*C. cearae*), the Hooded Gnateater (*C. roberti*), and the Black-bellied Gnateater (*C. melanogaster*), all endemics of Brazil, as well as the Slaty Gnateater (*C. ardesiaca*).

The “broken-wing” display observed for the Rufous Gnateater on Ilha dos Eucalptos is the first to have a photographic record for this species. The behavior could also have been classified as “bird flapping wings” or “injured bird” because variation in the behavior of individuals allows for different interpretations. This record, together with the report of Willis et al. (1983), are the only cases of anti-predator distraction display for this species associated with the defense of a chick outside the nest; other observations were probably related to the defense of nests (Belton 1985, Marini et al. 2007).

Information regarding the plumage of young Rufous Gnateater individuals is uncommon. Of the 3624 images for the species found on WikiAves, only four were of juvenile plumage, and all were of the same chick (WA 1612774 - Bolochio 2015), which appears to be of similar age to the individual photographed in the present work. The juvenile plumage of the individual reported here is in accordance with the description and a black-and-white photograph provided by Willis et al. (1983), and the description presented by Greeney (2018).

Data available thus far on anti-predator distraction displays for Neotropical forest birds is quite incipient, which suggests that this behavior may not be as common as among species of Charadriidae and Scolopacidae (Humphreys & Ruxton 2020). There are no reports for the two species of *Pittasoma*, which, together with *Conopophaga*, comprise the family Conopophagidae (Winkler et al. 2021). Interestingly, anti-predator distraction displays have not been observed in other families that are sympatric and syntopic with Conopophagidae, such as Thamnophilidae, Grallaridae, or Scleruridae, among others, that occur and nest in the same type of environment.

ACKNOWLEDGMENTS

We are thankful to the Sailing Center nautical marina for the logistical support with boats, in particular Marquinho, Léo, Elias, Luiz, and Osmar. To Rafael Indicatti for identifying the

spider mentioned in the text. To Carlos Bosque, Harold Greeney, and an anonymous researcher for the important final revisions of the manuscript. To Leandro Caetano (ex-coordinator of the Division of Conservation Units in the municipality of São Paulo) for support with aerial images. To Cristiane Gomes for sending some references. To Dione Seripierri, Viviane Neves dos Santos, and the library team at the USP Zoology Museum for help with references. To Paulo Rogerio for finishing the map, and to Bret Whitney for reviewing a previous version of the manuscript and unpublished information. F. Schunck wishes to thank the American Birding Association (<https://aba.org>), in particular Betty Petersen (*in memoriam*) and Liz Deluna Gordon from the Birders' Exchange Program for supporting the field project.

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