

Gubernetes yetapa breeding in southern Brazil

**BREEDING ASPECTS OF *GUBERNETES YETAPA* (AVES,
TYRANNIDAE) IN RIO GRANDE DO SUL STATE, BRAZIL**

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Abstract: The Streamer-tailed Tyrant (*Gubernetes yetapa*) is an exclusively neotropical bird, associated with wetlands and widely distributed in Brazil. This study aimed to fill gaps in knowledge about this species, especially regarding its reproductive biology. We monitor a population of *G. yetapa* with the aim of describing its reproductive behavior, nest characteristics, and territory use in a wetland in the state of Rio Grande do Sul. Our findings revealed that this wetland serves as an important breeding site, where the total home range of the species was 28.2 ha, significantly reduced to 3.37 ha during the breeding season. The nest described here contained three eggs, two of which hatched successfully. After leaving the nest, the young birds foraged independently before joining mixed flocks with other species of birds. This study sheds light on the breeding ecology of the species and highlights the importance of wetlands for its conservation.

Keywords: nest helper; breeding behavior; Fluvicolinae; natural history; Streamer-tailed Tyrant.

The Streamer-tailed Tyrant (*Gubernetes yetapa*) is an exclusively neotropical bird that is a monotypic member of the family Tyrannidae, subfamily Fluvicolinae. It inhabits predominantly wet grasslands and marshy terrain near streams, always with some shrubs nearby (Farnsworth & Langham 2020), and uses wetlands vegetation for breeding (Heming *et al.* 2016). Its distribution encompasses Brazil, Paraguay, Argentina, Uruguay, with an isolated population in northwestern Bolivia (Sick 1997, Sadi & Rabau 2009, IUCN 2016, Farnsworth & Langham 2020). Although the species is globally classified as 'Least Concern' (IUCN, 2016), it is considered 'Near Threatened' (NT) in the state of Rio Grande do Sul, Brazil (Rio Grande do Sul 2014) and 'Endangered' (EN) in Argentina (Aves Argentinas 2017). The natural history of the species is poorly known, and aspects of its reproductive biology have only recently been reported. Heming *et al.* (2016) addressed information about nest and eggs in Brazil and Paraguay, while Studer & Crozariol (2021) described nests and some aspects of breeding behavior in Minas Gerais state. Here we aimed to describe, for the first time, some breeding aspects of *G. yetapa* in Rio Grande do Sul state, such as an estimation of home range and breeding territory, the description of nestlings' development, notes on parental care, and the presence of a nest helper.

This study was carried out in a wetland of 7.4 ha in the *campus* of the Universidade Federal de Santa Maria (27°55'31.73"S; 53°19'10.48"W), Palmeira das Missões, Rio Grande do Sul state. The wetland is bordered by two distinct formations: on one side a field area undergoing a natural regeneration process, dominated by Poaceae (Da Silva *et al.* 2013), *Eryngium* sp. (Apiaceae), and *Baccharis* sp. (Asteraceae), and on the other side, there are agricultural matrices and a corridor of riparian forest that separates them. The municipality is situated in an ecotone between the Atlantic Forest and Pampa biomes (Hasenack *et al.* 2010, IBGE 2019). The predominant vegetation was grassland. However, these natural areas have been converted to agricultural land, threatening the remaining native vegetation (Da Silva *et al.* 2013). The wetlands of this region are rich in organic matter, and easily drained or irrigated by gravity, due to the unevenness of the plateau streams (Soares 2004). According to the Köppen classification, the municipality has a climate classified

as CFA (humid temperate with hot summers). The annual average temperature varies between 16°C and 18°C, and the average annual precipitation can reach 2,500 mm (Alvares *et al.* 2013).

The search for nests took place in the first week of November (2017 and 2018). Behavior observations were made at a distance of approximately 20 meters from the wetland, where the terrain is higher, allowing better visualization of the individuals. We used *Ad libitum* method to describe individual behaviors (Altmann 1974). Records were made on a field form that included date, weather conditions (cloud cover and rainfall), biological cycle (breeding and non-breeding), behavior, and duration. To locate nests, we looked for evidence of adult breeding behavior (Marini *et al.* 2010) by observing all the activities of the pair, and when they flew to the ground and returned to the same perch, we checked for the presence of a nest in the vegetation. During the nest monitoring, we used cameras placed one meter from the nest to take photos and videos to describe the activities and development of the nestlings.

We classified the nest according to Simon and Pacheco (2005) and monitored it in the morning every three to four days (Marini *et al.* 2010). We measured the nest (total length and height, height from the ground, depth, smaller diameter, and larger diameter) using a tape measure and a digital caliper.

To estimate the areas occupied by individuals, we used the polygon method (Odum & Kuenzler 1955, adapted by Ribeiro *et al.* 2002), using QGIS 3.12 program. The minimum convex polygon was formed by joining all the outermost points where we recorded the individuals.

We observed three individuals of *G. yetapa* (two adults and one subadult) using a restricted portion of the wetland in late October. In this area, at least one of these three individuals was on alert, while the others remained inconspicuous in the vegetation. The third individual (hereafter helper) could be identified and distinguished by its juvenile plumage. A month earlier, this individual had a drastically short tail, which distinguished it from the others and allowed observers to identify it.

The total home range of the population sampled in this study was estimated in 28.2 ha during the non-breeding period. On the other hand, in the breeding period, the area was reduced

to 3.37 ha (95.03% reduction) and it was exclusively within the wetland. A behavior observed only during the breeding period was territory monitoring or vigilance. In this behavior, adult individuals (solitary or not) flew the entire length of the breeding territory, tilting their heads toward the ground and emitting alarm calls.

After observing these differences in individual behavior, we followed the couple of *G. yetapa*, and on 2nd November 2018, we found a nest containing three completely white and slightly oval eggs. Furthermore, snakeskin and plastic were found in the nest with the eggs. The nest was low cup-shaped, with an overall height of 6.67 cm, an external diameter of 15.51 cm, and a depth of 6.7 cm (Figure 1). It was attached to the side of the supporting plant (*Saccharum* sp.) and was 104 cm above the ground. We observed it every three to four days in the morning. We observed the eggs for 12 days, until two hatched. The third egg/nestling disappeared, and we found no evidence of hatching or predation.

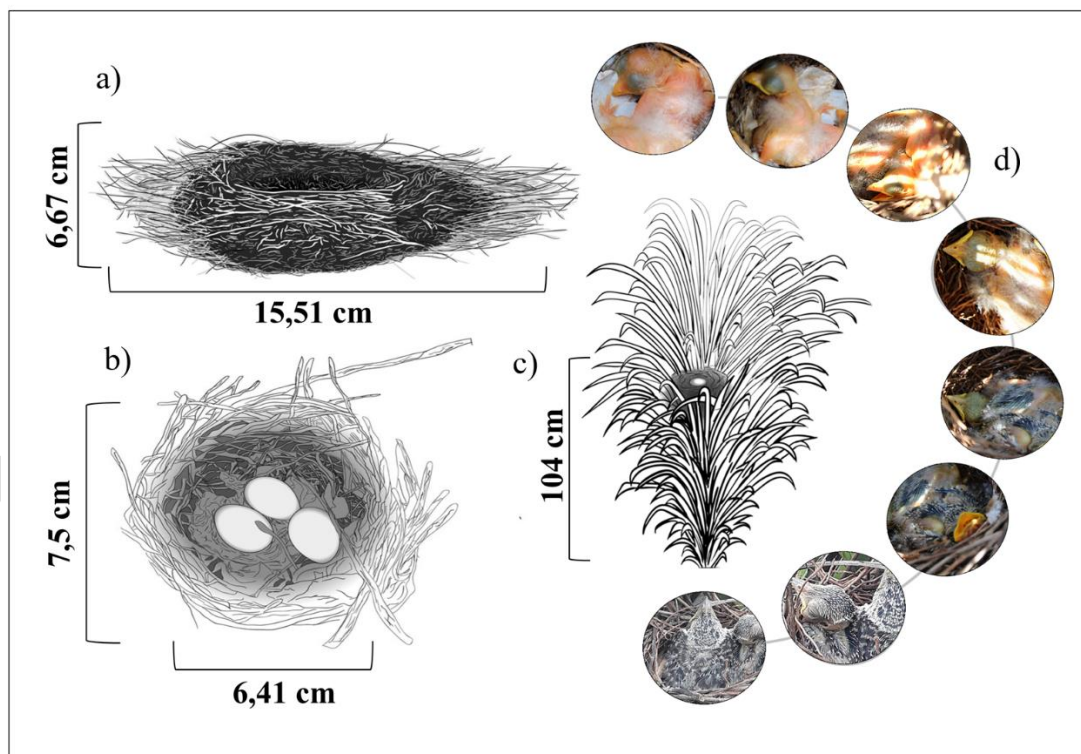


Figure 1. Measurements of the nest of *G. yetapa* and the development of the nestlings (D). A) Schematic illustration of the nest inside view showing total length and height. B) Top view of the nest emphasizing the smaller and larger diameters of the incubation chamber. C) Side view of the nest attached to *Saccharum* sp., showing the height of the nest in relation to the ground. Illustrations: Pedro Amaral.

The hatchlings were born on different days, indicating asynchronous incubation (different stages of development). At birth, the nestlings were practically naked, except for the white downy feathers on their necks, wings, and backs. The eyes were closed; the skin was orange, except for the blackened orbital areas. The beak, inside of the mouth, and tongue were orange, while the commissure was yellowish; the tarsus, fingers, and nails were also orange. After a day or two of life, the beak, tarsus, and nails became yellowish, and the beak commissure was much more visible and completely yellow. At four to five days of age, the eyes remained closed, and the first remiges sheaths appeared. At six to seven days of age, the fledglings opened their eyes to reveal a dark brown iris. Except for the tail and lower coverts, the body was covered with feathers with bluish-gray sheaths. The nestlings barely moved and made no sounds when the observer approached. After ten days, the birds filled 90% of the nest and held their heads high on the edge of the nest. The beak had changed color from orange to dark gray, and the fully covered body had more pronounced dark gray feathers on the back. Finally, after 13 days of observation, the chicks were not found in or around the nest. The adults became quieter and did not indicate their position in the wetland.

Six days after the chicks were not found in the nest, one juvenile was seen in the vegetation receiving food from their parents and the nest helper. This individual had the same feather coloration as the adult, but lighter colored plumage and a light brown collar with no visible tail. When the two adults and the helper approached the chicks, they emitted calls and the two chicks emerged from the vegetation to receive food.

In the last days of December, chicks were observed foraging alone, away from the adults. The individuals began to leave the wetland and join mixed flocks in search of food. The flocks consisted mainly of birds strongly associated with wetlands, such as *Pseudoleistes guirahuro* (Vieillot 1819) and *Xanthopsar flavus* (Gmelin 1788).

Three individuals (two adults and one subadult) were observed taking care of the nest and feeding the nestlings. The three individuals fed the fledglings, with the pair always remaining close and the helper exhibiting independent behavior and moving farther away. In addition to

actively helping to care for the offspring, the individual defended itself from predators by joining the pair in vocalizations and flapping its wings to chase away species that approached the nest.

The nest of *G. yetapa* described in this study agrees with Heming *et al.* (2016) and Studer & Crozariol (2021), and the similarities between these studies considering the plant support and the use of snakeskin, suggest some preferences of the species in material selection. Considering these strategies used by the species, the presence of snakeskin may be acquired by tyrant flycatchers to prevent predation (Medlin & Risch 2006, Liu & Liang 2021). On the other hand, interlacing the nest in several vertical structures may be a solution to prevent the nest from slipping (Hansell 2000), which is important considering that the nests are built in wetlands. The incubation and nestling periods of *G. yetapa* are similar to those of other flycatchers (Lopes & Marini 2005, Medeiros & Marini 2007, Marini *et al.* 2009a, 2009b).

The permanence of an offspring that remain with their parents until the next reproductive period, rather than dispersing in search of a new living area, may be a strategy to increase juvenile survival (Martin 1993). The helpers increase the defense against predators (Silva-Júnior & Melo 2009) and may prevent nest parasitism (Feeney *et al.* 2013). In addition, because the helper performs the same behaviors as the parents (e.g., feeding the nestlings), this strategy may also increase the nestling's growth rate and/or reduce the time spent in the nest, thereby avoiding the risk of starvation (Emlen & Wrege 1991, Skutch 1999). Because wetlands of Rio Grande do Sul are historically degraded habitats (Burguer 2000), the presence of helpers may suggest a strategy to maximize fitness under poor conditions (Jetz & Rubenstein 2011).

Our study highlights the importance of wetlands, which are crucial for the reproduction of *G. yetapa*. These habitats have been historically neglected and negatively affected by human activities in Brazil (Junk 2013). Moreover, in Rio Grande do Sul, the state where this research was carried out, agriculture is considered one of the main factors damaging wetlands (Burguer 2000, Carvalho & Ozório 2007). Thus, considering the threatened status of *G. yetapa* in this state (NT), we strongly recommend greater attention to the species not only in this region, but throughout its distribution.

Based on this first description on the breeding behavior of *G. yetapa* and nestlings in Rio Grande do Sul, we hope to contribute to further ecological studies with this species, in addition to contribute for the conservation of wetlands and *G. yetapa*, as well as other species inhabiting these environments.

ACKNOWLEDGMENTS

We thank Universidade de Passo Fundo Foundation (FUPF) for the scholarship. We also thank the Crestani Family whose who kindly gave us access to the property to carry out this research, and Professors Daniela Castiglioni and Elaine Lucas Gonsales (Universidade Federal de Santa Maria *campus* Palmeira das Missões) for lending us the field clothes.

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Submitted: 22 September 2023

Accepted: 20 January 2023

Published online: 16 February 2024

Associate Editor: Sara Miranda Almeida

Ahead of print