

First documented case of combined bill and tarsus
deformities in the Rufous-bellied Thrush *Turdus rufiventris*
Vieillot, 1818 (Passeriformes: Turdidae)

Primeiro caso documentado de deformidades combinadas no
bico e no tarso em sabiá-laranjeira *Turdus rufiventris*
Vieillot, 1818 (Passeriformes: Turdidae)

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Abstract: Morphological deformities in birds are rare and may reflect genetic, nutritional, or environmental factors. We report an adult *Turdus rufiventris* Vieillot, 1818, captured in an urban area of Central Brazil, exhibiting simultaneous abnormalities in the bill and tarsus. The mandible was excessively elongated, curved, and deviated laterally; the scales on both tarsi were prominent, and two toes on the left foot had duplicate nails. Despite these deformities, the individual displayed an active reproductive condition, body mass within the expected range, and signs of normal feeding, indicating good physiological condition and functional compensation ability. This record represents the first formal report of such a combination of deformities in *T. rufiventris* in Brazil and contributes to the understanding of the diversity of morphological anomalies in Neotropical birds, emphasizing the importance of continuous monitoring of wild populations, particularly in urban contexts.

Keywords: Beak abnormality. Neotropical birds. Bill deformity. Avian keratin disorder. Ranfoteca. Tarsus.

Resumo: Deformidades morfológicas em aves são raras e podem refletir fatores genéticos, nutricionais ou ambientais. Relatamos o caso de um adulto de *Turdus rufiventris* Vieillot, 1818, capturado em área urbana do Centro-Oeste brasileiro, apresentando anomalias simultâneas no bico e no tarso. A mandíbula era excessivamente alongada, curva e desviada lateralmente, as escamas de ambos os tarsos eram proeminentes e dois dedos do pé esquerdo apresentavam duplicação da unha. Apesar dessas deformidades, o indivíduo era reprodutivamente ativo, apresentava massa corporal dentro da faixa esperada e demonstrava sinais de alimentação normal, indicando boas condições fisiológicas e capacidade de compensação funcional. Este registro representa o primeiro relato formal de tal combinação de deformidades em *T. rufiventris* no Brasil e contribui para a compreensão da diversidade de anomalias morfológicas em aves neotropicais, enfatizando a importância do monitoramento contínuo de populações silvestres, particularmente em contextos urbanos.

Palavras-chave: Anomalia do bico. Aves neotropicais. Deformidade do bico. Distúrbio da queratina em aves. Ranfoteca. Tarso.

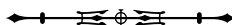
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INTRODUCTION

Morphological anomalies, such as deformities of the bill and tarsus, have been reported in several bird species and may have multiple origins, including genetic causes, trauma (e.g., collisions with windows), infections, nutritional deficiencies, and environmental contamination (e.g., exposure to agrochemicals; Craves, 1994; Gartrell et al., 2003; Pomeroy, 1962; Santos et al., 2018; Smith et al., 2019; Souza et al., 2016; Tangredi, 2007). Such deformities can affect behavior, foraging efficiency, reproductive success, and even individual survival (Geuster & Favretto, 2021; Møller, 1997).

Most reported cases are sporadic and occur in isolation, both in relation to the anomalies themselves and to the individuals that exhibit them (Craves, 1994; Pomeroy, 1962). Among the most frequently observed anomalies are bill deformities, which have been documented in several regions of the world and across multiple avian families, including Tityridae, Columbidae, Icteridae, Picidae, Turdidae, Thraupidae, Sturnidae, Corvidae, Falconidae, Throchilidae and Strigidae (Andriola et al., 2018; Geuster & Favretto, 2021; Gorosito et al., 2016; Handel et al., 2010; Handel & Van Hemert, 2014; Moura et al., 2020, 2022, 2023; Ortúzar-Ferreira et al., 2024; Purificação, 2019; Salisbury & Salisbury, 2016; Santos et al., 2018; Shahir et al., 2023; Straube, 1996).

In Brazil, formal records of morphological deformities remain scarce, with only one study compiling the known cases for the country, totaling 60 records across 35 species and 22 families (Purificação, 2019). However, these numbers are likely underestimated and currently outdated, as additional cases have been reported since that review, including records in *Melanerpes candidus* (Otto, 1796) and *Milvago chimachima* (Viellot, 1816) (Moura et al., 2020, 2023). Thus, each record, even isolated ones, is relevant for understanding population-level variation, potential environmental factors, and the possible effects of pollutants or pathogens associated

with such anomalies (Bassir & Adekunle, 1970; Galligan & Kleindorfer, 2009; Zylberberg et al., 2016). In this study, we report an adult *Turdus rufiventris* Vieillot, 1818, captured and banded in an urban area of Cuiabá, Mato Grosso (MT), Central Brazil, exhibiting simultaneous deformities in the bill and tarsus.

METHODS

The capture of the individual was conducted under *Sistema de Autorização e Informação em Biodiversidade* (SISBIO) permit no. 100367-1 and *Centro Nacional de Pesquisa e Conservação de Aves Silvestres* (CEMAVE) permit no. 5086, at a bird banding and monitoring station established along a power transmission line located in the urban area of Cuiabá (-15° 38' 57.17" S, -55° 59' 44.67" W; Figure 1). The vegetation in the area is highly altered, dominated by exotic grasses and surrounded by scattered tree individuals characteristic of the Semideciduous Seasonal Forest of the Cerrado biome (Figure 2). According to the Köppen climate classification, Cuiabá has a tropical savanna climate (Aw), with two well-defined seasons, a dry season from May to September and a rainy season from October to April, with daily maximum temperatures ranging from 30 °C to 36 °C and an annual mean precipitation of approximately 1,350 mm (De Paula et al., 2021; Santos, 2013; Soria et al., 2024). During field activities, five mist nets (12 m × 3 m, 16 mm mesh) are operated by two trained banders. Captured birds are handled following best banding practices and the guidelines of the CEMAVE. Each individual is fitted with a standard CEMAVE metal band, and biological and ecological data are recorded, including age and molt stage classified following the Wolf-Ryder-Pyle (WRP) system (Pyle et al., 2022), body mass measured, and reproductive condition evaluated based on the criteria proposed by DeSante et al. (2021), and body condition assessed through subcutaneous fat scoring and pectoral muscle inspection following Lugarini et al. (2020).

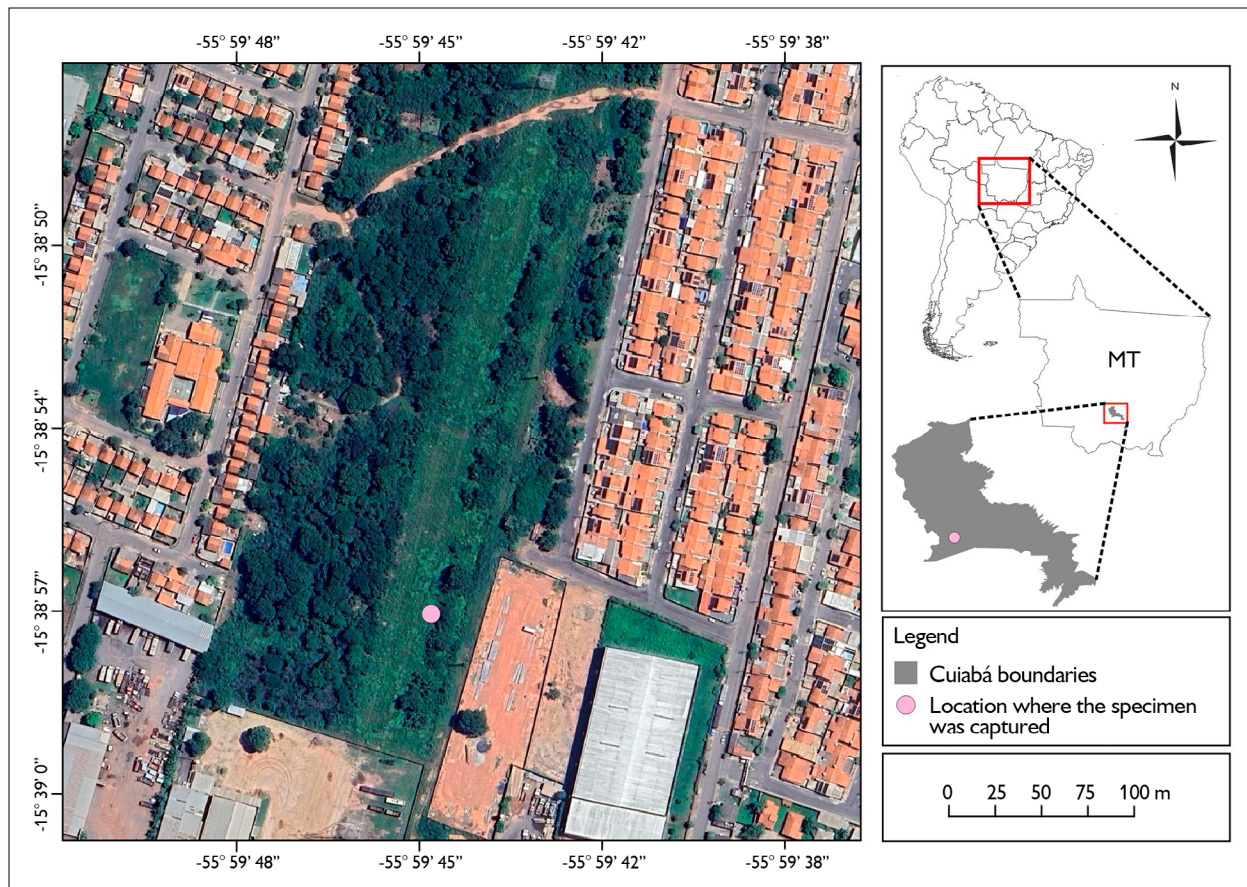


Figure 1. Location map of the specimen capture site. Image source: Google Satellite. Geodetic Datum: SIRGAS 2000. Map: Gabriel M. Tavares (2026).



Figure 2. Habitat overview showing the vegetation structure at the location where the specimen was captured. Photo: Nathália Victória (2025).

RESULTS

On the morning of 19 October 2025, an adult individual of *Turdus rufiventris* exhibiting deformities in the beak and tarsus was captured and banded (H82967; Figures 3A, 3B). The beak deformity was located in the gnathotheca (lower mandible), which showed excessive growth, pronounced upward curvature, and deviation toward the right side, preventing proper anatomical alignment (Figure 4A). In contrast, the rhinotheca (upper maxilla) appeared to be within the normal size and shape range for the species (Figure 4B). On the tarsus, the scales were prominent (Figures 4C, 4D), and two digits of the left tarsus displayed duplicated claws (Figure 4D). Despite these morphological anomalies, the body mass (73 g) and the observation of

feces containing fruit remnants during handling indicate that the bird was in good physical condition and feeding normally, even with the beak deformity. The individual presented a fat score of 1, characterized by a thin layer of fat restricted to the base of the furcular cavity, with no excessive fat deposition in the abdomen or axillary regions, and the pectoral musculature was symmetrical, with no evidence of atrophy. Additionally, the individual presented Definitive Basic Plumage (DCB) age (Figures 5A, 5B), was in the reproductive period, as evidenced by a cloacal protuberance score 3, defined as a fully developed structure at maximum enlargement, easily detectable and markedly projected from the abdominal region, and showed no evidence of molt.

DISCUSSION

The record of a *Turdus rufiventris* individual exhibiting simultaneous deformities in both the beak and tarsus represents an unusual occurrence for the species and, to our knowledge, constitutes the first formal report of this nature in Brazil. Although morphological deformities in birds are occasionally documented, cases involving multiple structures are rare and may reflect distinct etiological processes (Handel & Van Hemert, 2014;

Van Hemert et al., 2012). In Neotropical Passeriformes, beak anomalies have been observed across several families and species, yet their occurrence is uncommon, affecting fewer than 0.5% of individuals (Pomeroy, 1962; Souza et al., 2016). Previous records in congeners, such as *T. falcklandii*, report isolated beak alterations (Gorosito et al., 2016), further underscoring the uniqueness of the finding presented here.

The origin of these deformities remains uncertain and may be associated with multiple factors, including physical trauma during development, bacterial or viral infections, genetic disorders, nutritional deficiencies, or exposure to environmental contaminants such as heavy metals and pesticides (Handel & Van Hemert, 2014; Van Hemert et al., 2012; Zylberberg et al., 2016). Although it is not possible to determine the exact cause of the anomaly in the individual in question, the simultaneous occurrence of deformities in both the beak and tarsus suggests a potential ontogenetic origin, possibly related to genetic abnormalities or nutritional deficiencies during growth. However, given that the record was obtained in an urban environment, the influence of anthropogenic factors, such as pollutants or collisions with artificial structures, cannot be ruled out as contributing to the observed deformities.

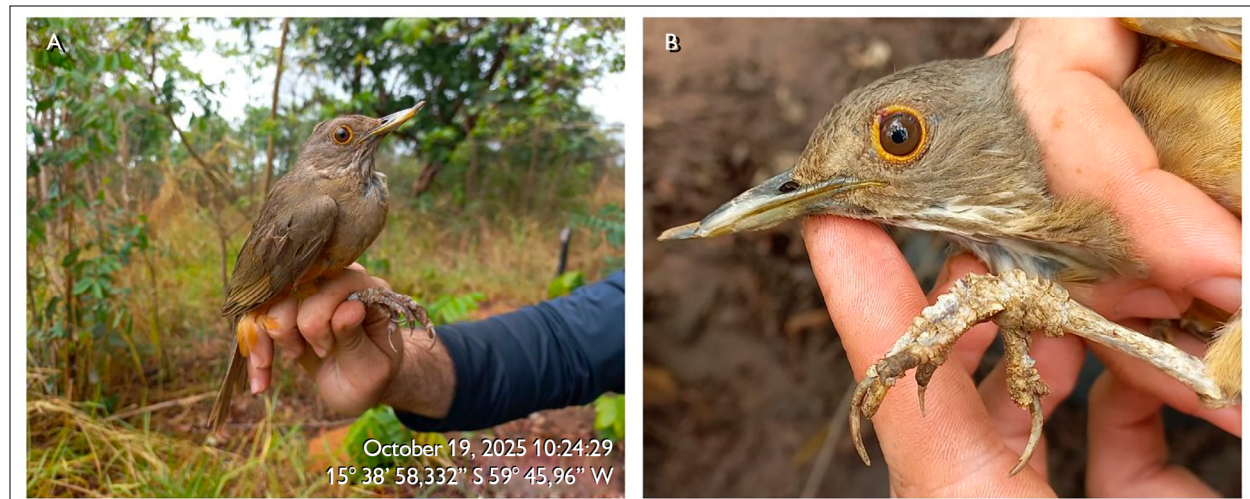


Figure 3. Morphological deformities observed in the specimen: A) general view of the specimen; B) detail of the malformations. Photos: Nathália Victória (2025).



Figure 4. Morphological anomalies observed in the specimen. (A, B) Mandibular deformity characterized by a pronounced upward curvature and right-side deviation, illustrated in vertical (A) and lateral (B) views. Note the normal maxillary anatomy in (B) for contrast. (C) Prominent scale morphology. (D) Autopodial anomaly presenting as duplicated claws on two digits of the left tarsus. Photos: Nathália Victória (2025).



Figure 5. Application of the WRP global age coding system, identifying the DCB age class: A) remiges; B) rectrices. Photos: Nathália Victória (2025).

Despite the observed alterations, the individual exhibited good physiological condition, as indicated by age, a reproductive-condition cloaca, and feces released during handling containing food remnants, suggesting functional compensation. Moreover, its body mass (73 g) exceeded the reported species mean (69.4 g; Tobias et al., 2022), further supporting that the individual was not underweight. Similar reports in other species indicate that birds with deformities can survive and reproduce, albeit potentially with reduced foraging efficiency or reproductive success (Purificação, 2019; Shahir et al., 2023; Souza et al., 2016).

CONCLUSION

Isolated records such as this are important for documenting the frequency and diversity of morphological anomalies in Neotropical birds, particularly in common and widely distributed species. Moreover, the accumulation of such observations, even when based on a small number of cases, can help detect geographic or temporal patterns. In addition, long-term monitoring of affected individuals may provide insights into the effects of environmental and anthropogenic factors on the morphological integrity of populations. Such approaches contribute to, and may facilitate, the early detection of potential threats to wild bird fauna.

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AUTHORS' CONTRIBUTION

N. Victória contributed to project administration, research, data acquisition, data curation, and writing (original draft, review and editing); and G. M. Tavares contributed to conceptualization, research, data acquisition, data curation and writing (review and editing).