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SHORT-COMMUNICATION

A case of beak deformity in the Shiny Cowbird *Molothrus bonariensis* and a review on beak deformities in wild birds in Brazil

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ABSTRACT: Beak deformities in wild birds are rarely reported. Here, I described a case of beak deformity in Shiny Cowbird, *Molothrus bonariensis*, and also provide a review on beak deformities recorded in wild birds in Brazil. In October 2016, I observed a *M. bonariensis* with a grossly elongated maxilla in the east region of the Mato Grosso state, Brazil. The literature review revealed 60 records of beak deformities in the Brazilian avifauna. The most common types of deformity were crossed maxillae or mandibles (38%), probable accidental injuries (27%), and elongations (15%). Deformities were reported in 35 bird species of 22 families. The most affected species was *Ramphastos toco* with 21 records. The number of published reports from Brazil was low overall, and are not related as an epizootic episode recorded in some bird communities.

KEY-WORDS: avian keratin disorder, beak abnormality, bill deformity, crossed beak, elongated beak.

Beak deformities are rarely reported in wild birds, which may be due to the fact that they are infrequent (Pomeroy 1962, Craves 1994). Beak deformities may be either permanent or temporary, and are caused by a range of factors (Pomeroy 1962). The main causes are genetic mutations, injuries (*e.g.*, collisions with windows), diseases, nutritional deficiencies, contact with chemical pollutants (*e.g.*, agricultural pesticides), problems during incubation, and the inadequate wear of the rhinotheca (Pomeroy 1962, Craves 1994).

Most cases of beak deformity are records of isolated cases (Pomeroy 1962, Craves 1994). One notable exception is the case of the wild birds in Alaska, USA, in particular since the 1990s. In this region, beak deformities have been recorded in more than 2500 birds of 30 species (Handel *et al.* 2010, Van Hemert & Handel 2010). Recurrent sightings of birds with deformed beaks were also reported in the United Kingdom in subsequent years (Harrison 2011) and in the Patagonia, Argentina (Gorosito *et al.* 2016). Following these epizootic episodes, considerable research efforts have been invested in an attempt to identify the possible causes of these deformities, known as avian keratin disorder (Handel *et al.* 2010, Van Hemert & Handel 2010, Handel & Van Hemert 2015). The most recent evidence indicates that the deformities observed in Alaska are associated with a viral infection (Zylberberg *et al.* 2018). However, it is still unclear whether this virus is involved in the epizootic episodes recorded in other regions of the world.

In Brazil, despite its extensive geographical area, there has been little research on the occurrence of beak deformities in wild birds, and few cases have been reported (Sazima *et al.* 2016, Souza *et al.* 2016). In the present study, I described, most probably, the first report of a case of a beak deformity in a Shiny Cowbird *Molothrus bonariensis* for Brazil. I also present a review on the published records of beak deformities in Brazil, based on a comprehensive literature search.

I used the bibliography identified in Google Scholar (https://scholar.google.com) to make a compilation on beak deformities cases in wild birds in Brazil, and other specific bibliographic sources not indexed as scientific journals of restricted circulation to Brazil and technical books. The literature search was performed using multiple combinations of the words in English and Portuguese: avian keratin disorder, beak abnormality, beak deformity, beak deformities, bill deformity, crossed beak, elongated beak, bird, wild bird and Brazil.

On the afternoon of 11 October 2016, I briefly sighted a female *M. bonariensis* with a heavily deformed beak on the campus of Mato Grosso State University (14°41'25''S; 52°20'55''W), located within the Bacaba Municipal Park in Nova Xavantina, Mato Grosso state, Brazil. I sighted the female again at the same site on

the following day, at around 15:00 h, local time. This individual was part of a flock of five *M. bonariensis*. On this occasion, I could confirm that the bird had a grossly elongated maxilla (Fig. 1). In addition to being elongated (approximately three times longer than the normal length of the beak), the maxilla was quite curved downward, and had some wear at the extremity. I also observed a contrast in the coloration of the beak, which was greyish black (the standard color) at the base and brown in the elongated portion of the rhinotheca. Despite this deformity, the bird appeared to be healthy, with well-groomed plumage, and similar in size to other adult females. During the short period that I was able to monitor the bird (~4 min), it captured food in a distinct manner in comparison with the other members of the flock. I observed the bird tilting its head to one right side and using the base of its beak to catch insects (apparently ants) in the grass, while the other members foraged normally. Individual adaptations in feeding behavior have been observed in birds of other species with deformed beaks (Pomeroy 1962, Van Hemert *et al.* 2012).

I found 60 recorded cases of beak deformities in wild birds for Brazil from 11 publications (Table 1). Deformities were recorded in 35 bird species, belonging to 22 families, of which 11 families were Passeriformes. Ramphastidae and Thraupidae had the highest number of species with deformities, with 4 each, followed by Thamnophilidae, with 3. The species with the most records were the Toco Toucan *Ramphastos toco* (n = 21) and the Picazuro Pigeon *Patagioenas picazuro* (n = 3). With the

Table 1. Cases of beak deformities in wild birds registered in Brazil.

Taxon	Type of deformity	Municipality-state	Date	Source
Sulidae				
Sula dactylatra	Curved beak	Mostardas-RS	28 February 2006	Franz *et al.* 2008
Sula leucogaster	Unspecified	Paraná state	1995	Straube 1996
Ardeidae				
Ardea alba	Shortening of beak - accidental	Araxá-MG	16 March 2013	Souza *et al.* 2016
Cathartidae				
Coragyps atratus	Short and deformed upper mandible; lower mandible with fractured extremity - accidental	Colinas do Tocantins-TO	27 December 2010	Souza *et al.* 2016
Rallidae				
Aramides saracura	Crossed upper mandible	Palmeira das Missões-RS	13 May 2016	Santos *et al.* 2018
Columbidae				
Patagioenas picazuro	Upper mandible crossed	Luz-MG	May–June 2012	Vitorino & Souza 2013
	Upper mandible strongly twisted to the left	Campinas-SP	09 August 2011	Sazima *et al.* 2016
	Upper mandible strongly twisted to the left	Campinas-SP	28 April/03 May 2015	Sazima *et al.* 2016
Trochilidae				
Clytolaema rubricauda	Atrophy of upper mandible	Quatro Barras-PR	28 May 1987	Straube 1996
	Lower mandible distinctly curved to the left	Rio de Janeiro-RJ	23–24 April 2015	Sazima *et al.* 2016
Amazilia versicolor	Atrophy of lower mandible	Morretes-PR	16 November 1986	Straube 1996
Galbulidae				
Galbula ruficauda	Crossed upper and lower mandible	Itiquira-MT	13 February 2013	Souza *et al.* 2016
	Crossed upper and lower mandible	Goiânia-GO	03 October 2015	Souza *et al.* 2016
Ramphastidae				
Ramphastos toco	Malformation at the extremity of the upper mandible	Brasília-DF	08 September 2007	Souza *et al.* 2016

Taxon	Type of deformity	Municipality-state	Date	Source
	Crossed upper and lower mandible	Batayporã-MS	26 July 2009	Souza *et al*. 2016
	Absence of the upper mandible tip - accidental	Corumbá-MS	05 September 2009	Souza *et al*. 2016
	Upper mandible crossed	Poços de Caldas-MG	06 November 2009	Souza *et al*. 2016
	Fissure at the tip of the upper mandible - accidental	Caetanópolis-MG	07 January 2010	Souza *et al*. 2016
	Absence of the lower mandible tip - accidental	Goiânia-GO	01 April 2010	Souza *et al*. 2016
	Upper mandible crossed	Uberaba-MG	04 June 2010	Souza *et al*. 2016
	Absence of the upper mandible tip - accidental	Peruíbe-SP	30 April 2011	Souza *et al*. 2016
	Absence of the lower mandible tip - accidental	São Roque de Minas-MG	10 June 2011	Souza *et al*. 2016
	Lower mandible elongated; absence of the upper mandible tip	Araxá-MG	06 April 2012	Souza *et al*. 2016
	Upper mandible crossed	Joanópolis-SP	30 April 2013	Souza *et al*. 2016
	Absence of approximately half of the upper mandible - accidental	Bonito-MS	12 December 2013	Souza *et al*. 2016
	Part of deformed upper mandible - accidental	Mundo Novo-MS	24 March 2014	Souza *et al*. (2016)
	Part of deformed upper mandible - seems to burnt	Três Corações-MG	28 June 2014	Souza *et al*. 2016
	Absence of the upper mandible tip - accidental	Mineiros-GO	30 December 2014	Souza *et al*. 2016
	Absence of approximately half of the lower mandible - accidental	Araçatuba-SP	17 February 2015	Souza *et al*. 2016
	Absence of the upper mandible tip - accidental	Campo Grande-MS	02 May 2015	Souza *et al*. 2016
	Absence of the upper mandible tip - accidental	Niquelândia-GO	04 July 2015	Souza *et al*. 2016
	Perforation of the upper mandible - accidental	Natalândia-MG	30 December 2015	Souza *et al*. 2016
	Malformation at the extremity of the upper mandible	Araçoiaba da Serra-SP	08 February 2016	Souza *et al*. 2016
	Malformation at the extremity of the upper mandible	Campo Belo-MG	13 March 2013	Rezende 2013
Ramphastos tucanus	Absence of the upper mandible tip - accidental	Comodoro-MT	06 November 2011	Souza *et al*. (2016)
Ramphastos dicolorus	Absence of the lower mandible tip - accidental	Mairinque-SP	25 May 2016	Souza *et al*. 2016
Pteroglossus aracari	Upper mandible crossed	Porciúncula-RJ	21 June 2013	Souza *et al*. 2016
Picidae				
Melanerpes candidus	Upper mandible elongated; absence of the upper mandible tip	Sacramento-MG	31 May 2014	Souza *et al*. 2016

Taxon	Type of deformity	Municipality-state	Date	Source
Falconidae				
Falco femoralis	Upper mandible elongated; crossed lower mandible	Goiânia-GO	25 August 2013	Souza *et al*. 2016
Psittacidae				
Thectocercus acuticaudatus	Mandible vestigial	Canudos-BA	06 April 2016	Souza *et al*. 2016
Myiopsitta monachus	Upper mandible elongated	São Roque-SP	23 May 2011	Souza *et al*. 2016
	Upper mandible elongated	Poconé-MT	07 June 2011	Souza *et al*. 2016
Thamnophilidae				
Thamnophilus torquatus	Upper mandible crossed	Santo Antônio do Monte-MG	26 May 2012	Souza *et al*. 2016
Pyriglena leucoptera	Upper mandible crossed	São Miguel Arcanjo-SP	18 March 2011	Gallo-Ortiz 2011
Percnostola rufifrons	Lower mandible elongated	Curuá-PA	22 February 2012	Souza *et al*. 2016
Furnariidae				
Furnarius rufus	Upper mandible strongly twisted to the right	Campinas-SP	08 July 2010	Sazima *et al*. 2016
Pipridae				
Ilicura militaris	Upper mandible crossed	Nova Lima-MG	15 October 2015	Souza *et al*. 2016
Tityridae				
Pachyramphus polychopterus	Beak more short and curved to the side	Bocaiúva-MG	24 November 1998	Vasconcelos & Rodrigues 2006
Corvidae				
Cyanocorax cristatellus	Upper mandible crossed	Alto Paraíso de Goiás-GO	24 November 2012	Darosci 2017
Troglodytidae				
Cyphorhinus arada	Extremity of beak side-facing	Unspecified	Unspecified	Sick 1997
Turdidae				
Turdus leucomelas	Unspecified	Bocaiúva-MG	Unspecified	Vasconcelos & Rodrigues 2006
Turdus rufiventris	Upper mandible elongated	São Paulo-SP	14 September 2013	Souza *et al*. 2016
Mimidae				
Mimus saturninus	Lower mandible deflected to left side	Engenheiro Coelho-SP	15 June 2011	Souza *et al*. 2016
Icteridae				
Cacicus haemorrhous	Crossed upper and lower mandible	Aracruz-ES	31 August 2013	Souza *et al*. 2016
Chrysomus ruficapillus	Upper mandible crossed	Santo Antônio do Monte-MG	23 February 2014	Souza *et al*. 2016
Thraupidae				
Tangara sayaca	Upper mandible elongated	Piraju-SP	17 July 2010	Souza *et al*. 2016
Tangara palmarum	Fissure of the lower mandible	Porto Velho-RO	03 October 2012	Souza *et al*. 2016
Tangara ornata	Upper mandible crossed	Ubatuba-SP	16 December 2010	Souza *et al*. 2016
Sporophila nigricollis	Fissure in rhinotheca	Conceição do Mato Dentro-MG	24 November 2013	Souza *et al*. 2016
Fringillidae				
Euphonia violacea	Upper mandible elongated	Ubatuba-SP	02 May 2016	Souza *et al*. 2016

exception of a chick Brown Booby *Sula leucogaster* and a juvenile Masked Booby *Sula dactylatra*, all birds affected by deformities were adults.

Based on the published photographs and the case descriptions, I was able to determine that 38% of the cases of beak deformity involved crossed beaks, due to some type of deviation of the maxilla or mandible. A further 27% of the cases appeared to be the result of accidental injuries. This type of deformity was found primarily in three species of toucans, which can be explained by the large size of the beak of these species. First, in theory, the large beak of toucans probably becomes more vulnerable to accidental fractures. Second, a large, colorful beak provides more visual conspicuity, which facilitates field registration in relation to the other bird species. Birds with elongated beaks corresponded to 15% of the records. Altogether, other types of deformity contributed with 17% of the records, while the deformity was not described specifically in the cases of Brown Booby *S. leucogaster* and Pale-breasted Thrush *Turdus leucomelas* (Table 1).

Despite the large number of icterid species found in Brazil, beak deformities have been recorded in only three taxa, including the present case. Recently, a case of crossed beak was recorded for *M. bonariensis* in Argentina (Bianchini & Arenas 2018). I evaluated the photographic record of this case and observed that, in addition to the crossed beak, at least the upper mandible was also elongated. Apparently, this record and that of the present study are the only two records of beak deformity in *M. bonariensis*. In both cases, the elongation of the upper mandible and the difference in color of the elongated part of the beak is notable. Considering only the two isolated cases, the similarities found do not reveal much at the moment, but can serve as a basis for possible future observations.

As in most of cases recorded in Brazil, it was not possible to monitor the specimen over a long period to determine whether the deformity was permanent or temporary, nor to collect it for analysis. At first, it seems unlikely that this case of beak elongation, or any of the others recorded in Brazil, has an etiological origin similar to the alarming cases of beak deformity recorded in Alaska (Handel *et al.* 2010, Van Hemert & Handel 2010). In fact, the number of published reports from Brazil were low overall, and the events did not appear to be related to epizootic outbreaks. However, beak deformities are more common than suggested by the literature, given that not all cases are reported in scientific publications (Vasconcelos & Rodrigues 2006). Moreover, without systematized research efforts on the subject this issue cannot be elucidated. Laboratory analyses, the long-term monitoring of affected individuals, even in a small number of cases, and formal publication of records may help to better clarify the causes and consequence of beak deformities in birds. These approaches will contribute to the detection of possible threats to the wild bird fauna.

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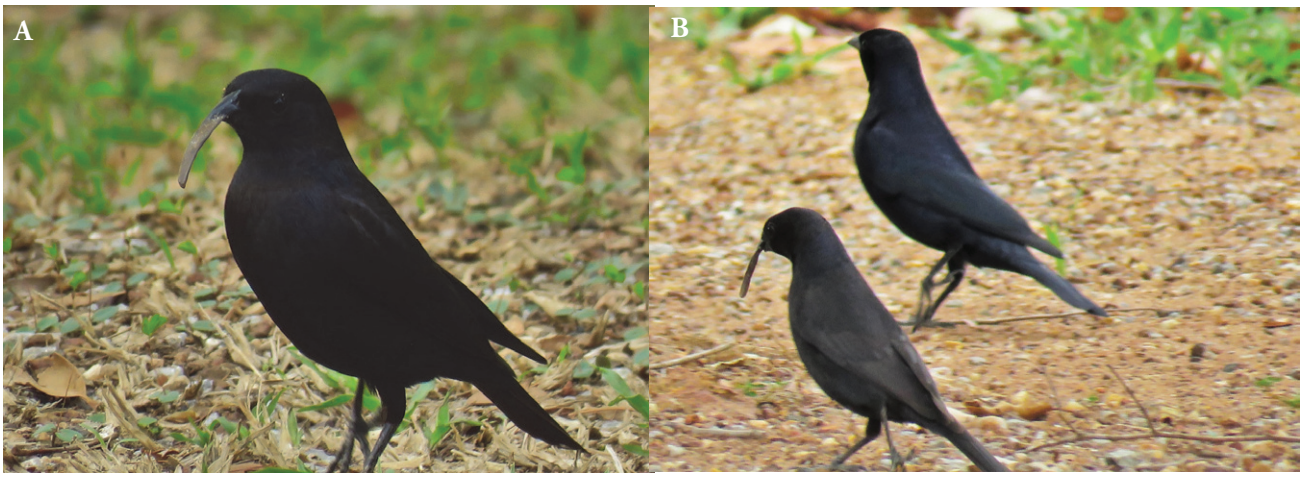

Figure 1. Female Shiny Cowbird *Molothrus bonariensis* with beak elongated (**A**) and comparison with a male with normal beak (**B**) in Nova Xavantina, Mato Grosso state, Brazil. Photo author: K.N. Purificação.

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